Figure 7.8: Proposed Restoration Project (extracted from planning drawings

Table 7.3: Summary of Soils and Geology Assessment

Receptor	Importance	The Impact	Nature of the Impact (Before Mitigation)	Description	Nature of the Impact (After Mitigation)
Lands	High	Loss of agricultural land as a resource	Small Adverse, Long-Term with Moderate Effects	The implementation of the proposed Restoration Plan, which will be completed on a phased basis during operation. This will ultimately reinstate the site to its existing land use as an agricultural resource.	Neutral, Long-term with Slight effects
Soils (Topsoils)	High	Topsoil stripping	Small Adverse, Short-Term with Slight Effects	Whilst topsoil is being stripped within the site, no topsoil will be removed from the site. As topsoil from a new phase is being stripped, it will be kept on-site for reuse in the restoration of previous phase (which will be occurring concurrently).	Neutral, short-term and Imperceptible.
Subsoils (sands & gravels)	Medium-High	Extraction of sand and gravels from the site	Moderate Adverse, Long-Term with Significant Effects	Whilst there will be a loss of sand & gravels from the site, there will be continued restoration of the site during the phased operation. Ultimately, the site will be reinstated to its existing land use as an agricultural resource. Processing of the sand and gravel aggregates will occur in local manufacturing and processing industries within the surrounding region.	Neutral, long-term with Moderate Effects

Receptor	Importance	The Impact	Nature of the Impact (Before Mitigation)	Description	Nature of the Impact (After Mitigation)
Soils & Subsoils	Medium-High	Encountering unexpected contaminated lands and Spillages / Contamination due to spills & leaks	Negligible Adverse, Short-Term, Imperceptible Effects And Small Adverse, Long-Term and Slight Effects	To prevent contamination, the EMP will be implemented on site. The EMP will include measures relating to the use and storage of oils and chemicals at the site. The refuelling of vehicles will be undertaken on a dedicated hardstanding area, draining to an oil interceptor. An Emergency Response Procedure including procedures for any chemical/oil/waste leaks at the facility is in place and all relevant personnel working at the site will be trained in its implementation. It is unlikely that already contaminated soils will be encountered on site. The EMP will set out a procedure to confirm that the any contaminated soils that may be encountered will be dealt with appropriately.	Neutral, with Imperceptible Effects
Soils & Subsoils (& surfacewater/groundwater bodies)	Medium-High	Soil erosion / Increased sedimentation	Small Adverse, Short-Term and Slight Effects	The site will be operated on a phased basis, only being stripped as necessary. As works in one phase are complete, soils from the next active phase, will be used to reinstate the previous phase. To prevent soil erosion, the EMP will be implemented on site. The EMP will include measures relating to the use, storage and management of soils & stockpiles on-site.	Neutral, Short-Term, Slight-Imperceptible

Receptor	Importance	The Impact	Nature of the Impact (Before Mitigation)	Description	Nature of the Impact (After Mitigation)
				During prolonged dry or windy periods, any areas with the potential to generate dust will be watered, in particular areas next to the site entrance.	

7.7 Residual Impacts

The implementation of mitigation measures and adherence to the EMP will minimise the potential for impacts on the soils and geology environment. On this basis, it was considered that there would be no significant residual impacts relevant to soils and geology as a result of the proposed Project.

Whilst there is a loss of the sand and gravel aggregate from within the site, there is a recognised need for the provision of aggregates on a national and local basis in Ireland. The appropriate removal of aggregates in adherence to the EMP and planning conditions, would result in minimal environmental impact and on this basis, the overall loss of aggregates from the environment was considered not significant.

7.8 References

Department of Communications, Climate Action and Environment, Geological Survey of Ireland, Public Data Viewer Series Website, retrieved November 2019, https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ebaf90ff2d554522b438ff313b0c197a&scale=0

Laois County Council (2017). Laois County Development Plan 2017-2023. https://laois.ie/departments/planning/development-plans/draft-laois-county-development-plan-2017-2023/, retrieved November 2019,

Teagasc Soil Maps, retrieved November 2019, http://gis.teagasc.ie/soils/map.php

8. Hydrology (Flood Risk Assessment), Water Quality & Hydrogeology

This Chapter assesses what impacts the proposed Project may have on surface water and groundwater at and within proximity to the site during the construction, operational and restoration phases.

The main impacts associated with the proposed Project include potential impacts on the surface water and groundwater systems that support the Stradbally River and the River Barrow and Nore Special Area of Conservation. There is also the potential for the proposed Project to result in pollution and sedimentation of surface water and groundwaters at the site and to impact surrounding domestic and group water supplies.

Sand and gravels will not be extracted from below the groundwater water table. Process water (wash water) will be generated by the washing and screening plant, used to process the extracted sand and gravels.

The water management system on-site will be based on a collection and conveyance system, that is focused on capturing and storing water within the site for use in the washing and screening plant. The collected water will also be used for dust suppression and in the wheel wash.

Four ponds lined with impermeable membrane will be constructed to the north of the site. Collected water will be retained within the site through a series of pipes, a water balance pond (Pond 1), sludge settlement ponds (Ponds 2&3) and a storm water attenuation/ sediment settlement pond (Pond 4).

The washing and screening plant for the sand and gravels, is highly efficient in terms of water usage and management. At least 80% of the process water will be recycled within the wash plant, through an integrated water treatment plant. The remaining 20% top-up process water will be provided by:

- Recycled recovered water from sludge settlement ponds;
- Recycled recovered water from the stockpiled sand and gravels;
- Surface water run-off from the storm water pond; and
- Groundwater abstraction from a water supply borehole, located close to the north western boundary.

There will be no discharge of process water (wash water) from the site. Process water will be collected and recovered back into the washing and screening plant. The site will discharge surface water run-off to a drain on the northern boundary, at an approved greenfield rate, in line with the existing conditions.

There will be no discharge of foul or grey water from sanitary facilities to the surface water or groundwater environment at the site. A portaloo will be provided on site, with a management contract via a licensed waste contractor. Bottled water will also be provided for use by site staff.

Groundwater supply is required as part of the site water requirements. The proposed abstraction will have no impacts on the quantity or level of water at surrounding group water and domestic water supplies. The zone of contribution (ZOC) relating to the abstraction on-site will not interact with these water supplies and there is no groundwater flow from the site to these water supplies. The ZOC is defined as the area of land contributing to the water supply borehole on-site.

Climate change has been allowed for in the following areas:

- <u>Estimating groundwater winter levels for the site</u>: An allowance of 10% of annual groundwater level variability across the site was made. This means that all extraction works will be undertaken 1m above the winter groundwater levels (plus an additional 10%);
- <u>Sizing of the storm water pond (Pond 4)</u>: A 20% increase in storm water attenuation volumes was added, to account for potential future increases in run-off from a flood event; and
- <u>Sizing of the storm water pond (Pond 4)</u>: The constant storage of 40 days of summer period surface water usage is provided for in the pond, in the event of a significant dry period.

With the implementation of mitigation measures, the impacts on surface water and groundwater quality such as from suspended solids or pollutants (ammonia, spilled oils, fuels and flocculants) were considered to have imperceptible effects. Mitigation measures include:

- There will be no discharge of process water to the water environment, with all process water being recycled back into the washing and screening activity;
- Isolation of the sludge settlement ponds (Ponds 2 & 3) and storm water pond (Pond 4). There is no connection between these ponds to avoid the risk of sludgey/silty water being discharged to the surface water environment;
- At least 80% of the process water will be managed within a closed tank system which is part of the washing and screening plant;
- In terms of groundwater, extraction works on the site will be to a depth that leaves 1m above the estimated highest winter groundwater level (plus the climate change allowance) across the extraction area;
- The washing and screening plant will be electrically powered;
- An Environmental Management Plan (EMP) will be implemented on-site. This Plan will incorporate measures relating to the management of fuels, storage of flocculants, requirements for visual checks and emergency response (amongst others).

Stradbally River & River Barrow and Nore Special Area of Conservation

The potential impacts on the Stradbally River which supports the River Barrow and Nore Special Area of Conservation (SAC) were considered.

Whilst proposed Project will use 70% of the collected surface water on-site, the remaining 30% will still reach the existing drain to the north of the site, at an appropriate greenfield rate, in line with existing conditions. This drain is intermittently connected to the Stradbally River at certain times during the year (mainly winter).

In addition, the volume of collected surface water which will be used on-site (the collected 70%) represents a very small proportion of the overall flow already in the Stradbally River and the site area of c. 12 hectares, is very small when compared to the overall 10,400 hectare land catchment, providing run-off to the River. The loss of surface water will not impact surface water flows to the River and qualifying features of the SAC.

In terms of groundwater, the zone of contribution (ZOC) relating to the water supply borehole was assessed. The ZOC for the proposed borehole will be confined within the site boundary, flowing from the south south-east towards the north north-east. The loss of groundwater to the abstraction will not impact the groundwater flows to the River and qualifying features of the SAC.

The significance of any effects to the SAC, its catchment and the qualifying interests were considered imperceptible.

8.1 Introduction

Suzanne Tynan, principal of Tynan Environmental, is a hydrogeologist and hydrologist with twenty two years' experience in the area of hydrology and hydrogeology. Suzanne holds an MSc. in Hydrology and Water Resources Management (Department of Civil and Environmental Engineering, Imperial College, London), an MSc. in Environmental Science (School of Natural Sciences, Trinity College, Dublin) and a BSc, in Geology and Botany (School of Sciences, University College Dublin) and has held research fellowship and researcher positions at Trinity College Dublin. She has PGeo (Professional Geologist) chartered status from the Institute of Geologists of Ireland (IGI) and from the European Federation of Geologists (EurGeol). Suzanne is a board member of the Institute of Geologists of Ireland, a member of the working group which wrote the Institute of Geologists of Ireland (2013) Guidelines for the Preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements and is currently on the working grouping updating this guidance to concur with recent legislative changes. She was a member of the Water Framework Directive National Groundwater Working Group sub-group writing guidance on groundwater dependent ecosystems.

Suzanne has significant technical and project management experience in the area of assessment, mitigation and management of the relationship between projects and the water environment. This includes experience in the areas of EIAR, flood risk assessment and hydro-ecology (the study of the interaction between water systems and dependant ecology) and design of avoidance and mitigation measures for infrastructure located in or adjacent to water environments. Suzanne has carried out supporting hydrogeology/hydrology for EIAR and Natura Impact Statements for numerous types of surface water and groundwater dependent Natura 2000 qualifying interest habitats, for proposed developments including roads, quarries, housing developments, groundwater abstraction, marina, gas pipeline, windfarm and drainage projects. These have been carried out on behalf of both government and private clients. This work includes the design of a national methodology for screening the impacts of drainage maintenance schemes on groundwater dependent Natura 2000 sites on behalf of OPW and assessment of the risks associated with mine dewatering in large open cast mines in Poland in collaboration with the Polish EA. Current and recent major hydrogeological/hydrological and flood risk assessments include two projects funded by OPW in support of characterisation and remediation of 2015 groundwater flooding in Co. Sligo, combined groundwater surface-water flood risk modelling and NIS works for a road and local authority housing development on behalf of Limerick County Council, assessment of the risk of fluvial and/or groundwater flooding at sites for proposed school, waste transfer station, quarries and land reclamation sites. These projects include the development of integrated surface water and groundwater management systems. Work has also included the modelling of the impacts of climate change on flooding in the Thames Valley, at the British Geological Survey Suzanne has carried recently out a multiannual programme of work on behalf of the Geological Survey of Ireland and the Federation of Group Water Schemes and for Irish Water to delineate zones of contribution and/or source protection for twenty-five groundwater supplies across the country.

Design and implementation of site works, analysis and report writing were carried out by Suzanne Tynan of Tynan Environmental, apart from the works provided by external contributors listed below.

8.1.1 External Contributors

- Jason Redmond and Associates provided:
  - Site topographic survey;
  - Material excavation and re-instatement quantities;
  - Extraction phasing layout and layout element areas;
  - Design and layout of sludge settlement ponds and pre-process water supply balancing pond.
- CDE Global Ltd. provided information regarding the processing plant to be installed at the site including,
  - Specification of the material processing plant;
  - Specification of the water treatment and recycling unit (thickener);
  - Details of material post processing water content;
  - Details of process water requirements and process water top-up rates per tonne/process time of site material grades;
  - Expected sludge volumes, water and silt content per tonne of material/processing time rising from processing at the site, based on sample particle size distributions of site material;
- Whitehill Environmental provided:

- Appropriate Assessment Screening Determinations;

- Environmental Laboratory Services (ELS) Ltd. (INAB accredited) carried out sampling and analysis of surface and groundwater;
- Petersen Drilling Services Ltd. carried out drilling and installation of piezometers according to BS 5930:2015 Code of Practice for Site Investigations;
- James Fisher Testing Services (Ireland) Ltd (UKAS accredited) carried out material analysis according to Particle Size Distribution-EN 933 Part 1: 2012 Cl 7.1&7.2 Washing & Sieving Method
- The report and figures contain Irish Public Sector Data (Geological Survey) licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence.

8.2 Project Methodology

8.2.1 Relevant Guidance

The report is written with reference to:

- Environmental Protection Agency (2017) *DRAFT Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.*
- European Communities (2001). *Assessment of plans and projects significantly affecting Natura 2000 sites - Methodological guidance on the provisions of Article 6(3) and (4) of the Habitat's Directive 92/43/EEC;*
- European Communities (2018). *Managing Natura 2000 Sites.*
- Institute of Geologists of Ireland (2013) *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.*
- Institute of Geologists of Ireland (2007). *Recommended Collection, Presentation and Interpretation of Geological and Hydrogeological Information for Quarry Developments.*
- Department of Environment, Heritage and Local Government (2004). *Quarries and Ancillary Activities: Guidelines for Planning Authorities.*
- Environmental Protection Agency (2006). *Environmental Management in the Extractive Industry (Non-Scheduled Minerals): Environmental Management Guidelines.*
- Irish Concrete Federation (2005). *Environmental Code* 2nd Edition.
- Capita Symonds (2008) *Good Practice Guidance on Controlling the Effects of Surface Mineral Working on the Water Environment.* Report to the Department of Communities and Local Government and to the Mineral Industry Research Organisation.
- Murnane, E., Heap, A. and Swain, A. (2006) **CIRIA C648** *Control of water pollution from linear construction projects - Technical Guidance.*
- Masters -Williams et al (2001). **CIRIA C352** *Control of water pollution from construction sites - Guidance for consultants and contractors.*

are unacceptable, design or other measures can be taken to avoid or reduce these effects to acceptable levels.

The initial EIA Directive has been in place since 1985 (85/337/EEC). This Directive along with three amendments was amalgamated into Directive 2011/92/EU in December 2011. Proposed changes to the Directive were adopted by the Council of the European Union in May 2014 (Directive 2014/52/EU), with a 3-year period to transpose the changes. These changes formed the first revision of Directive 2011/92/EU.

The EU (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) transpose the requirements of Directive 2014/52/EU into planning law in Ireland and came into effect from the 1st September 2018.

The EIA process for the proposed Project can generally be summarised as in Table 1.1.

Table 1.1: Summary of the EIA Process

EIA Process Stage	Description
EIA Screening Is an EIA required?	Screening is the first stage of the EIA process, whereby a decision is made on whether or not a mandatory EIA is required. The EIA screening assessment was undertaken by Pat Booth and Rowan and concluded: *'A mandatory EIA is required for development that comes within the classes of development specified by Annex I or Annex II of the EIA Directive, as incorporated into Irish legislation in Schedule 5 of the Planning and Development Regulations, 2001 (as amended).* *The proposed development falls within the category:* *Schedule 5, Part 2, 2b: Extraction of stone, gravel, sand or clay, where the area of extraction would be greater than 5 hectares.* *On this basis, an EIA is being undertaken on the proposed development.'*
EIA Scoping What issues should be considered in the EIAR	Consultation was undertaken with the Local Authority (Laois County Council), Development Applications Unit (co-ordinating the National Parks and Wildlife Service, National Monuments Service & Architectural Heritage Advisory Unit) and Inland Fisheries Ireland regarding the scope of the EIAR. An EIA Scoping Report was issued: • Laois County Council on 18th October 2019; • Inland Fisheries Ireland on 1st November 2019; and • Development Applications Unit on 1st November 2019. A meeting was also held with Laois County Council in March 2016 to discuss preliminary proposals relating to the project.

EIA Process Stage	Description
	Some responses were received and are detailed in Section 1.2.2 below.
Baseline Data Collection	A baseline of the existing environment on and around the site was established. This stage included a review of existing available information (desk based) and undertaking environmental surveys at the site. Field based surveys included biodiversity, landscape and visual, noise, traffic and transport and hydrology (inc. flood risk) and hydrogeology.
Impact Assessment	An assessment of the environmental impacts, dealing with the construction, operational & restoration phases, and the significance of associated effects was undertaken.
Mitigation	Mitigation measures to reduce the potential impacts of the proposed Project which cannot be avoided practically through design have been presented in the EIAR.
Consultation	Consultation was undertaken with the Local Authority (Laois County Council), Development Applications Unit (co-ordinating the National Parks and Wildlife Service, National Monuments Service & Architectural Heritage Advisory Unit) and Inland Fisheries Ireland regarding the scope of the EIAR.
Decision & Announcement	The public will be informed of the application and decision via the Laois County Council planning process
Monitoring	The continued measurement of potential effects on the environment through monitoring, provides assurance that the proposed systems and mitigation measures are operating as intended. Any planning conditions alongside the mitigation measures outlined in the EIAR will be incorporated in the Environmental Management Plan developed for the proposed Project. This Plan will be implemented & monitored on site by Pat Booth.

1.2.2 EIA Scoping Report (Consultation)

The EIA Scoping Report was issued in October – November 2019. Some responses were received from the consultees. Table 1.2 below summarises the responses received and were these have been addressed in the EIAR document.

Table 1.2: Consultee Responses

Consultee	Key Items Raised in the Response	Where this is Addressed in the EIAR
Laois County Council	**Road Safety requirements:** • As per Laois County Council Roads & Parking Standards Document; • Requirements for Traffic Impact Assessment, Road Safety Audit, Traffic Management Plan & Preconditions Surveys. **Surface Water Drainage:**	Road Safety requirements have been addressed within Chapter 5 Traffic & Transport and in Appendix 5.1: Traffic and Transportation Assessment

Consultee	Key Items Raised in the Response	Where this is Addressed in the EIAR
	• Refer to the Laois County Council Stormwater Management Policy • Details of the percolation characteristics of the site required • Details of the settlement lagoons, wheel wash & surface water runoff should be provided; • Prevention of surface water discharge onto the public road is paramount.	Surface Water Drainage details are provided in • Chapter 2: Project Description • Chapter 8: Hydrology, Water Quality & Hydrogeology
Development Application Unit	The proposed Project site is located within an area of known archaeological settlement and activity. All of these monuments are afforded statutory protection. The visual impacts of the proposed Project was recommended to be assessed as part of the cultural heritage assessment	Addressed within Chapter 13 Cultural Heritage Addressed within Chapter 13 Cultural Heritage & 10 Landscape & Visual
Development Application Unit (NPWS)	No response to date (other than confirmation of project reference number)	N/A
Inland Fisheries Ireland	No response to date	N/A

1.2.3 EIAR Guidance

In the development of the EIAR, the following guidance was consulted:

- Environmental Protection Agency (EPA), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, Draft, 2017);
- EPA Advice Notes for Preparing Environmental Impact Statements (EPA, Draft, 2015);
- Quarries and Ancillary Activities: Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government, April 2004).

Rating of Environmental Effects

In developing the impact assessments, a key objective was to identify any 'significant effects' resulting from the proposed Project. Within this EIAR, the classification of effects has been undertaken with consideration of the EPA, *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, Draft, 2017*). Table 3.3, Description of Effects in the Guidelines outlines how specific effects can be described in relation to quality, magnitude and significance.

Some of the technical assessments have given consideration to aspect specific guidance and best practice. Where this has occurred, these guidance documents are identified specifically within the individual sections.

1.2.4 EIAR Structure

The EIAR is the document which records the assessment and is typically structured to describe the existing environment, the potential impacts and describing any mitigation measures required to reduce or eliminate potential impacts.

The EIAR is presented in a grouped format structure. Table 1.3 outlines the structure of this EIAR and a summary of what is included in each Chapter.

Table 1.3: EIAR Structure

Chapter	Description
Volume 1	
Non Technical Summary	Presents a summary of the EIAR in non technical language
Volume 2	
Chapter 1-4: Introduction and Approach to Environmental Impact Assessment, Proposed Project Description, Consideration of Alternatives and Planning Policy	Provides detail on: • Background to the proposed Project, • Need for the proposed Project • Approach to and structure of the EIA • Consideration of alternatives • Consideration of planning policy
Chapter 5 to 15:	Reporting of the EIA for each specialist environmental topic, including the introduction of the subject area, approach and methodology of assessment, a description of the existing environment, assessment of the potential impacts of the proposed Project, mitigation, monitoring proposals and potential significant residual effects. The following environmental aspects are assessed. • Traffic and Transport • Noise and Vibration • Soils and Geology • Water Quality, Hydrology and Hydrogeology (inc. Flood Risk) • Air Quality and Climate Factors • Landscape and Visual • Biodiversity • Population and Human Health • Cultural Heritage • Waste Management • Material Assets
Chapter 16: Cumulative Assessment & Interaction of the Foregoing	Presents on the interactions with different environmental aspects and potential cumulative impacts associated with the proposed Project.
Volume 3	
Appendices	Supporting information that includes Maps, Drawings, third party reports, reference documents etc

1.2.5 Appropriate Assessment: Natura Impact Statement

The Birds Directive (79/409/EEC) and the Habitats Directive (92/43/EEC) provide legal protection for habitats and species of European importance. Article 2 of Directive 92/43/EEC requires the maintenance or restoration of habitats and species of European Community interest, at a favourable conservation status. Articles 3 – 9 of the Directive provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as *Natura 2000*. Natura 2000 sites are Special Areas of Conservation (SACs) designated under the Habitats Directive and also Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/EEC). The terms "European site" replaced the term "Natura 2000 site" under the EU Environmental Impact Assessment and Habitats Regulations 2011 (S.I. No. 473 of 2011).

A key protection mechanism is the requirement to consider the possible nature conservation implications of any plan or project on European sites. Appropriate Assessment (AA), which is outlined in Article 6(3) of Directive 92/43/EEC, is the process which considers the possible effects of a plan or project on the European sites network.

In accordance with these requirements, the potential impacts of the proposed Project on the conservation objectives and qualifying interests of the River Barrow and Nore Special Area of Conservation (SAC) were assessed. The AA Stage 2 Natura Impact Statement (NIS) determined that with the implementation of mitigation, there will be no deterioration in water quality and no impacts on any of the designated habitats or species associated with the SAC.

It was concluded that the integrity of the SAC would not be adversely affected by the proposed Project.

A copy of the Natura Impact Statement was provided with the planning application documents.

1.3 Difficulties Encountered.

There were no specific difficulties encountered when carrying out this assessment.

2. Proposed Project Description

This Chapter has been prepared by Rowan Engineering Consultants (Rowan) and presents information on the construction, operational and restoration phases of the proposed Project.

2.1 Overview of the Proposed Project

The proposed works will consist of the following:

- Quarry activities for the extraction of and processing of sand and gravel within a c. 12ha site at Garrans;
- On site processing of the material to include extraction, washing, sizing, screening and stockpiling;
- Intermittent crushing of oversized aggregate material;
- Dispatch of the processed materials off-site on Heavy Goods Vehicles (HGVs);
- Installation of site wheel wash, refuelling area, oil interceptors, sludge settlement ponds and storm water attenuation/settlement ponds;
- Development of a, 3No. lay-bys on the local road L7939, a new site entrance and internal site access road;
- Landscaping works to include a planted berm running next to the site entrance and southern boundary of the site;
- Provision of site office, welfare facilities and all ancillary development infrastructure; and
- Final restoration of the site.

No blasting will be undertaken at the site, with site operations such as crushing, which would be required intermittently, undertaken towards the rear of the site (at the northern boundary).

2.2 The Existing Environment

The site is located in the townland of Garrans, Co Laois, approximately 500m east from Garrans Cross Roads and the regional road R427. The site encompasses approximately 12 hectares and is accessed by the local road, L7939 which is running west-east, towards the R428. The land is currently greenfield, made up of fields and hedgerows used for farming activities.

The site is bound to the north by a section of Coillte owned forestry. There is history of previous quarrying activities for sand and gravel to the north west of the proposed Project, registered under Stradbally Quarries Ltd (QY05/74/1).

The site is largely bound by agricultural lands on the west, eastern and southern boundaries, with the Stradbally River is located c. 300m south of the site. There is a tributary to the Stradbally River at a distance of c. 400m north of the site.

There are a number of one-off private residences located along the R427 at Garrans Cross Road and off the surrounding local roads.

The site would be described as hummock topography, with an elevation ranging between 67 to 80m Above Ordnance Datum (AOD). There is a slope downwards towards the north and north easterly boundary of the site.

Refer to Figure 2.1 for site location details.

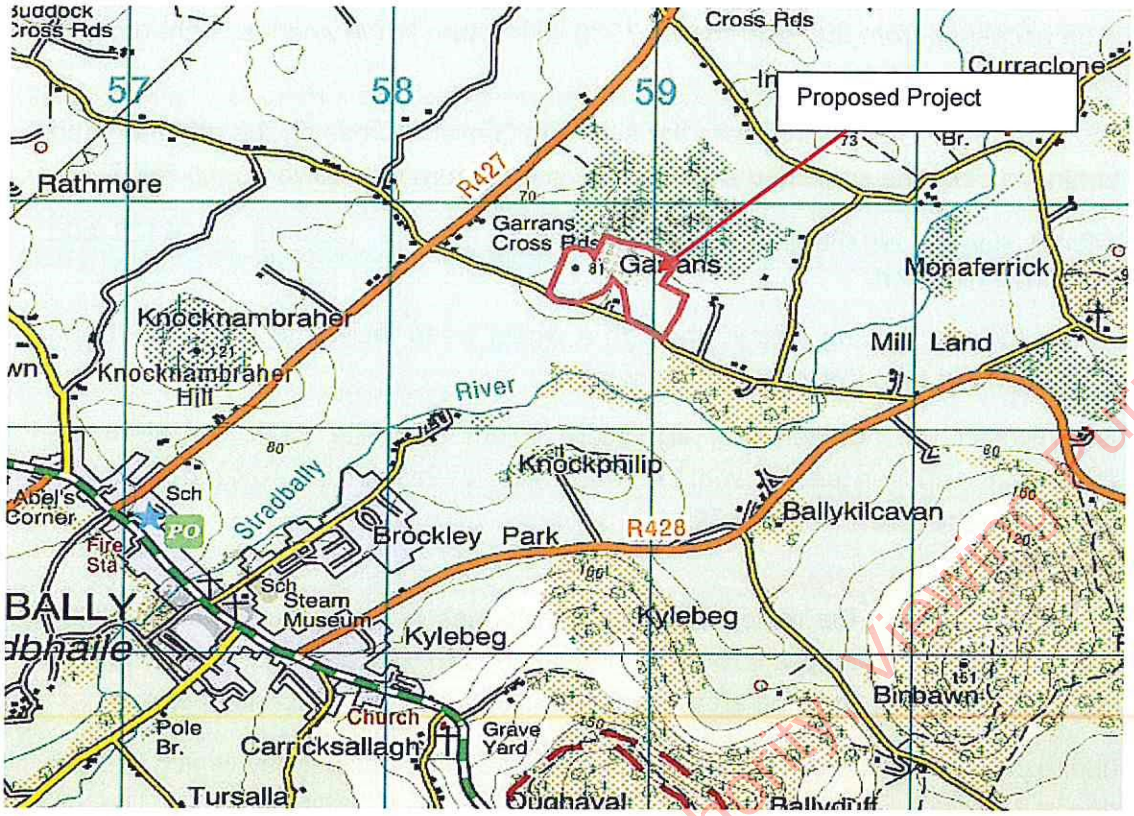


Figure 2.1a: Site Location Map

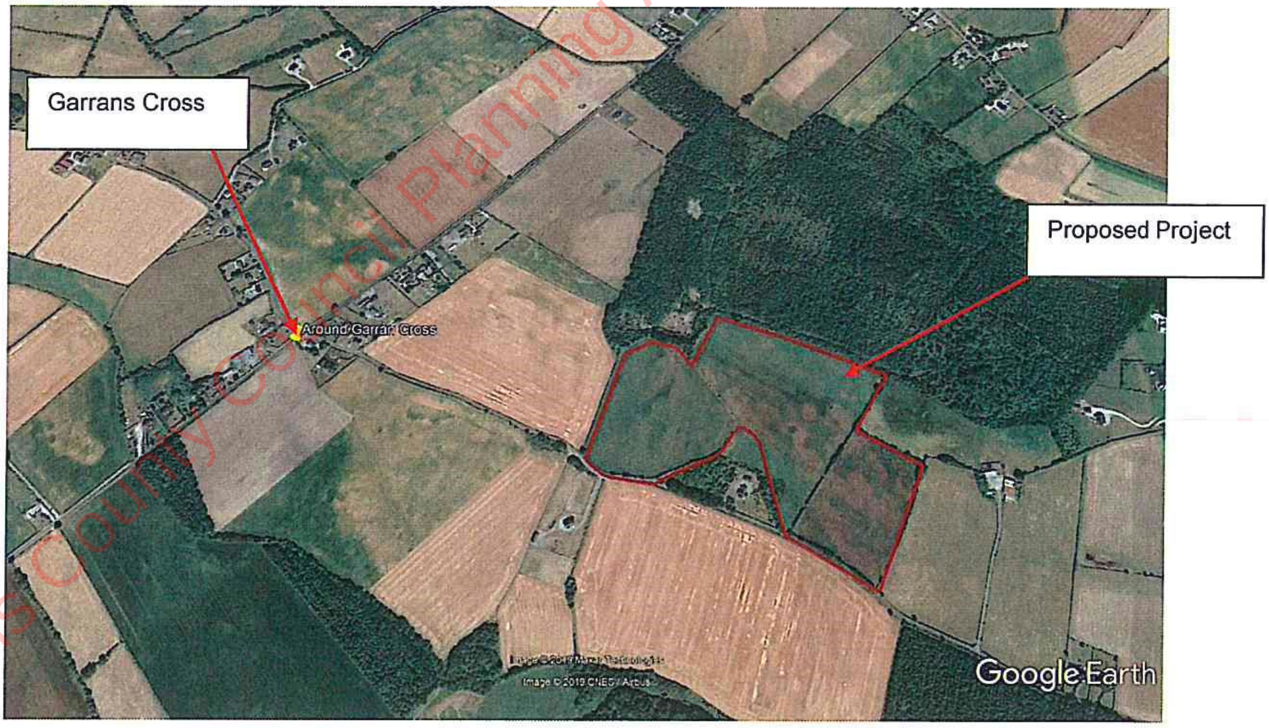


Figure 2.1b: Site Location Map

2.3 Site Access & Egress

The site will be accessed from the local road, L7939 with a turn left *in* and turn right *out* rule implemented at the site entrance.

Heavy Goods Vehicles (HGV's) will access the site from Garrans Cross off the regional road R427 and turning left into the site. HGV's leaving the site will turn right towards the R427.

There will be no access, turning right into or left out of the site, towards the R428 and Ballykilcavan Bridge direction.

HGV's will leave the site, having passed through a wheel wash facility, to prevent dirt and debris being transported onto the local road network.

The proposed Project will not generate significant volumes of site traffic, between the proposed site entrance and the junction with the R427. 3No. lay-bys will be provided to support traffic movements on this stretch of the L7939.

2.4 Proposed Project Programme

Overall it is estimated that in the region of 1.22million tonnes of aggregate material will be extracted from the site over c. 20 years (61,000 tonnes/ annum). On this basis, assuming 300 working days per year, there would be an average extraction rate of 200 tonnes per day.

However, during peak times, the daily rate may increase to 350 tonnes per day (which equates to an average of 15 heavy good vehicles (HGV's) arriving and exiting the site daily). The 350 tonnes per day would allow for occasional extraction at a rate in excess of the typical average rate.

2.5 Hours of Operation

The proposed working hours for the site activities subject to agreement with the planning authority are:

- Monday – Friday: 0700-2000hrs; and
- Saturday: 0800-1800hrs.

2.6 Site Facilities, Plant and Equipment

Office and welfare facilities will be provided on site.

The main plant, equipment and infrastructure on site will include the following:

- Security Gates;
- Site office, welfare facilities and car parking area;
- Oil interceptors;
- Wheelwash;
- Washing and screening plant; and
- 4No. ponds for sludge settlement and storm water attenuation/sediment settlement;
- Mixture of fixed and mobile equipment such as front loaders (with onboard weighing systems), extractors, dumper trucks, dozers and a mobile crusher and washer and screener.

2.7 Site Enabling

2.7.1 Site Enabling

Some site enabling works will be required at the outset prior to activities commencing on-site. These will include:

- Undertaking archaeological test works to determine if any sub surface archaeological remains are located within the proposed extraction area (Refer to Chapter 13 Cultural Heritage for more details);
- Upgrade of the site entrance and internal road into the site. It is proposed to provide a new site entrance directly from the local road L7939. An internal access road will be constructed from crushed rock moving into the centre of the site.
- Provision of the 3No. lay-bys on the local road L7939;
- Installation of site office and welfare facilities (portacabin);
- Installation of the washing and screening plant;
- Installation of the planted berm next to the site entrance and on the southern boundary; and
- Installation of wheel wash, electricity connection to the site, hardstanding plinth, refuelling area, settlement ponds and oil interceptors.

There are no proposed wastewater discharges associated with the site. All wastewater generated will be captured and tankered off-site (i.e. holding tank / chemical toilet). A management contract will be in place with an approved waste contractor.

Mains water will not be provided into the site. Bottled water will be provided for site staff needs.

It is proposed that groundwater will be abstracted from an on-site groundwater supply well, to support the site's processing needs. The well will be located close to the north western boundary of the site. Abstraction will equate to c. 9m^3 per day, at the average extraction rate of 200 tonnes per day (sand and gravel).

The site wheelwash will be installed on the internal road into the site. The washwater will be recycled through an in-built water recycling system which will be topped us as required from the settlement ponds. All HGV's will be required to exit through the wheelwash to mitigate material and dust deposition from spreading onto the local road network.

The designated refuelling area will be located in the north west corner of the site. This area will facilitate the refuelling of mobile equipment on the site .There will be no storage of fuel at the site, with refuelling being undertaken with a mobile tanker that will access the site as needed. The refuelling area will be a concrete hardstanding area with a gully to collect any spillages. The gully will be connected to an oil interceptor.

Electricity power supply will be organised for the site.

2.7.2 Management of Boundaries (Hedgerows)

It is proposed that all hedgerows on the site perimeter will be retained. Hedgerows within the site boundary will be removed in line with requirements of the phased extraction plan – the hedgerow between Phases 3 and 4.

All hedgerow removal will be undertaken outside of the bird nesting season (1st March to 31st August) or under the supervision of a suitably qualified ecologist.

To compensate for the loss of the internal hedgerow system, the Landscape Plan in Appendix 10.6 for the restoration phase has specified the provision of new hedgerows, These have been planned in such a way to mirror, the historical field pattern according to Ordnance Survey 25 inch 1888-1913 & 1837-1842 maps.

2.8 Site Operations

2.8.1 Site Phasing

The operation of the proposed Project has been designed to operate on a phased basis – Phases 1-4. Refer to Figure 2.2 below and Appendix 2.1 for copies of the Site Layout Plan and the Operational Phasing Plan.

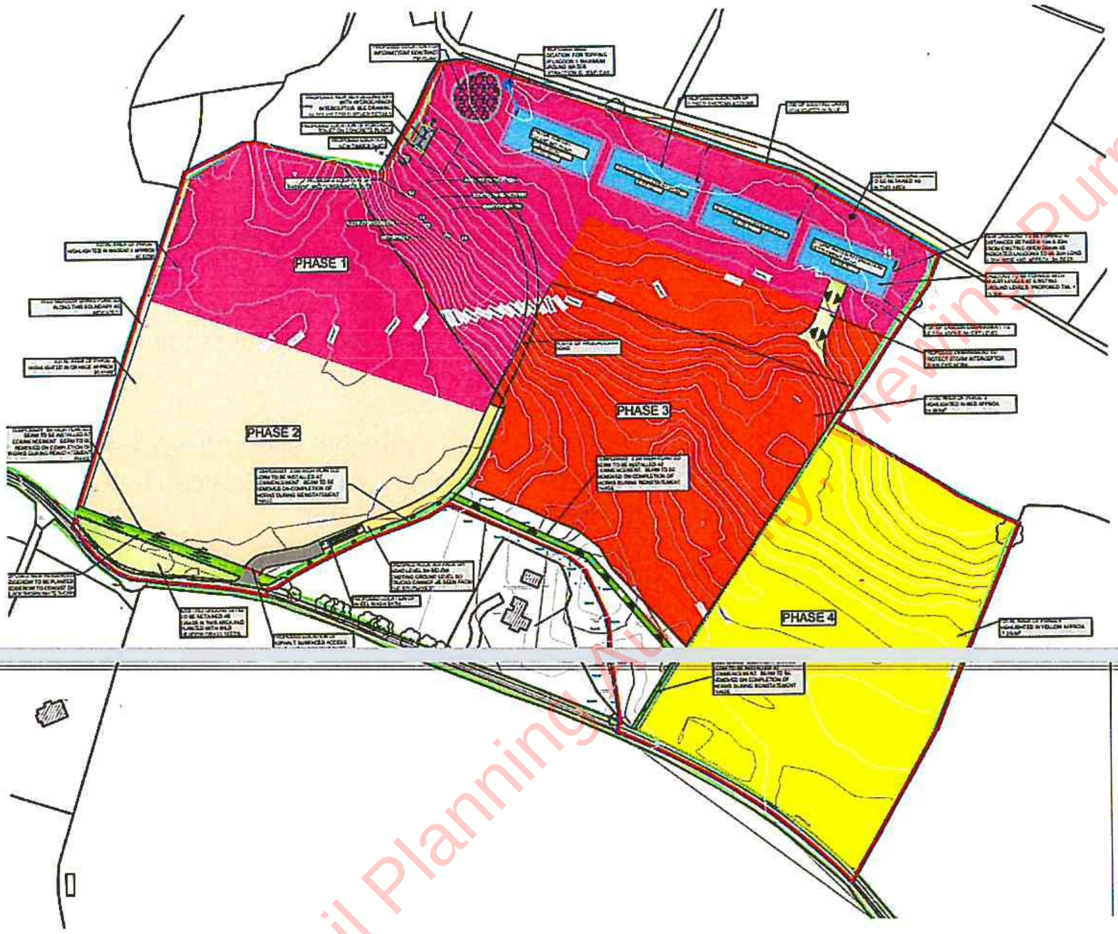


Figure 2.2: Site Layout Plan (Ref: extracted from the planning drawings)

The overall area of the site is c.12.84 hectares / 128,408m^2. The four phases incorporate the following areas:

- Phase 1 (Pink): c. 40,825 m^2
- Phase 2 (Orange): c. 20,410 m^2
- Phase 3 (Red): c. 29,995 m^2
- Phase 4 (Yellow): c. 27,250 m^2

The site will be stripped of overburden (topsoils and subsoils) and extracted on a phase by phase basis, with all aggregate material, removed from one phase before moving to the next.

There is a buffer area in the northern section of the site i.e. surrounding the 4No. ponds and the refuelling area which will not be stripped or excavated during the lifetime of the proposed Project.

All extraction works will move in essentially a southerly direction towards the local road L7939.

The washing and screening plant will remain in location (in Phase 1, next to the hardstanding area) for the duration of the works on-site. All site vehicles and other mobile equipment will be move and operate within the void of each individual phase, as required.

2.8.2 Site Clearance

Vegetation clearance within the extraction areas will be undertaken outside of the bird nesting season (1st March to 31st August) or under the supervision of a suitably qualified ecologist.

2.8.3 Topsoil and Subsoil Stripping

Once the site enabling works are completed, topsoils and subsoils (overburden) will be stripped in phases at the site before accessing the aggregate material (sand and gravels).

Within each individual phase, the topsoils and subsoils will be removed on a phased basis, to limit the area of the site that is exposed at any one time – i.e. the site will be stripped on a needs basis in line with the extraction activities. Refer to the Operational Phasing Plan in Appendix 2.1.

The proposed phasing activities can be summarised as follows:

Table 2.1: Summary of phasing proposals for the proposed Project

Phase	Description
Phase 1 (Pink)	Topsoil and overburden stripped from Phase 1 will be used to construct the temporary screening berm on the southern boundary of this phase. The berm will be c. 2m high and will be removed on the commencement of Phase 2 and used in the reinstatement of Phase 1. This grassed berm will serve in providing an additional visual buffer for the site from the local road (L7939) and the residences located in proximity to the site. (The berm next to the site entrance and on the southern boundary will be installed as part of site enabling works). Excavation of this phase will move from the northern boundary towards the southern boundary. Any excess topsoil and overburden will be stockpiled on the excavated quarry floor for use in a 'roll-along' restoration of Phase 1 as the ground become available.
Phase 2 (Orange)	Topsoil and overburden stripped from Phase 2 will be used in the restoration of Phase 1. The excavation works will move in a southerly direction.
Phase 3 (Red)	Topsoil and overburden stripped from Phase 3 will be used in the restoration of Phases 1 & 2. The excavation works will move in a southerly direction.
Phase 4 (Yellow)	Topsoil and overburden stripped from Phase 4 will be used in the restoration of Phase 3. The excavation works will move in a southerly direction. Material from the constructed berms (which will be removed for the restoration phase), will be used in the restoration of Phase 4.

2.8.4 Extraction Activities

All aggregate material will be removed from one phase before extraction begins in the next phase. There will be no extraction below groundwater levels and there will be no blasting associated with the proposed Project.

The proposed Project is estimated to extract c. 1.22 million tonnes of aggregate material and extraction activities will remain above the groundwater levels at the site i.e. the sand and gravels will not be extracted from below the groundwater water table.

The total of 1.22 million tonnes of aggregate was therefore calculated based on the following:

- Extraction will be to a depth of at least 1m above the estimated highest winter groundwater level across the extraction area (71.79m); and
- A climate change uncertainty allowance of 10% of annual groundwater variability across the site was then also added to the groundwater levels.

The material extraction depths are set out in the cross sections for the site, provided in Appendix 2.1 and refer to Chapter 8 Hydrology & Hydrogeology for full details.

Once the topsoils and overburden have been stripped, the aggregate (sand and gravel) will be extracted with a wheeled front-end loader (30 tonne). It is envisaged that an average of 200 tonnes of excavated material per day (350 tonnes at the occasional peak), will be directly fed into the hoppers of a mobile washing and screening plant (Photograph 2.1) which will be located to the north of the site, adjacent to the refuelling area.

Oversized material is tipped out of the plant at this initial stage.

Photograph 2.1: Image of a typical washing and screening plant

The acceptable material is conveyed for screening, washing and sizing within the plant. The plant will convey material into various stockpiles such as:

- Material < 4mm: 2 grades of washed sands (fine and coarse) conveyed into stockpiles; and
- Material > 4mm: other aggregate sizes conveyed into stockpiles.

The plant will be electrically powered.

The objective of the washing process for the material is two fold – 1. To meet particular standards and specifications for future processing needs and 2. To remove material such as clays, leaves and twigs.

Crushing of oversized material (larger than 20mm) will be undertaken intermittently, about once every three months, in the north west corner of the site. The mobile crushing equipment proposed for use will produce a size of aggregate (<20mm) which is then suitable for feeding into the washing and screening plant.

2.8.5 Water Usage at the Site

There will be no discharge of process wash waters from the site.

The plant is very efficient in that c. 80% of the process water used, will be recycled through an integrated water treatment plant (which is part of the washing and screening plant) and then entered, straight back into the process.

The proposed washing and screening plant will require 234-407 m^3 of water to facilitate the screening, sizing and washing of 200 -350 tonnes/ day.

Given that 80% (192-334 m^3) of the water is recycled straight back into the washing process, the plant only requires a 20% top-up (42-73 m^3/processed tonnage/day) of additional water.

The remaining 20% top-up process water will be provided by:

- Recycled recovered water from sludge settlement ponds.
  Silt which is settled out of the washwater from the wash plant will be pumped, with some water towards the 2No. sludge settlement ponds located on the northern boundary. The water recovered from these ponds will be recycled back into the wash plant;
- Water recovered from the stockpiled aggregate material will be collected in a pipe network and recycled back into the washing and screening plant;
- Surface water run off from the site will be collected and stored in the storm water attenuation/ settlement ponds. This will be introduced into the wash plant; and
- Groundwater abstraction from a water supply borehole, located close to the north western boundary will be introduced into the wash plant as required.

The breakdown of the 20% top-up process water is outlined in Table 2.2 below.

The process top-up water will be directed to a water balance pond. This pond will manage the combined water inputs and feed water into the washing and screening plant.

In addition to the 20% top-up, the water breakdown in Table 2.2 has also accounted for water usage requirements, for the wheel wash and for dust suppression.

Full details and background to the process water breakdown is provided in Chapter 8 Hydrology and Hydrogeology.

Table 2.2a: Breakdown of Water Requirements for the Site

Material Processing Rates (tonnes/day)	Full Process Water Requirement for the Wash Plant (m^3/processed tonnage/day)	Recycled Water within water treatment plant (80%) m^3/processed tonnage/day	20% Top-Up Process Water (m^3/processed tonnage/day)	Sludge Wat[illegible] Content [illegible] Sludge Pond[illegible] (m^3/processe[illegible] tonnage/day[illegible]	Recovered Water from Sludge Ponds (m^3/processed tonnage/day)	Material Water to Stockpile at 12% content (m^3/processed tonnage/day)	Recovered Water from Stockpile Dewatering System (m^3/processed tonnage/day)	Wheel wash and dust suppression water requirement (m^3)	Water Balance needed from surfacewater collection and groundwater abstraction (m^3/processed tonnage/day)
200	234	192	**42**	18	**6**	24	**14**	2	**24**
350	407	334	**73**	31	**12**	42	**22**	4	**42**

Explanation: *42 m^3 top-up – 6 m^3 recovered from sludge settlement [illegible]onds & 14 m^3 from stockpile areas = balance of 22 m^3 required + 2 m^3 for wheel wash and dust suppression. This results in a water balance [illegible]f 24 m^3/processed tonnage/day to be made up from surface water and groundwater sources.*

Table 2.2b: Breakdown of Surface Water and Groundwater Requi[illegible]ements for the Site

Material Processing Rates (tonnes/day)	Water Collected from Surface Water (Average)	Groundwater Abstraction	Water Balance from surfacewater collection and groundwater abstraction (m^3/processed tonnage/day)
200	15 m3/day	9 m3/day	24
350	15 m3/day	27 m3/day	42

2.8.6 Drainage Proposals for the Site

There will be no discharge of process wash waters from the site.

There will be a surface water discharge, at an appropriate greenfield rate, from the site to the existing drain on the northern boundary (in line with existing conditions on the site).

The water management system on-site will be based on a collection and conveyance system, that is focused on capturing and storing water within the site for use in the processing stages.

This will include the recycling of process water, the collection of surface water drainage from the site and also collection from the stockpile storage areas.

The drainage proposals are as follows:

- Collected water will be retained within the site through a series of pipes and 4No. ponds located towards the northern boundary of the site at distances of c. 15-22m from the existing drain, that runs along this boundary (Refer to Figure 2.3 below).;
- The 4No. ponds are as follows:
    - Pond 1: water top up balancing pond;
    - Ponds 2 & 3: sludge settlement ponds;
    - Pond 4: storm water attenuation / settlement pond
- The 4No. ponds will be lined with a suitable impermeable membrane.
- **Pond 1**: will accept and manage the combined water inputs from each of the top up sources and feed back into the washing and screening plant.
- **Ponds 2&3:** Silty water from the washing and screening plant will discharge from the plant to the sludge settlement ponds (Ponds 2 & 3). These ponds will operate in rotation, with a retention time in excess of 24hours. This will allow for the settlement of sludge and the recovery of c. 6-12m^3 of water per day, that will be recycled back into the process, via Pond 1. The dried silt/sludge will be used in the restoration activities, alongside the stripped topsoils and overburden.
- **Pond 4:** Surface water will be collected from the working and grassed areas of the site and from the outlet of the refuelling area. This surface water will be directed to Pond 4. Following settlement, the water will be recycled into the process, via Pond 1.
  There will also be a discharge point located at Pond 4, towards the existing drain on the northern boundary. This outlet will be fitted with a hydrocarbon interceptor, hydrobrake and discharge meter. The discharge will be at an appropriate greenfield rate (6.35 lts/sec), in line with existing conditions on-site.
- Ponds 2&3 and Pond 4 will operate in isolation to avoid the risk of silty process water or sludge, entering Pond 4 and being discharged to the environment i.e. there will be no pipe connection between Ponds 2&3 an Pond 4.
- **Water Supply Borehole**: The water supply borehole will be connected to Pond 1. Water will be abstracted from the well as required, into Pond 1 and then onwards to the washing and screening plant. The volumes of water abstracted from the borehole will be monitored and records maintained on-site.
- **Stockpile Area:** Surface water will be collected from underneath the aggregate stockpiles and directed into Pond 1 and then back to the washing and screening plant.

Water management proposals are discussed in detail in Chapter 8 Hydrology and Hydrogeology.

Refer to the Drainage Drawings (planning drawing), provided with Appendix 2.1 and in Figure 2.3.

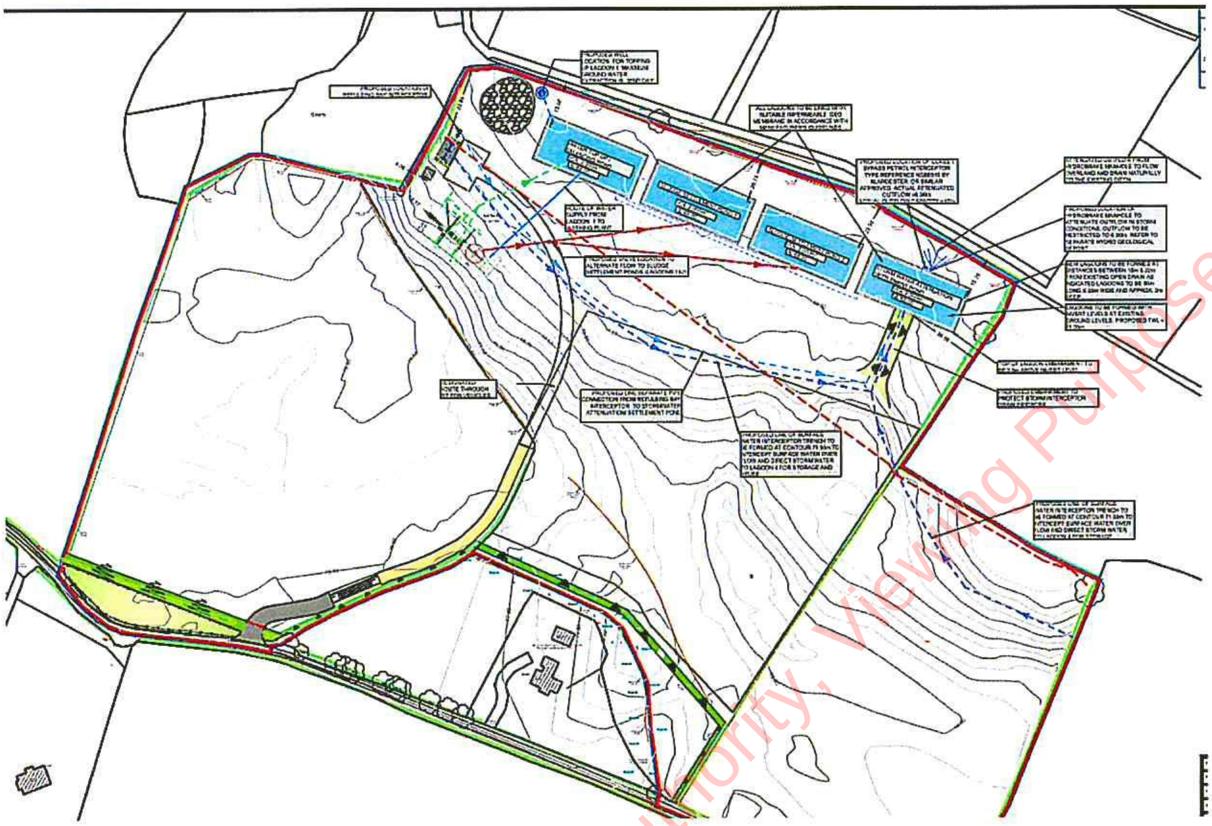


Figure 2.3: Site Settlement Ponds (surface water and sludge) (Ref: extracted from the planning drawings)

2.8.7 Aggregate Storage and Dispatch

As the material is washed, it will be stockpiled on site depending on the grade of the material. Material will be loaded from stockpiles onto HGV's using the front-ended loader, which are installed with internal weighing systems.

The extracted aggregate will be used to primarily support the demand within the County Laois and County Kildare regions and is thereby supporting local and regional economic development and contributing towards the security of supply of local manufacturing products in the region.

An approximate breakdown of the volumes being dispatched from the site are as follows:

- 30% to Portlaoise Town;
- 20% to Stradbally;
- 20% to Portarlington;
- 20% to Athy;
- 5% to South Kildare; and
- 5% to North County Laois Area.

The material will leave the Garrans site and is generally expected to be used within a 25km radius of the site.

2.9 Site Security and Boundary Treatment

There is a post and wire fencing along the site perimeters in addition to the existing hedgerows. These will be maintained.

It is proposed that a security gate (lockable) with additional 1.6m high fencing will be installed at the site entrance.

2.10 Proposed Restoration & Landscaping (Site Decommissioning)

Following the cessation of extraction activities within each phase, restoration works for the relevant phase will commence. It is not proposed that the voided areas would be infilled.

The voided lands would be graded and sloped back to meet the levels at the site outline.

Dried silt from the settlement ponds and the stripped topsoils and subsoils will be placed within the void.

The area will then be re-seeded with agricultural grass seed mixture native to the local area.

The perimeter fence will be stockproofed and secure.

Any monitoring points (such as dust deposition) will be removed.

To compensate for the loss of the internal hedgerow system, the Landscape Plan in Appendix 10.6 for the restoration phase has specified the provision of new hedgerows. In addition, the Landscape Plan, also specifies additional tree planting on the site boundaries and areas of Irish meadow/wildflower mixture planting within the site.

Figure 2.4: Proposed restoration for the site. (Ref: extracted from the planning drawings)

2.11 Environmental Monitoring, Controls and Sampling

Monitoring of dust emissions, surfacewater and groundwater shall be undertaken when the site is operational. Refer to Chapters 9 Air Quality and 8 Hydrology and the EMP (Appendix 2.2) for further details on this. This analysis shall be undertaken at off-site accredited laboratories.

2.12 Roles and Responsibilities

During operation, Pat Booth will employ up to 3 people on-site. Pat Booth shall:

- Be responsible for having a site member on site to oversee all site activities;
- Be responsible for the overall management and performance of the site;
- Be the main point of contact in the event of contact from a member of the public, local authority and/or other organisations;
- Be responsible for undertaking regular inspections of the site and site perimeter;
- Be responsible to confirming that the site activities are undertaken in adherence to:
  - EIAR and any subsequent planning permissions;
  - Environmental Management Plan (EMP); and
  - Legislative requirements and environmental best practise.
- Maintain all environmental records and documentation.

2.13 Vulnerability to Climate Change, Major Accidents and Disasters

2.13.1 Vulnerability to Major Accidents and Disasters

With the introduction of EIA Directive 2014/52/EC and the transposition of the Directive through the EU (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018), there is a requirement to consider the "*expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned*".

During the desktop review for the proposed Project, it was confirmed that there are no SEVESO (Lower or Higher Tier) or EPA Licensed sites within 5km of the Garrans site. Given the distance from these sites, it was determined that the proposed Project would not be vulnerable to accidents from these operations.

To reduce the potential for and impact of accidents and disasters, the site will operate in accordance with the requirements of the:

- EIAR and any subsequent planning permissions;
- EMP (Appendix 2.2);
- Legislative requirements and environmental best practise;
- Health and safety legislation requirements.

An Emergency Response Procedure (ERP) and spill/leakage protocol are detailed in the EMP.

The purpose of the ERP is to address any emergency situation which may originate on-site. It also includes provision for minimizing the effects of an incident on the environment. The ERP shall be activated as necessary and outlines the appropriate actions to be taken. In summary, the response procedure includes the following:

- Deploy the necessary resources to deal with the incident;
- Notify the relevant bodies as required i.e. LCC, Inland Fisheries Ireland, National Parks and Wildlife Service (NPWS);
- Initiate appropriate corrective actions to deal with the incident; and

- Initiate appropriate preventative actions to prevent a reoccurrences of the incident;
- Comply with any requirements in relation to the investigation, notification, management and reporting.

2.13.2 Vulnerability to Climate Change

Climate issues and events relevant to the proposed Project would include the emission of greenhouse gas (GHG) emissions from plant and vehicles and potential vulnerability from flood risk, high wind speeds and extreme temperatures. These items are considered below.

Plant and Vehicle GHG Emissions

The GHG emissions resulting from the plant and vehicle activities will contribute to both the annual emission levels of County Laois and also to the wider national levels. However, it is considered that the emissions from the proposed Project are of a minor scale with little contribution to overall emission levels.

The following mitigation measures will be implemented on site:

- Vehicles on the site will be not left idling for more than a few minutes;
- Plant and equipment on site will be regularly maintained and records retained in this regard;
- Energy consumption & emissions data will be considered in the purchasing new plant and vehicles.

As mentioned in Chapter 1, It is currently estimated that there would be a reduction of c. 200,000km per annum of Heavy Goods Vehicles (HGV's) road trips within the Laois and Kildare regions, with the Garrans site in operation.

Flood Risk and Rainfall

Increased flood risk and impacts from high rainfall are one of the most significant effects of climate change and this is recognised in the Climate Change Adaptation Strategy (2019-2024) published by LCC in 2019.

Consideration has been given as part of the proposed Project to the likely environmental impacts that may arise in association with unplanned events such as floods, etc.

With regard to storm water attenuation, a total storage volume in excess of 1500m^3 has been provided in the impermeable storm water attenuation/sediment settlement pond (Pond 4). This volume has accounted for both storm water run-off and storage requirements to retain process water during extended dry periods.

The storm water run-off rates and volumes were estimated for the 1 in 20 year storm, for a storm duration of 15 minutes to 48 hours. This was deemed to align with the proposed 20 year life of the proposed Project. In addition, a 20% climate change allowance was added to rainfall depths, used in the calculation of storm water run-off rates.

Flood water would be attenuated and discharged at the greenfield run-off rate for that return period storm (0.0092 m^3/sec – refer to Chapter 8 Hydrology and Hydrogeology).

The vulnerability of the site to flood risk was considered low.

Extended Dry Periods

There is a projected increase in dry-weather days expected due to climate change in the future. On this basis, it was considered appropriate to facilitate the storage of collected surface water for use in the washing process, in the event of an extended dry period.

The total storage volume in excess of 1500m^3 in the impermeable storm water attenuation/sediment settlement pond (Pond 4), incorporates the storage of 40 days of average summer period surface water usage (May – September: 400m^3). This volume of water will be stored continuously on-site in Pond 4, for use during an extended dry period. Refer to Chapter 8 Hydrology and Hydrogeology for full details.

High Wind Speeds (Storm Events)

Unplanned events such as high-speed winds would have the potential to generate dust. Works will be ceased during excessively high winds.

Dust suppression techniques will be enabled during activities as required, with visual inspections and dust deposition monitoring undertaken on site when the site is active i.e. during extraction and processing operations (Refer to the EMP Appendix 2.2 for full details).

Extreme Temperatures

Unplanned events such as extreme hot and cold conditions have the potential to generate unsafe working conditions for workers on-site or for those responsible in the transport of material off site. Weather conditions will be monitored. Works on site and dispatching of material on the local road network will be ceased during significant weather events.

3. Consideration of Alternatives

Pat Booth has been in business for c. 27 years operating quarries locally in the Laois and Midlands areas, that have provided aggregate materials (sands and gravel) into the manufacturing and construction industries. Recognising the continued demand for aggregate both locally and on a national basis, Pat Booth has been actively seeking appropriate locations to commence additional extractive activities. These are outlined in the following sections.

3.1 Alternative Locations

The consideration of alternative locations for anyone in the extractive industry, is limited to locations where the sufficient deposits of aggregate material are available and have the potential to provide for future extraction activities.

For the proposed Garrans site, data from the Geological Survey of Ireland (GSI) mapped the presence of esker sand and gravel deposits extending into the north west corner of the proposed site and extending south eastwards and southwards. For the purposes of this project, no extraction would occur within 1m of the 71.79m O.D. water level (maximum groundwater level with a 10% climate change factor applied). This indicates that in the region of c. 1.22 million tonnes of aggregate material is available for extraction at the site.

Additionally, there is history of previous quarrying activities for sand and gravel to the north west of the proposed Project site boundary, registered under Stradbally Quarries Ltd.

Other considerations that supported the decision to proceed with proposed extraction activities at the Garrans site included:

- The site is proximate to Portlaoise Town and various motorway and national road routes, offering safe and easy access onto the national road network;
- The topography of the site lends itself to a simple phasing plan that will be implemented over the course of site's active lifetime. This phasing plan allows extracted sections of the site to be reinstated once the extractive works are completed, resulting in only small sections of the site being exposed for periods of time.
  Reinstatement works will be supported with topsoils and subsoils that have been stripped from the currently active phase of the site. This phasing approach aligns with industry best practise and means that site works would be relatively localised and self-contained within defined sections of the site for periods of time. This was considered to be effective in the reducing the potential for significant adverse impacts on the surrounding environment; and
- The site is enclosed, with Coillte owned forestry on the adjoining northern boundary and with mature hedgerows on the western and eastern boundaries. These will be retained during the course of the site works. The enclosed nature of the site was considered effective in limiting views into the site and thereby reducing impacts to the landscape and surrounding views.

On the basis of the above the, the proposed site was deemed the appropriate location to progress with extraction activities.

3.2 Alternative Layouts & Designs

At project inception, alternative phasing's and layouts were reviewed.

An initial layout which entailed accessing, stripping and working across the full site at the one time was initially reviewed. However, this did not align with standard industry best practise and on this basis, was not considered any further.

The proposed site layout, phasing plan and restoration plan was deemed the preferred solution, facilitating access to the extractive areas and available site capacity, whilst implementing an effective phasing plan to minimise the potential for environmental impacts.

The proposed layout also allows for the retention and maintenance of the mature perimeter hedgerow system on the site boundaries, which will assist with screening for residential receptors.

3.3 Alternative Processes

Based on the levels proposed, c. 1.22 million tonnes (511,168 m^3) of aggregate material is available for extraction at the site. It is proposed that the extracted material will be washed, screened, sized, & stockpiled on-site prior to dispatch off-site on HGV's.

An alternative process would be to not wash and process the material at the Garrans site. This would entail the transport of the extracted material to another site for processing.

However, this processing option was not considered further for the following reasons:

- Due to the significant additional transport movements that would be generated on the local road network, to facilitate the washing of extracted material at an off-site source;
- Costs associated with the additional handling, movement and washing of material at an off-site source;
- Increased potential for significant environmental effects such as air quality (dust deposition and emissions from HGV's) and additional and unnecessary traffic movement on the local road network.

3.4 Site Entrance Options

A number of site entrance options were considered. One of the initial alternatives included an option to access the site in through its western boundary, with traffic leaving the regional road R427 and accessing across greenfield lands, into the western boundary of the site. However, this was not considered further for the following reasons:

- The additional land-take that would be required for the proposed Project; and
- The potential for environmental effects, with the extents of the proposed Project being less localised and contained.

It was considered that a site entrance from the local road, L7939 was the most appropriate alternative. The proposed site entrance was reviewed against an option which was located further west on the L7939.

The currently proposed entrance was deemed the most appropriate alternative as it allowed for the required sightlines at its location and was also deemed to be less intrusive to the property opposite. On this basis, the site entrance as currently proposed was incorporated into the proposed Project design.

3.5 Remediation Proposals

An initial proposal was reviewed, where no restoration work would be implemented on cessation of the extraction activities. However, this was not considered further as leaving an open void in the environment was not considered industry best practise, with the potential for adverse impacts on landscape and visual and also with the potential for dust deposition (in the short-term). This would be mitigated to some degree with the recolonization of local vegetation that would likely occur relatively quickly. However, overall the impacts were considered adverse.

3.5.1 Infilling the Site

The potential to infill the site back to original ground levels and future agricultural use was considered. This type of development is undertaken on a regular basis in Ireland. It would be subject to planning permission, the waste management permitting/licensing regime and would require an environmental assessment.

Whilst this scenario returns the lands to their original state and ground levels, there is potential from some impacts resulting from the infill process such as traffic movements, dust deposition, noise and water quality. When taken into consideration with the additional planning and permitting requirements, the scenario was not considered further.

3.5.2 Final Restoration Proposal

The final restoration proposal involves placing the dried sludge/silt from the sludge settlement ponds, topsoils and subsoils into the void, reseeding with an agricultural seed mix and grading and sloping the sides back towards the ground levels in the surrounding environment.

Stock proof fencing would be installed on the perimeter of the site and there would be no public access to the site. This option allows for the return of the lands to their original agricultural use, with no traffic accessing the site, minimal environmental disturbance and within a short timescale.

To compensate for the loss of the internal hedgerow system, the Landscape Plan in Appendix 10.6 for the restoration phase has specified the provision of new hedgerows. The new hedgerows would be planted to reflect the historical field pattern in the area. In addition, the Landscape Plan, also specifies additional tree planting on the site boundaries and areas of Irish meadow/wildflower mixture planting within the site.

On this basis, the current restoration proposal was considered the most appropriate alternative to submit with this planning application.

3.6 "Do-Nothing" Alternative

The 'do nothing' alternative involves maintaining the site in its current state.

Reasons why it was considered that the "do-nothing" alternative was not a preferred option in this case are:

- Not utilising the available capacity of the site, to extract aggregates was considered a loss of opportunity. The extraction and processing activities will be undertaken in an environmentally acceptable manner, within an enclosed site boundary whilst also providing valuable aggregate to local and regional manufacturing and construction industries;
- It was considered that permitting the proposed Project is supportive of the need to provide long term, secure and sustainable sources of aggregate within County Laois. The importance of accessing these sites is recognised in the Laois County Development Plan 2017-2023 and where support '*in principle*' is provided through various policies of the Plan (Policy References: RUR8, RUR9, RUR10 and RUR11) to facilitate their future development;
- It was considered that permitting the proposed Project is also supportive of the wider national need, to provide significant reserves of aggregates, to support the Irish Government in realising the commitments outlined in the National Planning Framework 2040;
- Not utilising the available capacity of the site, would result in economic losses, directly to the quarry operator and through future employment losses (c. 2 direct and 2 indirect) within the area; and

- Not utilising the available capacity of the site, could result in employment security concerns for local and regional manufacturing plants that rely on the supply of suitable raw material to continue future operations.

4. Planning and Policy Context

This Chapter sets out the planning history associated with the proposed Project site. Additionally, the Chapter includes a review of national, regional and local policy relevant to the proposed Project development.

4.1 Site Planning History

There is no planning history associated with the site at Garrans.

It is noted that there is previous history of aggregate quarrying in proximity to the proposed Project (to the immediate north west), registered under Stradbally Quarries (QY05/74), with a total quarry area of 1.743ha.

4.2 Planning Policy and Development Context

4.2.1 Project Ireland 2040: The National Planning Framework

The National Planning Framework 2040 outlines high level strategic planning and development guidance for the country to the year 2040, with a view to that growth being sustainable from an environment, economic and social perspective.

The NPF recognises the importance of the extractive industries for the '*...supply of aggregates and construction materials and minerals to a variety of sectors..*'. The document also indicates that the extraction of aggregates will continue where that extraction is compatible with the protection of the surrounding environment.

National Policy Objective 23 states the following with regard to the development of the extractive industry:

> *'Facilitate the development of the rural economy through supporting a sustainable and economically efficient agricultural and food sector, together with forestry, fishing and aquaculture, energy and extractive industries, the bio-economy and diversification into alternative on-farm and off-farm activities, while at the same time noting the importance of maintaining and protecting the natural landscape and built heritage which are vital to rural tourism.'*

There is a growing need for aggregates in Ireland to meet the development commitments outlined in the NPF. The proposed Project is considered to be compliant with the NPF in that it will provide for the development of the extractive industry in Ireland, whilst implementing appropriate mitigation measures, to reduce adverse impacts and to protect the surrounding environment.

4.2.2 Regional Planning Guidelines for the Midland Region 2010-2022 – Midland Regional Authority

This document was developed by the Midlands Regional Authority and published in 2010. It covers the counties of Laois, Offaly, Westmeath and Longford. The Guidelines present a '*..long term strategic planning framework that will direct the future physical, economic and social development of the Midland Region over the medium to long term.*'

The Guidelines identify a number of key priorities for investment within the Midland Region and which include investment in water and wastewater services, development of the national secondary road network and provision of an appropriate public transport network to link gateway and principal towns in the region (amongst others).

The Guidelines present a vision for the Midland Region that refers to the region being '*successful, sustainable and equitable.full of opportunities..*' and sets out economic development policies and objectives that address a range of areas. In summary the policies and objectives are focused on the promotion, expansion and diversification of the Region's economy, in a manner that is sustainable and meets the '*environmental, economic and social needs*' of the area.

To meet the proposed development and investment needs of the Region, there will be a need for aggregates to physically enable and allow for this development. On this basis, the proposed Project was considered to comply with the Guidelines, in that it will facilitate continued development within the Region, thereby supporting the strategic vision of the Guidelines, whilst implementing appropriate mitigation measures, to reduce adverse impacts and to protect the surrounding environment.

4.2.3 Regional Spatial and Economic Strategy (RSES) 2019-2031

The Regional Spatial and Economic Strategy was published in August 2019 by the Eastern & Midland Regional Assembly (within which County Laois falls). The aim of the Strategy is to set a strategic plan for the Region to 2031 and beyond.

A range of objectives and policies are identified for the Region in the areas of environment and climate, provision of infrastructure, quality of life, improving connectivity and economy and employment. Central to each of these topics, is the objective to enable and facilitate growth of the region, in a sustainable, low carbon manner and in a manner which enhances quality of life for people of the Region.

Regional Policy Objective (RPO) 6.7 states the following in relation to extractive industries:

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

The Strategy refers to the topic of low energy buildings and that the future design, construction and operation of new buildings has an important '*role to play in reducing energy demand and increasing energy efficiency*'. As part of this process, the Strategy references the importance of the '*whole life performance*' of concrete and aggregate products in a '*continued strive to provide a net positive environmental impact throughout the lifetime of its product*'.

Portlaoise Town is identified as a Key Town under the RSES. As part of this there are objectives to support the continued development and regeneration of the town, with RSES identifying future development opportunities such as

- Residential Development: Housing delivery in areas such as the '*Maltings Site on Mountmellick Road, Centrepoints Site on the Mountrath Road and the former Schools site within the town centre.*'; and
- Economic Development: Development of the J17 National Enterprise Park.

To achieve the objectives of the RSES, there will be a need for available aggregates to physically enable and allow for future development and on this basis, the proposed Project is considered to comply with the needs of the RSES.

Additionally, the adjacency of the Garrans site to the strategically important town of Portlaoise and having easy access to the surrounding national road network means that future aggregate supplies would be travelling only short distances to reach key destinations within the surrounding region. The proposed Project was thereby considered supportive of the Strategy's aims to develop in a low carbon and sustainable manner, with more potential for future positive environmental impacts.

4.2.4 Laois County Development Plan 2017-2023

The Laois County Development Plan (CDP) identifies that a '*sound local economy is fundamental to fostering sustainable communities and a good quality of life..*' and there is a commitment in the Plan to support the sustainable and economic development of County Laois during the lifetime of the CDP (2017-2023). The CDP recognises that the availability of aggregates is a necessary resource and that they are of importance to the economy and society.

The CDP also acknowledges that the extractive industry has the potential to cause environmental damage if sites are not appropriately managed and designed.

The Plan identifies a number of industry relevant policies. These are detailed under Section 5 of the CDP which deals with Rural Economic Activities. The policies and objective include:

> **'RUR6**: *Reconcile the need for resource-based economic activities to conduct a reasonable operation and the needs of residents in rural areas to access a good quality of life and access to rural areas*
>
> **RUR7:** *Have regard to Laois' Landscape Character Assessment, as well as more general Planning; considerations, such as transport, environmental sensitivities, habitat considerations, the need for buffer zones round water bodies in its determination of planning applications related to land-based economic activities;*
>
> **RUR8:** *Support in principle the expansion of the aggregates and concrete products industry which offers opportunity for employment and economic development generally subject to environmental, traffic and planning considerations and ensure that any plan or project associated with extractive industry is subject to Appropriate assessment screening in compliance with the Habitats Direction and subsequent assessment as required, applicants for planning permission shall have regard to the GSI-ICF Quarrying Guidelines*;
>
> **RUR9:** *To support the necessary role of the extractive industries in the delivery of building materials for infrastructural and other development and to recognize the need to develop extractive industries for the benefit of society and the economy*;
>
> **RUR10***: To secure the long-term supply of value-added products (such as concrete products and asphalt, which are often, but not always, produced in conjunction with aggregate extraction;*
>
> **RUR11:** *Support in principle the processing of minerals to produce cement, bitumen or other products in the vicinity of the source of the aggregate, where the transport network is suitable to reduce trip generation;*
>
> **RUR12:** *Investigate the feasibility of mapping the full extent of aggregate resources of the county during the lifetime of the County Development Plan 2017-2023 and seek to prevent the sterilisation and inappropriate development of aggregate and mineral resources in order to ensure a sustainable supply of these non-renewable resources*;
>
> **RUR13**: *Protect rural amenities, natural archaeological and natural heritage, visual amenities, eco-systems, conservation areas, landscape and scenic views from adverse impacts of agricultural practices and development particularly in high amenity areas and ensure that it is appropriate in nature and scale, and ensure it does not have an undue negative impact on the visual/scenic amenity of the countryside and identify mitigating*

measures where required. Integrate into the landscape, including the minimal use of signage;

The proposed Project supports the continued development of the aggregates and concrete products industry in County Laois. An Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) have been compiled which incorporate a range of assessments including, landscape, traffic, heritage, biodiversity, designated European sites (Natura 2000) and the local community. The EIAR and NIS concluded that there will be no significant adverse residual effects resulting from the proposed Project.

The proposed Project was considered to comply with the above policies relating to rural economic activities.

Section 6 of the CDP – Infrastructure

Section 6 of the CDP deals with infrastructure requirements for County Laois and identifies a number of policies relevant to the protection of surfacewater and groundwater in the County including:

'***WS30:*** *Protect and develop, in a sustainable manner, the existing groundwater sources and aquifers in the County and control development in a manner consistent with the proper management of these resources, in accordance with the County Source Protection Zones;*

WS31: *Ensure the protection of groundwater dependant Natura 2000 sites which rely on the continued supply of groundwater resources to secure the key environmental conditions that support the integrity of the site and through the protection of groundwater standards as defined by the relevant River Basin Management Plan. Where no detailed Plan for protection of a specific source is available wastewater discharge will not be permitted within a radius of 300 metres of that source;*

WS32: *Ensure the protection of groundwater dependant Natura 2000 sites which rely on the continued supply of groundwater resources to secure the key environmental conditions that support the integrity of the site and through the protection of groundwater standards as defined by the relevant River Basin Management Plan. All Capital projects and programmes associated with the provision of water supply or wastewater and surface water treatment must be assessed in accordance with Article 6 of the Habitats Directive in order to avoid adverse impacts on Natura 2000 sites;*

WS34: *Comply with the provisions of the Water Framework Directive 2000;*

WS39: *Have regard to the Groundwater Protection Scheme and to comply with the Water Services Act 2007 (as amended) in decision-making on the location, nature and control of developments and activities in order to protect groundwater;*

WS43: *Ensure that developments that may adversely affect water quality will not proceed unless mitigation measures are employed, such as settlements ponds, interceptors etc;*

A hydrological and hydrogeological assessment has been undertaken which supports both the EIAR and NIS. The assessment considered the potential for impacts on the surface water and groundwater regimes associated with the Stradbally River and the River Barrow and Nore Special Area of Conservation (and their qualifying features). With appropriate mitigation, the assessment concluded that the significance of any effects would be imperceptible (not significant).

Mitigation measures include the recycling of all process (wash water) back into the washing activities i.e. there will be no discharge of process water from the site. Additionally, measures will include the development of 4No. settlement ponds for sludge and surface water, oil interceptor for the refuelling area, surface water and groundwater monitoring regimes and the implementation of an Environmental Management Plan.

Groundwater supply is required as part of the site water requirements. The proposed abstraction will have no impacts on the quantity or level of water at surrounding group water and domestic water supplies. The zone of contribution (ZOC) relating to the abstraction on-site will not interact with these water supplies and there is no groundwater flow from the site to these water supplies.

Refer to Chapter 8 Hydrology and Hydrogeology for full details.

The proposed Project was therefore considered to comply with the surface water and groundwater policies outlined in the Laois CDP 2017-2023.

Section 7 of the CDP – Heritage (Natural and Built)

Section 7 of the CDP is focused on Heritage and the plan outlines that Laois County Council is committed to the '*..conservation and preservation of the environment and will seek to protect natural resources of the county through the enforcement of policies and relevant legislation.*'

This section identifies a range of policies and objectives that relate to built and natural heritage and are aimed at promoting, protecting and enhancing the value of these heritage assets within the county.

Polices in this section which are generally relevant to the development and operation of the proposed Project and include:

> '**NH1:** *Ensure that the conservation of biodiversity in protected areas and in the wider countryside is integrated into all aspects of the operation of the Council*;
>
> **NH2:** *Ensure that the following guidance is taken into account when assessing planning applications for extractive industry "Notice Nature Biodiversity Guidance for Extractive Developments"*
>
> **NH3:** *Ensure that landscaping plans incorporate features or measures to foster biodiversity and enrich ecological networks;*
>
> **NH4:** *Preserve the County's extensive network of hedgerows and eskers which are of landscape and ecological importance;*
>
> **NH6:** *Implement the Habitats' Directive requirement to preserve other types of ecological linkages or stepping stones, such as railway embankments, road verges and ditches, riparian lands etc*
>
> **NH12**: *Recognise and protect the significant geological value of sites in County Laois and safeguard these sites, in consultation with the Geological Survey of Ireland and in accordance with the National Heritage Plan and "Geological Heritage Guidelines for the Extractive Industry"*'.
>
> **BIO1:** *Comply with the objectives of the National Biodiversity Plan 2011-2016 (and any future National Biodiversity Plan which may be adopted during the period of this plan) as appropriate to County Laois;*

BIO2: *Contribute, as appropriate, towards the protection of designated ecological sites including candidate Special Areas of Conservation (cSACs) and Special Protection Areas (SPAs); Ramsar Sites; Wildlife Sites (including Natura I Heritage Areas, proposed Natural Heritage Areas and Nature Reserves); Salmonid Waters; Flora Protection Order sites; and Freshwater Pearl Mussel catchments (the River Nore Freshwater Pearl Mussel sub-basin management Plan should be referenced in this regard);*

BIO3: *Contribute towards compliance with relevant EU Environmental Directives and applicable National Legislation, Policies, Plans and Guidelines*

BH5: *Safeguard Protected Structures from works that would adversely affect or erode their special character and where proposals are made to extend a protected structure or to site new buildings within the curtilage of a Protected Structure, ensure Protected Structure status is used as a stimulus to the imaginative and considered design of new element*

An EIAR and NIS have been compiled which incorporate a range of assessments including, landscape, traffic, heritage, biodiversity, designated European sites (Natura 2000) and the local community. The EIAR and NIS concluded that there will be no significant adverse residual effects resulting from the proposed Project.

The Ballykilcavan Bridge is located c. 630m east of the proposed Project, on the local road L7939. The is noted on the County Laois Record of Protected Structures (RPS) and on the National Inventory of Architectural Heritage (NIAH). The proposed Project will have no impacts on this asset. All site traffic accessing and exiting the site, will travel west, using the junction at Garrans on the regional road R427.

To compensate for the loss of the internal hedgerow system, the Landscape Plan in Appendix 10.6 for the restoration phase has specified the provision of new hedgerows. These have been planned in such a way to mirror, the historical field pattern according to Ordnance Survey 25 inch 1888-1913 & 1837-1842 maps.

The proposed Project was considered to comply with the heritage policies outlined in the County Laois CDP 2017-2023.

In relation to the extractive industry the following objective is included in Section 7, which specifically relates to the extractive industry and archaeological heritage:

OBJ8: '*When considering proposals for extractive Industry, the applicant shall have regard to*

- *the Archaeological Code of Practice agreed between Irish Concrete Federation and National Monuments Division;*
- *the Code of Practice for Bord Na Mona*
- *and other Archaeological Codes of Practice https://www.archaeology.ie/codes-of-practice.*
- *Currently the Code of Practice with TII is at an advanced stage (pers. comm.).*'

Housing and Economic Development

The housing strategy within the CDP refers to a housing target of 3,211 units by 2023 (from 2021), with 1,824 in Portlaoise Town and 62 in Stradbally. In terms of future economic development, there is reference to the future development of the National Enterprise Park, with a number of policies aimed as promoting and enhancing development, that will help improve the '*health*' of towns and villages in Laois.

Development Management Standards
The Plan defines a number of Development Management Standards **(DM69)** which would be considered by the Planning Department when considering applications for extractive projects. These standards relate to items such as the phasing of works, landscape and visual assessment, restoration and screening proposals and details for other buildings/structures that are part of any such extractive development.

Land Zoning
A land zoning map has been published as part of the CDP. These land use zones relate to identifying areas as amenity/open space, for economic development, community use etc. The proposed Project does not fall within an area zoned for land use

Conclusion in Relation to the Laois CDP 2017-2023
An environmental assessment of the proposed Project is presented in this EIAR and associated Natura Impact Statement. These assessments including the associated planning application documentation and drawings have taken account of elements such as Appropriate Assessment (Natura 2000 sites), landscape, visual, emissions to the environment, heritage and development management standards.

The EIAR concluded that there would be minimal environmental disturbance, with no significant residual or cumulative impacts. On this basis, the proposed Project is therefore considered to comply with the Laois CDP 2017-2023.

The proposed Projects location at Garrans aligns with the Laois CDP 2017-2023 objectives for the extractive industry in that:

- It will provide for economic and employment development in the County Laois region. The proposed Project will provide for some local employment both directly and indirectly.
  By providing a local supply of aggregate material to local processing and manufacturing industries, the proposed Project will make an important contribution, towards their continued future operational and employment abilities;
- It will provide a local and secure supply for raw materials, in the vicinity of where they will be processed. The raw material from Garrans will provide a secure supply of material for local industry and will be travelling generally short distances (such as Portlaoise Town) for future manufacturing.
- There is an acknowledged shortage of some aggregates already occurring in the Midland region. The provision of a local and secure supply of aggregates to the Laois region will provide some certainty that the economic development of sites and housing targets for the county can be achieved in an efficient and sustainable manner; and
- The EIAR and NIS have been compiled and incorporate a range of assessments. These documents concluded that the construction, operational and restoration phases of the proposed Project will not result in any significant effects to the environment.

4.2.5 Portlaoise Local Area Plan 2018-2024
Portlaoise Town is located c. 9km west of the proposed Project site. The key focus of the Local Area Plan (LAP) is to guide the continued future growth of Portlaoise Town in a '….*low carbon,*

sustainable' manner, with the population of the town projected to grow from 20,145 in 2011 to 25,382 in 2023.

The Plan makes reference to items such as the development of an enterprise and employment campus, revitalisation of the town centre, facilitating new residential development and promoting employment through ensuring that a range of economic sectors are developed. Additionally, transport infrastructure needs include a number of key internal relief roads including links between The Dublin Road and Borris Road, Rathleague and Meelick and The Stradbally Road and Dublin Road (through Fintan's Land).

Specifically, in relation to housing, the LAP refers to the Housing Strategy in the Laois CDP 2017-2023 and identifies that Portlaoise Town '*has a projected requirement for an additional 1,824 households over the six-year period up to 2023'*.

To meet the proposed development and investment needs of Portlaoise Town, there will be a need for aggregates to physically enable and allow for this development.

On this basis, the proposed Project is considered to comply with the LAP, in that it will facilitate continued development for Portlaoise Town, by providing a local source of aggregates allowing construction and development works to progress.

The adjacency of the Garrans site, means that the aggregate supply would be travelling only short distances to the Town and is thereby supportive of the LAP's aims to develop the Town in a low carbon and sustainable manner.

4.3 Other Plans and Guidance

4.3.1 Essential Aggregates: Providing for Ireland's Needs to 2040

This document was published by the Irish Concrete Federation (ICF) in October 2019. The document highlights the need for significant aggregate resources within Ireland to realise the Irish Governments' commitments outlined in the National Planning Framework 2040. The objective of the document is to highlight the need for national planning policy for aggregates to '*ensure the sustainable supply of aggregates for Project Ireland 2040'*.

Specifically, this document outlines in its Key Points (No. 5&6) that:

> *5: 'Current demand for aggregates in Ireland at 12 tonnes per capita is twice the average demand in the EU 28. Project Ireland 2040 will necessitate the production of approximately 1.5 billion tonnes of aggregates.'*
>
> *6: 'Scarcities of some particular aggregate products are already emerging in the eastern and midland regions. Therefore, the future supply of aggregates needs to be planned, monitored and managed in a sustainable manner'*

Pat Booth has long recognised the local, regional and national demand for aggregates. In response to this, he has prioritised the identification of a suitable extraction location that can be developed with appropriate mitigation measures, where any resulting residual or cumulative impacts would be considered not significant.

The future development of the proposed Project will be a significant and sustainable contribution in the provision of aggregate resources at national and regional levels. In this sense, it will play a key role in helping Ireland realise the objectives and goals of Project Ireland 2040.

4.3.2 National (Sector Relevant) Guidelines

Relevant sector specific guidance for the proposed Project and which are also referenced in the Laois CDP 2017-2017 are the following:

- Quarries and Ancillary Activities Guidelines for Planning Authorities (2004);
- Environmental Management in the Extractive Industry (2006); and
- Environmental Code;

The proposed Project has taken these into account in the preparation of the planning application (EIAR and design). The site will also operate in accordance with these guidance documents during its operational phase.

4.4 The Need for the Proposed Project

At a national, regional and local level, the importance of the extractive industry in terms of future economies and continued development is recognised.

4.4.1 National and Regional Needs

Ireland's population is projected to increase to between 5.33million – 5.81million by 2036 from 4.74 million in 2016, with growth predicted in all regions of the country. This will result in a national population that will require access to more key resources such as housing, transport, wastewater and waste infrastructure, education, employment and health (amongst others).

As referenced above, the NPF 2040 has acknowledged Ireland's growing needs and sets out a high level plan for the future growth and development of the county to 2040. This growing need is also reflected at a regional and local level in the relevant RSES and CDP documents.

To achieve this growth the Irish Concrete Federation have recently indicated that access to 1.5billion tonnes of aggregates is needed through to 2040, with future scarcities already emerging in the eastern and midland regions. The secure supply of aggregates of up to c. 1.22 million tonnes from the proposed Project is supportive of the local, regional and national growth estimates and of the Irish Government's commitment to provide appropriate resources and infrastructure to facilitate this growth in a sustainable manner.

4.4.2 Need for a Low-Carbon Society

There are a number of national and regional climate change related policy or position papers including:

- Climate Action and Low Carbon Development, National Policy Position Ireland;
- National Mitigation Plan, Department of Communications, Climate Action and Environment (July 2017);
- Ireland's Transition to a Low Carbon Energy Future 2015-2000;
- Low Carbon Energy Roadmaps for Ireland;
- Delivering a Sustainable Energy Future for Ireland: the Energy Policy Framework 2007-2020; and
- Climate Action Plan 2019 (To Tackle Climate Breakdown).

In brief summary, these climate policy documents set out emission reduction measures and actions, contributing to the reduction of greenhouse gases and they support an overarching transition to a low-carbon future.

The need for aggregates is recognised and the provision of planned and local sources of aggregates into their surrounding regions will be important in contributing towards national and regional climate change targets. The emerging short supply of aggregates in the midlands area has already been recognised by the Irish Concrete Federation.

The aggregates from the Garrans site will be largely used within a 25km radius, providing a robust supply to local industries whilst also reducing the carbon emissions that would otherwise be emitted by vehicles travelling from elsewhere in Laois or wider afield.

It is currently estimated that there would be a reduction of c. 200,000km per annum of Heavy Goods Vehicles (HGV's) road trips within the Laois and Kildare regions, with the Garrans site in operation.

This is based on the reduced travel distances that would be in place with the Garrans site in place. Currently sites in far as Abbeyleix and wider afield are servicing the Portlaoise, North County Laois and Kildare regions. With the Garrans site in operation, it could service these regions, thereby reducing the dependency on further afield sites, resulting in reduced distances and carbon emissions from the associated HGV trips (Refer to Figure 4.1 for geographic locations).

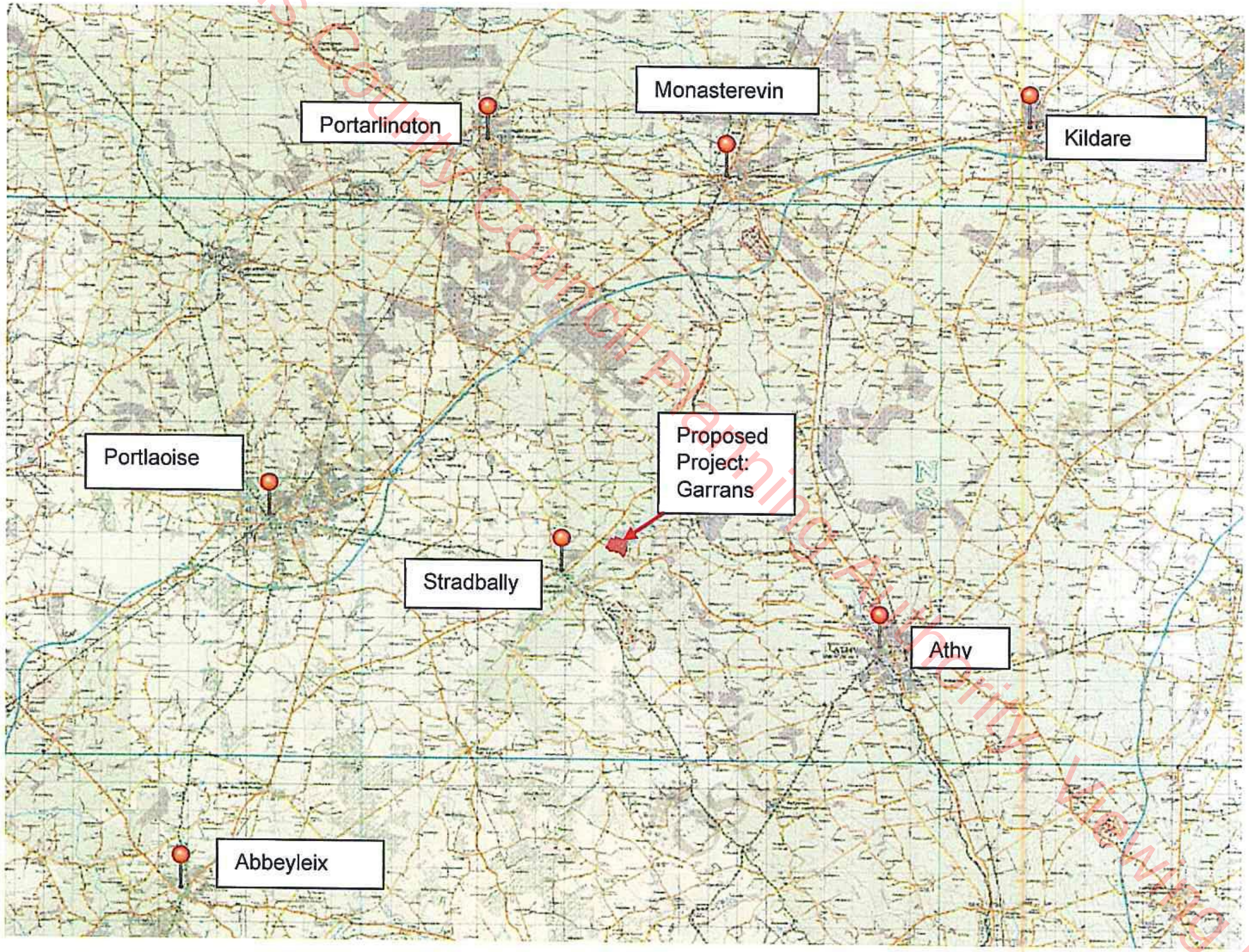


Figure 4.1 Geographic Locations relative to the proposed Project site.

4.4.3 Business Need

Pat Booth is from the County Laois area and has been operating in the local area for over 27 years, being involved in the extraction of aggregates and also in their onward processing in local concrete and precast industries. These local businesses have made significant contributions to the economy and communities of County Laois and the surrounding areas over these years.

The recognised future scarcity of some aggregates in the eastern and midlands regions, highlights the immediate and driving business need to access secure supplies of quality aggregate material within County Laois. This is needed to assist in securing the continued future operation and development of the local industries and the associated local employment.

Not utilising the available capacity of the site, would result in a local business loss, directly through future employment losses (c. 2 direct and 2 indirect) and could result in employment security concerns for local and regional manufacturing plants that rely on the supply of suitable raw material to continue future operations.

4.4.4 Conclusion

There is a recognised need for the supply of aggregate within Ireland.

Permitting the proposed Project would present a number of advantages:

- The ICF have recognised the emerging shortage of particular aggregates in the midland region. Development of the proposed Project would provide for c. 1.22 million tonnes of quality aggregate material to serve the Laois and Kildare regions. This supply of aggregates will be essential in contributing towards the achievement of development objectives outlined in the NPF 2040, Laois CDP 2017-2023 and the RSES published in 2019;
- From the Garrans location, much of the quarried aggregate can be used adjacently in Portlaoise Town (c. 15km away). Other nearby locations include Stradbally, Portarlington, Athy and North County Laois, all generally within a 25km radius of the Garrans site. This would reduce the need for and volume of other HGV's travelling from longer distances, on the local road network to serve these areas.
- The Garrans location also provides safe and quick access to the road network (regional and national) providing safe access to the required destinations;
- It would address local and regional aggregate needs and contribute towards the security of supply of local manufacturing products in County Laois;
- The proposed Project would provide a secure, low carbon supply of aggregate into the local and regional construction and manufacturing industries. There will be lower carbon emissions, with a reduction in the number of HGV's travelling from across country to supply aggregate material into the region. Currently in the region of 50% of aggregates used in County Laois are imported from outside the county; and
- The proposed Project will support economic and employment development within Laois and the wider region. The proposed Project will provide an additional source of employment in the area and will support the future security of businesses that it will supply. In the event that there was a shortage of aggregate material for businesses in the area, there would be significant impacts on their operations, with the potential for future job losses;

- There is a recognised need for continued economic and housing development within County Laois. The development of the proposed Project will provide for a secure and sustainable supply of aggregates for future construction works on these sites; and
- The screening and washing plant used at the Garrans site is the most modern of its kind in the extractive industry. Significantly, water for washing aggregate will be recycled by the proposed plant and reducing water needs within the site by up to 80%. The screening and washing of material will be undertaken with minimal noise emissions using noise reducing screens, minimal needs for water abstraction and low carbon emissions.

4.5 References

Central Statistics Office. (2017) Press Statement : https://www.cso.ie/en/csolatestnews/pressreleases/2019pressreleases/pressstatementregionalpopulationprojections2017-2006/ (Accessed online in October 2019).

Eastern and Midland Regional Assembly. (2019) Regional Spatial and Economic Strategy 2019-2001.

Government of Ireland. (2018) Project Ireland 2040 National Planning Framework.

Irish Concrete Federation. (2019) Essential Aggregates – Providing for Ireland's Needs to 2040.

Laois County Council. (2017) Laois County Development Plan 2017-2023.

Laois County Council. (2018) Portlaoise Local Area Plan 2018-2024.

Midland Regional Authority. (2010) Regional Planning Guidelines for the Midland Region 2010-2022.

5. Traffic and Transport

> **This Chapter assesses the potential effects of the proposed Project on the local traffic and transport network during the construction, operational and restoration phases.**
>
> **A Traffic and Transport Assessment was undertaken to review existing traffic volumes and conditions on the local road network. The assessment also assessed the impacts of any additional traffic on the road network, that will be generated by the proposed Project.**
>
> **Site access will be provided through a site entrance on the local road L7939 and 3 lay-bys will be provided on the L7939, back towards the junction at Garrans Cross, on the regional road R427. All traffic accessing and exiting the site will use the junction at Garrans Cross (R427). No site traffic will travel over the Ballykilcavan Bridge to access or exit the site.**
>
> **The additional traffic generated as a result of the proposed Project will result in some increases to traffic flows on the local road network. However, even when operating at peak excavation volumes (which will be occasional), the additional traffic was considered to be of low volumes.**
>
> **It was concluded that the existing junction on the R427, will have sufficient capacity with no queuing, to cater for the traffic increases in a safe and appropriate manner.**

5.1 Introduction

This Chapter of the EIAR has been compiled by Rowan Engineering Consultants Ltd. (Rowan) with Jason Redmond & Associates Consulting Engineers who were contracted to undertake the Traffic Transport Assessment (TTA) for the proposed Project. The TTA is provided in Appendix 5.1.

This Chapter considered the effects on local traffic and transport operations as a result of the proposed Project.

5.2 Methodology

The following were among the sources consulted in order to identify and assess the potential impacts on traffic and transport from the proposed Project:

- Laois County Development Plan (CDP) 2017-2023; and
- Traffic Transport Assessment, Jason Redmond & Associates Consulting Engineers, June 2020.

5.3 Baseline Conditions

5.3.1 Site Location – Road Network Context

The site entrance for the proposed Project is located on local road L7939, close to the regional road R427 at Garrans, Stradbally, Co. Laois. Travelling west from the site, provides access towards the R427, Garrans and accessing both Stradbally and Portlaoise. Travelling east from the site, provides access towards the regional road R428 and the north County Kildare region.

The R427 operates as a 2-lane road, with one lane in either direction and an urban speed restriction of 80 kilometres per hours (kph). The L7939 generally has a carriageway width of

c. 3.3m, which allows for one-way traffic. However, there are a number of areas when the width increases on the road and these areas are used as traffic lay-bys, allowing opposing vehicles to pass safely.

5.3.2 Site Entrance for the Proposed Project

Access into the proposed Project will be via traffic travelling the R427 onto the L7939. All access and egress to the site will be made via the L7939 and R427. No traffic will enter or exit the site from the east (R428)

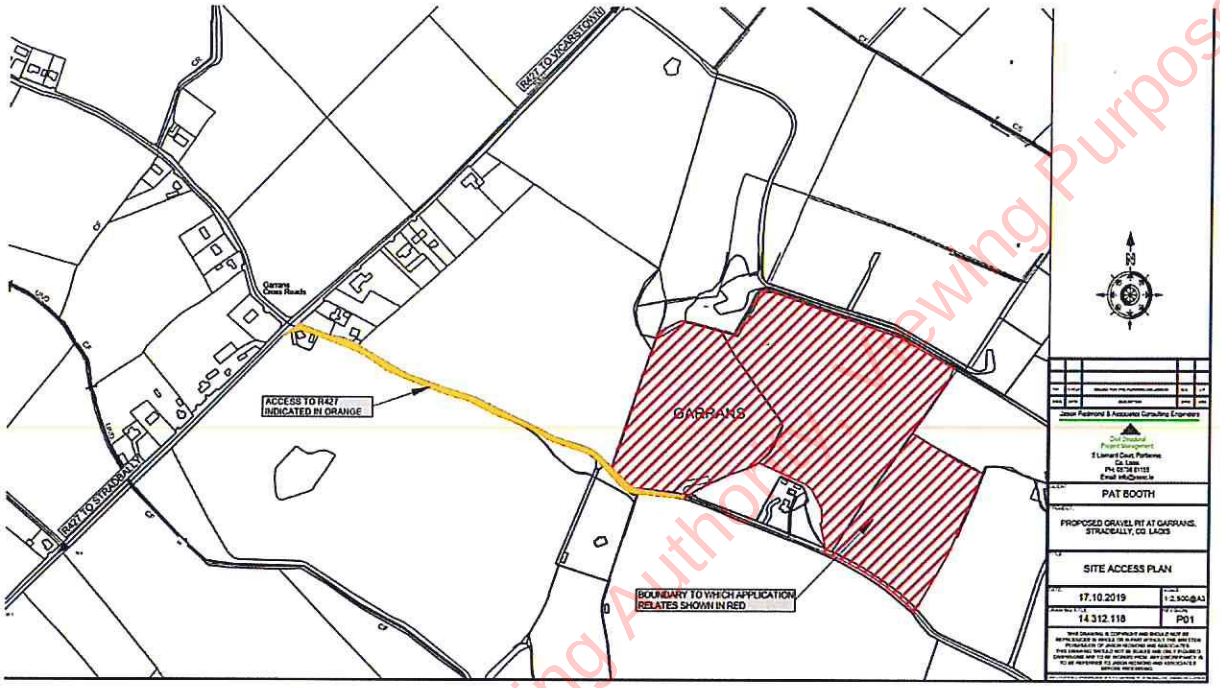


Figure 5.1: Access Route to/from the Proposed Project (Ref: extracted from planning drawings)

5.3.3 Current Traffic Flows

As part of the TTA, a traffic survey was undertaken in December 2019.

At the junction of the R427 with the L7939, there was a 2-way flow of 141 passenger car units (pcu's) on the R427 during the weekday, morning (AM) peak commuter period (0800-0930) and a 2-way flow of 195 pcu's during the weekday, evening (PM) peak commuter period (1600-1800).

There was also a 2-way flow of 15 pcu's along the L7939 road in the vicinity of the junction with the R427 during the weekday AM peak commuter period, and a 2-way flow of 12 pcu's during the PM peak commuter period.

5.3.4 Parking and Loading Facilities

Employee and visitor parking and HGV loading/unloading infrastructure will be provided within the site boundary. This will allow for all traffic to enter the site on arrival, with no queuing or delays in entering from the L7939.

5.3.5 Walking and Cycling

There are no footpaths present on the R427 or L7939. There are grass verges on each side of these roads. No cyclists or pedestrians were noted on either road during the traffic and transport assessment.

5.3.6 Other Proposed Transport and Development Proposals

No other significant transport or development proposals were identified in the vicinity of the proposed Project.

5.4 Predicted Impacts

5.4.1 Traffic Generation as a Result of the Proposed Project

The daily average production rate for the proposed Project is 200 tonnes per day. During peak times, the daily rate may increase to 350 tonnes per day. For the purpose of a robust TTA, the assessment was based on the peak figure (350 tonnes).

The assessment determined the following:

- 15 HGV Loads per day from the facility;
- Staff movements would consist of 2 inbound trips in the morning and 2 outbound trips in the evening; and
- A total of 6 additional trips were assumed to occur daily for miscellaneous items.

Refer to Figure 5.2a for a summary of the maximum daily trips. Note that in terms of pcu's, 1 HGV equates to 2 pcu ie. 15 loads is equivalent to 30 pcu's.

Figure 5.2b presents the AM and PM peak figures, having assumed that 12% of the HGV loads will occur during these peak periods.

	Arrivals	Departures	Total
Haulage Vehicles, pcu	30	30	60
Staff, pcu	2	2	4
Miscellaneous, pcu	6	6	12
Total, pcu	38	38	76

Table 4.1: Summary of Total Maximum Daily Trips (in pcu's)

Figure 5.2a: Total Maximum Daily Trips (Ref: Extracted from the TTA)

	AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures
Haulage Vehicles	4 (30x12%)	4 (30x12%)	4 (30x12%)	4 (30x12%)
Staff	2	0	0	2
Miscellaneous	0	0	0	0
Total	6	4	4	6

Table 4.2 – Hourly Peaks Associated with Proposed Quarry (in pcu's)

Figure 5.2b: AM and PM Peak Flows (Ref: Extracted from the TTA)

5.4.2 Proposed Lay-Bys

During a joint site visit with an Area Engineer from Laois County Council, the L7939 between the junction on the R427 and the proposed Project was reviewed. A number of locations for lay-bys were agreed and are detailed in Figure 5.3.

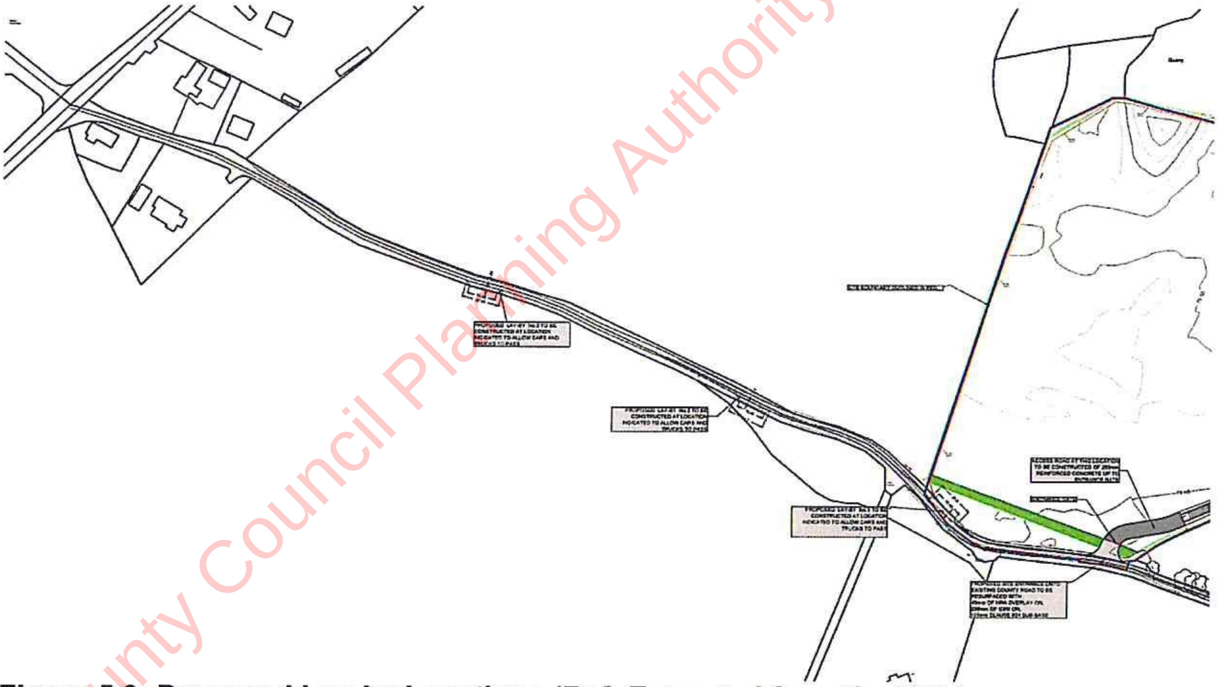


Figure 5.3: Proposed Lay-by Locations (Ref: Extracted from the TTA)

5.4.3 Operation of the Proposed Project

The traffic modelling used a PICADY[3] software package to assess a ratio of flow capacity and queue length. The modelling outputs from the TTA indicated that the proposed junction with the R427/L7939 *'will have more than adequate capacity to accommodate the worst case traffic'*, with no queuing anticipated.

[3] Approved by Transport Infrastructure Ireland

The calculations determined that there will be a spare capacity of 98% for vehicles in the design year of 2026.

Refer to the TTA in Appendix 5.1 for full details.

Given the low volume of additional traffic and that the road network is within capacity, impacts resulting associated with traffic and transport were considered not significant.

5.4.4 Traffic Disruption & Safety

The development of the proposed Project could have some benefits (indirectly) by allowing for improvements in traffic disruption and road safety in the surrounding region. The Garrans site in operation would reduce the dependency on other local extraction facilities in County Laois and the surrounding region. The Garrans facility would be used to service sites in the Portlaoise, North County Laois and Kildare regions, thereby reducing the dependency on facilities hauling from distances, further afield. This could result in a reduction in the number of HGV's travelling through the County to access Portlaoise, North County Laois and Kildare and thereby having a potential positive impact for traffic disruption and safety.

5.4.5 Restoration of the Proposed Project

Following the cessation of extraction activities within each phase, restoration works for the relevant phase will commence. The lands will be graded and sloped to meet the levels of the surrounding areas. The area will be re-seeded with agricultural grass seed mixture native to the local area.

Once the restoration works are complete, the need to have traffic access and exit the site will be removed. During the restoration phase, there will be no works undertaken at the site and no regular traffic access into/out of the site. The effect on the local road network from this phase of the proposed Project was considered to be imperceptible.

5.5 Mitigation Measures

An Environmental Management Plan (EMP) (Appendix 2.2) has been prepared setting out a framework in relation to the management of the site including traffic management requirements during operation.

The EMP will be updated prior to the commencement of the works on site and compliance with the EMP will be mandatory.

With the construction of the proposed lay-bys, no other specific mitigation measures were identified with respect to traffic and transport when the proposed Project is operational.

5.6 Residual Impacts

In terms of residual impacts, the operation of the proposed Project, with regard to traffic and transport was considered not significant, taking into account the available capacity and that the overall traffic volumes from the site are generally considered low.

6. Noise and Vibration

This Chapter assesses the potential noise and vibration impacts which may be generated during the construction, operational and restoration phases of the proposed Project. **Impacts will be associated with machinery use, excavation, washing and screening of sand & gravels and heavy good vehicles (HGVs) operating within the site.** **Noise modelling was completed and has shown that noise criteria can be met, with effects from the proposed Project considered not significant.** **Increases in traffic noise to and from site, on the local road network will be minimal and the significance of any effects would be imperceptible (not significant).** **A range of best practice noise management measures will be implemented through the Environmental Management Plan. This includes measures such as restricted speed limits on-site, regular maintenance of plant, vehicles and the internal access road and switching off vehicles when not in use.** **Additionally, a soil berm will be constructed and planted at the outset of the project to the west of the site entrance and along the southern boundary. The berms will result in reduced levels at the nearby noise sensitive locations.**

6.1 Introduction

This chapter of the EIAR summarises the likely noise and vibration impacts of the proposed Project. The Chapter has been compiled by Rowan Engineering Consultants (Rowan), with noise modelling and impact assessment undertaken by Enfonic Noise and Vibration Solutions. The full Noise Impact Assessment by Enfonic has been provided in Appendix 6.1 and details regarding the fundamentals of noise are provided in Appendix 6.2.

6.2 Methodology

In assessing the noise and vibration impacts the following methodology was adopted:

1. Characterise the receiving environment through a noise baseline survey;
2. Determine appropriate criteria for evaluating the significance of impacts through reference to guidance documents and international best practice (where applicable);
3. Calculate the potential impacts using industry standardised calculation methods;
4. Assess the impact by comparing the calculated levels against the adopted criteria;
5. Where necessary specify remedial or reductive measures to control the impacts to be within the adopted criteria, and;
6. Present the predicted impact of the proposed Project including the remedial or reductive measures.

6.2.1 Relevant Guidance

Relevant guidance/documents taken into consideration in the development of this Chapter include:

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, August 2017);
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA, September 2015);
- Quarries and Ancillary Activities (Guidelines for Planning Authorities), (DEHLG[4], 2004);
- Environmental Management Guidelines: Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (Environmental Protection Agency (EPA) 2006);
- Kildare Local Authorities – Second Noise Action Plan (Kildare County Council, July 2013);
- BS 5228 – 1:2009: Code of Practice for Noise and Vibration Control on Construction and Open Sites (Noise and Vibration);
- BS 4142: Methods for Rating and Assessing Industrial and Commercial Sound;
- ISO 9613-2:1996: Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation;
- ISO 1996-1: 2016: Acoustics -Description, Measurement and Assessment of Environmental Noise; and
- ProPG: Planning & Noise: Professional Practise Guidance on Planning & Noise, Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH) (2017).

6.2.2 Background to Noise & Vibration

Noise

A glossary of the main noise/acoustic terminology is provided with the Noise Impact Assessment in Appendix 6.1.

A brief introduction to the fundamentals of noise has been documented in Appendix 6.2.

Vibration

There will be no requirement for blasting at the site. Crushing of oversized material (larger than 20mm) will be undertaken only intermittently, about once every three months, in the north west corner of the site. Any vibration arising from crushing activities will be well below any relevant vibration thresholds at the nearest receptors. On this basis, the assessment of vibration was scoped out of the EIAR.

6.2.3 Assessment Criteria

Noise Assessment Criteria

BS 4142: Noise Modelling and Impact Assessment

The Noise Impact Assessment developed by Enfonic was undertaken with reference to BS 4142 as applicable guidance.

The standard rates the noise levels from an operation and compares it with 'background' noise levels. The level difference is an indication of the impact that the operation might have,

[4] Department of Environment, Heritage and Local Government – now Department of Communications, Climate Action and Environment

'If for example, if the 'Rated' noise level (the Specific noise + any penalties for particular noise characteristics) exceeds the Background noise by 10dB or more, it is likely to be an indication of a significant adverse impact. A difference of around 5dB indicates an adverse impact. If the level does not exceed the background, it is likely to have a low impact.

This however is dependent on the 'context' of the site and its environs e.g. time of day, nature of the neighbourhood, local attitudes to the development etc. There is also a degree of uncertainty applicable to the results e.g. for weather, instrumentation, measurement duration, calculation errors etc which ought to be considered.' (Enfonic, 2020)

The Noise Impact Assessment is provided in Appendix 6.1.

<u>EPA: Environmental Management Guidelines</u>
Reference has also been made to the EPA Environmental Management Guidelines: Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (2006). This Guidance is directly applicable to facilities which are subject to the EPA licensing regime.

It deals in general terms with the approach to be taken in the measurement and control of noise and provides advice in relation to the setting of noise emission limit values (ELVs) and compliance monitoring in the Extractive Industry.

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

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

6.2.4 Noise Modelling

Enfonic used a computer-based prediction model which calculated expected noise levels from the proposed Project, in accordance with ISO 9613-2:1996: Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation.

Refer to the Noise Impact Assessment in Appendix 6.1 for full details.

6.3 Baseline Conditions

6.3.1 Baseline Noise Survey

Ian Douglas (Rowan) conducted an attended noise survey of the site over two dates; 26th September and the 6th November 2019, the locations of which are represented in Figure 6.1 as survey locations "Survey 1-4".

The noise monitoring equipment used during the measurements was a SVANTEK 971 Class 1 IEC 61672-1:2013 Sound Level Meter (Serial No. 77617). The sound level meter was calibrated before the measurements, and its calibration checked after, using a SVANTEK SV33A Class 1 Acoustic Calibrator (Serial No. 79912). No calibration drifts were found to have occurred during surveys. All noise equipment had been calibrated to a traceable standard by UKAS (United Kingdom Accreditation Service) accredited laboratories within 12 months preceding the surveys.

Access to the nearest noise sensitive locations – in this case, residential dwellings (displayed as purple buildings in Figure 6.1 with other buildings displayed in yellow) was not possible.

The survey location Survey 1-4 were therefore chosen to act as proxy positions to these dwellings; i.e. the existing noise levels here should be very similar to those at the respective dwellings.

The results of the baseline noise survey are detailed in the Noise Impact Assessment in Appendix 6.1, with the table summary in Table 6.1 below.

Table 6.1: Baseline Noise Survey Results

Location	Date/time	Period	LAeq	LA90
1	06/11/2019 13:22:06	00:15:00.000	73.3	33.6
1	06/11/2019 14:47:22	00:15:00.000	44.0	33.4
1	26/09/2019 09:31:08	00:30:00.000	80.8	41.6
		Average	[illegible]	[illegible]
2	06/11/2019 13:40:26	00:15:00.000	75.4	31.6
2	06/11/2019 15:03:46	00:15:00.000	41.1	33.6
		Average	58.2	32.6
3	06/11/2019 14:04:28	00:15:00.000	33.6	26.3
3	26/09/2019 10:06:18	00:30:00.000	75.4	37.7
		Average	54.5	32.0
4	06/11/2019 14:29:16	00:15:00.000	34.4	30.9
4	06/11/2019 15:21:08	00:15:00.000	40.9	34.0
		Average	37.7	32.5
		(dB re. $2x10^{-5}Pa$)		

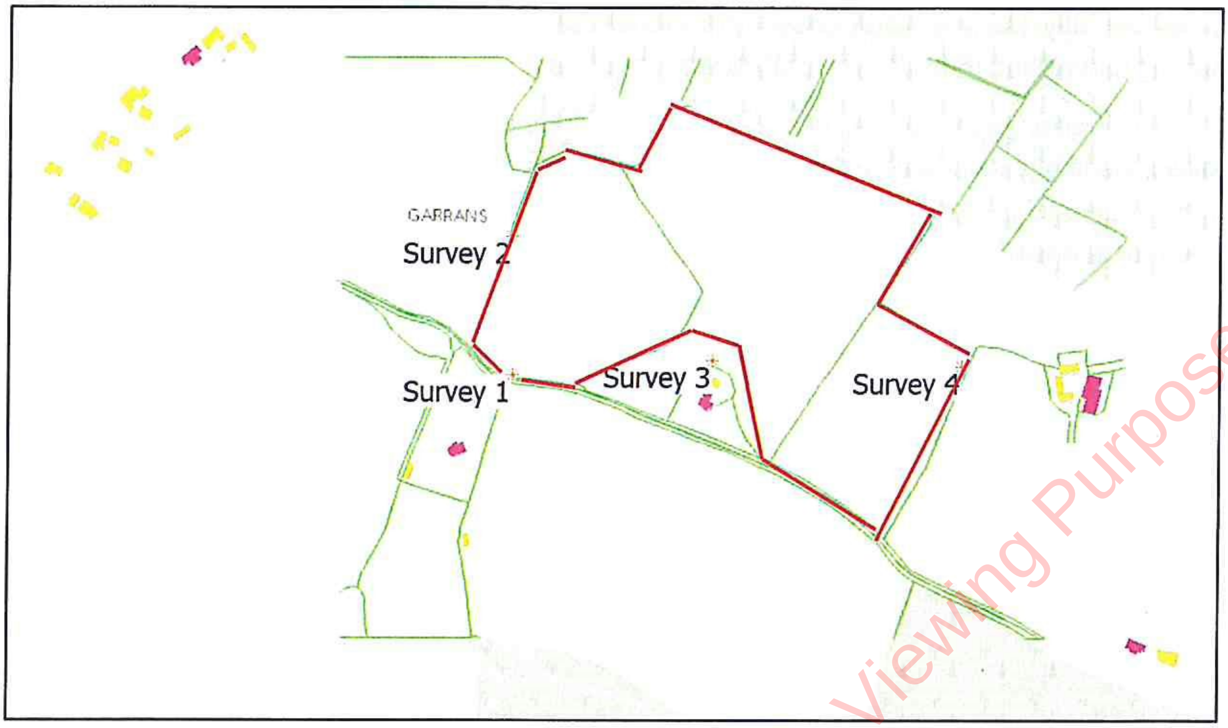


Figure 6.1: Location of attended noise measurements

6.3.2 Noise Associated with the Proposed Project

Table 6.2 details the noise source power data, that was used in the noise model, for the various equipment that will be used onsite.

Table 6.2: Summary of noise source sound power data

			Octave Band Sound Power Levels Lw (dB re2x10^{-12}pW)								
Item	Model	Power rating -kW	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	Overall
Onsite Generator	P165-6		86.3	90.4	80.9	83.3	85.5	81.7	78.5	68.4	93.9
Aggregate Screen	M2500 Wash Plant c/w A400 Aquacycle		76.8	86.9	91.4	91.8	97.0	96.2	94.0	86.9	101.9
Rigid road lorry (full)		270	97.8	93.9	93.4	97.8	105.0	101.2	100.0	90.9	108.6
Rigid road lorry (empty)		260	102.3	100.4	103.9	111.3	107.5	103.7	101.5	94.4	114.6
Artic lorry 44T		283	85.8	91.9	95.4	98.8	101.0	99.2	96.0	87.9	105.9
Wheeled loader 30T	Volvo L180	221	92.8	92.9	92.4	95.8	99.0	101.2	91.0	85.9	105.1
Tracked hydraulic excavator 35T	Daewoo digger	128	85.8	91.9	94.4	98.8	98.0	96.2	93.0	82.9	104.0
Dump Truck 35T	Moxy dump truck	240	92.8	101.9	102.4	107.8	109.0	108.2	99.0	87.9	114.0

There will be an average extraction rate of 200 tonnes of sand and gravel per day at the site. This may increase on occasion to 350 tonnes per day during peak times.. Assuming 350 tonnes per day (as the worst case), this would result in 15 heavy good vehicles (HGVs) entering and exiting the site on a daily basis. This has been factored into the noise model.

An on-site diesel generator has also been factored into noise model. It is proposed to access a direct electricity connection into the site and the diesel generator would not be needed. In terms of the noise impact assessment, as a worst-case scenario, the model assumed a generator in operation at the site.

Figure 6.2 indicates the typical locations and routes (where applicable) for each noise source as well as earth berms which will be constructed to reduce the noise impact on House S and House C.

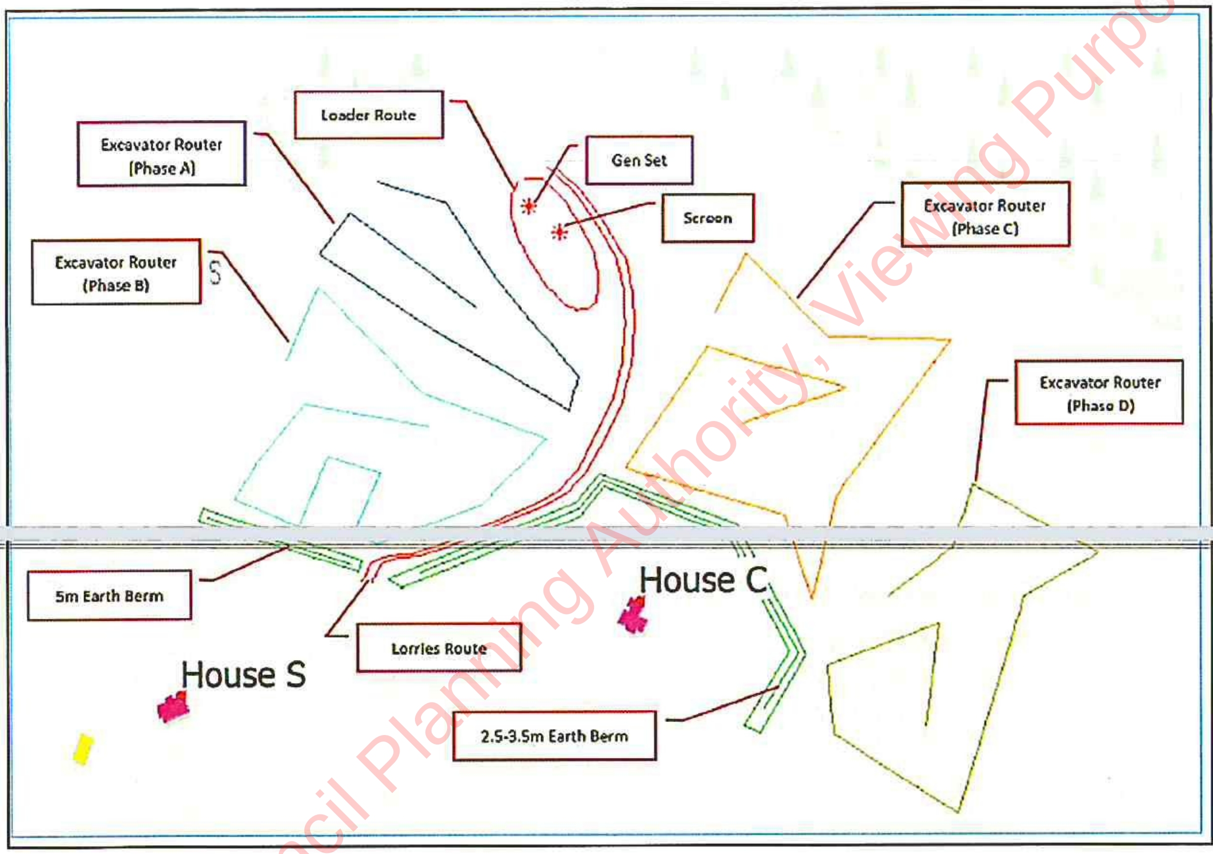


Figure 6.2: Source locations and routes and earth berms as used in the noise model

6.4 Predicted Impacts

6.4.1 Do Nothing Scenario

Under the Do-Nothing Scenario, the site would remain in its current state (a greenfield site) and continue to be used for agricultural activities. The baseline noise conditions would likely change very little, other than the potential for development of some one-off housing or small agricultural developments in the surrounding area.

6.4.2 Construction and Operational Phase

As the construction phase is quite similar to operational phase, it was deemed unnecessary to differentiate between the two phases.

Initial works for the proposed Project will involve stripping the topsoil and overburden and using it to construct the screening berms (2.5 - 5m high) close to the site entrance on the local road L7939 and along the southern boundary of Phase 3. The internal assess road, wheel wash and refuelling area shall be installed and various excavation/quarry equipment (washing and screening plant & loader) shall be transported to site.

Operation activities will involve the stripping of topsoil on a monthly basis (approximately) using a tracked hydraulic excavator. A 30 Tonne loader is expected operate to excavate the sand and gravel and loading into the washing and screening plant.

Tables 6.3 and 6.4 below, detail the predicted noise levels during the various stages of the proposed Project (with the excavator in operation) and the noise level differences compared to existing noise levels.

Assuming that bedrooms are located on the upper floors (4m), and as the site is operational only during the day-time, the impacts to be considered are at the ground floor level (1.5m) only. The second-floor levels are reported only as information.

The maximum impacts therefore from Table 6.3a&b relate to House C, as this is the closest receptor. The level difference here is +9dB on the ground floor level.

Table 6.3b demonstrates that the noise level increases remain below 10dB, for the ground floor levels, throughout all stages for each of the receptors.

This difference falls within the 'Low' category.

Table 6.3a: Summary of impact assessment

Name	Description	Height m	With Excavator - Phase 1	With Excavator - Phase 2	With Excavator - Phase 3	With Excavator - Phase 4
House C_A	Central	1.5	42	42	42	42
House C_B	Central	4.0	46	45	46	45
House E a_	East a	4.0	35	35	38	38
House E a_	East a	1.5	34	33	36	35
House E b_	East b	4.0	31	31	33	35
House E b_	East b	1.5	30	30	32	34
House S_A	South	1.5	41	42	41	41
House S_B	South	4.0	42	43	42	41
House W_A	West	1.5	32	33	31	30
			dB re: $2x10^{-5}Pa$			

Note: A is ground floor level and B is upper floor level

Table 6.3b: Summary of impact assessment

Name	Description	Height m	Proxy Loc	Measured L_{A90}	Predicted L_{Aeq} Noise Level
House C_A	Central	1.5	Survey 3	32	41
House C_B	Central	4.0			45
House E a_	East a	4.0	Survey 4	32	34
House E a_	East a	1.5			33
House E b_	East b	4.0	Survey 1	36	30
House E b_	East b	1.5			29
House S_A	South	1.5	Survey 1	36	41
House S_B	South	4.0			41
House W_A	West	1.5	Survey 2	33	30
					dB re: $2x10^{-5}Pa$

Note: A is ground floor level and B is upper floor level

Table 6.4 Summary of BS4142 impact assessment

Level Difference	Adverse Impact
<0	None
Around 5dB	Low
>10dB	Significant

The noise model suggests that a 'Low' adverse impact is likely on the ground floor level at the receptor closest to the proposed Project (House C). In this regard, the following is also noted:

- Receptor House C is located close to the local road L7939. Some of the existing measured ambient noise levels at this location, exceed the predicted levels from the proposed Project.
  Refer to Table 6.1, where during the baseline noise monitoring, an ambient noise level of 54.5dB (LAeq) was recorded. This is higher than the predicted noise level of 41dB (LAeq), which was predicted for the ground floor level at receptor House C.
- The noise model has assumed an initial 'worse-case' throughout the phases whereby the ground level remains as it is currently. The nature of the site of course means that as the sand and gravel extracted, the ground level will deepen and therefore the excavator will be working below ground level.
  This will result in a significant reduction in the noise level at House C. Professional experience suggests that a -3dB reduction in the level can be expected once the ground level reduces by c.2m and decreasing further the deeper it goes.
  Considering that excavation depths are expected to vary between 4-5m and 8m in some parts, the noise impact is likely to reduce from 'Low' to 'None' as the phases develop.
- The noise model has assumed the operation of a diesel generator on-site. In reality, a direct electricity connection will be sought for the site, which will negate the need for the generator and which would support a degree of noise reduction at the site.

ProPG Guidelines

This guidance is not directly applicable to the noise impact assessment. However, *'it is an indication of acceptable external noise levels for residential dwellings'* (Enfonic, 2020).

The external noise limit recommended in the ProPG Guidance is 50dB (LAeq).

The predicted noise levels from the noise model are all below this level, which indicates that the '*development site is likely to be acceptable from a noise perspective*' (Enfonic, 2020).

EPA: Environmental Management Guidelines

When the proposed noise levels are compared to the daytime limits as set out in the EPA's Environmental Management Guidelines, all predicted noise levels are below the daytime limit of LAeq (1 h) = 55 dBA.

6.4.3 Restoration Phase

Following the cessation of extraction activities within each phase, restoration works for the relevant phase will commence. The lands will be graded and sloped to meet the levels of the surrounding areas. The area will be re-seeded with agricultural grass seed mixture native to the local area.

Once the restoration works are complete, the source of noise emissions (extraction works and traffic) will be removed. During the restoration phase, there will be no works undertaken at the site and no regular traffic access into/out of the site.

There will be no noise impacts associated with the restoration phase of the proposed Project.

6.5 Mitigation Measures

6.5.1 Measures Incorporated As Part of the Design

There are two earth berms incorporated as part of the 'design' of the site and which effect the noise propagation, resulting in reduced levels at the nearby residential dwellings.

One is a 5m berm to the west of the site entrance and the other berm ranges from 2.5m – 3.5m and effectively 'wraps' around House C on the southern boundary of Phase 3.

6.5.2 Environmental Management Plan

An Environmental Management Plan (EMP) (Appendix 2.2) has been prepared setting out a framework in relation to the management of environmental nuisances when the proposed Project is operational.

The EMP will be updated prior to the commencement of the works on site and compliance with the EMP will be mandatory.

The EMP details the mitigation measures that will be implemented on site to minimise environmental impacts and specifically relating to noise, will include:

- All vehicle engines will be switched off when not in use;
- Plant and machinery used on-site will comply with the EC (Construction Plant and Equipment) Permissible, Noise Levels Regulations, 1988 (S.I. No. 320 of 1988);

- Best practicable means will be implemented to minimise noise emissions and the site will comply with the general recommendations of BS 5228-1 2009 and "Environmental Good Practice Site Guide' 2005 compiled by CIRIA and the UK Environmental Agency;
- Care will be taken when loading & unloading vehicles to reduce or minimise potential disturbance to local residents;
- Access / internal haul roads will be kept dean and maintained in a good state of repair, i.e. any potholes are filled, and large bumps removed, to avoid unwanted rattle and "body-slap" from heavy goods vehicles;
- Restricted speed limits will be implemented on site to reduce the generation of noise from moving HGV's within the site;
- The berms will be erected to act as acoustic barriers adjacent to the closest residences;
- All existing perimeter hedge planting will be retained;
- Additional vegetation planting will be provided around the perimeter of the site (Refer to the Landscape Plan Appendix 10.6 and Chapter 10 for full details); and
- The berms will be inspected on a regular basis and maintained as necessary.

6.6 Residual Impacts

The construction of the berms and development of the EMP will allow for the implementation of appropriate environmental practises and it was considered that any adverse impacts would be "Low" to "None". On this basis, there will be no significant residual impact resulting from the proposed Project in relation to noise.

6.7 References

Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, TI, (2014).

Guidance Note for Noise Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4). EPA (2016).

Environmental Management in the Extractive Industry (Non-Scheduled Minerals). EPA, (2006).ISO 1996-2:2007 Acoustics - Description, measurement and assessment of environmental noise- Part 2 Determination of environmental noise levels (2007).

Calculation of Road Traffic Noise (CRTN), UK Department of Transport, (1968)

ISO1996-1 2016 Acoustics- Description, measurement and assessment of environmental noise - Part 1 Basic quantities and assessment procedure.

BS 64 2-1 (2008) Guide to evaluation of Human Exposure to Vibration in Buildings - Vibration sources other than Blasting

BS 7385-1 (1990) Evaluation and Measurement for Vibration in Buildings Guide for Measurement of Vibration and evaluation of their effects on buildings.

BS 7385-2 (1993) Evaluation and Measurement for Vibration in Buildings - Guide to damage levels from Ground borne Vibration

BS 5228-1 2009+A1.2014, Code of practice for noise and vibration control on construction and open sites. Noise.

BS 5228-2:2009+A1 2014- Code of practice for noise and vibration control on construction and open sites- Part 2 Vibration.

Guidelines for Noise Impact Assessment, Institute of Environmental Management and Assessment (IEMA), (2002).

EC (Construction Plant and Equipment) Permissible, Noise Levels Regulations. 1988 (SI No 320 of 1988).

Environmental Good Practice Site Guide, CIRIA and the UK Environmental Agency, (2005).

ProPG: Planning & Noise: Professional Practise Guidance on Planning & Noise, Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH) (2017).

7. Soils and Geology

This Chapter assesses the potential impacts the proposed Project may have on soils and geology during the construction, operational and restoration phases.

Given the nature of the proposed works, the construction and operational phases have been considered as the one phase/process. The main impacts associated with the proposed Project include the permanent loss of aggregates (sand & gravels) from the site, topsoil removal, potential contamination of surrounding soils from fuels/soils and soil erosion.

There will be no loss of topsoils from the site, with all topsoils being used in the development of soil berms on-site during the extraction phases. As restoration works commence within an extracted phase, the stripped topsoil will be reused to support the return of that or the previous phase to an agricultural future use.

An Environmental Management Plan (EMP) will be implemented on site, which will detail mitigation measures to minimise impacts on soils and geology. The EMP will implement appropriate environmental practises such as emergency response and spill/ leak management procedures to protect soils and geology at the site.

Whilst there will be a loss of the sand and gravel aggregate from within the site, there is a recognised need for the provision of aggregates on a national and local basis in Ireland. The appropriate removal of aggregates in adherence to the EMP and planning conditions, would result in minimal environmental impact and on this basis, the overall loss of aggregates from the environment was considered not significant.

7.1 Introduction

This Chapter of the EIAR has been compiled by Rowan Engineering Consultants (Rowan) Ltd. This Chapter considers and assesses the effects of proposed Project on soils and geology, anticipated to occur during the course of the site activities.

7.2 Methodology

The potential impact of the proposed Project on soils and geology was assessed by determining the importance of relevant baseline attributes and quantifying the magnitude and significance of the impact on these attributes.

Information on the following areas was consulted in order to support the assessment of potential impacts on soils and geology from the proposed Project:

- Geological heritage sites;
- Landfills, industrial sites and the potential for contaminated ground;
- Quarries and mines; and
- Characteristics and range of soils.

Sources of information included in the review were:

- Geological Survey of Ireland (GSI);
    - Geological heritage;

- Quaternary maps;
  - Bedrock mapping;
  - Karst database; and
  - Historical geotechnical records
- Environmental Protection Agency;
  - Historical dump sites;
  - Natural Heritage sites; and
  - EPA Licensed sites
- National Parks and Wildlife Service – Natura 2000 (European) sites;
- Corine Dataset;
- Aerial imagery from Google and Bing (2020) and,
- Laois County Development Plan (CDP) 2017-2023.

7.2.1 Relevant Guidance

Relevant guidance taken into consideration in the development of this Chapter include:

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, August 2017);
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA, September 2015);
- Quarries and Ancillary Activities (Guidelines for Planning Authorities), (DEHLG[5], 2004);
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA (now Transport Infrastructure Ireland, 2005); and
- Geology in Environmental Impact Statements (EIS's) – A Guide; Institute of Geologists Ireland (IGI) 2002); and
- Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of EIS's (IGI, 2013).

7.2.2 Study Area

The soils and geology study area for the proposed Project has extended to the soils within the site and the immediate surrounding area, at Garrans, Stradbally, Co. Laois.

7.2.3 Criteria for Rating of Environmental Impacts

The criteria used to rate the potential environmental impacts of the proposed Project on soils and geology was based on sensitivity and magnitude criteria outlined in the NRA Guidelines (Tables 4.1 & 5.1 of these Guidelines).

Significance criteria aligns with the significance terminology outlined in the EPA document, Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Draft, August 2017) (Table 3.3).

[5] Department of Environment, Heritage and Local Government – now Department of Communications, Climate Action and Environment

7.3 Baseline Conditions

The description of the baseline environment relates to a desktop review, of the existing soils, subsoils and geological bedrock where the proposed Project is situated.

7.3.1 Proposed Project Location

The site at Garrans would be described as hummock topography, with an elevation ranging between 67.1-80m Above Ordnance Datum (AOD). There is a slight slope downwards towards the north easterly corner of the site. The land is currently greenfield and used for farming activities intermittently.

There is history of previous quarrying activities for sand and gravel to the north west of the proposed Project, registered under Stradbally Quarries Ltd (QY05/74/1).

The site is largely bound by agricultural lands on the west, eastern and southern boundaries, with the Stradbally River is located c. 300m south of the site. There is a tributary to the Stradbally River at a distance of c. 400m north of the site.

A location map for the proposed Project is provided in Figure 7.1 below.

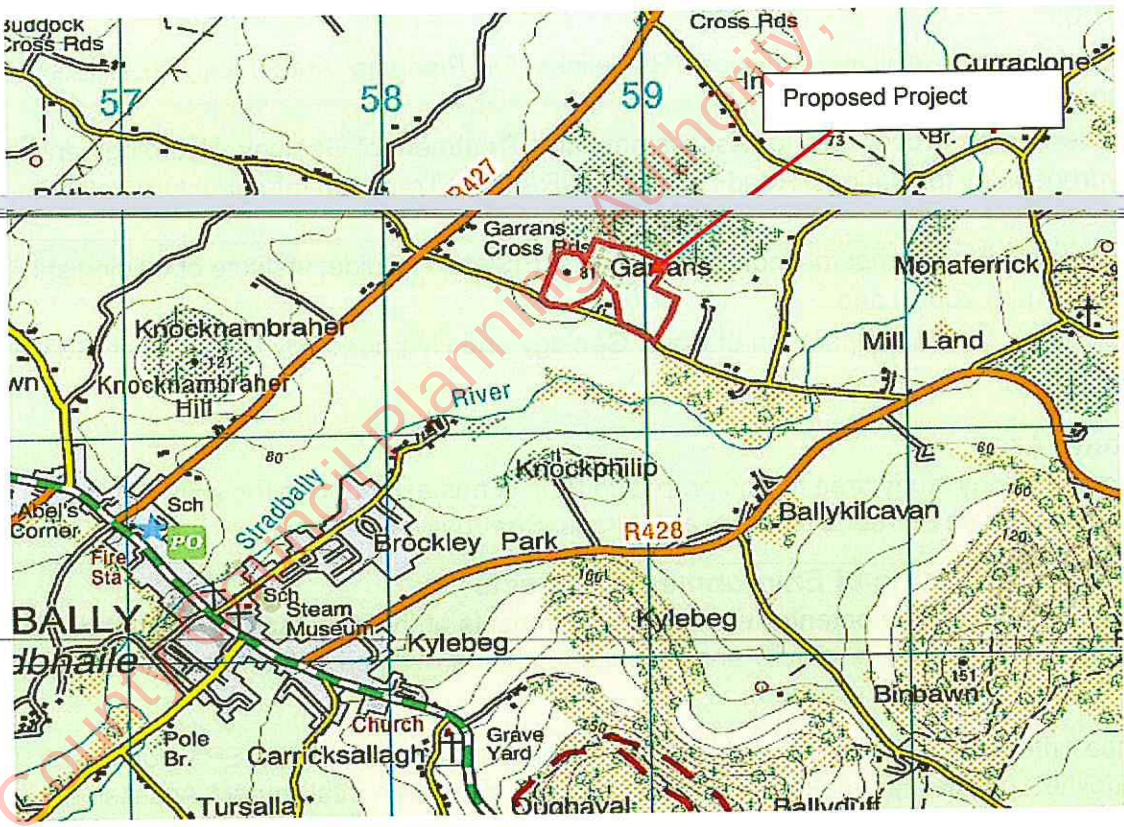


Figure 7.1: Site Location

7.3.2 Proposed Project Description

A full description of the proposed Project is provided in Chapter 2.

The proposed works will consist of the following:

- Quarry activities for the extraction of and processing of sand and gravel within a c. 12ha site at Garrans;

- On site processing of the material to include extraction, washing, sizing, screening and stockpiling;
- Intermittent crushing of oversized aggregate material;
- Dispatch of the processed materials off-site on Heavy Goods Vehicles (HGVs);
- Installation of site wheel wash, refuelling area, oil interceptors and storm water attenuation/sediment settlement and sludge settlement ponds;
- Development of a, 3No. lay-bys on the local road L7939, a new site entrance and internal site access road;
- Landscaping works to include a planted berm running next to the site entrance and south boundary of the site;
- Provision of site office, welfare facilities and all ancillary development infrastructure; and
- Final restoration of the site.

Overall it is estimated that in the region of 1.22million tonnes of aggregate material would be extracted from the site over c. 20 years (61,000 tonnes/ annum).

7.3.3 Geological Heritage

Figure 7.2 presents the geological heritage sites that are located in the vicinity of the proposed Project. There are no sites within 2km of the proposed Project, with the closest site being located c. 4.5km north west of the site.

Table 7.1 present provides a description of these sites.

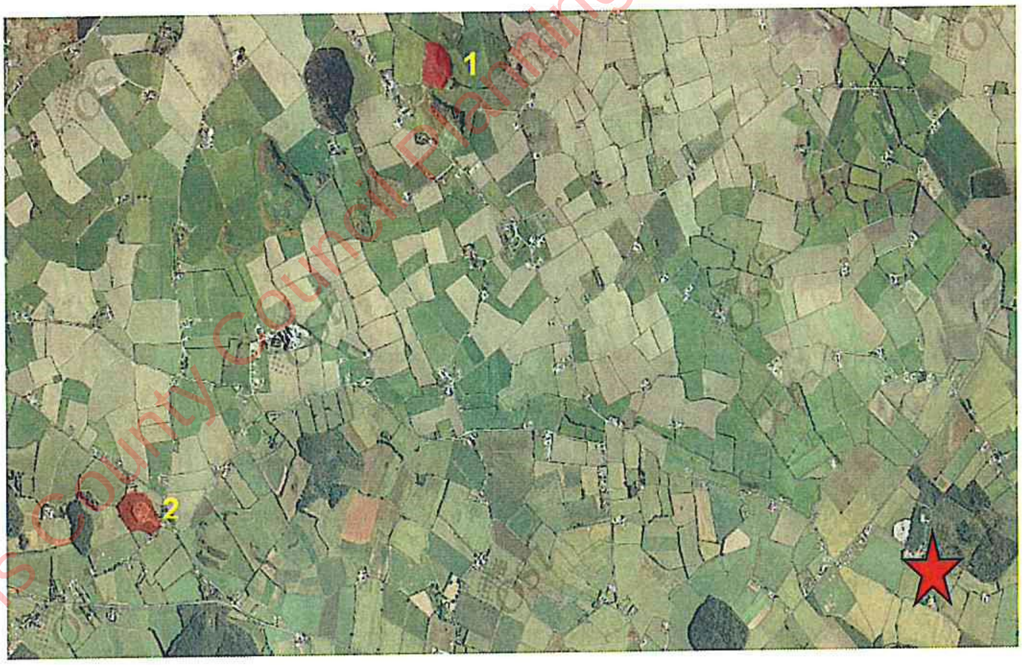


Figure 7.2: Geological heritage sites in the vicinity of the proposed Project (red star)

Table 7.1: Geological heritage sites

No.	Name	Distance from Site	Designated	Description
1	**Poulastore**	c.4.5km	LS027	A cave situated in the top of Kilone Hill (this is one of very few caves in Laois)
2	**Rock of Dunamase**	c.5.4km	LS031	A small but prominent steep sided limestone hill capped by ruins of a Norman castle.

7.4 GeoHazards

The GSI database did not indicate any history of landslide events at or in proximity to the proposed Project site. The closest events appear to be located, to the west of the site, near the Slieve Bloom Mountains.

7.4.1 Designated Sites

There are two Natura 2000 sites within 15km of the proposed Project. These sites are summarised in Table 11.3 of Chapter 11 Biodiversity and are the River Barrow and Nore Special Area of Conservation (SAC) 002162 and the Ballyprior Grassland SAC 002256.

7.4.2 Soils and Subsoils

The more recent Irish Soil Information System produced a national soil map which describes the soils at the proposed Project and in the vicinity as being fine loamy drift with limestones (See Figure 7.3).

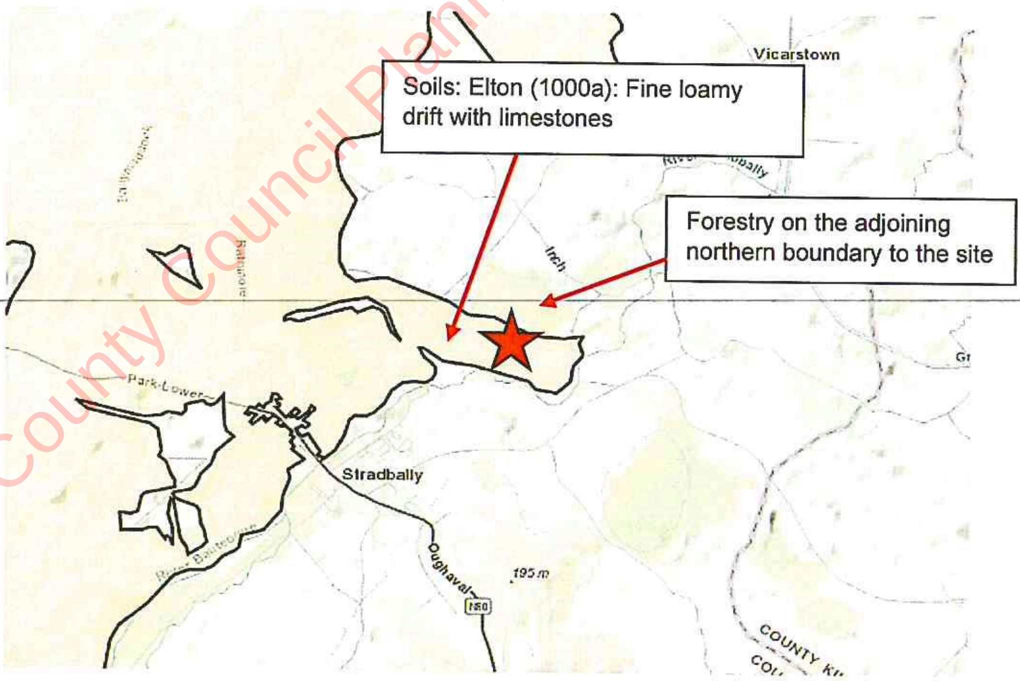


Figure 7.3: Soils description at and in the vicinity of the proposed Project from the Teagasc Irish Soil Information System

According to the Geological Survey of Ireland (GSI), soils at the site are classified as tills chiefly derived from limestone, with some esker sands and gravels stretching in from the north west corner (See Figure 7.4 below).

Within a 2km radius of the site, the main soil type generally appears to be tills derived from limestone. There is a band of alluviums present which would be associated with the Stradbally River and its tributary which are in the vicinity of the site (orange shading on Figure 7.4 below)

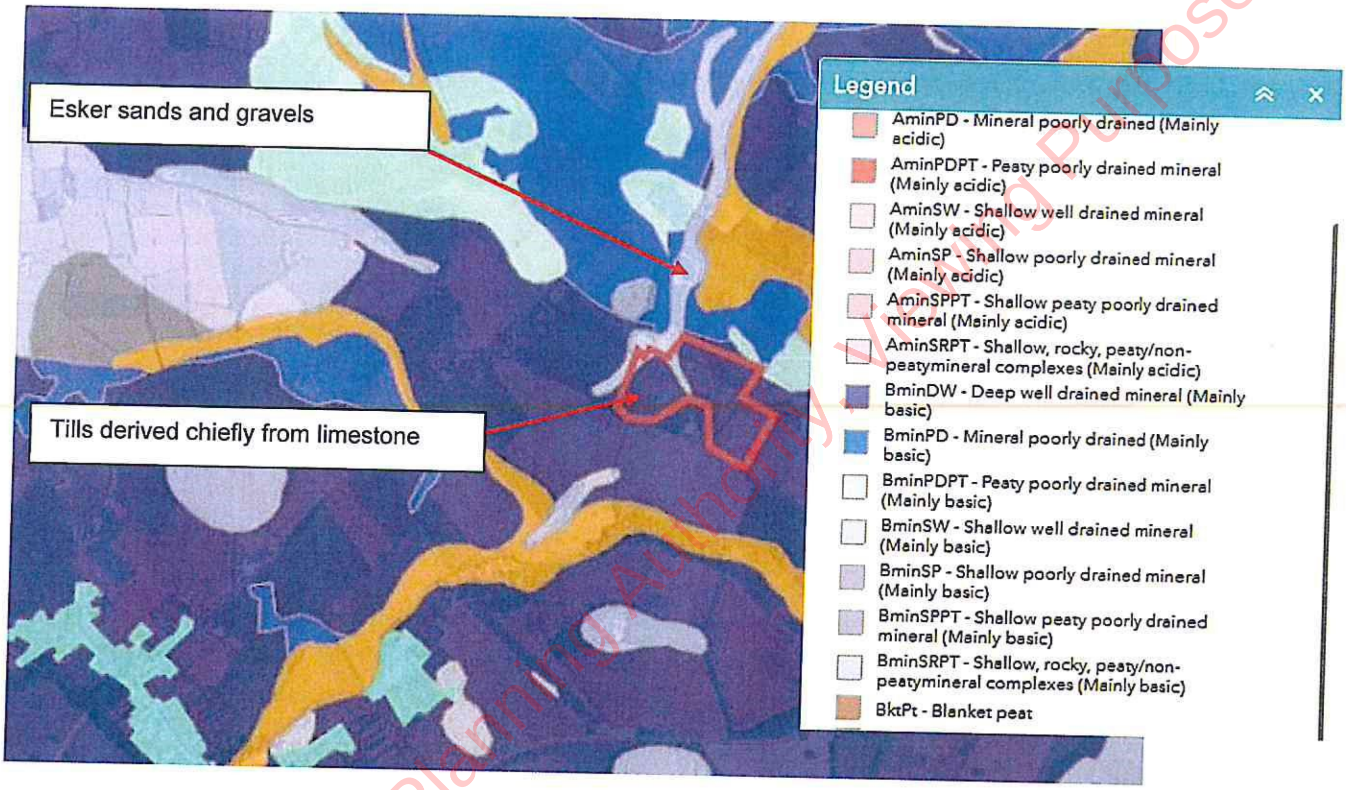


Figure 7.4: Soils description at and in the vicinity of the facility from the Geological Survey of Ireland mapping

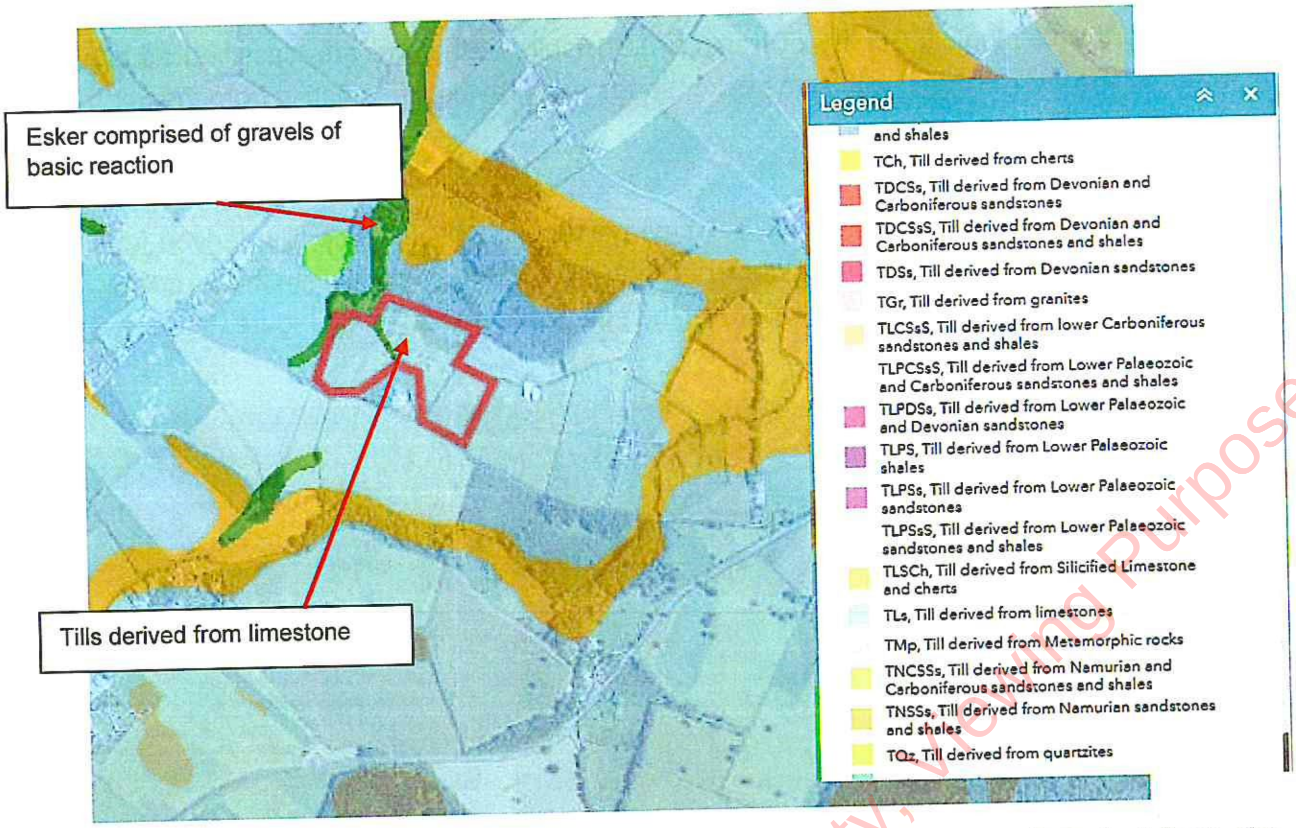


Figure 7.5: Subsoils description at and in the vicinity of the proposed Project from the Geological Survey of Ireland mapping

The GSI quaternary sediment maps detail the dominant sediment type within 1m of the surface. These maps were consulted and indicated that main sediment type within the site and its surrounding area tills derived from limestone (See Figure 7.5 above).

It is noted, however that the recent GSI Aggregate Potential Mapping, dated to 2016, reclassified these glacial till subsoils, describing them as sand and gravels of glaciofluvial origin.

These sand and gravels extend back towards the alluvial subsoils and soils, associated with the tributary of the Stradbally River.

Subsoils are exposed in the disused Coillte pit immediately to the north west of the site boundary. During a visit by Tynan Environmental, examination of the layered sand and gravel sediments validated the presence of the esker ridges identified in the recent GSI mapping (GSI, Aggregate Potential Mapping (2016). More details on this site visit are presented in Chapter 8 Hydrology and Hydrogeology – Section 8.4.11.

7.4.3 Bedrock Geology

Bedrock is not exposed at or adjacent to the proposed Project site. During site investigations at the site (Section 7.4.4), bedrock was encountered during drilling at depths from 15-20m below ground level. The bedrock encountered was grey limestone and is consistent with the mapped Dinantian Pure Bedded Limestones (Figure 7.6).

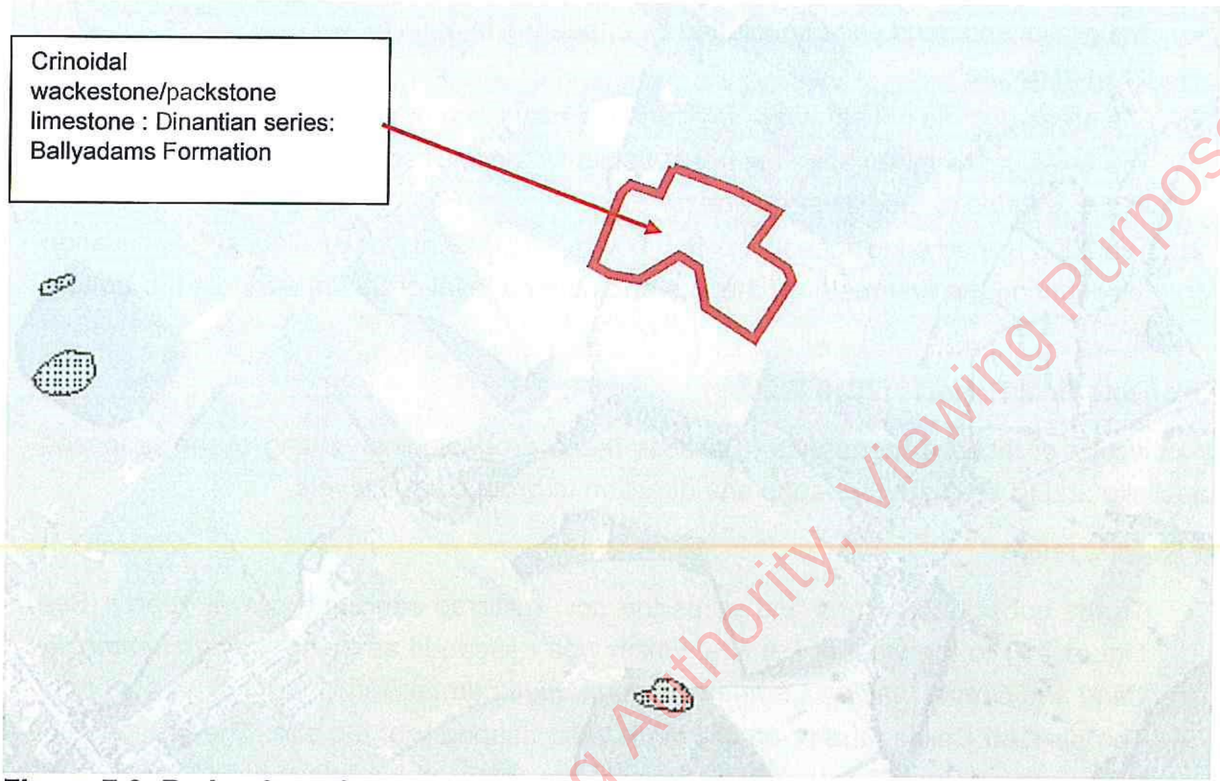


Figure 7.6: Bedrock geology at and in the vicinity of the proposed Project.

The GSI Karst database was consulted and no karst features were indicated as being present at or in the vicinity of the site. The closest karst features identified by the GSI are located west of the site, next to Junction 16 of the M7 motorway, which makes reference to a swallow hole feature at this location.

7.4.4 Site Investigations

Investigations were undertaken at the site in October 2003 and more recently hydrogeological investigations were undertaken in 2018 & 2019. These were:

- Ground Investigation Report, (Land Surveying Services (2003));
- Preliminary Hydrogeological Report at Garron's Pit, Stradbally, Co. Laois (Tynan Environmental, 2018); and
- Results of Site Investigations and Groundwater Monitoring at Garron's Pit, Stradbally, Co. Laois (Tynan Environmental, 2019).

Ground Investigation Report (2003)

The purpose of this Report was to determine soil types and to quantify the volume of in-situ material available for possibly future quarrying for the landowner at that time.

4No. trial pits (A-D) were dug to c. 3.0m. Below are some of the key points summarised from the Report:

- No groundwater was observed in trial pits A, B and C, with topsoil noted to c. 0.3m and subsoils to c. 0.8m. Natural rounded gravels, followed by fine natural sands were observed in the trial pits down to the excavated 3m;
- Alluvial silt was observed at 0.3-0.7m in trial pit D. Water was encountered at 1.5m and digging was abandoned at 2.4m;
- The gravel and sand were concluded as appearing in definite '*veins or layers and was clean in* nature';
- The areas dug did not show any indication of backfilling or previous excavation works;
- The overburden material below the subsoils was classified as '*either sand or gravel, and is suitable for use as structural fill*';
- The 2003 Report concluded that c. 565,000 m^3 of material was available for excavation (discounting the first meter of the site and using a level of 66.5m AOD as the bottom limit).

Hydrogeological Reports (2018 & 2019)

The objective of these Reports was to assess the hydrogeological setting of the proposed Project site and to estimate the range and direction of groundwater levels.

The Reports refers

- To the subsoil conditions and notes the now restored sand and gravel quarry (See Figure 7.7) to the west of the site, which was described as being '*being Hummocky Sand and Gravel (having a hummocky form, high permeability*';
- The disused Caillte Quarry on the north west boundary of the site. The presence of this quarry was noted as validating the presence of the esker ridges as identified in the GSI mapping, with sand and gravels to approximately 66.5m AOD;
- A composite of the 4No. 2003 trial pits indicated the minimum depth of 12.75m of sand and gravels at the site;
- Bedrock is not exposed at or adjacent to the site;

4No. boreholes were installed at the site to support the groundwater investigations. With regards to soils and geology, the following was recorded:

- The depths of silt and clays in the boreholes ranged from a top depth of 4.30m to 10.50m below ground level (bgl).

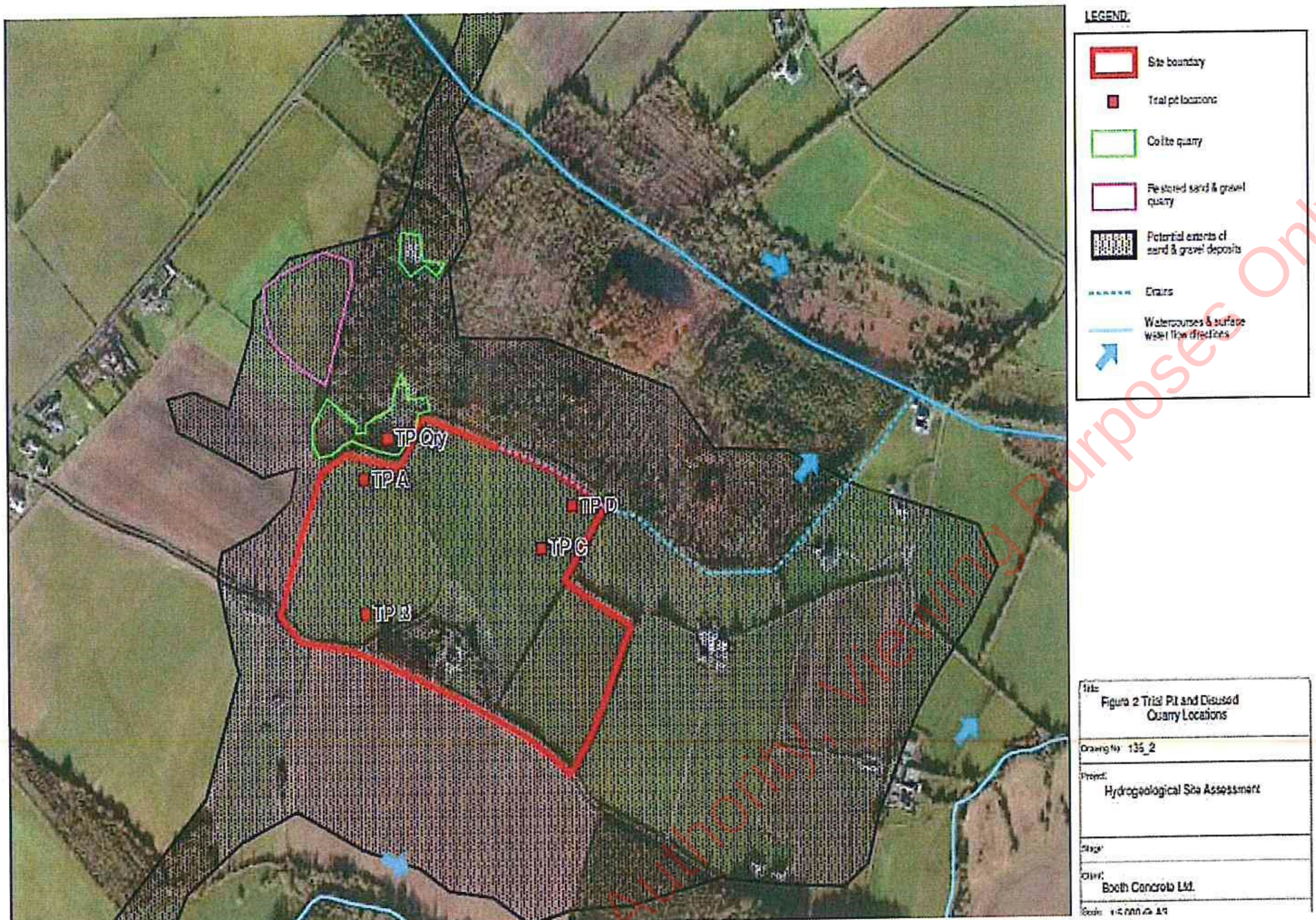


Figure 7.7: Extract from Hydrogeological Report (Tynan Environmental 2019)

7.4.5 Risks to the Soils and Geology Environment

The risks to the soils and geology environment at the site are

- The extraction of aggregates from the site;
- The loss of available lands which are currently used for agricultural purposes;
- The risk from hydrocarbon spillage or leakage during the operation of the proposed Project;
- The potential to encounter contaminated lands within the site;
- Soil erosion and compaction; and
- Sedimentation of neighbouring surfacewater bodies and groundwater bodies.

The importance of the soils and geology receptors is outlined below:

Table 7.2: Importance of Soils and Geology Receptors

Receptor	Importance*	Description
Lands	High	The lands would be viewed as good quality agricultural lands, suitable for grazing. It is also currently under tillage for cereal crops.
Topsoils	High	The topsoil is generally considered well drained across the site, providing for tillage agricultural activities within the site.
Subsoils	Medium- High	The presence of sand and gravel beneath the site is likely to result in a high vulnerability classification for the groundwater.
Bedrock Geology	Low	Bedrock is not exposed at proposed Project site. During site investigations at the site, bedrock was encountered during drilling at depths from 15-20m below ground level. Bedrock is at depths that will not be encountered or impacted by the quarrying activities.

*Referenced to Box 4.1: Estimation of Importance of Soils and Geology Attributes (NRA, 2005).

7.5 Predicted Impacts

7.5.1 Do-Nothing Scenario

Under the Do-Nothing Scenario, the site would remain in its current state (a greenfield site) and continue to be used for agricultural activities. The baseline conditions would change very little, other than any natural variation in soils, over time.

7.5.2 Construction / Operational Phase

This section of the assessment describes the predicted impacts resulting from the proposed Project (relevant to site enabling, operations and restoration) and the significance of the effects on soils and geology receptors.

In terms of soils and geology, the main potential impacts associated with the proposed Project would be:

- The extraction and removal of c. 1.22 million tonnes of aggregate is a direct impact and in this regard, the impact on lands was considered small adverse (magnitude), long-term, with moderate effects. Portions of the land will no longer available as an agricultural resource whilst the site is operational. The likely significance of the effect was considered moderate, given the relative abundance of agricultural land in the surrounding environment and that the site would be ultimately restored to an agricultural resource;

- Loss of topsoil during excavation and stripping activities is a direct impact. The site will be extracted on a phased basis (Phases 1-4). When a Phase is fully extracted, restoration works will commence, alongside stripping and excavation of the next Phase. This phased process reduces the area being worked at any one time. As topsoil from a new phase is being stripped, it will be kept on-site for reuse in the restoration of previous phase (which will be occurring concurrently). This impact was considered negligible – small adverse (magnitude), short-term due to phasing, with slight effects,

  The topsoil will be stripped on a phased basis and will kept on-site for certain re-use within the extracted phases of the site;

- The extraction and removal of c. 1.22 million tonnes of aggregate, over 20 years is a direct impact and, in this regard, the impact on subsoils (sand and gravel aggregates) was considered moderate adverse (magnitude), long-term, with significant effects. Refer to the cross sections prepared for the proposed Project, showing the existing and proposed finished ground levels at the site (Appendix 2.1)

- The risk of encountering contaminated ground in unknown locations. Results from the desktop review and site investigation have indicated that it is unlikely that contaminated soils would be encountered at the site. However, the potential still exists that they may be encountered. Taking into account the scale and extent of the proposed Project, any impact was considered short-term, negligible adverse (magnitude), with imperceptible effects.

- Contamination of the surrounding soils has the potential to occur due to spills and leaks of fuels, lubricants and oils used during site enabling works and/or once the site is fully operational. The impact was considered long-term (dependent on the extent), small adverse (magnitude), with slight effects on the soils and geology environment;

- Exposure of soils and soil stockpiles to the environment may result in potential for soil erosion impacts. Soil erosion can result in increased sedimentation to the surrounding surfacewater and groundwater bodies. The impacts were considered short-term, small adverse (magnitude), with slight effects.

  The site is intermittently connected to the Stradbally River SAC (1.25km downstream), via the drain on the northern boundary and the Stradbally River tributary. However, the effects were considered slight, due to the likely significant dilution of any sediment pollution, which would occur in the pathway to the Stradbally River (1.25km downstream).

7.6 Mitigation Measures

Mitigation measures will be implemented when the site is operational, including during the course of any site enabling works. An Environmental Management Plan (EMP) (Appendix 2.2) has been prepared setting out a framework in relation to the management of environmental issues when the proposed Project is operational.

The EMP will be updated prior to the commencement of the works on site and compliance with the EMP will be mandatory.

The EMP details the mitigation measures that will be implemented on site to minimise environmental impacts and specifically relating to soils and geology will include:

- Soil stockpiles will not be stored at elevated locations on the site;
- All vehicles leaving the site will be cleaned by the wheel washing facility to prevent the spread of mud and dust on public roads;
- Vehicles delivering materials with dust potential will be enclosed or covered with tarpaulin;
- During prolonged dry or windy periods, any areas with the potential to generate dust will be watered, in particular areas next to the site entrance; and
- Public roads will be inspected regularly for cleanliness and cleaned as necessary;
- There will be minimal storage of oils and chemicals on site. They shall be stored on bunds in a hardstanding area;
- There will be no storage of fuel on-site. Refuelling of vehicles, plant and equipment will be undertaken at the designated refuelling area by a mobile fuel tanker, that will enter the site as required
- Any spillages or leakages shall be cleaned up immediately and addressed in line with the requirement of the Emergency Response Procedure and Spill Protocol outlined in the EMP (Appendix 2.2);
- With regard to the potential for sediment release from the site, the site will operate a collection and conveyance system on-site, that is focused on capturing and storing water within the site for use in the processing stage. Silty/sludge water from the wash plant will be managed in isolation, to surface water collected on-site, to avoid the risk of discharge to the environment.
  Collected waters from the site will be managed through a system of 4No. ponds that will be lined with an impermeable material and are sized to allow are appropriate retention times and settlement of sediment. (Refer to Chapter 8 Hydrology and Hydrogeology for full details).
- An Emergency Response Procedure including procedures for any chemical/oil/waste leaks at the facility is in place and all relevant personnel working at the site will be trained in its implementation.

The proposed Project has prepared a Restoration Plan for the site. Refer to Figure 7.8. The restoration of the site will be completed on a phased basis i.e. the restoration of Phase 1 will be undertaken as the extraction of Phase 2 commences. Final restoration works include reseeding of the site with an agricultural grass mix, grading and sloping works and installation of stock proof fencing.

Stripped material from each phase will be used to support the restoration of the previous phase. All topsoil and overburden stripped from the site will be kept on-site and reused during restorative works.

Figure 7.8: Proposed Restoration Project (extracted from planning drawings

Table 7.3: Summary of Soils and Geology Assessment

Receptor	Importance	The Impact	Nature of the Impact (Before Mitigation)	Description	Nature of the Impact (After Mitigation)
Lands	High	Loss of agricultural land as a resource	Small Adverse, Long-Term with Moderate Effects	The implementation of the proposed Restoration Plan, which will be completed on a phased basis during operation. This will ultimately reinstate the site to its existing land use as an agricultural resource.	Neutral, Long-term with Slight effects
Soils (Topsoils)	High	Topsoil stripping	Small Adverse, Short-Term with Slight Effects	Whilst topsoil is being stripped within the site, no topsoil will be removed from the site. As topsoil from a new phase is being stripped, it will be kept on-site for reuse in the restoration of previous phase (which will be occurring concurrently).	Neutral, short-term and Imperceptible.
Subsoils (sands & gravels)	Medium-High	Extraction of sand and gravels from the site	Moderate Adverse, Long-Term with Significant Effects	Whilst there will be a loss of sand & gravels from the site, there will be continued restoration of the site during the phased operation. Ultimately, the site will be reinstated to its existing land use as an agricultural resource. Processing of the sand and gravel aggregates will occur in local manufacturing and processing industries within the surrounding region.	Neutral, long-term with Moderate Effects

Receptor	Importance	The Impact	Nature of the Impact (Before Mitigation)	Description	Nature of the Impact (After Mitigation)
Soils & Subsoils	Medium-High	Encountering unexpected contaminated lands and Spillages / Contamination due to spills & leaks	Negligible Adverse, Short-Term, Imperceptible Effects And Small Adverse, Long-Term and Slight Effects	To prevent contamination, the EMP will be implemented on site. The EMP will include measures relating to the use and storage of oils and chemicals at the site. The refuelling of vehicles will be undertaken on a dedicated hardstanding area, draining to an oil interceptor. An Emergency Response Procedure including procedures for any chemical/oil/waste leaks at the facility is in place and all relevant personnel working at the site will be trained in its implementation. It is unlikely that already contaminated soils will be encountered on site. The EMP will set out a procedure to confirm that the any contaminated soils that may be encountered will be dealt with appropriately.	Neutral, with Imperceptible Effects
Soils & Subsoils (& surfacewater/groundwater bodies)	Medium-High	Soil erosion / Increased sedimentation	Small Adverse, Short-Term and Slight Effects	The site will be operated on a phased basis, only being stripped as necessary. As works in one phase are complete, soils from the next active phase, will be used to reinstate the previous phase. To prevent soil erosion, the EMP will be implemented on site. The EMP will include measures relating to the use, storage and management of soils & stockpiles on-site.	Neutral, Short-Term, Slight-Imperceptible

Receptor	Importance	The Impact	Nature of the Impact (Before Mitigation)	Description	Nature of the Impact (After Mitigation)
				During prolonged dry or windy periods, any areas with the potential to generate dust will be watered, in particular areas next to the site entrance.	

7.7 Residual Impacts

The implementation of mitigation measures and adherence to the EMP will minimise the potential for impacts on the soils and geology environment. On this basis, it was considered that there would be no significant residual impacts relevant to soils and geology as a result of the proposed Project.

Whilst there is a loss of the sand and gravel aggregate from within the site, there is a recognised need for the provision of aggregates on a national and local basis in Ireland. The appropriate removal of aggregates in adherence to the EMP and planning conditions, would result in minimal environmental impact and on this basis, the overall loss of aggregates from the environment was considered not significant.

7.8 References

Department of Communications, Climate Action and Environment, Geological Survey of Ireland, Public Data Viewer Series Website, retrieved November 2019, https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ebaf90ff2d554522b438ff313b0c197a&scale=0

Laois County Council (2017). Laois County Development Plan 2017-2023. https://laois.ie/departments/planning/development-plans/draft-laois-county-development-plan-2017-2023/, retrieved November 2019,

Teagasc Soil Maps, retrieved November 2019, http://gis.teagasc.ie/soils/map.php

8. Hydrology (Flood Risk Assessment), Water Quality & Hydrogeology

This Chapter assesses what impacts the proposed Project may have on surface water and groundwater at and within proximity to the site during the construction, operational and restoration phases.

The main impacts associated with the proposed Project include potential impacts on the surface water and groundwater systems that support the Stradbally River and the River Barrow and Nore Special Area of Conservation. There is also the potential for the proposed Project to result in pollution and sedimentation of surface water and groundwaters at the site and to impact surrounding domestic and group water supplies.

Sand and gravels will not be extracted from below the groundwater water table. Process water (wash water) will be generated by the washing and screening plant, used to process the extracted sand and gravels.

The water management system on-site will be based on a collection and conveyance system, that is focused on capturing and storing water within the site for use in the washing and screening plant. The collected water will also be used for dust suppression and in the wheel wash.

Four ponds lined with impermeable membrane will be constructed to the north of the site. Collected water will be retained within the site through a series of pipes, a water balance pond (Pond 1), sludge settlement ponds (Ponds 2&3) and a storm water attenuation/ sediment settlement pond (Pond 4).

The washing and screening plant for the sand and gravels, is highly efficient in terms of water usage and management. At least 80% of the process water will be recycled within the wash plant, through an integrated water treatment plant. The remaining 20% top-up process water will be provided by:

- **Recycled recovered water from sludge settlement ponds;**
- **Recycled recovered water from the stockpiled sand and gravels;**
- **Surface water run-off from the storm water pond; and**
- **Groundwater abstraction from a water supply borehole, located close to the north western boundary.**

There will be no discharge of process water (wash water) from the site. Process water will be collected and recovered back into the washing and screening plant. The site will discharge surface water run-off to a drain on the northern boundary, at an approved greenfield rate, in line with the existing conditions.

There will be no discharge of foul or grey water from sanitary facilities to the surface water or groundwater environment at the site. A portaloo will be provided on site, with a management contract via a licensed waste contractor. Bottled water will also be provided for use by site staff.

Groundwater supply is required as part of the site water requirements. The proposed abstraction will have no impacts on the quantity or level of water at surrounding group water and domestic water supplies. The zone of contribution (ZOC) relating to the abstraction on-site will not interact with these water supplies and there is no groundwater flow from the site to these water supplies. The ZOC is defined as the area of land contributing to the water supply borehole on-site.

Climate change has been allowed for in the following areas:

- <u>Estimating groundwater winter levels for the site</u>: An allowance of 10% of annual groundwater level variability across the site was made. This means that all extraction works will be undertaken 1m above the winter groundwater levels (plus an additional 10%);
- <u>Sizing of the storm water pond (Pond 4)</u>: A 20% increase in storm water attenuation volumes was added, to account for potential future increases in run-off from a flood event; and
- <u>Sizing of the storm water pond (Pond 4)</u>: The constant storage of 40 days of summer period surface water usage is provided for in the pond, in the event of a significant dry period.

With the implementation of mitigation measures, the impacts on surface water and groundwater quality such as from suspended solids or pollutants (ammonia, spilled oils, fuels and flocculants) were considered to have imperceptible effects. Mitigation measures include:

- There will be no discharge of process water to the water environment, with all process water being recycled back into the washing and screening activity;
- Isolation of the sludge settlement ponds (Ponds 2 & 3) and storm water pond (Pond 4). There is no connection between these ponds to avoid the risk of sludgey/silty water being discharged to the surface water environment;
- At least 80% of the process water will be managed within a closed tank system which is part of the washing and screening plant;
- In terms of groundwater, extraction works on the site will be to a depth that leaves 1m above the estimated highest winter groundwater level (plus the climate change allowance) across the extraction area;
- The washing and screening plant will be electrically powered;
- An Environmental Management Plan (EMP) will be implemented on-site. This Plan will incorporate measures relating to the management of fuels, storage of flocculants, requirements for visual checks and emergency response (amongst others).

Stradbally River & River Barrow and Nore Special Area of Conservation

The potential impacts on the Stradbally River which supports the River Barrow and Nore Special Area of Conservation (SAC) were considered.

Whilst proposed Project will use 70% of the collected surface water on-site, the remaining 30% will still reach the existing drain to the north of the site, at an appropriate greenfield rate, in line with existing conditions. This drain is intermittently connected to the Stradbally River at certain times during the year (mainly winter).

In addition, the volume of collected surface water which will be used on-site (the collected 70%) represents a very small proportion of the overall flow already in the Stradbally River and the site area of c. 12 hectares, is very small when compared to the overall 10,400 hectare land catchment, providing run-off to the River. The loss of surface water will not impact surface water flows to the River and qualifying features of the SAC.

In terms of groundwater, the zone of contribution (ZOC) relating to the water supply borehole was assessed. The ZOC for the proposed borehole will be confined within the site boundary, flowing from the south south-east towards the north north-east. The loss of groundwater to the abstraction will not impact the groundwater flows to the River and qualifying features of the SAC.

The significance of any effects to the SAC, its catchment and the qualifying interests were considered imperceptible.

8.1 Introduction

Suzanne Tynan, principal of Tynan Environmental, is a hydrogeologist and hydrologist with twenty two years' experience in the area of hydrology and hydrogeology. Suzanne holds an MSc. in Hydrology and Water Resources Management (Department of Civil and Environmental Engineering, Imperial College, London), an MSc. in Environmental Science (School of Natural Sciences, Trinity College, Dublin) and a BSc, in Geology and Botany (School of Sciences, University College Dublin) and has held research fellowship and researcher positions at Trinity College Dublin. She has PGeo (Professional Geologist) chartered status from the Institute of Geologists of Ireland (IGI) and from the European Federation of Geologists (EurGeol). Suzanne is a board member of the Institute of Geologists of Ireland, a member of the working group which wrote the Institute of Geologists of Ireland (2013) Guidelines for the Preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements and is currently on the working grouping updating this guidance to concur with recent legislative changes. She was a member of the Water Framework Directive National Groundwater Working Group sub-group writing guidance on groundwater dependent ecosystems.

Suzanne has significant technical and project management experience in the area of assessment, mitigation and management of the relationship between projects and the water environment. This includes experience in the areas of EIAR, flood risk assessment and hydro-ecology (the study of the interaction between water systems and dependant ecology) and design of avoidance and mitigation measures for infrastructure located in or adjacent to water environments. Suzanne has carried out supporting hydrogeology/hydrology for EIAR and Natura Impact Statements for numerous types of surface water and groundwater dependent Natura 2000 qualifying interest habitats, for proposed developments including roads, quarries, housing developments, groundwater abstraction, marina, gas pipeline, windfarm and drainage projects. These have been carried out on behalf of both government and private clients. This work includes the design of a national methodology for screening the impacts of drainage maintenance schemes on groundwater dependent Natura 2000 sites on behalf of OPW and assessment of the risks associated with mine dewatering in large open cast mines in Poland in collaboration with the Polish EA. Current and recent major hydrogeological/hydrological and flood risk assessments include two projects funded by OPW in support of characterisation and remediation of 2015 groundwater flooding in Co. Sligo, combined groundwater surface-water flood risk modelling and NIS works for a road and local authority housing development on behalf of Limerick County Council, assessment of the risk of fluvial and/or groundwater flooding at sites for proposed school, waste transfer station, quarries and land reclamation sites. These projects include the development of integrated surface water and groundwater management systems. Work has also included the modelling of the impacts of climate change on flooding in the Thames Valley, at the British Geological Survey Suzanne has carried recently out a multiannual programme of work on behalf of the Geological Survey of Ireland and the Federation of Group Water Schemes and for Irish Water to delineate zones of contribution and/or source protection for twenty-five groundwater supplies across the country.

Design and implementation of site works, analysis and report writing were carried out by Suzanne Tynan of Tynan Environmental, apart from the works provided by external contributors listed below.

8.1.1 External Contributors

- Jason Redmond and Associates provided:
  - Site topographic survey;
  - Material excavation and re-instatement quantities;
  - Extraction phasing layout and layout element areas;
  - Design and layout of sludge settlement ponds and pre-process water supply balancing pond.
- CDE Global Ltd. provided information regarding the processing plant to be installed at the site including,
  - Specification of the material processing plant;
  - Specification of the water treatment and recycling unit (thickener);
  - Details of material post processing water content;
  - Details of process water requirements and process water top-up rates per tonne/process time of site material grades;
  - Expected sludge volumes, water and silt content per tonne of material/processing time rising from processing at the site, based on sample particle size distributions of site material;
- Whitehill Environmental provided:

- Appropriate Assessment Screening Determinations;

- Environmental Laboratory Services (ELS) Ltd. (INAB accredited) carried out sampling and analysis of surface and groundwater;
- Petersen Drilling Services Ltd. carried out drilling and installation of piezometers according to BS 5930:2015 Code of Practice for Site Investigations;
- James Fisher Testing Services (Ireland) Ltd (UKAS accredited) carried out material analysis according to Particle Size Distribution-EN 933 Part 1: 2012 Cl 7.1&7.2 Washing & Sieving Method
- The report and figures contain Irish Public Sector Data (Geological Survey) licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence.

8.2 Project Methodology

8.2.1 Relevant Guidance

The report is written with reference to:

- Environmental Protection Agency (2017) *DRAFT Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.*
- European Communities (2001). *Assessment of plans and projects significantly affecting Natura 2000 sites - Methodological guidance on the provisions of Article 6(3) and (4) of the Habitat's Directive 92/43/EEC;*
- European Communities (2018). *Managing Natura 2000 Sites.*
- Institute of Geologists of Ireland (2013) *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.*
- Institute of Geologists of Ireland (2007). *Recommended Collection, Presentation and Interpretation of Geological and Hydrogeological Information for Quarry Developments.*
- Department of Environment, Heritage and Local Government (2004). *Quarries and Ancillary Activities: Guidelines for Planning Authorities.*
- Environmental Protection Agency (2006). *Environmental Management in the Extractive Industry (Non-Scheduled Minerals): Environmental Management Guidelines.*
- Irish Concrete Federation (2005). *Environmental Code* 2nd Edition.
- Capita Symonds (2008) *Good Practice Guidance on Controlling the Effects of Surface Mineral Working on the Water Environment.* Report to the Department of Communities and Local Government and to the Mineral Industry Research Organisation.
- Murnane, E., Heap, A. and Swain, A. (2006) **CIRIA C648** *Control of water pollution from linear construction projects - Technical Guidance.*
- Masters -Williams et al (2001). **CIRIA C352** *Control of water pollution from construction sites - Guidance for consultants and contractors.*

8.2.2 Existing Information
Data relating to the site and environs arising from the following sources were reviewed and incorporated into the analysis, assessment and reporting:

- *Site Ground Investigations Report (3/10/2003);*
- *Site Topographic Survey (November, 2015);*
- *Geological Survey of Ireland (GSI) soils, subsoils, quaternary, bedrock geology, active extraction sites, geotechnical investigations, borehole, bedrock aquifer, sand and gravel aquifer; aggregate potential, groundwater recharge, groundwater wells and springs, surface water features, karst feature and groundwater protection area mapping and databases (www.gsi.ie and www.dccae.gov.ie)*
- *Teagasc/EPA (2004) subsoils mapping and notes;*
- *Water Framework Directive groundwater body characterisation reports (www.gsi.ie);*
- *Water Framework Directive monitoring locations, monitoring results, water bodies, catchments, status, pressures, waste water discharge, programme of measures and protected areas data (https://gis.epa.ie/EPAMaps/Water);*
- *EPA Hydrotool flow estimation and catchment characteristics data (https://gis.epa.ie/EPAMaps/Water) and hydrometric data from EPAHydroNet http://www.epa.ie/hydronet/#Water%20Levels*
- *Office of Public Works (OPW) (http://waterlevel.ie/);*
- *Met Eireann meteorological data (www.met.ie);*
- *Ordnance Survey of Ireland (OSI), GSI, Google and Bing Maps aerial photographs;*
- *OSI historic 1:10,560 and 1: 2,500 scale maps.*

8.2.3 Field Works
The following field works were carried out at and surrounding the site and the results incorporated into the analysis, assessment, and reporting.

Table 8.1: Field Works

Works	Methodology	Date/Monitoring Period
Inspection of soil, subsoil exposures and surface and groundwater features	• Location and examination of exposures, by cleaning of surface, recording with photographs and field notes. • Location of springs, seepages, drains and watercourses	19/7/2016
Intrusive site investigations, subsoil and bedrock logging in BH1, BH2, BH3 and BH4	• Site investigations and installations designed and supervised (on site/by phone) by Tynan Environmental; • Drilling carried out by Petersen Drilling Services Ltd. using a Knebel HY79 air flush hammer drill in	15 – 17/10/2018

Works	Methodology	Date/Monitoring Period
	accordance with BS 5930:2015 Code of Practice for Site Investigations • Logging of material to BS 5930:2015 Code of Practice for Ground Investigations by Petersen Drilling Ltd. or Tynan Environmental and/or validation on -site in samples by Tynan Environmental. Recording with photographs and field notes. • Samples taken at approximately 2 m interval, analysed for particle size distribution (PSD).	
Installation of standpipes in BH1, BH2, BH3 and BH4	• Installation of piezometers under supervision of Tynan Environmental, designed in response to hydrogeological conditions encountered at each borehole location. • High resolution RTK GPS survey of borehole locations to datum (m OD)	15 – 17/10/2018
Monitoring of groundwater water level in BH1, BH2, BH3 and BH4	• Borehole instrumentation using continuous pressure transducer water level monitors recording monitoring and barometric compensation monitor (Eijkelkamp) recording at 10 minute intervals. Monitors have a resolution of +/- 0.02 or +/- 0.01 m • Manual water level measurements using dipper.	17/10/2018 – 10/4/2019 (BH4 to 21/1/2019) 17/10/2018, 21/1/2019, 10/4/2019
Monitoring of groundwater in BH2	• Borehole instrumentation as above • Manual water level measurements using dipper.	2/1/2020- current 21/1/2020
Water level heights survey, summer and winter	• Survey of surface water, spring water, drain and adjacent borehole water levels heights on site and surrounds, including tributary of Stradbally river, Stradbally river and surrounds using RTK GPS, dipper and staff.	19/7/2016, 21/1/2019, 2/1/2020
Groundwater and surface water sampling and analysis	• Sampling requirements and locations specified by Tynan Environmental; • Sampling and analysis of groundwater (2 locations) and surface water (6 locations) at and surrounding the site according to best practise guidance were carried out by ELS Ltd.	13/12/2019

8.2.4 Analysis and Impact Assessment

Analysis and assessment are carried out using best practise methodology, supported by referenced publications and in accordance with and/or with reference, to existing guidance as set out above.

8.3 Project Description

The characteristics of the proposed Project which interact with and have the potential to have likely, significantly impact on the water environment are set out below. These characteristics relate primarily to the Operational Phase. Specific reference is made to commissioning and re-instatement phases, where necessary.

8.3.1 Material Extraction and Processing

Method and Depth

Material will be extracted using an excavator, with the material moved using a wheeled loader.

Extraction will be to a depth of at least 1 m above the estimated highest winter groundwater level across the extraction area, to which is added a climate change uncertainty allowance of 10% of annual groundwater level variability across the site. Material extraction depths across the site are set out in cross sections provided in Appendix 2.1.

Extraction Rate

Average daily extraction rate over a 20 year period is 203 tonnes/day (61,000 tonnes per annum).

Maximum daily abstraction rate is 350 tonnes/day. This is to allow for occasional (not greater than one month) extraction at a rate in excess of the average rate, to respond to market requirements.

A stockpile of c. 2000 tonnes (10 days processing) will be created during the commissioning phase of the quarry to buffer the requirement to increase extraction above the average so as to minimise the number of occasions on which a higher extraction rate would be required.

Extraction Phasing

A full description of the site phasing is set out in the Project Description Chapter of this EIAR. Four phases of material extraction are proposed and set out in the drawings provided in Appendix 2.1. A proportion of the site to the north (around the 4No. ponds and refuelling area) will not be quarried and the land in this area will not be stripped of vegetation.

Material Processing System

The material processing system proposed is highly efficient in terms of water usage and management. It comprises integrated processing, water treatment/recycling, stockpile and sludge dewatering and recovery, as follows and as set out in Figure 8.1 Material Processing System Diagram, below.

- Mobile washing plant which comprises feeding, screening, sand washing and stockpile conveyors (CDE CDE M2500 E5), thereafter described as the 'processing plant';
  - Material ≥4 mm is rinsed, screened and delivered by conveyor to stockpiles according to size;
  - Material<4 mm is classified in two cyclones to produce two grades of clean sands; delivered by conveyor to stockpiles according to size.
  - Water top up of a maximum of 20% of plant water requirement;
  - The plant is driven by an electricity.
- Integrated primary water treatment plant (CDE AquaCycle Thickener)

   - Overflow arising from the cyclones and washing is directed to the closed tank water treatment plant;
   - Dosed with flocculant in the deaeration chamber, then sent to the thickener settlement chamber. The < 63 micron silt/clay particles form a chain and sink to the bottom of the chamber.
   - Clarified water flows over a weir and is recycled into the screening and washing plant system resulting in at least 80% recycling of process water; Up to 90% may be recycled in some scenarios.
   - At a pre-set slurry density thickened sludge is pumped to a sludge pond, at an approximately 1:2 ratio of silt to water;
   - The plant is driven by electricity.
- Sludge Settlement Ponds (Ponds 2&3)
   - Settle thickened sludge;
   - Recovered water recycled to the process water top-up balancing pond;
- Stockpile Dewatering system
   - Conveyors place stockpiles on the stockpile dewatering system area;
   - The system comprises an impermeable under layer and outer bund, with stockpile water collection by gravity drainage,
   - Gravity drainage of material water, and any direct rainfall, is conveyed to the process top-up water balancing pond (Pond 1).

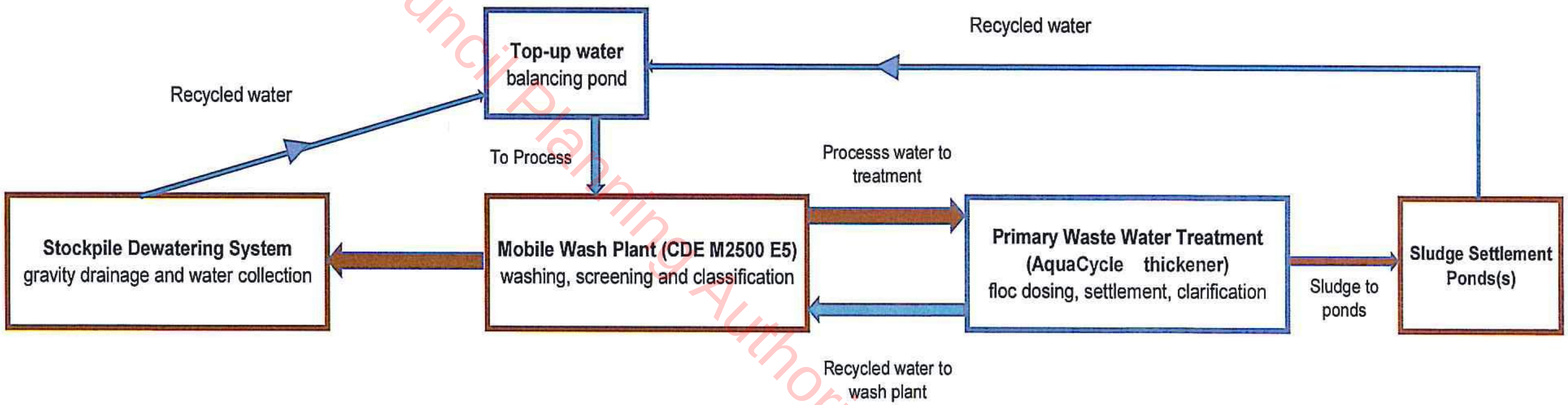
Material Processing System Water Budget

The water budget for the material processing system set out above, operating at the average and maximum processing rates, is as follows in Table 8.2.Table 8.2

Table 8.2 Material Processing System Water Budget

Process rate (tonnes/time)	Material processing rates (tonnes/day)	Full Process water requirement (m^3/processed tonnage/day)	Recycled water within process and water treatment plant ≥80% (m^3/processed tonnage/day)	Top-up water requirement to process ≤20% (m^3/processed tonnage/day)
100	203	234	192	42
	350	407	334	73

Figure 8.1: Material Processing System Diagram



8.3.2 Water Management

<u>Process and Ancillary Water Recovery, Recycling and Usage</u>

The site water management system entails water recovery and recycling within all stages of the process and ancillary activities, in order to minimise water usage.

In addition to material processing, ancillary site activities which involve water usage are:

- Wheel Washing, and
- Dust Suppression.

The process and ancillary water recovery, recycling and usage budget is set out in Table 8.3 below. The budget proceeds from the fact that at least 80% of the material process water requirement is fulfilled by recycling within the plant and integrated water treatment plant, as described above. Up to 90% may be recycled in some scenarios, therefore approximately 80% is a conservative estimate used for the purposes of a conservative assessment of the maximum top-up water requirement.

Assuming a requirement for approximately 20% top-up of process water, the top -up water requirement rate is 21 m^3/100 tonne processed. This equates to 42 m^3/day for the average processing rate and 73 m^3/day for the occasional maximum processing rate. The top-up volume will be provided by:

- Recycled recovered water from the sludge storage ponds, recycled in a closed system loop to the processing plant. Estimates of recovery rate are conservative at approximately 33% of sludge volume. The estimate is based on settlement rates over a 24 hour period and the suppliers experience of recovery rates at working iterations of the processing plant.
- Recycled recovered stockpile material water, recycled in a closed system loop to the processing plant. All gravity drainage is collected in the stockpile recovery system. Estimate of average recovery rate is based on expected gravity drainage rates (specific yield) (Fetter, 1994) of the bulked site material properties. See Appendix 8.4 for site material characteristics.
- Water usage, for the remaining water requirement which cannot be derived from recovery and recycling.

Table 8.3 Process and Ancillary Water Recovery, Recycling and Usage Budget

Material processing rates (tonnes/day)	Full Process water requirement (m^3/processed tonnage/day)	Recycled water within process and water treatment plant ≥80% (m^3/processed tonnage/day)	Top-up water requirement to process ≤20% (m^3/processed tonnage/day)	Sludge water content to settlement ponds (m^3/processed tonnage/day)	Recovered water from sludge ponds (m3/processed tonnage/day)	Material water to stockpile at 12% content (m^3/processed tonnage/day)	Recovered water from stockpile dewatering system (m3/processed tonnage/day)	Wheel wash and dust supression assumed unretrieved (dust suppresson 10 nozzles 1 m3/hr)	Water Usage (m3/processed tonnage/day)
203	234	192	42	18	6	24	14	2	**24**
350	407	334	73	31	12	42	22	4	**42**

Site Water Usage Supply

The daily operational water usage requirement of 24 m^3/processed tonnage/day for the average processing rate and 42 m^3/processed tonnage/day for the occasional maximum processing rate will be supplied from:

- Surface water run-off collection and storage;
- Groundwater abstraction, for the remaining water supply requirement which cannot be derived from collection of 70% of surface water run-off.

The proportion of usage of collected from each source, will depend on the seasonal availability of surface water run-off for collection and storage. Estimates of average daily surface water available for usage at the operational site and the requirement for groundwater abstraction to achieve the daily operational site water usage are set out below in Table 8.4 Surface water and Groundwater usage supply.

Surface Water Supply

Surface water availability includes adjustment for losses while in storage. A rate of usage of 70% of site surface water run-off is assumed.

Average surface water usage is, therefore, 15 m^3/day. Surface water available for usage is estimated to vary from a minimum of 7 m^3/day in July to 26 m^3/day in October.

The plant initial processing run will have a water requirement of 234 m^3/processed tonnage. This initial run will be supplied from the same sources as the operational phase water. That is to say, surface water run-off water will be collected and stored in advance and topped up with stored groundwater abstraction. The water management system will be commissioned in advance of the process being started, in order that sufficient collection and storage of surface water can occur.

Climate Change Allowance in Surface Water Supply

Average usage from surface water over the summer period (April – September) is 10 m^3/day. Climate change projections predict an increase in the number of dry days ranging from 15% to 40% (Nolan, 2015). Storage of 40 days of summer period surface water usage, that is 400 m^3, will be retained continuously in storage on site. This is generated from storm water run-off.

The frequencies of heavy precipitation events are projected to increase across the whole year, but show notable increases (approximately 20%) during the winter and autumn months (Nolan and McKinstry, 2019). Current guidance (OPW, 2009) is addition of 20% to flood flows.

The potential increase in winter run-off has not been factored into available winter surface water run-off supply, in order to be conservative in this regard. There is therefore likely to be additional surface water available during winter and autumn months.

A 20% increase has, however, been factored into required storm water attenuation storage calculations, to provide a factor of safety relating to climate change.

Groundwater Abstraction

The characteristics of the groundwater abstraction are as follows:

- At the average material extraction rate, the estimated requirement for groundwater supply is an annual average of 9 m^3/day. Supply requirement will range from 1 m^3/day in January to a maximum of 17 m^3/day in July. Occasional material extraction at the maximum proposed extraction rate, would require an intermittent groundwater supply rate ranging from 19 m^3/day in January to a maximum of 35 m^3/day in July.
- The hydrogeological characteristics of the sand and gravel deposit, that is the transmissivity, storage and groundwater level fluctuations indicate that these abstraction rates can readily be achieved. Significantly higher sustainable yields are likely to be available from this deposit. (See Section Currently 4.1 Site Hydrogeology, below).
- A water supply borehole extending to c. 5 m below the average water level, located close to the north western boundary of the site, will provide the supply.

Zones of Contribution to Groundwater Abstraction

Zones of Contribution to the borehole have been delineated for the groundwater abstraction. The Zone of Contribution (ZOC) is the extent of area which supplies groundwater to an abstraction borehole, pumping at a given daily abstraction rate, on an annual basis. The cone of depression of the abstraction (that is, the area of reduced groundwater levels) is smaller than, and fully contained within, the ZOC area. See Appendix 8.1, Figure 5 for extents.

Zone of Contribution Delineation Methodology

The hydrogeological investigations and ZOC delineations have been carried out according to the principles and methodologies set out in DELG/EPA/GSI (1999) Groundwater Protection Schemes, the GSI/EPA/IGI training course on Groundwater Source Protection Zone (SPZ) Delineation, as well as EPA (2011) *Advice Note No. 7: Source Protection and Catchment Management to Protect Groundwater Sources.*

Groundwater Abstraction Rate

At the average material extraction rate (c. 200 tonnes/day), the estimated requirement for groundwater supply is an annual average of 9 m^3/day. Supply requirement will range from 1 m^3/day in January to a maximum of 17 m^3/day in July.

Occasional material extraction at the maximum proposed extraction rate (350 tonnes/day), would require an intermittent groundwater supply rate ranging from 19 m^3/day in January to a maximum of 35 m^3/day in July (See Table 8.4, above for details of monthly groundwater usage).

ZOCs have been delineated for the following abstraction rates:

- A conservative ZOC (ZOC 1) has been delineated for the maximum (July) required groundwater abstraction rate of 17 m^3/day, for the 200 tonnes/day processing rate. By convention, ZOCs are delineated for a continuous 'steady state' average abstraction rate over a year, which assumes maintenance of the same pumping rate throughout a year. Withdrawal of groundwater from the full extent of the ZOC will only occur if that abstraction rate is continuous throughout the year.
  According to best practise, a ZOC is delineated for 150% of annual average usage (i.e. 9 m^3/day * 150% = 13.5 m^3/day) to provide a factor of safety. Defining the ZOC for the maximum July rate of 17 m^3/day, rather than 150% of the average annualised daily abstraction rate, therefore significantly overestimates the extent of the area which will contribute groundwater to the borehole, by an additional factor of safety of approximately 25%.

- An additional ZOC (ZOC 2) has been delineated for the intermittent maximum (July) required groundwater abstraction rate of 35 m^3/day, for the occasional 350 tonnes/day processing rate. This is a notional ZOC, which would only occur, if water were to be extracted at this maximum rate, throughout the year. This will not occur, since this is an intermittent processing rate. A factor of safety of the order of >50% is likely to be associated with this ZOC area. This is delineated only for the purposes of a very conservative assessment of risk to sensitive ecological receptors.

Supply Borehole Characteristics

The abstraction will comprise one borehole, located at the north west boundary of the site. Likely depth is approximately 10 m total depth below ground level, to ensure is 5 m in the saturated zone (below average groundwater level). A variable rate submersible pump will be installed in the borehole and the abstraction rate will be metered.

Conceptual Model of Groundwater Flow

The detailed conceptual model of groundwater flow derived from site investigations and all other available groundwater data is set out in this Chapter. The approximately 10 m depth abstraction borehole will penetrate a glacio-fluvial sand and gravel deposit, which is estimated to be up to 20 m deep in this area. Groundwater flow to the borehole is from the south south-west, towards the north north-east. Groundwater gradient is estimated to be 0.004. Saturated zone transmissivity in the borehole, based on average surrounding borehole hydraulic conductivity is estimated to be 122.5 m2/day (See Appendix 8.6 details). Groundwater vulnerability is naturally extreme, as defined by the Geological Survey of Ireland (GSI).

Recharge and Water Balance

The term 'recharge' refers to the amount of water replenishing the groundwater flow system. The estimation recharge rate is critical in ZOC delineation, as it will dictate the size of the zone of contribution to the required abstraction. The recharge rate is estimated to be an annual average of 398 mm/year, as set out in Section Currently 8.4.13 Groundwater Recharge Rate and Site Water Balance, below.

The water balance calculation requires that the annual recharge volume over the area contributing to the abstraction (the ZOC) equals the annual abstraction volume. ZOC areas are therefore as follows:

- ZOC 1: An area of 0.0155 km^2 (1.55 ha) is required to supply sufficient recharge for a continuous annual abstraction (at the July rate) of 17 m^3/day.
- ZOC 2 : An area of 0.032 km^2 (3.2 ha) is required to supply sufficient recharge for a continuous annual abstraction (at the intermittent July rate) of 35 m^3/day.

ZOC Boundaries

ZOC boundaries are based upon a combination of analytical equations and data derived from hydrogeological site investigations. ZOC boundaries are as follows:

- ZOC 1
  The eastern and western boundaries of the ZOC are based on groundwater flow lines, derived from measured groundwater gradients and other hydrogeological site investigations. They are also consistent with estimates of maximum half-width estimated using the uniform flow equation maximum half width calculation (Todd D.K., 1980 in Groundwater Hydrology) (See Appendix 8.6 for calculations);
  The downgradient boundary at 6 m north of the borehole is based on the uniform flow equation (Todd D.K., 1980 in Groundwater Hydrology);
  The south south-eastern, upgradient boundary is based on the water balance.
- ZOC 2
  The eastern and western boundaries of the ZOC are based on groundwater flow lines, derived from measured groundwater gradients and other hydrogeological site investigations. They are also consistent with estimates of maximum half-width estimated using the uniform flow equation maximum half width calculation (Todd D.K., 1980 in Groundwater Hydrology) (See Appendix 8.6 for calculations);
  The downgradient boundary at 11 m north of the borehole is based on the uniform flow equation (Todd D.K., 1980 in Groundwater Hydrology);
  The south south-eastern, upgradient boundary is based on the water balance.

Climate Change Allowance in Groundwater Supply and ZOC Delineations

The hydrogeological characteristics of the site indicate that the proposed yields are sustainable under projected climate change conditions (See Section Currently 8.4.13. Hydrogeological response to Climate Change, below)

The extremely conservative ZOC delineations allow a large factor of safety (of the order of 25% and >50%) with respect to the area contributing groundwater supply to the borehole. This factor of safety will allow for any sand and gravel groundwater system responses to changes in meteorological parameters projected under climate change. (See Currently 8.4.13. Hydrogeological response to Climate Change, below).

The frequencies of heavy precipitation events are projected to increase across the whole year, but show notable increases (approximately 20%) during the winter and autumn months (Nolan and McKinstry, 2019). Current guidance (OPW, 2009) is addition of 20% to flood flows.

The potential increase in winter flows has not been factored into available winter surface water run-off supply, in order to be conservative in this regard. There is therefore likely to be additional surface water available during winter and autumn months, in which case lower groundwater abstraction rates may be required.

Table 8.4 Surface Water and Groundwater Supply

Daily Water Balance Parameter (m^3/day)	Average	Month											
		January	February	March	April	May	June	July	August	September	October	November	December
Site average daily site run-off volume from permeable area of 12.76 ha (m^3/day)	25	33	18	21	16	19	19	16	28	22	39	31	33
Site average daily site run-off volume from hardstanding areas of 0.08 ha and including evaporative losses (m^3/day)	0	1	1	0	-1	-2	-2	-2	-1	0	1	2	2
Total site average daily run-off (m^3/day)	25	35	19	22	15	17	17	14	27	22	40	33	35
Collected volume at 70% of site average daily run-off (m^3/day)	17	24	13	15	12	13	13	12	20	16	27	22	23
Evaporation losses from storage/attenuation pond (m^3/day)	2	0.5	0.9	1.7	2.4	3.7	4.2	4.3	3.3	2.2	1.2	0.5	0.4
Surface water available for process usage (m^3/day)	**15**	**23**	**12**	**13**	**9**	**10**	**9**	**7**	**16**	**13**	**26**	**21**	**23**
Groundwater abstraction requirement at average (203 tonnes/day) material processing rate (m^3/day)	**9**	**1**	**12**	**11**	**15**	**14**	**15**	**17**	**8**	**11**	**0**	**3**	**1**

Daily Water Balance Parameter (m^3/day)	Average	Month											
		January	February	March	April	May	June	July	August	September	October	November	December
Groundwater abstraction requirement at occasional maximum (305 tonnes/day) material processing rate (m^3/day)	27	19	30	29	33	32	33	35	26	29	16	21	19

Surface Water Run-off Collection, Conveyance and Storage

See Figure 8.2 below, for a schematic of the full water management system.

Average Daily Surface water run-off

Estimates of daily site run-off rates per month for the developed site are set out in Table 8.4 Surface water and groundwater usage supply above. Average daily run-off is seasonal and varies from a minimum of 16 m^3/day in July, to a maximum of 38 m^3/day in October.

Storm water run-off

Site storm water run-off rates and volumes from the 12.84 ha developed site have been estimated for the 1 in 20 year storm for storm durations of 15 minutes to 48 hours, using the rational equation method. This is appropriate for the 20 year proposed life of the quarry. Met Eireann estimations of point rainfall frequencies (www.met.ie and Fitzgerald D.L., 2007), which provide rainfall depths at sliding durations for specified return periods for the site location, were used.

Climate Change Allowance for Storm water run-off

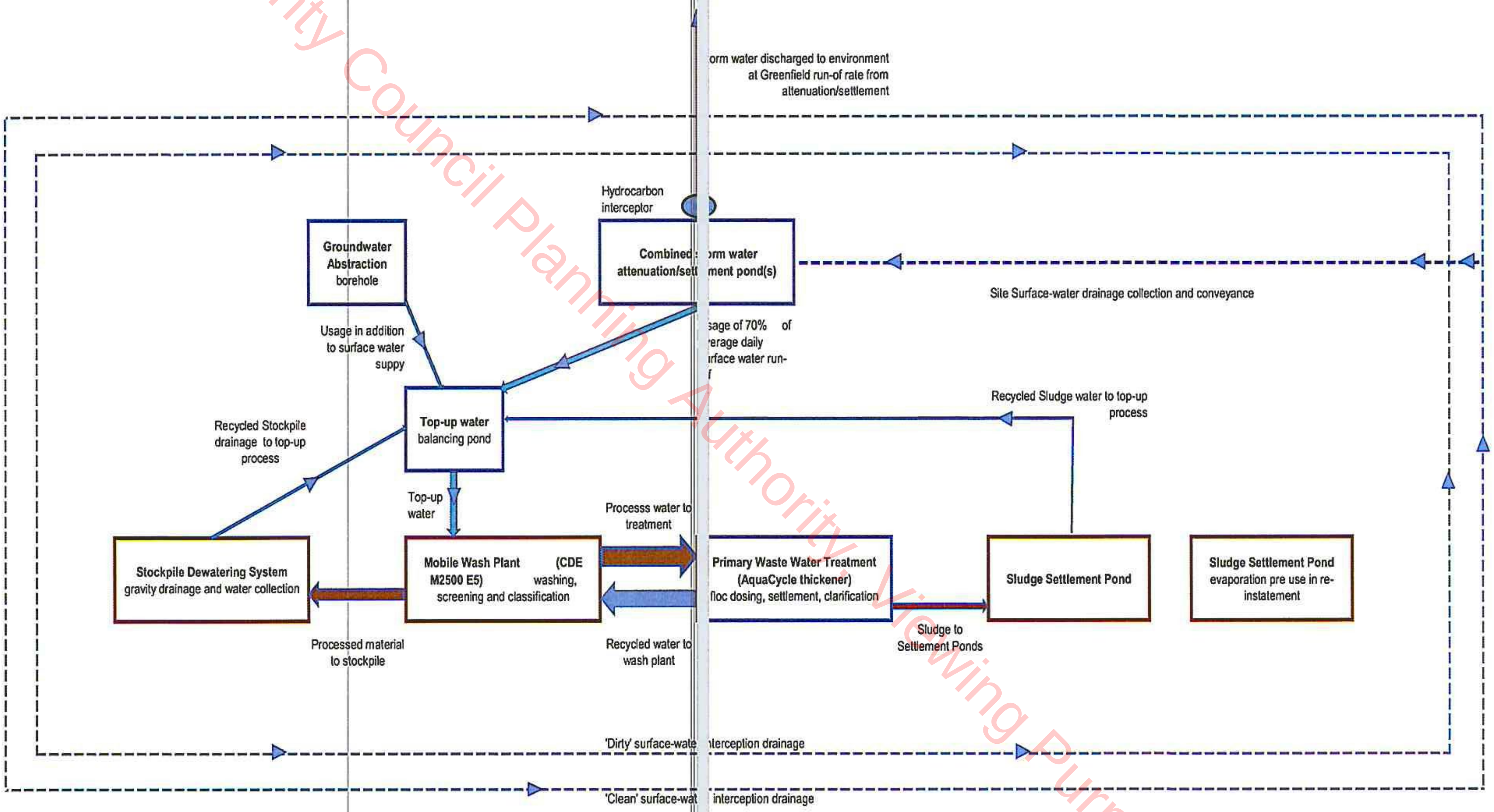
Climate change projections are that rainfall is projected to increase during winter and autumn (Nolan, 2019, 2017, 2015, Gleeson, 2013). A climate change allowance of 20% has been added to the rainfall depth used to calculate storm water run-off rates in accordance with OPW (2009) Assessment of Potential Future Scenarios For Flood Risk Management - Draft Guidance (See Appendix 8.2 for calculations).

The rational method is used to estimate storm water run-off is extremely conservative and is reported as yielding flood peaks typically twice as large as Flood Studies Report methods (Cawley and Cunnane, 2003), therefore is therefore an additional factor of safety in storm water attenuation storage designs based upon it.

Collection and conveyance

The collection and conveyance system is a flexible, reactive system, which will be modified to be effective for each phase of the development. It comprises the following elements:

Figure 8.2: Site Water Management System



- 'Clean water' interceptor drainage, which collects clean surface water runoff from areas of the site which have not been stripped of vegetation and from re-instated areas of the site, which are fully re-vegetated.
  This minimises the volume of water in which pollutants could be entrained; If necessary, geotextile lining or french drains will be implemented to prevent erosion and improve conveyance.
- Dirty water' interceptor drainage which collects surface water run-off from areas of the site where pollutant entrainment may occur. This includes working areas of the quarry and recently re-instated areas, where vegetation is not yet established, but excludes the bunded re-fuelling area. If necessary, erosion control measures will be implemented.
- Collection from a small area of shed roof;
- Conveyance of all collected drainage to the storm water attenuation/sediment settlement pond (Pond 4).

Storage

Total storage volume of 1500 m^3 in impermeable combined storm water attenuation/sediment settlement pond(s) is designed to attenuated both storm water run-off and store retained water to provide process water during dry periods. This comprises:

- Storm water attenuation storage

  Storm water from the critical 20 year return period storm with climate change allowance (and lower return period storms), is attenuated and discharged at the greenfield run-off rate for that return period storm of 0.0092 m^3/s. See Appendix 8.2 details and calculations. The maximum storage required for the critical storm is 1054 m^3.

- Retention in storage of process water, for projected climate change increase in dry-weather days. Storage of 40 days of average summer period surface water usage (May – September at 10 m^3/day) that is a total of 400 m^3. is retained continuously in storage on site. This contains a significant margin of safety for climate change designed to mitigate against projected increases in dry periods (largest for summer,) with likely values ranging from 12% to 40% (See Section currently 8.4.1 Climate Change Projections, below). This stored water is collected initially during the commissioning phase and maintained by storm water.

Water usage rate from the storage will be controlled via a flexible pumping regime and a discharge/rate meter.

A top-up water balancing pond, of volume (2000 m^3) is located before the processing plant, in order to balance the combined inflows from the usage sources: the storm water attenuation/sediment settlement pond, groundwater abstraction. the recycled water from the stockpile dewatering system and sludge settlement ponds.

Discharge to the Environment

Discharge to the environment from the storm water attenuation/sediment settlement pond (Pond 4) (for volumes in excess of the retained 40 day storage) will be actively controlled, via a flow control and a discharge meter to the pre-development greenfield run-off rate of 6.35 l/s (See Section 8.4.5. and Appendix 8.2). See the Drainage Layout Map in Appendix 2.1.

The discharge will occur onto an area of natural vegetation, at approximately 19 m distance upgradient of the man-made drain, in the form of a level spreader. The greenfield discharge rate is very low and unlikely to cause erosion. Erosion control measures such as rip-rap will be emplaced if commencement of erosion is observed.

Grey and Foul Waste Water

Sanitary and comfort facilities are self contained. These comprise:

- Provision of a 'portaloo' toilet and hand wash facilities on site; managed under contract with an approved waste collector;
- Provision of bottled water to site staff.

There is no discharge of foul or grey water from sanitary or comfort facilities to ground, or the water environment, at the site. A management contract with an approved waste collector will be put in place for removal and replacement of the infrastructure and its contained waste.

Sludge Management

The sludge management system comprises two sludge settlement ponds (Ponds 2 & 3), lined with an impermeable membrane, operating in rotation, each with the same design specification and operated as follows:

- Two settlement ponds, each lined with an impermeable membrane, each with volume of 2,000 m^3, comprising 2 m depth by 1000 m^2 area;
- One pond receiving a maximum sludge volume of 31 m^3/day. The design results in a retention time significantly in excess of 24 hrs. It allows a progressive settlement of sludge at a rate that generates 6 – 12 m^3/day of water which can be recycled back into the processing system, while allowing a freeboard in excess of 0.5 m;
- The second drying pond containing sludge, drying by evaporation, before removal of the dried sludge for re-instatement;
- Switching of drying pond function to receiving pond function, after removal of dried sludge.

Water Pollution Controls

Pollution Source Controls

Controls which will prevent pollution at source by suspended sediments and associated pollutants (such as ammonia, nitrogen or organic matter released from excavated subsoils), and hydrocarbons and foul/grey water organic wastes are as follows:

Closed system treatment and recycling of at least 80% of silt laden process water, within the processing plant and closed tank integrated primary water treatment plant. This reduces the volume of water containing suspended sediment exiting the processing plant by 80% and thus significantly reduces the volume of 'dirty' water requiring conveyance to, and treatment in, open sediment settlement ponds.

- No discharge of untreated or treated process water to the water environment. Process water which leaves the process in processed material and in sludge is recycled back into the process and is not discharged to the water environment. This is achieved via the:
- Stockpile dewatering system, comprising collection of all stockpile drainage and any direct rainwater, followed by direct, closed recycling into the process top-up water balancing pond. This avoids entrainment of stockpile material in surface water run-off.
- Recycling of available water from sludge settlement ponds and recycling into the process top-up water balancing pond (see sludge management, above.
- Minimisation of exposed ground by stripping of soils only at the commencement of a quarrying phase and immediate re-seeding of the worked out phase, in order to minimise entrainment of sediment and associated pollutants in surface water run-off. Stripped soil stockpiles/berms, will be re-seeded with appropriate grassland species.
- Retention of a vegetated (non-stripped) buffer zone to a minimum distance of 60 m distance upgradient from the man-made drain which occurs on site, in order to avoid entrainment of sediment in any surface water run-off draining directly to the drain. This will act as a buffer for any pollutants entrained in surface water run-off from any other part of the site.
- Stripped soil stockpiles will be located at the southern end of the site, at the maximum available distance from the man-made drain and a minimum of 60 m from the drain. Stripped soil stockpiles/berms, will be immediately re-seeded with appropriate grassland species.
- 'Clean' water interceptor drainage system collecting surface water run-off from vegetated, non working areas of the site, in order to avoid entrainment of suspended sediments and other potential pollutants including hydrocarbons in drainage water. This reduces the volume of 'dirty' water requiring treatment;
- Electric processing and integrated primary water treatment plant and gravity stockpile drainage system, significantly reducing fuel usage on site and therefore the risk of hydrocarbon spillage.

- No storage of fuels on site. Extraction plant (comprising an excavator and a wheeled loader) fuelled by a mobile fuel bowser brought to site. Fuelling occurs within a designated, impermeable bunded fuelling area, provisioned with a hydrocarbon interceptor. It is positioned so as to retain approximately 3 m of unsaturated material above the maximum predicted groundwater level. Drainage from the re-fuelling area is isolated from the surface water system and is conveyed directly to the storm water attenuation/sediment settlement pond; Handling of fuels and oils brought to site will be in accordance with UK Guidance for Pollution Prevention (2019) and Pollution Prevention Guidance (pre 2019).
- Where plant allows, environmentally considerate lubricants, such as synthetic non-toxic biodegradable hydraulic fluids, will be used.
- Scheduled visual checking for leaks and mechanical issues will occur, in order to minimise leakage and breakdowns on site. General servicing of site machinery takes place off-site.
- Storage of primary water treatment system polymer flocculant in a locked, fully watertight shed, from which no outflow of stored volume can occur.
- No discharge of foul or grey water from sanitary or comfort facilities to ground, or the water environment, at the site. Provision of a 'portaloo' toilet on site with a management contract with an approved waste collector.
- The site Environmental Management Plan (EMP), which sets out all environmental controls, including inter alia:
    - Correct site management procedures,
    - Monitoring and maintenance methods, schedules and recording
    - Accident responses.

All staff will be trained to understand their roles and responsibilities as set out in the EMP.

<u>Pollution Treatment Controls</u>

Controls which will treat water polluted by suspended sediment (and associated pollutants) or accidental spills of hydrocarbon or flocculant are as follows:

- Closed system treatment and recycling of at least 80% of material process water within the processing plant and integrated primary water treatment plant.
- Sediment Settlement Pond(s)
  Settlement pond(s) will be used to treat suspended solids and any associated pollutants (such as ammonia, nitrogen or organic matter), flocculant and hydrocarbons (CIRIA C532, 2001) entrained in site surface water drainage.
- Pond design and function will be as follows:
    - Site surface water drainage waters ('clean' and 'dirty') are conveyed to the combined storm water attenuation/sediment settlement pond;

- The pond(s), which is lined with an impermeable membrane, is designed to act as a wet pond which treats storm water from the 1 in 20 year event, as appropriate to the 20 year proposed life of the quarry. The pond(s) will have a total storage volume of 1,500 m3, with a depth of 1.55 m, including a freeboard of 0.5 m. The storage volume comprises 1,054 m3 storage for storm water and 400 m3 continuous storage of surface water, to be used as process water top-up during dry weather periods;
- Shape is rectangular, approximately 20m x 50 m, to maximise settlement efficiency along the length from inflow to outflow point;
- Retention time required to settle fine silt, in a pond of 1.5 m depth is 19 hours (CIRIA C648, 2006). Wet required pond minimum treatment volume (CIRIA 2000 in Butler et al, 2011) is 506 m3. The pond volume is significantly in excess of this and also allows for a retention time of 24 hrs, in accordance with Environmental Protection Agency (2006);
- Regular maintenance of the settlement pond will occur. Wet silt will be moved to the sludge management pond. If a pollutant spill has occurred, the pond will be emptied and sediment removed immediately after and sent to a licensed waste management facility;
- Periodic review of the efficacy of the pond system will occur, with addition of a second pond to the system if required suspended sediment limits are not being met.
- Regular checks for pond leakage or structural instability will be carried out and the results recorded.

Accidental Pollution Treatment Controls

The EMP, accident response methods, roles and responsibilities are the basis of the accident responses to be implemented by site staff.

Controls which will treat water polluted by hydrocarbons or flocculant in the case of accidental spillage or escape are:

- Spill kits, which will be stored on site. Staff will be fully trained in the correct and appropriate use, monitoring and removal of spill kits;
- Shutting off of the flow control valves on the discharge point from the storm water attenuation/settlement ponds which receive site surface water drainage. Immediate subsequent removal of contents for off-site disposal with an appropriately licensed waste disposal company.

Controls which will treat water polluted by suspended sediment and associated nutrients in the case of accidental spillage or breakdown of the integrated primary water treatment system are:

- Temporary bunding and diversion to the sludge-settlement ponds, which have sufficient excess capacity to store, settle and recycle the average daily process water and/or to the storm water attenuation/settlement pond, if sufficient storage exists at the time of the accident.
- Reducing outflow or stopping flow at the discharge point from the storm water attenuation/settlement ponds, in order to increase retention time, if required.

8.3.3 Re-instatement

Reinstatement of land will be carried out on a phased basis, on completion of the preceding phase. The material available for re-instatement is estimated from available site investigations results as comprising:

- 22,440 m^3 silt size material recovered from sludge;
- 28,150 m^3 top-soil recovered during stripping and stored

This will result in a depth of re-instatement of approximately (0.18 m silt+ 0.22m topsoil) across the site.

8.4 Existing Environment

8.4.1 Meteorological Setting

Current Average Hydro-Climatic Conditions

Understanding hydrogeology and hydrology requires an understanding of general meteorological patterns across the area. Average annual rainfall in the 1km surrounding the site is 821 mm/year (Met Eireann 1 km square rainfall grid 1981-2010 and Walsh S., 2012)). Average annual evapotranspiration is 362 mm/year (Met Eireann). Average annual effective rainfall, that is, rainfall available for run-off and groundwater recharge in the vicinity of the site, is therefore 468 mm/year (Met Eireann and GSI Groundwater Recharge map, 2019).

Monthly meteorological data from Met Eireann sources closest to the site and which is considered indicative of conditions at the site is set out in Table 8.5 below. The Athy rainfall station, which records number of rain days, is located at a distance of 10 km east south-east. Oakpark synoptic station, which records evaporation, is located 25 km to the south east. Monthly rainfall amounts have a seasonal pattern as does open-water evaporation. Average number of rain days has a less marked seasonal pattern.

Climate Change Projections

Regional climate projections have been modelled on a 4 to 6 km grid scale, for the mid 21st century, in Ireland by inter alia Nolan et al (2017), Nolan (2015), Nolan and McKinstry (2019) and Gleeson et al (2013). Relevant projections are summarised below.

Rainfall is projected to increase during winter and autumn and decrease during summer and over the full year (Nolan, 2019, 2017, 2015, Gleeson, 2013).

- The frequencies of heavy precipitation events are projected to increase across the whole year, but show notable increases (approximately 20%) during the winter and autumn months (Nolan and McKinstry, 2019) by mid-century.
- Drier conditions are projected to be more pronounced in the summer, with likely reductions in rainfall ranging from 0% to 13% and from 3% to 20% for the medium- to low-emission and high-emission scenarios respectively, by mid-century (modelled 20 year period 2014 – 2060) (Nolan, 2015).
- The number of extended dry periods (defined as at least 5 consecutive days for which the daily precipitation is less than 1 mm) is also projected to increase substantially by mid-century over the full year and during autumn and summer. The projected increases in dry periods are largest for summer, with likely values ranging from 12% to 40% for both the medium- to low-emission and high-emission scenarios by mid-century (Nolan, 2015).

Projections for mid-century indicate an increase of 1–1.6°C in mean annual temperatures, with the largest increases seen in the east of the country (Nolan, 2015). Temperature projections show a clear west-to-east temperature gradient, with the largest increase seen in the east (Nolan and McKinstry, 2019).

Projections for evaporation and evapotranspiration have not been explicitly modelled, as they are a function of these and additional meteorological and soil parameters.

Table 8.5 Current Average Hydro-Climatic Conditions

Month	January	February	Marc	April	May	June	July	August	September	October	November	December	Average Annual
1 km grid long term average 1981-2010													
Average monthly rainfall (mm)	83	59	[illegible]	56	60	60	56	74	65	92	79	82	830
Pro-ratad monthly actual evapotranspiration (AE) (mm)	30	30	[illegible]	30	30	30	30	30	30	30	30	30	362
Athy Rainfall Station (6414) 2010-2019													
Average monthly rainfall (mm)	71	73	[illegible]	41	52	70	55	64	68	82	85	97	814
Average number of rain days (0.2 mm +) (mm)	13	11	[illegible]	9	11	10	11	11	11	12	13	15	138
Oakpark Synoptic Station (375) 2017-2019													
Average monthly rainfall (mm)	80	57	[illegible]	56	60	61	59	72	70	93	86	84	840
Average monthy (open water) evaporation (E) (mm)	16	26	[illegible]	74	114	129	130	100	68	36	16	14	773
Average monthly potential evapotranspiration (PE) (mm)	13	19	[illegible]	51	81	93	97	73	49	26	12	11	558

8.4.2 Topography and Landform Setting

The regional setting of the site is the western edge of the lowlands surrounding the River Barrow and its floodplain 6 km to the east. Topography at the site averages 75 m O.D. The land rises to the west south west and towards the northern edge of the Castlecomer Plateau and to a height of 340 m O.D. at Fossey Mountain at a distance of c. 10 km. These uplands are the catchment divide between the Barrow river catchment to the east, in which the site is located and the Nore river catchment to the west.

The site and surrounds are located in an area of hummocky topography, resulting from glacial deposition of sediments from melting ice, which extend up to 4 km south west, west and north of the site and approximately 1 km south and east. These glacial landforms comprise sediments which overlie the bedrock beneath. The landforms are predominantly deglacial hummocky sands and gravels, with discrete elongate sub-aqueous esker ridges running through the area (Geological Survey Ireland (2013) Quaternary Geology Map of Ireland).

The hummocky sands and gravel sediments are classified as glaciofluvial sands and gravels of Carboniferous limestone petrology. The esker sediments are classified as basic esker sands and gravels. (Primary source is Teagasc, 2006; 134% additional area of potential granular sediments in county Laois derived from GSI, 2000 (Draft)).

Flatter, lower lying areas around the Stradbally River and its tributaries are composed of alluvial soils and subsoils.

8.4.3 Regional Water Balance

The natural water balance for the region of hummocky sand and gravel and esker glacial deposits surrounding the site is dominated by groundwater recharge, with low rates of surface water run-off occurring.

The average annual water balance for the area surrounding the site is tabulated below. The water balance is derived from meteorological data (Met Eireann) and from effective rainfall and groundwater recharge data (Geological Survey of Ireland, 2018 and Hunter Williams et al, 2013). Effective rainfall is rainfall available for run-off and groundwater recharge. It is noted that the recharge mapping displayed on www.gsi.ie has not been updated to reflect updated mapping of the extents of glacio-fluvial sand and gravel subsoils in Co. Laois, by the Geological Survey of Ireland. The recharge co-efficient tabulated here, takes account of these most recent subsoil mapping results and is derived using the Geological Survey of Ireland recharge calculation method (Hunter Williams et al, 2013).

Table 8.6 Annual average regional water balance

Water Balance Inputs and Outputs	Average Annual (mm)
Rainfall (Met Eireann 1 km grid 1981-2010) (mm)	830
Pro-ratad monthly actual evapotranspiration (AE) Met Eireann in GSI/Hunter Williams *et al* (2013) (mm)	362
Effective Rainfall (ER) (mm)	468
Groundwater recharge (85% of ER) (mm)	398
Surface water run-off (15% of ER) (mm)	70

8.4.4 Hydrology (Surface Water) Regional Setting

<u>Surface Watercourses and Catchments</u>

The site is located in the South Eastern River Basin District, in the Barrow WFD Catchment/Hydrometric Area (No. 14). It is located in the Stradbally river sub-catchment. The Stradbally river is a tributary of the River Barrow and has a regional flow direction north eastward towards the River Barrow.

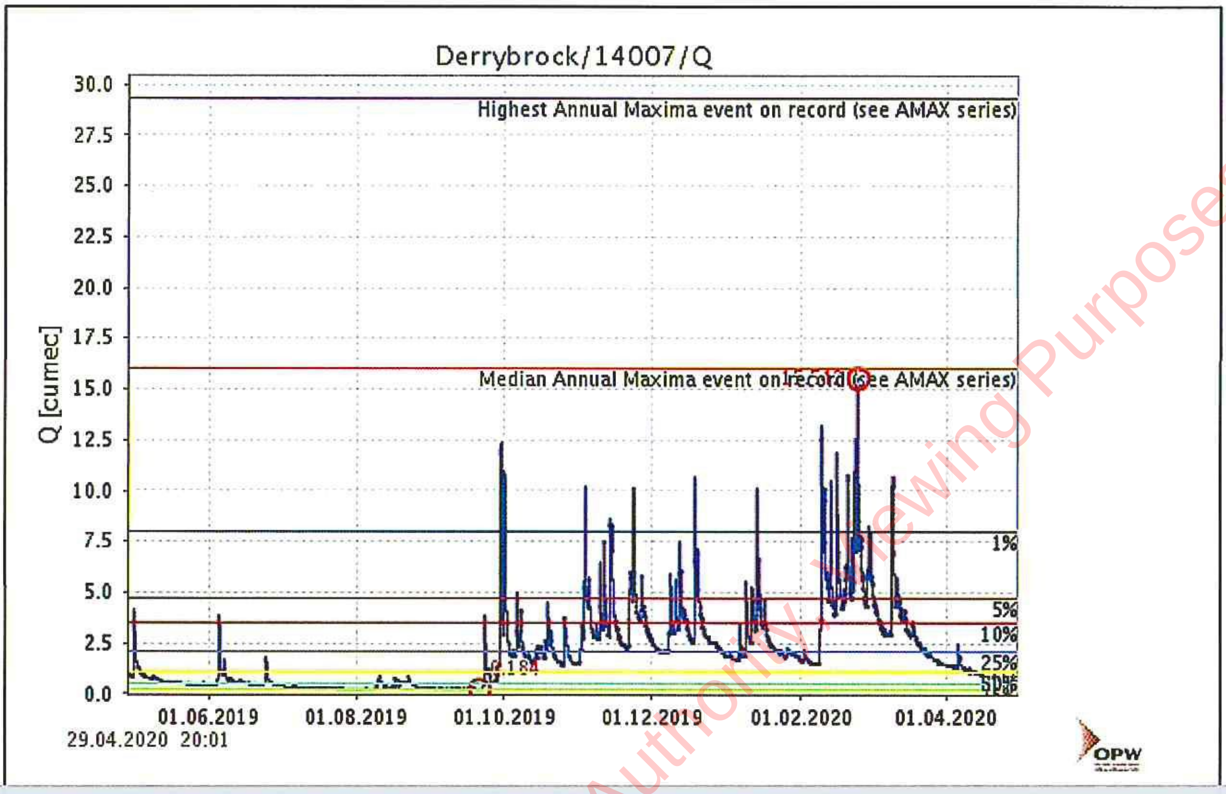
The Stradbally river flows eastwards at a distance of approximately 300 m south of the site, then turns to flow north at a distance of approximately 600 m east of the site (See Appendix 8.1, Figure 1). The Stradbally river has a total length of 9.48 km, is a 4th order river and flows into the Barrow river at a distance of 5 km downstream of the site. A small (unnamed on any map series) tributary of the Stradbally river flows predominantly north-west to south-east to the north of the site and joins the Stradbally river approximately 1.25 km north east of the site. A man-made drain, commencing approximately half way along the northern site boundary, runs eastwards, then northwards to connect with that tributary at approximately 0.75 km downstream of the site. The man-made drain has intermittent seasonal flow and therefore creates a seasonal connection between the site and the Stradbally river, located 1.25 km downstream of the site. Two hydrometric stations are located close to the site on the Stradbally river, EPA Station 14044 Stradbally 3.24 km upstream of, and OPW 14007 Derrybrock 2.76 km downstream of where the tributary joins the Stradbally river. (See Photos in Section 8.4.6 & 8.4.7 below) of the Stradbally river and un-named tributary.

The Grand Canal is passes at approximately 3 km to the east of the site. It flows in a broadly northerly direction and passes over the Stradbally river approximately 3 km downstream of the site, in the Camac aqueduct, close to Derybrock bridge. There is no hydrological connection between the site and the Grand Canal

The Stradbally river (EPA Code Stradbally (Laois)_030 and WFD Code IE_SE_14S020350) has a total catchment area of 123 km^2 (EPA Hydrotool, https://gis.epa.ie/EPAMaps/Water). A catchment area of 104 km^2 drains to the Stradbally river at the point where the tributary linked to the site enters the Stradbally River (pro-ratad hydrometric station data).

Hydrometric statistics (1980 to 2013) for the Stradbally river adjacent to the site are available for OPW Hydrometric Station 14007 Derrybrock, 2.76 km downstream (http://waterlevel.ie/hydro-data/stations/14007/station.html?1590599483). Percentile flow (x%ile) is the flow equalled or exceeded for the given percentage of time. High (1%ile) flow at Derrybrock is 7.943 m^3/s, equivalent to 682,560 m^3/day. Average (50%ile) flow is 1.092 m^3/s, equivalent to 94, 348 m^3/day. Low flow (95%ile flow) is 0.207 m^3/s, equivalent to 17,884 m^3/day. The pattern of flow (m/s) for the May 2019 – May 2020 is illustrated in the hydrograph Derrybrock/14007/Q below ((http://waterlevel.ie/hydro-data/stations/14007/station.html?1590599483). The hydrometric data indicates that the Stradbally river in this area shows a relatively fast and peaky response to rainfall, with a distinct seasonality pattern. The catchment to this point includes relatively close upland areas and approximately 30% poorly drained soils, resulting in a relatively fast response time. This hydrometric data is considered representative of flow conditions supporting surface water dependent qualifying interests (QIs) in the River Barrow and River Nore SAC in the vicinity of the site.

Figure 8.3 OPW Hydrometric Data



Water Framework Directive Status and Surface Water Quality

Water Framework Directive (WFD) status (2013-2018) for the Stradbally river upstream and downstream of the site for is classified as 'Moderate'. Surface water risk status is 'At Risk'. A single significant river pressure of 'Urban Waste Water' is identified in the Stradbally river. Stradbally town urban waste water discharges, comprising two storm drainage and one waste water treatment plant, are the point source pressures. The waste water treatment plant (Lic No. D0292-01) is currently in compliance with the required standards. No other significant pressures are identified along the length of the Stradbally river (https://gis.epa.ie/EPAMaps/Water), including no river significant pressures resulting from abstraction or the extractive industries. The Stradbally river is not classified as a Nutrient Sensitive Area under the Urban Waste Water Treatment Directive (UWWT). The two upstream inputting surface water bodies, the Crooked (Stradbally)_010 and the Stradbally (Laois)_020 are calssified as having good status (2013-2018). The River Barrow, into which the Stradbally river discharges, at a distance of 5 km downstream of the site, has a current status of 'Good'. The River Barrow is Classified as a

Nutrient Sensitive Area under the Urban Waste Water Treatment Directive (UWWT). The single generalised significant river pressure of anthropogenic pressure is identified in the section of the River Barrow through Athy town, approximately 15 km downstream of the site. The sub-catchment to this river section is designated as an area for action.

WFD operational monitoring is carried out in the Stradbally river at station RS14S020350, where the L97939 road crosses the Stradbally river described here as Mill Land bridge (See Photos in Section 8.4.6 & 8.4.7 below). This is located at a distance of 0.9 km upstream of the tributary which seasonally connects the site with the Stradbally river. The most recent Q value at this location (2017) is 3-4, resulting in moderate ecological status/potential at this location. No WFD monitoring of general physico-chemical parameters is carried out at this location.

The nearest downstream WFD physico-chemical monitoring is carried out at Derrybrock Bridge RS14S020400 approximately 4 km downstream. The results (2008 – 2018) of key parameters, total ammonia and ortho-phosphate, are indicative of 'high' quality water. Ammonia levels show a slight trend upwards from the dataset 2007 baseline. Ortho-Phosphate levels are trending downwards. Total oxidised nitrogen indicates 'moderate' quality water. Total Oxidised Nitrogen levels are trending upwards from the baseline. The most recent Q value at this location (2017) is 3-4, resulting in moderate ecological status/potential at this location.

Physico-chemical water sampling was carried out for this study on 23/1/2020, at six locations on and surrounding the site (See Appendix 8.1, Figure 4). Results for analysed parameters are used to

- Characterise site and off-site waters and,
- Provide a baseline record of water conditions supporting ecological and quality status.

See Appendix 8.3 for certificates of analysis.

Results are compared in Table 8.7 below with standards for general physico-chemical parameters, to support the status of the Biological Quality Elements, as set out in S.I. No. 272 of 2009 the European Communities Environmental Objective (Surface Waters) Regulations. Water quality is also compared with standards set out in S.I. No. 293/1988 — European Communities (Quality of Salmonid Waters) Regulations as these parameters give an indication of general water quality supporting biological elements. The Stradbally river and it's tributary are not designated as a drinking water protected area under European Communities (Drinking Water) (No. 2)

Regulations 2007 (SI no. 278/2007). Results are compared with drinking water limits (DWL) from S.I. No. 122 of 2014 Drinking Water Regulations as an overall indicator of water quality.

Parameter values in the Stradbally river, its tributary and the site, recorded during the single sampling event, are withing the range of values indicative of an overall 'good' waterbody status, with 'high' status values for total ammonia. This is consistent with the results of WFD monitoring results at Derrybrock Bridge. There is one exceedance of the standards for Salmonid waters for nitrite, at SW2 in the Stradbally river. Drinking water parameters analysed are below the limits, with the exception of total and faecal coliforms. This is not unexpected in a surface water body in an agricultural area.

Table 8.7 Hydrochemistry	Stradbally Rver			Tributary of Stradbally River		Site	Standards supporting BQEs (SBQE) Salmonid Standards (SS)
Parameter	**SW1**	**SW2**	**SW3**	**SW5**	**SW6**	**Drain (SW4)**	**Drinking Water Limit (DWL)**
Oxygenation Conditions							
Biochemical Oxygen Demand (BOD) (mg O_2/l)	<0.1	1.6	1.7	2.0	<0.1	2.0	High status ≤1.3 (mean) or ≤2.2 (95%ile) (SBQE) Good status ≤1.5 (mean) or ≤2.6 (95%ile)
Dissolved Oxygen							Lower limit 95%ile >80% saturation Upper limit 95%ile <120% saturation (SBQE)
Acidification Status							
pH	8.0	8.1	8.1	8.0	8.1	7.9	Hard Water 6.0< pH < 9.0 (SWO)
Nutrient Conditions							
Phosphate (Ortho/MRP) (mg P/l)	0.035	0.046	0.028	0.024	0.023	0.015	High status ≤0.025 (mean) or ≤ 0.045 (95%ile) Good status ≤0.035 (mean) or ≤0.075 (95%ile) (SBQE)
Total Ammonia (mg/l N)	0.023	<0.005	<0.005	0.006	0.005	0.009	High status ≤0.040 (mean) or ≤ 0.090 (95%ile) Good status ≤0.065 (mean) or ≤0.140 (95%ile) (SBQE)
Total Oxidised Nitrogen (mg N/l)	4.9	4.1	4.7	6.5	6.2	5.1	[-]
Quality of Salmonid Waters							
Suspended Solids (mg/l)	6	8	8	<5	<5	8	≤25 (SS)
Nitrite (mg/l N)	0.011	**0.167**	0.009	<0.005	0.006	<0.005	<0.05 (SS)

Hydrocarbons (EPH C8-C40)	<LOQ[1]	<LOQ	<LOQ	<[illegible]OQ	<LOQ	<LOQ	[-]
Drinking Waters							
Nitrate (mg/l N)	4.9	4.1	4.6	[illegible].4	6.2	5.1	50 (DWL)
Ammonium (mg/l NH_4)	0.029	<0.006	<0.006	[illegible]008	0.006	0.011	0.3 (DWL)
Total Coliforms (MPN[1]/100 ml)	**1733**	**2420**	**1733**	**[illegible]79**	**1300**	**218**	0 (DWL)
Faecal Coliforms (cfu/100 ml)	**520**	**510**	**300**	**[illegible]40**	**880**	**180**	0 (DWL)

LOQ is limit of quantification

8.4.5 Hydrology Site Surface Water Characteristics

Surface Watercourses

No natural surface watercourses occur at or surrounding the site. This results from the fact that soils at the site are deep, well-drained mineral soils (National Soils map, Teagasc, 2008), underlain by free draining glaciofluvial sands and gravels. The free draining nature of the soils in photographs taken during spring 2019 (10/4/2019) See Photos in Section 8.4.6 & 8.4.7).

A man-made drain has been dug along part of the northern site boundary and continues into adjacent lands. The drain has a u-shaped/trapezoidal cross section, with sub-vertical banks sand and silt banks. The banks are vegetated and Willow and other small bushes grow permanently on the banks of the drain. The drain, once established has a consistent average width of approximately 2.5 m and a depth of approximately 1 m within the site, the invert (base) level varies very little, from 66.6 to 66.4 m OD. See Photos in Section 8.4.6 & 8.4.7).

The drain runs for 0.6 km, before it connects with the unnamed tributary of the Stradbally river to the north east. This tributary discharges to the Stradbally river a further 0.65 km downstream, at a total distance of 1.25 km from the site.

The drain contains intermittent flow. During site visits in summer on 19/7/2016 and 13/7/2016 no surface water flow was observed in the drain within the site, which was significantly overgrown at those times. Water was observed in the drain on 21/1/2019 and 2/1/2020, although flows were negligible. Water levels observed are consistent with groundwater levels elsewhere on the site, as were water flow rates. Water in the drain at these times is considered to comprise predominantly groundwater.

The purpose of this drain was probably to maintain groundwater levels below the level of the adjacent arable agricultural land, which it successfully achieves. It will also intermittently convey storm water run-off from the adjacent land.

Surface Water Run-off Characteristics

Average site monthly, and pro-ratad daily, surface water run-off is tabulated below in Table 8.8. Monthly run-off is derived from the site water balance, based on an average partitioning of effective rainfall into 15% surface water runoff and 85% groundwater recharge based on site characteristics (Geological Survey of Ireland, 2018 and Hunter Williams *et al*, 2013). The actual evapotranspiration parameter has been pro-ratad from the annual average. This is not considered to introduce unreasonable uncertainty into the estimates, due to the high permeability characteristics of the soils at the site and the effect of their associated field capacity on summer actual evapotranspiration rates. Average daily run-off is seasonal and varies from a minimum of 16 m^3/day in July, to a maximum of 34 m^3/day in October.

Site greenfield run-off rate for specific return period storms has been estimated using the Institute of Hydrology IH24 method for small rural catchments (Institute of Hydrology, 1994) and Cawley and Cunnane (2003) growth factors. QBAR or mean annual flood flow (approximately 2.3 year return period) is 6.35 l/s. See Appendix 8.2 for calculations.

Average and storm run-off rates are very low and result from the presence of deep well drained soils overlying permeable glaciofluvial sands and gravel deposit

Table 8.8 Average site surface water run off (water balance method)

Water Balance Parameter	Month												Average Annual
	January	February	March	April	May	June	July	August	Septe mber	Octo ber	Novem ber	Dece mber	
Average monthly rainfall (Met Eireann 1 km grid 1981-2010) (mm)	83	59	64	56	60	60	56	74	65	92	79	82	830
Pro-ratad monthly actual evapotranspiration (AE) (Met Eireann in GSI/Hunter Williams *et al* (2013)) (mm)	30	30	30	30	30	30	30	30	30	30	30	30	362
Effective Rainfall (mm)	53	29	34	26	30	30	26	44	35	62	49	52	468
Effective Rainfall (m)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.5
Average monthly groundwater recharge (85% ER) (mm)	45	25	29	22	26	26	22	37	30	53	42	44	398
Average monthly groundwater recharge (85% ER) (m)	0.05	0.02	0.03	0.02	0.03	0.03	0.02	0.04	0.03	0.05	0.04	0.04	0.40
Average monthly surface water run-off (15% ER) (mm)	8	4	5	4	5	5	4	7	5	9	7	8	70
Average monthly surface water run-off (15% ER) (m)	0.008	0.004	0.005	0.00 4	0.005	0.005	0.00 4	0.007	0.00 5	0.00 9	0.007	0.00 8	0.070
Volume Site average monthly run-off (12.84 ha) (m3)	1021	559	655	501	578	578	501	847	674	1194	944	1002	9014
Volume Site average daily run-off (12.84 ha) (m3)	34	18	22	16	19	19	16	28	22	39	31	33	297

Table 8.9 Greenfield run-off rates (IH 24 Method)

Storm Return Period (years)	Site Run-off (l/s)	Site Run-off (m^3/s)
2.3 (QBAR)	6.346605138	0.00634660
10	8.75831509	0.00875831
20	9.20257745	0.00920257
50	11.04309294	0.01104309

Site Flows Relative to Stradbally River Flows

Average daily run-off from the site of 25 m^3/day, is equivalent to approximately 0.03 % of the average (50%ile) equivalent daily flow of 94,348 m^3/day in the Stradbally river at Derrybrock.

Maximum average daily winter run-off (October) from the site of 39 m^3/day is equivalent to approximately 0.0006% of high (1%ile) equivalent daily flow of 682,560 m^3/day at Derrybrock. The site greenfield run-off rate of 0.0087 m^3/s (calculated using IH24) for the 10 year return period storm, is equivalent to 0.0001 of the 1%ile flow at Derrybrock.

Lowest flows (95%ile) in the Stradbally are groundwater baseflow dominated rather than generated by surface water run-off. Lowest average daily summer run-off (July) from the site of 14 m^3/day. However, it is very unlikely that any summer run-off generated on the site reaches the Stradbally river via the man-made drain and unnamed tributary, except during high return period storm rainfall events. The drain was observed as being dry at site during 2018 and 2019 Summer site visits. For the purposes of comparison, in the extremely unlikely event that all of the daily run-off generated by a July summer rainfall event did reach the Stradbally river, it would be equivalent to approximately 0.08% of daily equivalent low flow of 17,884 m^3/day the Stradbally river at Derrybrock.

Site Drain Hydrochemistry

Hydrochemistry in the man-made drain was sampled once, in winter (23/1/2020), and reported in Table 8.7Table 8.7 above as Site/Drain (SW4) . Hydrochemistry is intermediate between that the other surface water samples and groundwater samples. This is indicative of the mixed function of the drain as a groundwater drain, which also conveys surface water run-off during winter storm events.

8.4.6 Surface Watercourse Photos

Photo 1 Stradbally river looking downstream (north) from Mill Land bridge (2/1/2020)

Photo 2 Stradbally river looking downstream from at Mill Land bridge (19/7/2016)

Photo 3 Stradbally river at weir at Mill Land bridge (2/1/2020)

Photo 3 Stradbally river with embankments c. 0.6 km upstream of Mill Land bridge (2/1/2020)

Photo 5 Unnamed tributary looking upstream into culvert under R247 road (19/7/2016)

Photo 6 Unnamed tributary looking downstream from culvert under R247 road (19/7/2016)

8.4.7 Site Drainage Photos

Photo 1 Site view towards south west from BH1 (10/4/2019)

Photo 2 Site view towards west (10/4/2019)

Photo 3 Site view towards east south-east (10/4/2019)

Photo 4 Site view towards north east (10/4/2019)

Photo 5 Man-made drain (dry) on site looking down-drain (south east) from start of drain (dry) (19/7/2016)

Photo 7 Man-made drain (containing water) on site looking down-drain (south east) (21/1/2020)

8.4.8 Hydrological Response to Climate Change

Likely surface water system responses to climate change

Guidance on quantification of allowances for specific elements of surface water response to climate change in Ireland is set out in OPW (2009). These allowances for future scenarios (100 year time horizon) are as set out below.

Table 8.10: Climate Change Allowances

Surface Water Response (100 year time horizon to 2109)	MRFS	HEFS
Flood Flows	+20%	+30%
Extreme Rainfall Depths	+20%	+30%

There is no guidance on quantification of allowances for average surface water flows or for surface water run-off rates. There also is no guidance on changes to the baseflow (groundwater) which contributes the majority of low flow surface low flows.

High Flows at OPW Hydrometric Station 14007 Derrybrock

Addition of the 20% allowance for high flows, to the 1%ile flow at OPW Hydrometric Station 14007 Derrybrock, increases the 1%ile flow from 7.943 m^3/s (equivalent to 682,560 m^3/day) to 9.5316 m^3/s (equivalent to 823,530 m^3/day.)

Low Flows OPW Hydrometric Station 14007 Derrybrock

River low flows are dominated by groundwater baseflow. Aquifer storage and transmissivity are considered key parameters in sustaining baseflow in the scenario of changes in seasonal rainfall (Hunter Williams *et al,* 2019). Sand and gravel sediments located on the west and north western bank of the Stradbally river will contribute a significant proportion of this baseflow. The groundwater yield and level response to changes in climatic parameters associated with climate change in sand and gravel bodies is buffered and dampened, in both time and amount, by the high intergranular storage (and transmissivity) of the materials. Seasonal variations are therefore less than they would otherwise be).

In order to apply the precautionary principle, an assumption is made that a **10%** reduction in groundwater baseflow could occur. This would reduce the 95%ile flow of 0.207 m^3/s, (equivalent to 17,884 m^3/day) to 0.1863 m^3/s (equivalent to 16,096 m^3/day).

Average Flows OPW Hydrometric Station 14007 Derrybrock

McGrath, R and Lynch P. (2008) predict, with an acceptable degree of certainty, that annual (maximum) mean flows in the river Barrow will not change. This is assumed for the Stradbally River also.

8.4.9 Surface Water Resource

The Stradbally river and its tributary are not designated as a drinking water protected area under European Communities (Drinking Water) (No. 2) Regulations 2007 (SI no. 278/2007) and the Water Framework Directive.

The Stradbally river is used as a discharge location for a waste-water treatment plant discharge from Stradbally town, at a distance of approximately 3 km upstream of where the site is intermittently connected to the Stradbally river via a man-made drain discharging into the unnamed tributary. The waste water treatment plant (Lic No. D0292-01) is currently in compliance with the required standards.

8.4.10 Protected Surface Water Dependent Habitats and Species

The Stradbally and Barrow rivers downstream of Stradbally town are designated as part of the River Barrow and River Nore Special Area of Conservation (SAC) Natura 2000 site (Site Code 002162). The qualifying interests of the SAC which are supported by the hydrological regime are set out in the Appropriate Assessment Screening Document which accompanies this submission. Those qualifying interests which could potentially be significantly impacted by the proposed development are set out in the Natura Impact Statement*. The surface water hydrological and water quality conditions which support those groundwater dependent qualifying interests, as described in the SAC conservation objectives (NPWS, 2011) and accompanying NIS, are set out in

Neither the Stradbally river or River Barrow are designated as salmonid rivers under the Salmonid Regulation (S.I. 293 only).

Table 8.11 provides details of the conservation objectives for the relevant qualifying interests.

Table 8.11 SAC Conservation Objectives

Surface Water Dependent Qualifying Interest	Hydrological Attribute	Measure	Target	Notes
6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Hydrological regime: Flooding depth/height of water table	Metres	Maintain appropriate hydrological regimes	This habitat requires winter inundation, which results in deposition of naturally nutrient-rich sediment
3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	i) Water quality: Suspended sediment ii) Water Quality: Nutrients	Mg/l	i) The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments ii)The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	Phosphorus (MRP) is typically the limiting nutrient, however increased nitrogen (NO3-) negatively impacts upon the Nfixing blue-green algal communities that requently contribute to tufa deposition. Nutrient enrichment of the habitat typically leads to increased filamentous green-algal biomass, and consequent changes in other algae, bryophyte and macrophyte species composition and abundance.
1099 River lamprey *Lampetra fluviatilis*	i) Water quality: Suspended sediment ii) Water Quality: Nutrients	Mg/l	To restore the favourable conservation condition of these species No decline in extent and distribution of spawning beds	An increase in siltation load or changes to siltation patterns of the river could create barriers for the lampreys and prevent them from accessing spawning habitats
1096 Brook Lamprey	i) Water quality: Suspended sediment ii) Water Quality: Nutrients	Mg/l		
1092 White-clawed crayfish (*Austropotamobius pallipes*)	Water quality	EPA Q value	At least Q3-Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA) An increase in siltation load or changes to siltation patterns of the river could impact spawning habitats for the crayfish

Surface Water Dependent Qualifying Interest	Hydrological Attribute	Measure	Target	Notes
1106 Atlantic salmon (*Salmo salar*) (only in fresh water)	Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)
1355 Otter *Lutra lutra*	Water quality			
9130 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*)	Hydrological regime: Flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river flood plains but not for woodland around springs/seepage areas

8.4.11 Hydrogeology (Groundwater) Regional Setting

Bedrock Geology

Bedrock is not exposed at or adjacent to the site. Bedrock is mapped (McConnell *et al*, 1995) as being crinoidal wackestone/packstone limestone of the Ballyadams formation. This formation falls into the broad, hydrostratigraphic rock unit classification of Dinantian Pure Bedded Limestones (Geological Survey of Ireland, Hydrostratigraphic Rock Unit Groups, 2016). There are no bedrock faults mapped within 7 km of the site.

Water Framework Directive (Bedrock) GWB Extents

The site and surrounds are within the Bagnelstown Upper WFD bedrock groundwater body (IE_SE_G_153), which has a total area of 590 km^2 .The groundwater body is delineated for the karstic flow regime bedrock aquifer underlying the site and surrounds (https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx). A groundwater body is a discrete groundwater flow unit, within which there is potentially groundwater connectivity. There is no groundwater flow across the boundary of the GWB, into other GWBs, since the boundary represents a groundwater catchment divide (a no-flow boundary type).

Groundwater Body Status

Chemical, quantitative and overall status in the Bagnelstown Upper GWB, for the period 2013-2018, are all classed as Good. The general anthropogenic pressure is the single WFD significant groundwater pressure identified for the GWB. There are no other significant pressures identified, including none relating to abstraction or extractive industry in the GWB. A WFD national groundwater investigative monitoring station is located at Vickerstown, 3.4 km north east of the site, code IEMGGWIE_SE_G_15316000014.

Subsoils

The site and surrounds are located in an area of hummocky topography, resulting from glacial deposition of sediments from melting ice, which extend up to 4 km south west, west and north of the site and approximately 1 km south and east. The hummocky sands and gravel sediments are classified as glaciofluvial sands and gravels of Carboniferous limestone petrology. The esker sediments are classified as basic esker sands and gravels. (GSI, Aggregate Potential Mapping (2016) - Primary source is Teagasc, 2006; 134% additional area of potential granular sediments in county Laois derived from GSI, 2000 (Draft)). This mapping is the most recent update of the Teagasc (2006) mapping, which re-classified the Till derived from limestones subsoil in this area as hummocky sand and gravel deposits. These deposits extend as far as the alluvial subsoils and soils which occur on both banks of the unnamed tributary of the Stradbally river and the Stradbally River. (See Appendix 8.1, Figure 3).

Bedrock Aquifer Vulnerability

Groundwater vulnerability of the bedrock aquifer is currently classified as moderate, at and surrounding the site. The mapped vulnerability classification does not take into account the updated subsoils mapping (GSI, Aggregate Potential Mapping (2016) - Primary source is Teagasc, 2006; 134% additional area of potential granular sediments in county Laois derived from GSI, 2000 (Draft)). Re-assessment of the updated subsoils surrounding the site as sand and gravel, according to DELG *et al* (2009), is likely to result in a high vulnerability classification. Groundwater vulnerability at the site itself, based on the results of intrusive site investigations (below), is here re-classified as high and extreme according to the above methodology.

8.4.12 Site Hydrogeology

Bedrock Geology

Bedrock is not exposed at, or in drains or the disused pit adjacent to the site. Bedrock was encountered during drilling at depths varying from 15 to 20 m b.g.l..at the base of three boreholes. The bedrock surface occurs at a levels ranging from 60.44 m OD in borehole BH4, 58.09 m in BH2, to 55.68 m OD in BH3 and > (See Appendix 8.1, Figure 5 for borehole locations) The bedrock surface therefore slopes broadly towards the north north-west under the site. Bedrock encountered was grey limestone, weathered to a depth of c.1 m where drilling continued into the bedrock. This rock is consistent with the mapped Dinantian Pure Bedded Limestones (See Appendix 8.4 for Borehole Logs).

Subsoils

Exposures

Subsoils are exposed in the disused Coillte pit immediately to the north west of the site boundary. Examination of these layered sand and gravel sediments validates the presence of the esker ridges identified in Geological Survey of Ireland mapping (GSI, Aggregate Potential Mapping (2016) - Primary source is Teagasc, 2006; 134% additional area of potential granular sediments in county Laois derived from GSI, 2000 (Draft)). An excavation was carried out by Coillte in the disused Coillte quarry in July 2015, to a dept of 66.5 m O.D., with sand and gravel encountered to that depth. See Photo in Section 8.4.17 below.

Sand and gravel sediments, with silt interlayers were observed in the banks of the man-made drain for the mapped distance of 0.5 km downstream from the head of the drain within the site into the field to the east.

Intrusive Investigations

Intrusive investigations within the site boundary comprised:

- 4 No. trial pits in October 2003 and
- 4 No. boreholes in October 2018 (See Field Works Section 8.2.3 Field Works above, for methods).

The four trial pits excavated to depths of 3m exposed 0.7 to 0.8 m of soil overlying layered, well sorted, high permeability sands and gravels (See Appendix 8.4 for trial pit descriptions and Particle Size Distribution Curves).

The four boreholes encountered 15 to 20 m depth of layered, fine to coarse, well sorted sands and gravels, with one silt or clay dominated horizon, within the profile. (See Appendix 8.4 for Borehole Logs and Particle Size Distribution Curves and Appendix 8.1, Figure 5 for locations).

The subsoils encountered during the intrusive site investigations validate the Geological Survey of Ireland recent re-classification of the glacial till subsoil as hummocky sand and gravel deposits (GSI, Aggregate Potential Mapping (2016) - Primary source is Teagasc, 2006; 134% additional area of potential granular sediments in county Laois derived from GSI, 2000 (Draft)).

Groundwater Levels on and Surrounding Site

Borehole Water Levels

Boreholes BH1, BH2, BH3 and BH4 were finished as piezometers according to best practise and the hydrogeological and material conditions encountered at each borehole location (See Appendix 8.4 for piezometer (stand pipe) installation details).

Groundwater levels were monitored continuously (10 minute intervals) from 17/10/2018 – 10/4/2019 (Boreholes BH1, BH2, BH3) and to 21/1/2019 (Borehole BH4). Monitored levels were validated using manual measurements.

Monitored groundwater levels are summarised in Table 8.12 below. See Appendix 8.5 for plots of borehole groundwater levels.

Table 8.12 Summary of Borehole Groundwater Levels

Groundwater monitoring borehole		BH 1	BH 2	BH 3	BH 4
Ground level (m O.D.)		78.76	78.09	70.69	76.34
Water level (m O.D.)	Maximum	68.75	69.32	69.13	69.65
	Minimum	67.49	67.36	67.31	67.61
Water depth (m b. g.l.)	Maximum	[illegible]	[illegible]	[illegible]	[illegible]
	Minimum	10.01	8.77	1.56	6.69
Seasonal Range (m)	Difference	1.26	1.96	1.82	2.04
Depth of bedrock Aquifer (m b.g.l.)		>18	20	15	17
Max seasonal water level + Climate change allowance of 10% of seasonal variation		70.12	71.39	71.04	71.79

The 12 month period March 2018 to April 2019 received 91% of the average annual cumulative rainfall at Oakpark synoptic station. The maximum groundwater levels attained are therefore considered representative of average winter groundwater levels.

Maximum and minimum groundwater levels are within the sand and gravel body at all times. The pattern and height of groundwater levels indicated that flow is unconfined. The seasonal range of groundwater levels is small at <2 m. This is consistent with sand and gravel waterbodies elsewhere in the south east of the country. (Tedd *et al* (2012) and Kilmuckridge GWB, Wexford, *WFD Summary of Initial Characterisation*).

Groundwater level response to rainfall is therefore subdued and slow. Maximum winter water levels occur into March, with minimum levels persisting into November. This timing of minimum and maximum groundwater levels is consistent with other sand and gravel bodies in the south east, in being later than that expected for bedrock aquifers (Tedd *et al*, 2012).

These response characteristics, buffered in both time and magnitude, are likely to be due to the large intergranular storage available in the sand and gravel deposit.

<u>Water levels in springs, drains, other boreholes and surface watercourses</u>

Water level heights, both groundwater and surface water were recorded on three occasions, including summer and winter. These included drains, springs and surface water courses at and surrounding the site, as far south and east as the Stradbally river and within the River Barrow and River Nore SAC. See Appendix 8.5 for tabulated groundwater levels. Groundwater gradients across the site and surrounds were defined from monitored groundwater levels in boreholes coupled with this data. Groundwater levels were interpolated on a grid from these datasets, contoured and then checked for hydrogeological correctness. Refer to Section 8.4.17 for photographs of the riverside springs.

<u>Groundwater Recharge Rate and Site Water Balance</u>

Recharge refers to the amount of water replenishing the groundwater flow system. The recharge rate is generally estimated on an annual basis, and assumed to consist of input (annual rainfall) less water loss prior to entry into the groundwater system (annual evapotranspiration and runoff).

The site water balance and recharge co-efficient tabulated below, takes account of the site investigations results, and most recent Geological Survey of Ireland subsoil mapping results. Recharge rates are derived using the Geological Survey of Ireland recharge calculation method (Hunter Williams *et al*, 2013).

Table 8.13: Water Balance Input and Outputs

Water Balance Inputs and Outputs	Average Annual (mm)
Rainfall (Met Eireann 1 km grid 1981-2010) (mm)	830
Pro-ratad monthly actual evapotranspiration (AE) Met Eireann in GSI/Hunter Williams *et al* (2013) (mm)	362
Effective Rainfall (ER) (mm)	468
Groundwater recharge (85% of ER) (mm)	398
Surface water run-off (15% of ER) (mm)	70

Borehole Transmissivities and Yields

Saturated zone transmissivities range from 223 m^2/day to 720 m^2/day across BH1, BH2 and BH3 (See Appendix 8.6 for transmissivity calculations). These transmissivity estimates are consistent with estimates for high yielding Regional and Locally Important sand and gravel aquifers and will provide a yield in excess of 100 m^3/d per metre of water drawdown in a well (Geological Survey of Ireland and Environmental Protection Agency, 2015). A borehole with 4 m of pumping drawdown, can therefore transmit in excess of 400 m^3/d. This is significant in excess of the intermittently maximum abstraction of 35 m^3/d.

Groundwater Gradients and Flow Directions

Groundwater gradient, and resultant groundwater flow direction within the site, is towards the north and north-east and is broadly aligned with topographic gradient. This is as expected for sand and gravel bodies. Site groundwater gradient is estimated to be 0.004. Site groundwater flow direction is also controlled by the presence of discharge zones/hydraulic controls to the north north-east, at the tributary of the Stradbally river and to the south and east, at the loop of the Stradbally river channel. A groundwater flow divide is estimated to occur c. 120 m to the south of the site boundary along the road. It is oriented in a south west to north east direction and may extent further north east than the estimated groundwater contours indicate. North of this divide, groundwater flow is north north-eastwards through the site towards the tributary. South and south east of this divide, flow is south eastwards and potentially also southwards towards the Stradbally river. The presence of the man-made drain along part of the northern boundary of the site has the effect of slightly reducing groundwater level in its immediate vicinity, but will not act as an important groundwater discharge boundary. See Appendix 8.1, Figure 5 for groundwater contours and flow directions.

Site Groundwater Hydrochemistry

The results of key parameters sampled in boreholes BH1 and BH3 on the site are summarised in Table 8.14. They have been compared to the drinking water limits (DWL) from the Drinking Water Regulations (S.I. No. 122 of 2014) and/or threshold values (TV) from the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010). Field measurements of Electrical Conductivity, temperature and pH were made in the man-made drain on 2/1/2020.

Table 8.14: Key groundwater hydrochemistry and water quality results

Parameter	BH 1	BH 3	Drinking Water Limit (DWL) or Threshold Value (TV)
Total Hardness (mg/l as $CaCO_3$)	373	420	[-]
Alkalinity (mg/l $CaCO_3$)	187	144	
Electrical Conductivity (μS/cm) (laboratory analysis)	620	579	800 (TV), 2,500 (DWL)
Total Coliforms (MPN[6]/100 ml)	**291**	**135**	0 (DWL)
Faecal Coliforms (*E. Coli*) (MPN/100 ml)	**4**	**6**	0 (DWL)
Nitrate (mg/l NO_3)	**45**	27	50 (DWL) 37.5 (TV)
Chloride (mg/l)	31	25	250 (DWL), 24 (TV)
Ammonium (mg/l N)	<0.005	<0.005	0.3 (DWL) [0.23 as N], 0.225 [0.175 as N] (TV)
Iron (Total, μg/l)	**630**	**2000**	200 (DWL)
Manganese (Total, μg/l)	45	170	50 (DWL)
Potassium:sodium ratio	0.2	0.14	0.4 (indicator)
Total Organic Carbon (mg/l)	3.46	1.51	0.3 (indicator)
Hydrocarbons (EPH C8-C40)	<LOQ	<LOQ	[-]

*LOQ = Limit of Quantification or lowest value that can be reported

Data indicate that the water is 'hard', has high electrical conductivity (E.C.) and has high alkalinity. This is typical of hydrochemistry in sediments derived from carboniferous limestones and in connectivity with limestone bedrock aquifers (Water Framework Directive Working Group on Groundwater, 2004).

Iron drinking water limits are exceeded in both boreholes and manganese in BH3. This may reflect natural variation in the carboniferous limestone source of the sand and gravel sediments and/or the underlying bedrock. High combined levels of iron and manganese levels can also be indicative of sources of organic pollution.

Nitrate levels are above the threshold value in BH1 and are above the upper bound of the average national background levels in both boreholes (90th %ile is 13 mg/l) as set out in O'Callaghan Moran/WFD South Eastern River Basin District (2007). Sources of nitrate

[6] MPN is most probable number

in groundwater include farmyard manure, slurry and dirty water or on-site wastewater treatment systems (such as septic tanks or similar).

Chloride levels are at and above the threshold value and the site is distance from the coast, which may be indicative of pollutant influence. The potassium:sodium (K:Na) ratio is below the background potassium:sodium ratio in most Irish groundwater of less than 0.4 and often less than 0.3. (A K:Na ratio of >0.4 can be used to indicate contamination by plant organic matter (e.g. slurry). T.O.C. values are at and below the indicator threshold of 0.3, which is taken to indicate the likelihood of surface water influence.

Both total and faecal coliforms are above the drinking water limits, though only slightly in the case of faecal coliforms.

The combination of parameter exceedances indicate that there is/are organic pollutant sources influencing water quality in both boreholes. These could include on-site waste water treatment systems upgradient on the groundwater flow path towards the site and/or pollution by grazing livestock.

Field measurements of Electrical Conductivity, temperature and pH made in the man-made drain on 2/1/2020 were consistent with those parameter values in BH3. This indicates a groundwater influence in the drain on this at this time.

8.4.13 Conceptual Model of Groundwater Flows

Effective rainfall percolates diffusely (across the whole extent) down into the 15-20 m thick glaciofluvial sand and gravel deposit, recharging it. The sand and gravel deposit and the underlying karst limestone aquifer have high recharge acceptance capacities and are overlain by deep, well drained soils. Groundwater recharge rates are therefore high at an annual average of c. 85% of E.R. (398 mm) and surface water run-off rates are correspondingly low at an average of c. 15% of E.R. Drainage density is therefore very low, as evidenced by the absence of any natural surface water courses at the c. 13 ha site or within 0.35 km of it.

Groundwater in the deposits is unconfined and the sand and gravel deposit is in hydraulic connectivity with the underlying bedrock aquifer at the site, as illustrated by the intrusive site investigations and the consistency between monitored groundwater levels in boreholes penetrating sand and gravel sediment only and those penetrating the underlying bedrock.

Flow through the coarse and fine sediments of the sand and gravel aquifer is intergranular in the primary porosity. Flow in the underlying, diffusely karstified limestone bedrock is restricted to discrete fissures and fractures, which provide secondary porosity. There is no primary porosity or intergranular flow within the bedrock. Estimated transmissivity below the groundwater level in the sand and gravel is moderate to high, varying from 223 m^2/day to 720 m^3/day in boreholes from west to east across the site.

A groundwater flow divide is estimated to occur c. 120 m to the south of the site boundary along the road. It is oriented in a south west to north east direction and may extend further north east than the available mapped groundwater contours indicate. North of this divide, groundwater flow is north north-eastwards through the site towards the unnamed tributary of the Stradbally river. South and south east of this divide, flow is south eastwards and potentially also southwards towards the Stradbally river. Groundwater flows in the most south easterly corner of the site may be towards the east and the Stradbally river from the groundwater divide. Groundwater gradients and associated flow directions are broadly a dampened reflection of the topography of the glacial sand and gravel deposits. The watercourses are groundwater discharge zones. Small springs, with groundwater hydrochemistry characteristics, were observed discharging in January 2020, from what may be the edge of the sand and gravel deposit, within 10 m of the Stradbally river, immediately south of the Mill bridge. However, the river has been heavily modified in this area, with historic six inch maps showing now removed storage ponds, sluice, weir and side channel structures, relating to a saw mills and house at Ballykilcavan. The location of the springs may also be related to those channel modifications in this area (See Appendix 8.1 Figure 5 for spring locations). Poorly drained land, denoted on the historic maps, on the south bank of the tributary of the Stradbally river, may indicated the presence of springs discharging from the north eastern edge of the sand and gravel deposit.

Groundwater flow paths from the groundwater divide, to the discharge zones at the watercourses to the south east and east range from 0.75 to 1 km in length. The flow path length within the sand and gravel deposit is constrained by the extent of the deposit. The occurrence of spring discharges at the edge of sand and gravel bodies is frequently observed, as for example in the Timahoe groundwater body, c 2 km to the south (*Timahoe GWB: Summary Initial Characterisation* document).

The Stradbally River probably also acts as a discharge zone for the underlying karstified (diffuse) limestone bedrock aquifer, being a significant watercourse. It is possible, but considered extremely unlikely, that bedrock groundwater flow could continue underneath the Stradbally river eastwards towards the Barrow. The flow path lengths would, however, be >8 km which beyond the range of possible flow path lengths estimated for high transmissivity karstified aquifers (Fitzsimons *et al*, 2005). The Stradbally river is therefore considered to be a discharge zone which acts as a hydraulic control on groundwater flow, in the form of a hydraulic no-flow boundary, that is, there is no significant groundwater flow across this boundary.

8.4.14 Hydrogeological Response to Climate Change

Likely groundwater system responses to climate change

There is currently no specific guidance on quantifying likely groundwater system responses to climate change in Ireland. An assessment of yield sustainability into the future is given by Hunter Williams *et al* (2019).

Aquifer storage and transmissivity are considered key parameters in sustaining yield in the scenario of changes in seasonal rainfall. Groundwater level response in sand and gravel bodies is buffered and dampened, in both time and amount, by the high intergranular storage (and transmissivity) of the materials and seasonal variations are therefore less than they would otherwise be (Hunter Williams *et al,* 2019). The groundwater recharge acceptance capacity (recharge rate) at and surrounding the site is high and is likely therefore to allow for additional recharge in the case of additional winter rainfall. This may result in a small increase in maximum water levels in the spring period following winter recharge. This may act as a buffer against reduced summer rainfall, reducing the impacts on water levels during the period of low water levels into November.

Groundwater yield, relative to the rate required for process abstraction, will not therefore change in any significant way by climate change.

Groundwater gradients in the sand and gravel body are low and can be expected to be low in the underlying regional important karstified aquifer. Changes in groundwater level in these high permeability settings are likely to have minimal impact on groundwater gradients. No significant changes in groundwater flow direction are therefore expected as a result of climate change.

Site Maximum Winter Groundwater Levels with Climate Change Uncertainty Allowance

Maximum likely site winter groundwater level was estimated, to inform quarrying depth above likely maximum groundwater level. In order to account for uncertainty in winter groundwater level, in the absence of any specific guidance on groundwater level changes, the precautionary principle was applied. 10% of annual groundwater level variation was added to the maximum recorded winter groundwater level at each groundwater monitoring point (Winter 2019). The additions at individual boreholes are set out in Table 8.12 Summary of borehole groundwater levels, above)

Maximum recorded site groundwater levels were combined with recorded winter water table gradients and interpolated across the site on a grid, in order to provide a groundwater level surface, adjusted for climate change uncertainty.

This approach to climate change uncertainty is considered conservative and appropriate to the site hydrogeological setting.

8.4.15 Aquifer Resource

Aquifer Classification

The bedrock aquifer underlying the site is classified as a Regionally Important Karstified (diffuse) aquifer (Rkd). No karst features have been mapped (GSI Groundwater Karst map (2020)) within the Water Framework Directive (WFD) groundwater body in which the site and surrounds are located.

Water Framework Directive Quantitative Groundwater Status for the period 2013-2018 is 'Good'. This includes good status for the Water Balance Test, the Impact of Groundwater on Surface Water Ecological/Quantitative Status Test and the Groundwater Dependent Ecosystems (GWDTE) – Quantitative Assessment Test. Abstraction. Neither Groundwater Abstraction or Extractive Pressures are identified for the groundwater body.

Sand and gravel aquifer deposits which overlie the bedrock aquifer occur at and south west of Stradbally town and at and to the south of Athy town. These are classified respectively as the Timahoe Gravel GWB, a locally important gravel aquifer (Lg) and the Athy-Bagnelstown Gravels GWB, a regionally important gravel aquifer (Rg). These overly the Bagnelstown Upper bedrock WFD groundwater body.

It is noted in the WFD *Bagnelstown Upper GWB: Summary Initial Characterisation* document, that sands and gravels overlie significant areas of this bedrock groundwater body and are themselves discrete groundwater bodies. The area surrounding the site is not currently classified as a sand and gravel GWB.

Public Water Supplies

Five public water supplies are located, or partially located, within 10 km of the site and within the Bagnelstown Upper Groundwater Body as follow:

Stradbally, Ballylinan and Timahoe Water Supply

The Stradbally, Ballylinan and Timahoe water supply is supplied by the Kyle spring, located 4.5 km south south-west of Stradbally town. This supply network extents northwards along the R427 adjacent to the site, as far as Vickarstown, and also supplies houses along the 'other' class road immediately north of the site.

Groundwaters source protection zones have been delineated for this supply (McHugh M. and Wright, G. (2000). Groundwater Source Protection Zones are the surface and subsurface areas surrounding a groundwater source, i.e. a well, wellfield or spring, in which water and contaminants may enter groundwater and move towards the source. The zone of contribution is a minimum distance of 6.5 km south of the site. The mapped zone of contribution to the spring extends southwards from the Kyle spring and groundwater flow supply the spring is from the south, northwards towards the spring.

There is therefore no connectivity between the site and the public water supply.

Athy Public Water Supply

Athy town public water supply is supplied by boreholes within Athy town. Source protection zones have been delineated for the boreholes (Geological Survey of Ireland and Kildare County Council, 2004). The total zone of contribution extends westwards from the borehole supplies in Athy. The ZOC boundary upgradient boundary is located a minimum of 1.6 km south east of the site. This, closest ZOC boundary, is located on a topographic divide at Binbawn, Ballyduff, and Ballintlea which is also the groundwater divide. Groundwater flows eastwards from this divide towards the supply boreholes. In addition, the site is located further west again of the Stradbally river, which almost certainly acts as a hydraulic boundary for shallow groundwater flows.

There is therefore no connectivity between the site and the public water supply.

Castlemitchell (Churchtown) Public Water Supply

This water supply is supplied from three individual boreholes. Source protection zones have been delineated for the boreholes (Geological Survey of Ireland and Kildare County Council, 2004). All of the zones of contribution to these boreholes are mapped as occurring within the ZOC of the Athy Public Water Supply.

There is therefore no connectivity between the site and the public water supply.

Portlaoise Public Water Supply

The water supply comprises a field of fifteen wells and one spring. Source protection zones have been delineated for the boreholes (Jacobs – Tobin, 2017). The total zone of contribution extends in a north-west south-east direction. The ZOC is a minimum distance of 5 km south west of the site. Groundwater flow direction is broadly from south east to north west towards the boreholes and spring. from the topographic divide at Hewson Hill and Aghnahily, which is also a groundwater divide. Flow to the east of this divide is regionally towards the Stradbally river.

There is therefore no connectivity between the site and the public water supply.

Portlaoise and Ballyroan Public Water Supplies

The Meelick borehole contributes to both the Portlaoise and Ballyroan water supplies. Source protection zones have been delineated for the borehole (Environmental Protection Agency, 2010). The zone of contribution extends south eastwards from the borehole. The ZOC is a minimum distance of 9 km south west of the site. Groundwater flow is north westward, then northwards towards the boreholes. Groundwater flow eastwards of the ZOC boundary is towards tributaries of the Stradbally river.

There is therefore no connectivity between the site and the public water supply.

Group Water Schemes

One group water scheme, which is affiliated with the National Federation of Group Water Schemes of Ireland (NFGWS), is located within 10 km of the site.

Heath Group Water Scheme (GWS)

The Heath GWS supplies are area to the north west of Stradbally, which is not supplied by the Stradbally town, Ballylinan and Timahoe Water Supply. A Zone of Contribution has been delineated for this spring supply (Whelan, A. et al. 2015). The ZOC is at a minimum distance of 5 km to the north west of the site. The zone of contribution extends south eastwards from the spring. Groundwater flow is north west towards the spring, from the topographic divide at Killenny and Raheen, which is also the groundwater divide. Groundwater flow on the eastern and south eastern side of these hills is towards the Stradbally river and the River Barrow.

There is therefore no connectivity between the site and the public water supply.

Four small group water schemes, which are not affiliated with the Federation of Group Water Schemes of Ireland are located within 10 km of the site (NFGWS pers. comm. and NFGWS supply network mapping (2018) – consulted, not for publication).

Ballyrider GWS

The closest scheme to the site is the Ballyrider GWS. No Zone of Contribution has been delineated for this GWS. The supply network extent indicates that approximately 20 properties are served by this scheme (NFGWS supply network mapping (2018) – consulted, not for publication). Three shallow dug wells are recorded in the Geological Survey of Ireland (2019) groundwater wells and springs database, but it is not clear whether or which one of these serves the GWS.

The closest of these wells is located at a distance of 1.2 km from the site.

Moyanna GWS

Moyanna GWS is located a minimum of 3 km north of the site. No Zone of Contribution has been delineated for this GWS. The supply network extent indicates that of the order of 35 properties are served by this scheme (NFGWS supply network mapping (2018) – consulted, not for publication). Four shallow dug wells and three dug wells are recorded in the Geological Survey of Ireland (2019) groundwater wells and springs database, but it is not clear whether or which one of these serves the GWS.

The closest of these wells is located at a distance of 3 km north from the site.

Vicarstown GWS

Vicarstown GWS is located a minimum of 3 km north east of the site. No Zone of Contribution has been delineated for this GWS. The supply network extent indicates that of the order of 15 properties are served by this scheme (NFGWS supply network mapping (2018) – consulted, not for publication). The GWS is supplied by a borehole (GSI No. 2619SWW002) in Vicarstown).

Barringtons Hollow GWS

Baringtons Hollow GWS is located a minimum of 2 km south west of the site. No Zone of Contribution has been delineated for this GWS. The supply network extent indicates that of the order of <10 properties are served by this scheme (NFGWS supply network mapping (2018) – consulted, not for publication). One shallow dug wells and two boreholes are recorded in the Geological Survey of Ireland (2019) groundwater wells and springs database, but it is not clear whether or which one of these serves the GWS.

Private Domestic/Farm Supplies

Approximately ten properties in the vicinity the site are not connected to a Group Water Scheme of public water supply network. These are known or assumed to have private wells for domestic and/or farm water supply. See Appendix 8.1, Figure 5 for adjacent property locations.

8.4.16 Protected Groundwater Dependent Habitats and Species

The Stradbally and Barrow rivers downstream of Stradbally town are designated as part of the River Barrow and River Nore Special Area of Conservation (SAC) Natura 2000 site (Site Code 002162). The qualifying interests of the SAC which are supported by the hydrological regime are set out in the Appropriate Assessment Natura Impact Statement which accompanies this submission.

The groundwater hydrological and hydrochemical conditions which support those groundwater dependent qualifying interests, as described in the SAC conservation objectives (NPWS, 2011) are set out in Table 8.15 below.

Table 8.15: Groundwater hydrological and hydrochemical conditions.

Groundwater dependent Qualifying Interest	Hydrological/Hydrogeological Attribute	Measure	Target	Notes
91E0 * Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	Hydrological regime: Flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river flood plains but not for woodland around springs/seepage areas
6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Hydrological regime: Flooding depth/height of water table	Metres	Maintain appropriate hydrological regimes	This habitat requires winter inundation, which results in deposition of naturally nutrient-rich sediment

<u>Hydrological Regime and Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (91E0)</u>

A small number of groundwater springs have been identified in a zone of the alluvial forest (91E0) immediately south of Mill Land bridge (where the L97939 road crosses the Stradbally river immediately south east of the site) (See Appendix 8.1 Figure 5). Three springs were identified within 10 m of the western riverbank . Spring flows measured on 2/1/2020 date had a combined estimated discharge of 0.0022 m^3/s. No other spring flows were observed on 21/01/2020 in areas of possible alluvial forest identified by the project ecologist.

Groundwater flow direction is from the west or west north-west towards these springs from the groundwater divide to the west north-west As set out in the conceptual model of groundwater flow, above, these springs may be a natural spring discharges from the edge of the sand and gravel deposit or may exist only as a result of significant modification of the river bank and channel in this area. These springs are in an area which is also periodically inundated in winter, as evidenced by flood lines and damage to the bridge and bridge wall masonry. (**See** Photos in Section 8.4.17). Flooding has occurred to a depth of 1 m above the river invert, based on the observed damage. The vegetation in this area has, therefore, both winter inundation and spring sources of water.

Hydrological Regime and Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430))

The Stradbally River is a groundwater discharge zone, from the sands and gravel deposits and almost certainly also from the underlying karstified (diffuse) bedrock aquifer. This groundwater discharge contributes to the baseflow component of the hydrological regime which supports qualifying interest Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430).

8.4.17 Groundwater Related Photographs

Photo 1 Sand and gravel face exposure adjacent to site (19/7/201)

Photo 2 Sand and gravel ground level (69 m O.D.) exposure adjacent to site (19/7/2016)

Photo 3 Piezometer Installation BH 1 pre-capping view towards south west (17/10/2018)

Photo 4 Piezometer Installation BH 1 completed view towards south west (10/4/2019)

Photo 5 Riverside spring looking north eastwards towards Mill bridge (2/1/2020)

Photo 6 Flood damaged masonry on Mill bridge (3/1/2020)

8.4.18 Existing Extractions

No active quarries are located within 7 km of the site. Other quarries within a 20km radius include the following:

- Ballyadams, Co. Laois (3026) c. 7 km to the south east , a hard rock (limestone) quarry,

- Wolfhill, Athy, Co. Kildare (LS001) c. 18 km to the south east, a hard rock (sandstone) quarry;

No quarries, yet to be commissioned, have been granted permission to quarry within the same distance.

None of these quarries are located within the surface water catchment on the western side of the Stradbally River, or within the Bagnelstown Upper groundwater body. There are therefore no surface water or groundwater linkages between the site and the setting of these existing quarries. There is therefore no possibility for the potential impacts of the proposed quarry to be cumulated with existing quarry impacts on the hydrogeological and hydrological setting.

No Cumulative Impact Assessment is therefore required.

8.5 Hydrological (Surface Water) Impact Assessment

In accordance with guidance set out in Environmental Protection Agency (2017) *DRAFT Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*, likely and/or significant effects (impacts) are the focus of this impact assessment.

The characteristics of the proposed development described and the mitigation measures assessed are the final result of iterative consideration of the most effective measures to avoid, prevent and reduce impact on the surface water environment.

A summary of the surface water impact assessment is provided in Table 8.16 below. Reference numbers have been assigned to mitigation measures in the text below. These reference numbers are reflected in the summary table: Table 8.16.

8.5.1 Assessment of Impact on SAC Qualifying Interests Supported by Hydrological Regime

Potential Impact

Potential, likely, significant, indirect impact of collection and usage of surface water run-off from the site on the hydrological regime in the Stradbally River, which supports the River Barrow and River Nore SAC qualifying interest 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels.

Source-Pathway-Receptor Assessment

Source

Collection and usage of 70% of average daily site surface water run-off for us as top up to the sand and gravel processing plant. Average surface water usage is 15 m^3/day. Surface water available for usage is estimated to vary from a minimum of 7 m^3/day in July to 26 m^3/day in October. (See Section 8.3.2 and Table 8.4 Site Water Usage Supply above for details).

Pathway

An intermittent, seasonal pathway exists between the man-made drain on the site and the tributary of the Stradbally river which drains into the Stradbally river at a total distance of 1.25 km downstream of the site. This man-made drain contains both groundwater, when groundwater levels are high during the winter period and also conveys surface water run-off during this time. The pathway therefore exists during winter, high groundwater periods. The drain has been observed as being dry during the period of low groundwater levels in the summer period. Storm water run-off reaching the drain during this period is lost as recharge to the underlying groundwater table and therefore no pathway exists during that period.

Receptor

The hydrological regime which supports qualifying interest 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*, downstream of the confluence of the tributary with the Stradbally River. This regime comprises the generalised hydrological regime, but specifically flooding height and winter inundation.

Mitigation Measures

Avoidance

- **M1**: The site water usage, sourced from a combination of surface water runoff and groundwater, is minimised to an average daily process water top-up requirement of 24 m^3/day, and an occasional maximum of 42 m^3/day by:
  - Recycling of at least 80% of process water within an integrated mobile washing plant (which comprises feeding, screening, sand washing and stockpile conveyors (CDE CDE M2500 E5)) and primary water treatment plant (CDE AquaCycle Thickener). This avoids losses by leakage and evaporation associated with collection and conveyance to and storage in, open water settlement ponds;
  - Recycling of all stockpile water to process top-up, from a stockpile de-watering system;
  - Recycling of approximately 33% of sludge water to process top-up, from a sludge settlement pond.

Approximately 30% of the average daily site surface water run-off will reach the man-made drain.

- **M2:** No alterations to the man-made drain will occur, therefore the intermittent, seasonal pathway from the site, to the tributary of the Stradbally River and the Stradbally River is retained. The drain and its banks are protected by the retention of a minimum width of 60m wide buffer zone of the natural vegetation, in which no quarrying or related activities will occur.

Prevention

- **M3**: Surface water run-off generated on the operational site from the critical 20 year return period storm with climate change allowance (and lower return period storms), are attenuated in 1054 m^3 of storage and discharged at the greenfield run-off rate (See Section 8.3.2 Surface Water runoff Collection, Conveyance and Storage, for details). This ensures that the discharge rate for storm water occurs at the natural, pre-development rate and flow rates contributing to flood conditions in the Stradbally river are maintained at natural, pre-development levels.

Impact Assessment

70% of average daily surface water run-off from the 12.84 ha site will be used. This corresponds to an average surface water usage is 15 m^3/day. Surface water available for usage is estimated to vary from a minimum of 7 m^3/day in July to 26 m^3/day in October.

The full 12.84 ha site from which surface water run-off is generated corresponds to 0.12% of the 10,400 ha catchment of the Stradbally river at the point where the drain and tributary linkage to the site occurs. The site therefore represents a very small (<<1%) proportion of the area generating run-off to the Stradbally river.

The average surface water run-off usage of 15 m^3/day, is equivalent to approximately 0.015 % of the average (50%ile) daily flow of 94,348 m^3/day in the Stradbally river at the OPW Hydrometric Station 14007 Derrybrock, 2.76 km downstream. The maximum usage of 26 m^3/day, is equivalent to 0.003 % of the average (50%ile) daily flow.

The maximum usage of 26 m^3/day (in October) is equivalent to approximately 0.004 % of the high (1%ile) flow at Derrybrock of 682,560 m^3/day. It is equivalent to 0.003% of the high (1%ile) flow of 823,530 m^3/day, which includes the addition of a climate change allowance of 20% to the existing flow.

The daily volume of usage of site surface water run-off at the site, is an extremely small proportion of the total daily volume of flow in the Stradbally river, during flow periods (predominantly winter) when a linkage exists from the site to the river. The attenuated storm water greenfield discharge rate ensures that surface water flow rates contributing to high flows in the Stradbally river are maintained at natural, pre-development levels.

The significance of the impact of collection and usage of surface water run-off from the site the general hydrological regime, and specifically on the flood height and winter inundation, which support the qualifying interest 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*, downstream of the confluence of the linking tributary with the Stradbally River, is imperceptible.

The significance of the impact of collection and usage of surface water run-off from the site on the overall hydrological regime in the catchment of the Stradbally river, will therefore be imperceptible.

The residual impact assessment result is therefore:

A neutral, imperceptible, likely, long-term, indirect, residual, impact.

Potential Impact

Potential, likely, significant, indirect impact of collection and usage of surface water run-off from the site on the hydrological regime in the Stradbally River, which supports the River Barrow and River Nore SAC qualifying interest 91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae).*

Source-Pathway-Receptor Assessment

Source

Collection and Usage of 70% of average daily site surface water run-off for us as top up to the sand and gravel processing plant. Average surface water usage is 15 m^3/day. Surface water available for usage is estimated to vary from a minimum of 7 m^3/day in July to 26 m^3/day in October. (See Section 8.3.2 Site Water Usage Supply above for details).

Pathway

Surface water run-off towards the channel of the Stradbally river located south east of the site.

Receptor

The hydrological regime which partially supports the qualifying interest interest 91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae).* This regime comprises the flooding height/periodic inundation component of the hydrological regime.

Impact Assessment

Surface water flows which result in flooding in the area of alluvial forest are derived from and occur in the catchment area upstream and to the east and south east of the Mill bridge. The site man made drain has no connectivity with the Stradbally river in this area. Intermittent connectivity of the site with the Stradbally river channel occurs at a distance c 1 km downstream. Surface water run-off contributing to flooding of the Stradbally river in this area is derived from a catchment area of > 8,500 ha to the west, south west and west of the site and this area. (Stradbally hydrometric gauge http://www.epa.ie/hydronet/#14044). Detailed site topographic survey indicates that a site area of <0.002 ha may drain towards this catchment. This is an irrelevantly small area in the context of the catchment contributing to flood flows. Collection of 70% of surface water run-off from this area will have no impact on flood flows in the Stradbally river. There is therefore no potential for surface water flows on the site to impact on flood flows or levels supporting the area of alluvial forest.

The impact assessment result is therefore:

A neutral, imperceptible, unlikely, long-term, indirect, impact.

8.5.2 Assessment of Impacts on Hydrological Regime in the Catchment of the Stradbally River

Potential Impact

Potential likely, moderate, direct and indirect impact of changes to site surface water run-off regime, by collection and usage of surface water run-off on the hydrological regime in the catchment of the Stradbally River.

Source-Pathway-Receptor Assessment

Source

Collection and usage of 70% of average daily site surface water run-off for use as top up to the sand and gravel processing plant. Average surface water usage is 15 m^3/day. Surface water available for usage is estimated to vary from a minimum of 7 m^3/day in July to 26 m^3/day in October. (See Section 8.3.2 Site Water Usage Supply above for details).

Pathway

An intermittent, seasonal pathway exists between the man-made drain on the site and the tributary of the Stradbally river which drains into the Stradbally river at a total distance of

1.25 km downstream of the site. This man-made drain contains both groundwater, when groundwater levels are high during the winter period and also conveys surface water run-off during this time. The pathway therefore exists during winter, high groundwater periods. The drain has been observed as being dry during the period of low groundwater levels in the summer period. Storm water run-off reaching the drain during this period is lost as recharge to the underlying groundwater table and therefore no pathway exists during that period.

Receptor

The hydrological regime of the catchment of the Stradbally river. This comprise the run-off characteristics of the catchment and flow in the drainage channels comprising the tributary of the Stradbally river and the River Stradbally.

Impact Mitigation Measures

Avoidance

- **M1:** The site water usage, sourced from a combination of surface water runoff and groundwater, is minimised to an average daily process water top-up requirement of 24 m³/day, and an occasional maximum of 42 m³/day by:
  - Recycling of at least 80% of process water within an integrated mobile washing plant (which comprises feeding, screening, sand washing and stockpile conveyors (CDE CDE M2500 E5)) and primary water treatment plant (CDE AquaCycle Thickener). This avoids losses by leakage and evaporation associated with collection and conveyance to and storage in, open water settlement ponds;
  - Recycling of all stockpile water to process top-up, from a stockpile de-watering system;
  - Recycling of approximately 33% of sludge water to process top-up, from a sludge settlement pond.

  Only up 70 % of the average daily site surface water run-off will be used.
- **M4:** Water discharged from the site to the man-made drain, comprises only water from the natural sub-catchment of the site and the tributary of the Stradbally river. No surface water arising in any other catchment or sub-catchment is transferred to and discharged in this catchment.
- **M2**: No alterations to the man-made drain will occur, therefore the intermittent, seasonal pathway from the site, to the tributary of the Stradbally river and the Stradbally River is retained. The drain and its banks are protected by the retention

of a minimum width of 60 m wide buffer zone of the natural vegetation, in which no quarrying or related activities will occur.

Prevention

- **M3**:Surface water run-off generated on the post development site from the critical 20 year return period storm with climate change allowance (and lower return period storms), are attenuated in 1054 m3 of storage and discharged at the greenfield run-off rate (See Section Current 3.2.3 Surface Water runoff Collection, Conveyance and Storage, for details). This ensures that the discharge rate for storm water occurs at the natural, pre-development rate and flow rates contributing to flood conditions in the Stradbally river are maintained at natural, pre-development levels.

Impact Assessment

70% of average daily surface water run-off from the 12.84 ha site will be used. This corresponds to an average surface water usage is 15 m^3/day. Surface water available for usage is estimated to vary from a minimum of 7 m^3/day in July to 26 m^3/day in October.

The full 12.84 ha site from which surface water run-off is generated corresponds to 0.12% of the 10,400 ha catchment of the Stradbally river at the point where the drain and tributary linkage to the site occurs. The site therefore represents a very small (<<1%) proportion of the area generating run-off to the Stradbally river.

The average surface water run-off usage of 15 m^3/day, is equivalent to approximately 0.015 % of the average (50%ile) daily flow of 94,348 m^3/day in the Stradbally river at the OPW Hydrometric Station 14007 Derrybrock, 2.76 km downstream. The maximum usage of 26 m^3/day, is equivalent to 0.003 % of the average (50%ile) daily flow.

The maximum usage of 26 m^3/day (in October) is equivalent to approximately 0.004 % of the high (1%ile) flow at Derrybrock of 682,560 m^3/day. It is equivalent to 0.003% of the high (1%ile) flow of 823,530 m^3/day, which includes the addition of a climate change allowance of 20% to the existing flow.

The lowest surface water run-off usage is 7 m^3/day. Surface water run-off from the site does not reach the tributary of the Stradbally river during summer low water periods. Run-off reaching the man-made drain, will percolate through the drain base and recharge the underlying groundwater table. During low flow periods, the majority of water in the tributary of the Stradbally river and the Stradbally river is contributed by groundwater baseflow resulting from groundwater recharge occurring over the preceding months, rather than surface water runoff.

The daily volume of usage of site surface water run-off at the site, is an extremely small proportion of the total daily volume of flow in the Stradbally river, during flow periods (predominantly winter) when a linkage exists from the site to the river. The attenuated storm water greenfield discharge rate ensures that surface water flow rates contributing to high flows in the Stradbally river are maintained at natural, pre-development levels.

The significance of the impact of collection and usage of surface water run-off from the site on the hydrological regime in the catchment of the Stradbally river, will therefore be imperceptible. There will not be any likely, significant impact on the WFD status of the surface water body, as it relates to, or is supported by the hydrological regime. Nor will there be any reduction in the likelihood of attaining the objective for the Stradbally river to improve on the current 'moderate' Water Framework Directive (WFD) status (2013-2018), as it relates to, or is supported by, the hydrological regime.

The residual impact assessment result is therefore:

A neutral, imperceptible, likely, long-term, indirect, residual, impact.

8.5.3 Assessment of Impacts on Surface Water Quality

Potential Impact

Potential, likely, significant, direct and indirect impact on quality of surface water in the tributary to the Stradbally river and Stradbally River resulting from process waters containing suspended sediment and any associated pollutants, such as ammonia, nitrogen or organic matter.

Source-Pathway-Receptor

Source

Suspended sediment and associated pollutants, such as ammonia, nitrogen or organic matter originating in the excavated subsoils, can arise from process water used for screening and sand washing and from water contained in stockpiles and process sludge.

Pathway

The intermittent, seasonal pathway which exists between the man-made drain on the site and the tributary of the Stradbally river, which drains into the Stradbally river at a total distance of 1.25 km downstream of the site. The pathway exists during winter, high groundwater periods. No pathway exists during summer dry periods.

Receptor

Water quality objectives in the man-made drain, the tributary of the Stradbally river and the Stradbally River. No water quality objectives are set for the man-made drain. Using the precautionary principle, the objectives for it are assumed to be as for the tributary of the Stradbally are river, which is required to meet standards set out in in S.I. No. 272 of 2009 the European Communities Environmental Objective (Surface Waters) Regulations. Objectives for the Stradbally river are to improve on the current 'moderate' Water Framework Directive (WFD) status (2013-2018). An indirect objective is to ensure that the current 'Good' status of the River Barrow, into which the Stradbally river discharges, at a distance of 5 km downstream of the site, is not impacted.

Impact Mitigation Measures

Avoidance

- **M5**: No discharge of process water to the water environment occurs. Process water which leaves the process in material and in sludge is recycled back into the process in a system loop, or exported off site in material, and is not discharged to the water environment (See Table 8.3 Process and ancillary water recovery, recycling and usage budget, for recovery rates). This is achieved via the:
  - Stockpile dewatering system; This comprising collection of all stockpile gravity drainage and any direct rainwater, followed by direct, closed recycling into the process top-up water balancing pond. This avoids entrainment of stockpile material in surface water run-off (See Section 8.3.1 Material Processing System and Figure 8.1 Site Water Management System for details);
  - Recycling of clarified water from the sludge settlement pond and recycling into the process top-up water balancing pond. (See Section 8.3.2 Sludge Management for details).
- **M6:** Stripped soil stockpiles will be located at the southern end of the site, at the maximum available distance from the man-made drain and a minimum of 60 m from the man-made drain. Stripped soil stockpiles/berms, will be immediately re-seeded with appropriate grassland species. This is in order to minimise entrainment of suspended sediments in surface water run-off.

Prevention

- **M7**: Closed tank system treatment of at least 80% of process water, within the primary water treatment plant (CDE AquaCycle Thickener) and subsequent closed, direct recycling back to the integrated processing plant (screening, sand washing and stockpile conveyors in a CDE M2500 E5) (See Section 8.3.1 Material Processing System, above for details). This avoids requirement for large open sediment settlement ponds (and conveyance to them) to treat the full daily process water volume, therefore decreasing risk of unintended spillages or overflow of process water.

- **M8**: The site Environmental Management Plan (EMP), which sets out all environmental controls, including inter alia:
  - Correct site management procedures,
  - Monitoring and maintenance methods,
  - Accident responses.

All staff will be trained to understand their roles and responsibilities as set out in the EMP.

Reduction

M9: Controls which will treat water polluted by suspended sediment and associated pollutants in the case breakdown of the integrated primary water treatment system or accidental spillage from the sludge management system are:

- Temporary bunding and diversion to the sludge-settlement ponds, which have sufficient excess capacity to store, settle and recycle the average daily process water and/or to the storm water attenuation/settlement pond, if sufficient storage exists at the time of the accident.
- Reduction in outflow or stopping flow at the discharge point from the storm water attenuation/settlement ponds, in order to increase retention time, if required.
- Location of the sludge management system and primary water treatment system a minimum distance of 20 m from the site man-made drain. In the case of accidental discharge from the pond, this buffer zone, which is fully vegetated, will retain sediment.

Impact Assessment

The sequence of mitigation measures being implemented will reduce the probability of process waters containing suspended sediment and any associated pollutants, such as ammonia and nitrogen, organic toxic matter reaching the intermittently connected tributary of the Stradbally river or the River Stradbally, 1.25 km downstream of the site, to very unlikely. In the low probability event that small concentrations of pollutants did exit the site in discharge waters, the length of the pathway between the site and the Stradbally river of 1.25 km would provide significant attenuation of pollutants by dilution during the winter flow periods during which a linkage with the site exists. Significant attenuation by dilution would also occur in the Stradbally river itself, in which average (50%ile) flows of 1.092 m^3/s, equivalent to 94,348 m^3/day and high (1%ile) flows of 7.943 m^3/s, equivalent to 682,560 m^3/day, occur. Additional attenuation by adsorption and biological processes would also occur along the 1.25 km linkage to the Stradbally River and in the Stradbally River itself. The probability of this source of pollutants impacting on the achievement of water quality objectives in the tributary of the Stradbally river and the Stradbally River is therefore negligible. There will not be any likely, significant impact on the WFD chemical status of the surface water body or any reduction in the likelihood of attaining the objective for the Stradbally river to improve on the current 'moderate' Water Framework Directive (WFD) status (2013-2018).

The residual impact assessment result is therefore:

A neutral, imperceptible, unlikely, temporary, direct and indirect, residual, impact.

Potential Impact

Potential, likely, significant direct and indirect impact on quality of surface water in the tributary to the Stradbally river and Stradbally River resulting from suspended sediment and associated pollutants, entrained in surface water run-off.

Source-Pathway-Receptor

Source

Suspended sediment and associated pollutants, such as ammonia. nitrogen or organic matter originating in the excavated subsoils, entrained in site surface water run-off.

Pathway

The intermittent, seasonal pathway which exists between the man-made drain on the site and the tributary of the Stradbally river, which drains into the Stradbally river at a total distance of 1.25 km downstream of the site. The pathway exists during winter, high groundwater periods. No pathway exists during summer dry periods.

Receptor

Water quality objectives in the tributary of the Stradbally river and the Stradbally River. The water quality objectives for the tributary of the Stradbally river are the standards set out in in S.I. No. 272 of 2009 the European Communities Environmental Objective

(Surface Waters) Regulations. IN addition, the water quality should not be such as to prevent the Stradbally river, into which it discharges, from achieving it's water quality objectives. Objectives for the Stradbally river are to improve on the current 'moderate' Water Framework Directive (WFD) status (2013-2018). An indirect objective is to ensure that the current 'Good' status of the River Barrow, into which the Stradbally river discharges, at a distance of 5 km downstream of the site, is not impacted.

Impact Mitigation Measures

Avoidance

- **M10**: Minimisation of exposed ground by stripping of soils only at the commencement of a quarrying phase and immediate re-seeding of the worked out phase, in order to minimise entrainment of sediment and associated pollutants in surface water run-off. Stripped soil stockpiles/berms, will be re-seeded with appropriate grassland species.

  Retention of a vegetated (non-stripped) buffer zone to a distance of 60 m from the man-made drain which occurs on site, in order to avoid entrainment of sediment in any surface water run-off draining directly to the drain.

  M6: Stripped soil stockpiles will be located at the southern end of the site, at the maximum available distance from the man-made drain and a minimum of 60 m from the drain. Stripped soil stockpiles/berms, will be immediately re-seeded with appropriate grassland species. This is in order to minimise entrainment of suspended sediments in surface water run-off.
- **M11:** The emplacement of a flexible, reactive, surface water interceptor drainage system which will be modified to be effective for each phase of the development. It comprises separated 'clean' water and 'dirty water elements as follow (See Section 8.3.2 Surface Water Run-off Collection, Conveyance and Storage, for details):
  - 'Clean water' interceptor drainage, which collects clean surface water runoff from areas of the site which have not been stripped of vegetation and from re-instated areas of the site, which are fully re-vegetated. This minimises the volume of water in which pollutants could be entrained; If necessary, geotextile lining or french drains will be implemented to prevent erosion and improve conveyance.
  - Dirty water' interceptor drainage which collects surface water run-off from areas of the site where pollutant entrainment may occur. This includes

working areas of the quarry and recently re-instated areas, where vegetation is not yet established, but excludes the bunded re-fuelling area. If necessary, geotextile lining or french drains will be implemented to prevent erosion and improve conveyance.

- Conveyance of all collected drainage to the storm water attenuation/sediment settlement pond.

Prevention

- **M12**: Combined storm water attenuation/sediment settlement pond (See Section 8.3.2 Surface Water runoff Collection, Conveyance and Storage, for details). This comprises:

    - Impermeable pond(s) with sufficient storage (1,054 m^3) to attenuate the site run-off resulting critical 1 in 20 year storm rainfall event;
    - Retention time c. 30% in excess of that required to settle fine silt size particles and designed to maximise settlement efficiency;
    - Discharge of treated water to the environment actively controlled, via a flow control and a discharge meter, to the greenfield run-off rate. The discharge will occur onto an area of natural vegetation, at approximately 19 m distance upgradient of the man-made drain, in the form of a level spreader. The greenfield discharge rate is very low and unlikely to cause erosion. Erosion control measures such as rip-rap will be emplaced if commencement of erosion is observed.

- **M8:** The site Environmental Management Plan (EMP), which sets out all environmental controls, including inter alia:

    - Correct site management procedures,
    - Monitoring and maintenance methods, schedules and recording
    - Accident responses.

  All staff will be trained to understand their roles and responsibilities as set out in the EMP.

Reduction

M13: Controls which will treat water polluted by suspended sediment and associated pollutants in the case of accidental spillage/overflow from the storm water attenuation pond/settlement pond:

- Temporary bunding and diversion to the sludge-settlement ponds, which have excess capacity sufficient to contain a 1 in 10 year storm water run-off event.
- Location of the storm water attenuation pond a minimum distance of 20 m the site man-made drain. In the case of accidental discharge from the pond, this buffer zone, which is fully vegetated, will retain sediment.

Impact Assessment

The sequence of mitigation measures being implemented will reduce the probability of suspended sediment and any associated pollutants, entrained in surface water run-off, reaching the intermittently connected tributary of the Stradbally river or the River Stradbally, 1.25 km downstream of the site, to very unlikely. In the low probability event that small concentrations of pollutants did exit the site in discharge waters, the length of the pathway between the site and the Stradbally river of 1.25 km would provide significant attenuation of pollutants by dilution during the winter flow periods during which a linkage with the site exists. Significant attenuation by dilution would also occur in the Stradbally river itself, in which average (50%ile) flows of 1.092 m^3/s, equivalent to 94,348 m^3/day and high (1%ile) flows of 7.943 m^3/s, equivalent to 682,560 m^3/day, occur. Additional attenuation by adsorption and biological processes would also occur along the 1.25 km linkage to the Stradbally River and in the Stradbally River itself. The probability of this source of pollutants impacting on the achievement of water quality objectives in the tributary of the Stradbally river and the Stradbally River is therefore negligible. There will not be any likely, significant impact on the WFD chemical status of the surface water body or any reduction in the likelihood of attaining the objective for the Stradbally river to improve on the current 'moderate' Water Framework Directive (WFD) status (2013-2018).

The residual impact assessment result is therefore:

A neutral, imperceptible, unlikely, temporary, direct and indirect, residual, impact.

Potential Impact

Potential, likely, significant, direct and indirect impact on quality of surface water in tributary to the Stradbally river and Stradbally River resulting from leaked or accidentally spilled fuels, lubricants or flocculants entrained in surface water run-off.

Source-Pathway-Receptor

Source

Leaked or accidentally spilled fuels, lubricants or flocculants entrained in site surface water run-off.

Pathway

The intermittent, seasonal pathway which exists between the man-made drain on the site and the tributary of the Stradbally river, which drains into the Stradbally river at a total distance of 1.25 km downstream of the site. The pathway exists during winter, high groundwater periods. No pathway exists during summer dry periods.

Receptor

Water quality objectives in the man-made drain, the tributary of the Stradbally river and the Stradbally River. The water quality objectives for the tributary of the Stradbally are river are those set out in S.I. No. 272 of 2009 the European Communities Environmental Objective (Surface Waters) Regulations. Objectives for the Stradbally river are to improve on the current 'moderate' Water Framework Directive (WFD) status (2013-2018). An indirect objective is to ensure that the current 'Good' status of the River Barrow, into which the Stradbally river discharges, at a distance of 5 km downstream of the site, is not impacted.

Impact Mitigation Measures

Avoidance

- **M14:** Electric processing and integrated primary water treatment plant and use of a gravity stockpile drainage system, significantly reducing fuel usage on site.
  No storage of fuels on site. Extraction plant (comprising an excavator and a wheeled loader) fuelled by a mobile fuel bowser brought to site. Fuelling occurs within a designated, impermeable bunded fuelling area, provisioned with a hydrocarbon interceptor. Drainage from the re-fuelling area is isolated from the surface water system and is conveyed directly to the storm water attenuation/sediment settlement pond. Handling of fuels and oils brought to site

will be in accordance with UK Guidance for Pollution Prevention (2019) and Pollution Prevention Guidance (pre 2019).

Where plant allows, environmentally considerate lubricants, such as synthetic non-toxic biodegradable hydraulic fluids, will be used.

Scheduled visual checking for leaks and mechanical issues will occur, in order to minimise leakage and breakdowns on site. General servicing of site machinery takes place off-site.

Storage of primary water treatment system polymer flocculant in a locked, fully watertight shed, from which no outflow of stored volume can occur.

- **<u>M11:</u>** The emplacement of a flexible, reactive, surface water interceptor drainage system which will be modified to be effective for each phase of the development. It comprises separated 'clean' water and 'dirty water elements as follow (See Section 8.3.2. Surface Water Run-off Collection, Conveyance and Storage, for details):
  - 'Clean water' interceptor drainage, which collects clean surface water runoff from areas of the site which have not been stripped of vegetation and from re-instated areas of the site, which are fully re-vegetated. This minimises the volume of water in which pollutants could be entrained; If necessary, geotextile lining or french drains will be implemented to prevent erosion and improve conveyance.
  - Dirty water' interceptor drainage which collects surface water run-off from areas of the site where pollutant entrainment may occur. This includes working areas of the quarry and recently re-instated areas, where vegetation is not yet established, but excludes the bunded re-fuelling area. If necessary, geotextile lining or french drains will be implemented to prevent erosion and improve conveyance.
  - Conveyance of all collected drainage to the storm water attenuation/sediment settlement pond.

<u>Prevention</u>

- **<u>M12:</u>** Combined storm water attenuation/wet sediment settlement pond (See Section 8.3.2 Surface Water runoff Collection, Conveyance and Storage, for details). This comprises:
  - Impermeable pond(s) with sufficient storage (1,054 m^3) to attenuate the site run-off resulting critical 1 in 20 year storm rainfall event;
  - Retention time c. 30% in excess of that required to settle fine silt size particles and designed to maximise settlement efficiency;

- Discharge to the environment actively controlled, via a flow control and a discharge meter, to the greenfield run-off rate. The discharge will occur onto an area of natural vegetation, at approximately 19 m distance upgradient of the man-made drain, in the form of a level spreader. The greenfield discharge rate is very low and unlikely to cause erosion. Erosion control measures such as rip-rap will be emplaced if commencement of erosion is observed.

- **M8:** The site Environmental Management Plan (EMP), which sets out all environmental controls, including inter alia:
  - Correct site management procedures,
  - Monitoring and maintenance methods, schedules and recording
  - Accident responses.

  All staff will be trained to understand their roles and responsibilities as set out in the EMP.

Reduction

M15: Controls which will treat water polluted by fuels, lubricants or flocculant in the case of accidental spillage or escape are:

- Spill kits, which will be stored on site. Staff will be fully trained in the correct and appropriate use, monitoring and removal of spill kits;
- Shutting off of the flow control valves on the discharge point from the storm water attenuation/settlement ponds which receive site surface water drainage. Immediate subsequent removal of contents for off-site disposal with an appropriately licensed waste disposal company.

Impact Assessment

The sequence of mitigation measures being implemented will reduce the probability of leaked or accidentally spilled fuels, lubricants or flocculants entrained in site surface water run-off reaching the intermittently connected tributary of the Stradbally river or the River Stradbally, 1.25 km downstream of the site, to very unlikely. In the low probability event that small concentrations of pollutants did exit the site in discharge waters, the length of the pathway between the site and the Stradbally river of 1.25 km would provide significant attenuation of pollutants by dilution during the winter flow periods during which a linkage with the site exists. Significant attenuation by dilution would also occur in the Stradbally river itself, in which average (50%ile) flows of 1.092 m^3/s, equivalent to 94,348 m^3/day and high (1%ile) flows of 7.943 m^3/s, equivalent to 682,560 m^3/day, occur. Additional attenuation by adsorption and biological processes would also occur along the 1.25 km linkage to the Stradbally River and in the Stradbally River itself. The probability of this source of pollutants impacting on the achievement of water quality objectives in the tributary of the Stradbally river and the Stradbally River is therefore negligible. There will not be any likely, significant impact on the WFD chemical status of the surface water body or any reduction in the likelihood of attaining the objective for the Stradbally river to improve on the current 'moderate' Water Framework Directive (WFD) status (2013-2018).

The residual impact assessment result is therefore:

A neutral, imperceptible, unlikely, temporary, direct and indirect, residual, impact.

8.5.4 Assessment if Impacts on Sac Qualifying Interests Supported by Water Quality

Potential Impact

Potential, likely, significant, indirect impact on the water quality in the Stradbally River, which supports the River Barrow and River Nore SAC qualifying interests, resulting from pollutants arising on the site.

Source-Pathway-Receptor

Source

Suspended sediment and associated pollutants, such as ammonia, nitrogen or organic matter released from the excavated subsoils, arising from process water or entrainment in surface water. Leaked or accidentally spilled fuels, lubricants or flocculants entrained in site surface water run-off

Pathway

The intermittent, seasonal pathway which exists between the man-made drain on the site and the tributary of the Stradbally river, which drains into the Stradbally river at a total distance of 1.25 km downstream of the site. The pathway exists during winter, high groundwater periods. No pathway exists during summer dry periods.

Receptor

Qualifying interests of the River Barrow and River Nore SAC. Qualifying interests 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, 1096 Brook lamprey *Lampeta planeri* and 1099 River lamprey *Lampetra fluviatilis* have low suspended sediment and nutrient water quality attribute requirements. Qualifying interests 1106 Atlantic salmon (*Salmo salar*) (only in fresh water), 1092 White Clawed Crayfish *Austropotamobiu pallipes* and 1355 Otter *Lutra lutra* have generalised water quality attribute requirements.

Mitigation Measures

All of the mitigtion measures set out in the preceding three assessments of potential impacts on surface water quality are required to avoid, prevent and reduce potential impacts on the SAC qualifying interest receptors.

In order to avoid repetition, these have not been set out again here.

Impact Assessment

The range and sequence of mitigation measures being implemented will reduce the probability of waters containing suspended sediment and any associated pollutants, such as ammonia and nitrogen, organic toxic matter, fuels, lubricants or flocculant reaching the River Stradbally, 1.25 km downstream of the site, to very unlikely.

In the low probability event that small concentrations of pollutants did exit the site in discharge waters, the distance between the site and the Stradbally river of 1.25 km would provide significant attenuation of pollutants by dilution during the winter flow periods during which a linkage with the site exists. Significant attenuation by dilution would also occur in the Stradbally river itself, in which average (50%ile) flows of 1.092 m^3/s, equivalent to 94,348 m^3/day and high (1%ile) flows of 7.943 m^3/s, equivalent to 682,560 m^3/day, occur. Additional attenuation by adsorption and biological processes would also occur along the 1.25 km linkage to the Stradbally River and in the Stradbally River itself.

The probability of this source of pollutants impacting on water quality and specifically suspended sediment and nutrient levels is therefore extremely low. There will not be any likely, significant impact on the WFD chemical status of the surface water body supporting ecology in the river or any reduction in the likelihood of attaining the objective for the Stradbally river to improve on the current 'moderate' Water Framework Directive (WFD) status (2013-2018).

The residual impact assessment result is therefore:

A neutral, imperceptible, unlikely, short-term, indirect, residual, impact.

8.5.5 Surface Water/Hydrological Impact Assessment

A summary of the surface water impact assessment is provided in Table 8.16 below.

Table 8.16: Summary of the Surface Water / Hydrological Impact Assessment

Potential Impact	Source	Pathway	Receptor	Mitigation Measures	Result of Impact Assessment
Assessment of Impacts on SAC Qualifying Interests supported by the Hydrological Regime					
Potential, likely, significant, indirect impact of collection and usage of surface water run-off from the site on the hydrological regime in the Stradbally River, which supports the River Barrow and River Nore SAC qualifying interest (QI) 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels.*	Collection and Usage of 70% of average daily site surface water run-off for use as top up to the sand and gravel processing plant.	Intermittent, seasonal pathway between the man-made drain on the site and the tributary of the Stradbally river which drains into the Stradbally river at a total distance of 1.25 km downstream of the site	Hydrological regime which supports the QI.	Avoidance: M1, M2 Prevention: M3	Neutral, imperceptible, likely, long-term, indirect, residual, impact
Potential, likely, significant, indirect impact of collection and usage of surface water run-off from the site on the hydrological regime in the Stradbally River, which supports the River Barrow and River Nore SAC qualifying interest 91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*).	Collection and Usage of 70% of average daily site surface water run-off for use as top up to the sand and gravel processing plant.	Surface water run-off towards the channel of the Stradbally river located south east of the site.	The flooding height/periodic inundation component of the hydrological regime which supports the QI.	None required	Neutral, imperceptible, unlikely, long-term, indirect, impact.
Assessment of Impacts on Hydrological Regime in the catchment of the Stradbally River					
Potential likely, moderate, direct and indirect impact of changes to site surface water run-off regime,	Collection and usage of 70% of average daily site	Intermittent, seasonal pathway between	The hydrological regime of the catchment of the Stradbally river.	Avoidance: M1, M2, M4 Prevention: M3	Neutral, imperceptible, likely, long-term,

Table 8.16: Summary of the Surface Water / Hydrological Impact Assessment

Potential Impact	Source	Pathway	Receptor	Mitigation Measures	Result of Impact Assessment
by collection and usage of surface water run-off, on the hydrological regime in the catchment of the Stradbally River.	surface water run-off for use as top up to the sand and gravel processing plant.	the man-made drain on the site and the tributary of the Stradbally river which drains into the Stradbally river at a total distance of 1.25 km downstream of the site.			indirect, residual, impact.
Assessment of Impacts on Surface Water Quality					
Potential, likely, significant, direct and indirect impact on quality of surface water in the tributary to the Stradbally river and Stradbally River resulting from process waters.	Suspended sediment and any associated pollutants, such as ammonia, nitrogen or organic matter originating in the excavated subsoils, which can arise from process water used for screening and sand washing and from water contained in stockpiles and process sludge.	Intermittent, seasonal pathway between the man-made drain on the site and the tributary of the Stradbally river which drains into the Stradbally river at a total distance of 1.25 km downstream of the site.	Water quality objectives in the man-made drain, the tributary of the Stradbally river and the Stradbally River.	Avoidance: M5 & M6 Prevention: M7 & M8 Reduction: M9	Neutral, imperceptible, unlikely, temporary, direct and indirect, residual, impact.

Table 8.16: Summary of the Surface Water / Hydrological Impact Assessment

Potential Impact	Source	Pathway	Receptor	Mitigation Measures	Result of Impact Assessment
Potential, likely, significant direct and indirect impact on quality of surface water in the tributary to the Stradbally river and Stradbally River resulting from suspended sediment and associated pollutants, entrained in surface water run-off.	Suspended sediment and associated pollutants, such as ammonia. nitrogen or organic matter originating in the the excavated subsoils, entrained in site surface water run-off.	Intermittent, seasonal pathway between the man-made drain on the site and the tributary of the Stradbally river which drains into the Stradbally river at a total distance of 1.25 km downstream of the site.	Water quality objectives in the man-made drain, the tributary of the Stradbally river and the Stradbally River.	Avoidance: M10, M6, M11 Prevention: M12, M8 Reduction: M13	Neutral, imperceptible, unlikely, temporary, direct and indirect, residual, impact.
Potential, likely, significant, direct and indirect impact on quality of surface water in tributary to the Stradbally river and Stradbally River resulting from leaked or accidentally spilled fuels, lubricants or flocculants entrained in surface water run-off	Leaked or accidentally spilled fuels, lubricants or flocculants entrained in site surface water run-off.	Intermittent, seasonal pathway between the man-made drain on the site and the tributary of the Stradbally river which drains into the Stradbally river at a total distance of 1.25 km downstream of the site.	Water quality objectives in the man-made drain, the tributary of the Stradbally river and the Stradbally River.	Avoidance: M14, M11 Prevention: M12, M8 Reduction: M15	Neutral, imperceptible, unlikely, temporary, indirect, residual, impact

Table 8.16: Summary of the Surface Water / Hydrological Impact Assessment

Potential Impact	Source	Pathway	Receptor	Mitigation Measures	Result of Impact Assessment
Assessment of Impacts on SAC Qualifying Interests supported by water quality					
Potential, likely, significant, indirect impact on the water quality in the Stradbally River, which supports the River Barrow and River Nore SAC qualifying interests, resulting from pollutants arising on the site.	Suspended sediment and associated pollutants, such as ammonia, nitrogen or organic matter released from the excavated subsoils, arising from process water or entrainment in surface water. Leaked or accidentally spilled fuels, lubricants or flocculants entrained in site surface water run-off.	Intermittent, seasonal pathway between the man-made drain on the site and the tributary of the Stradbally river which drains into the Stradbally river at a total distance of 1.25 km downstream of the site.	Qualifying interests 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, 1096 Brook lamprey *Lampeta planeri* and 1099 River lamprey *Lampetra fluviatilis* have low suspended sediment and nutrient water quality attribute requirements. Qualifying interests 1106 Atlantic salmon (*Salmo salar*) (only in fresh water, 1092 White Clawed Crayfish *Austropotamobiu pallipes* and 1355 Otter *Lutra lutra* have generalised water quality attribute requirements	*All mitigation from the previous 3 assessments:* Avoidance: M5, M6, M10, M11, M14 Prevention: M7, M8, M12 Reduction: M9, M13, M15	Neutral, imperceptible, unlikely, short-term, indirect, residual, impact.

8.6 Hydrogeological (Groundwater) Impact Assessment

In accordance with guidance set out in Environmental Protection Agency (2017) *DRAFT Guidelines on the Information to be Contained in Environmental Impact Assessment Reports,* **likely** and/or **significant** effects (impacts) are the focus of this impact assessment.

The characteristics of the proposed development described and the mitigation measures assessed are the final result of iterative consideration of the most effective measures to avoid, prevent and reduce impact on the groundwater environment.

A summary of the groundwater/ hydrogeological impact assessment is provided in Table 8.17 below. Reference numbers have been assigned to mitigation measures in the text below. These reference numbers are reflected in the summary table: Table 8.17.

8.6.1 Assessment of Potential Impacts on Group and Domestic Water Supplies and the Regional Aquifer Resource

Potential Impact

Potential, likely, significant, direct impact on Group Water Scheme and domestic well supplies.

It is noted that there was no connectivity between the site and any of the public water schemes assessed (Section 8.6.1). There will be no impact on these schemes from the proposed Project and they are not consider further in this section.

Source-Pathway-Receptor

Source

Groundwater supply of part of the site water requirements. At the average material extraction rate, the estimated requirement for groundwater supply is an annual average of 9 m^3/day. Supply requirement will range from 1 m^3/day in January to a maximum of 17 m^3/day in July. Occasional material extraction at the maximum proposed extraction rate, would require an intermittent groundwater supply rate ranging from 19 m^3/day in January to a maximum of 35 m^3/day in July.

Pathway

Groundwater flow paths within intersecting zones of contribution to groundwater abstractions.

Receptor

Water supply provided by four small group water schemes, which are not affiliated with the Federation of Group Water Schemes of Ireland and for which no Zones of Contribution have been delineated, located within 10 km of the site and ten domestic/farm properties in the vicinity of the site, which are not connected to a Group Water Scheme or public water supply network. These are known or assumed to have private wells for domestic and/or farm water supply

Mitigation Measures

Avoidance

- **M1:** The site water usage, sourced from a combination of surface water runoff and groundwater, is minimised to an average daily process water top-up requirement of 24 m^3/day, and an occasional maximum of 42 m^3/day by:
  - Recycling of at least 80% of process water within an integrated mobile washing plant (which comprises feeding, screening, sand washing and stockpile conveyors (CDE CDE M2500 E5)) and primary water treatment plant (CDE AquaCycle Thickener). This avoids losses by leakage and evaporation associated with collection and conveyance to and storage in, open water settlement ponds;
  - Recycling of all stockpile water to process top-up, from a stockpile de-watering system;
  - Recycling of approximately 33% of sludge water to process top-up, from a sludge settlement pond.
- **M16:** Minimisation of groundwater abstraction by combined usage of surface and groundwater resources. At the average material processing rate, groundwater abstraction comprises an average 37% of total water supply requirement, ranging from a minimum of 0% to a maximum of 68% across a year. At the occasional maximum material processing rate, groundwater abstraction ranges from an occasional 38% to 83% of total water supply requirement.
- **M17:** Placement of the abstraction well at the north west corner of the site. This ensure that the zone contributing groundwater to the abstraction is contained within the site boundary (with the exception of c. 6 m across the northern boundary) and does not intersect the area contributing either of the two domestic house supplies (assumed to abstract a conservative 1 m3/day) to the south of the site.

- **<u>M18:</u>** Zones of Contribution (zones contributing groundwater to the abstraction) delineated for the average and occasional maximum material extraction groundwater requirements are extremely conservative.

  - A conservative ZOC (ZOC 1) has been delineated for the maximum (July) required groundwater abstraction rate of 17 m^3/day, for the average material processing rate. By convention, ZOCs are delineated for a continuous 'steady state' average abstraction rate over a year, which assumes maintenance of the same pumping rate throughout a year. Withdrawal of groundwater from the full extent of the ZOC will only occur if that abstraction rate is continuous throughout the year. According to best practise, a ZOC is delineated for 150% of annual average usage (i.e. 13.5 m3/day) to provide a factor of safety. Defining the ZOC for the maximum July rate of 17 m^3/day, rather than 150% of the average annualised daily abstraction rate, therefore significantly .overestimates the extent of the area which will contribute groundwater to the borehole, by an additional factor of safety of approximately 25%.
  - An additional ZOC (ZOC 2) has been delineated for the intermittent maximum (July) required groundwater abstraction rate of 35 m^3/day, for the occasional maximum material processing rate. This is a notional ZOC, which would only occur, if water were to be extracted at this maximum rate, throughout the year. This will not occur, since this is an intermittent processing rate. A factor of safety of the order of >50% is likely to be associated with this ZOC area. This is delineated only for the purposes of a very conservative assessment of risk to sensitive ecological receptors.

<u>Impact Assessment</u>

<u>Ballyrider Group Water Scheme (GWS), located at a minimum distance of 1.2 km from the site.</u>

Regional groundwater flow direction in the area of the Ballyrider supply is east and south east towards the Stradbally river, therefore the groundwater abstraction source draws water from a contributing zone to the west or north west of the source. In addition, the local topographic gradient direction and therefore the local groundwater flow direction to each of the three potential contributing BHs (or any other borehole or spring) is from the west towards the east or south east. The likely zone contributing groundwater to the GWS source is a minimum of 1 km north of and up hydraulic gradient from the site. In addition the tributary of the Stradbally River, to the south of Ballyrider, is likely to act as a no-flow hydraulic boundary between this contributing area and the zone of contribution to the site abstraction. There is therefore no potential for the zone contributing to the abstraction at the site, to intersect with that of the GWS. There is therefore no flowpath from the site to the GWS. The site abstraction therefore has no potential to impact on the quantity or level of water at the GWS abstraction point.

Moyanna GWS

Moyanna GWS is located a minimum of 3 km north of the site. Regional groundwater flow direction in the area of the Moyanna supply is towards the east and south east, towards the Stradbally river, therefore the groundwater abstraction source draws water from a contributing zone to the west or north west of the source. In addition, the local topographic gradient direction and therefore the local groundwater flow direction to each of the potential BHs (or any other borehole or spring) is from the west or north west towards the east or south east. The likely zone contributing groundwater to the GWS source is a minimum of 2.5 km north of the site. In addition the tributary of the Stradbally River, to the south of Moyanna, is likely to act as a no-flow hydraulic boundary between this contributing area and the zone of contribution to the site abstraction. There is therefore no potential for the zone contributing to the abstraction at the site, to intersect with that of the GWS. There is therefore no flowpath from the site to the GWS. The site abstraction therefore has no potential to impact on the quantity or level of water at the GWS abstraction point.

Vicarstown GWS

Vicarstown GWS is located a minimum of 3 km north east of the site. Groundwater flow directions in the area of the Vicarstown source are either south towards the Stradbally river or east towards the River Barrow. The zone contributing to the borehole source is therefore to the north or north west of the supply borehole. The likely zone contributing groundwater to the GWS source is a minimum of 2.5 km north east of the site. In addition the tributary of the Stradbally River and the Stradbally river, to the south of south and east of Vicarstown are likely to act as no-flow hydraulic boundaries between this contributing area and the zone of contribution to the site abstraction. There is therefore no potential for the zone contributing groundwater to the abstraction at the site, to intersect with that of the GWS. There is therefore no flowpath from the site to the GWS. The site abstraction therefore has no potential to impact on the quantity or level of water at the GWS abstraction point.

Barringtons Hollow GWS

Baringtons Hollow GWS is located a minimum of 2 km south west of the site. Regional groundwater flow direction in the area of the Barringtons Hollow supply is east and south east towards the Stradbally river, therefore the groundwater abstraction source draws water from a contributing area to the west or north west of the source. In addition, the local topographic gradient direction and therefore the local groundwater flow direction to each of the three potential contributing BHs (or any other borehole or spring) is from the west towards the east or south east, to a discharge zone at the Stradbally river to the south of the site. The likely zone contributing groundwater to the GWS source is a minimum of 1.5 km south west of the site. There is therefore no potential for the zone contributing groundwater to the abstraction at the site, to intersect with that of the GWS. There is therefore no flowpath from the site to the GWS. The site abstraction therefore has no potential to impact on the quantity or level of water at the GWS abstraction point.

<u>Ten properties outside of, but in the vicinity of the site are not connected to a Group Water Scheme of public water supply network</u>.

The closest properties to the site are located at a distance of c. 70 m south southeast (P1) and c. 40 m (P2) south of the site boundary. Property P1 is a domestic house located c. 200 m south east of, and Property P2 is a domestic house located c. 100 m south east of ZOC 1 which has an approximately 50% margin of safety in its extents. Local groundwater flow is from the south south-east towards both the properties. Therefore, the zones of contribution to both of these abstractions are located almost entirely to the south south-east of the abstractions. ZOC 2 extends closer to the abstractions, but does not intersect with them. However, this is a nominal maximum ZOC boundary extent which will never occur in reality at the proposed abstraction rates.

None of the other supply wells are located within ZOC 1 or ZOC 2 or within 400 m of either ZOC. The next closest property P3 is a cattle supply at 400 m south south-east of the ZOCs. Flow direction towards this supply is likely to be from the south or south west and it is located across groundwater gradient from the zones of contribution. The zone contributing to this well cannot therefore intersect with the zones supplying the site abstraction.

No properties or abstractions are located in the forested area downgradient of the borehole ZOC, through which groundwater flows before discharging at the tributary of the Stradbally river to the north.

The residual impact assessment result is therefore:

A neutral, imperceptible, unlikely, long term, direct, residual, impact.

Potential Impact

Potential, likely, significant, direct and indirect impact on the aquifer groundwater resource.

Source-Pathway-Receptor

Source

Groundwater supply of part of the site water requirements. At the average material extraction rate, the estimated requirement for groundwater supply is an annual average of 9 m^3/day. Supply requirement will range from 1 m^3/day in January to a maximum of 17 m^3/day in July. Occasional material extraction at the maximum proposed extraction rate, would require an intermittent groundwater supply rate ranging from 19 m^3/day in January to a maximum of 35 m^3/day in July.

Pathway

Groundwater flow paths.

Receptor

Groundwater resource in the Regionally Important Karstified (diffuse) bedrock aquifer. The Bagnelstown Upper GWB comprise the contiguous aquifer which underlies the site. Quantitative status in the GWB is classified as good and abstraction is not identified as a pressure.

Mitigation Measures

Avoidance

- **M1**:The site water usage requirement is minimised to an average daily process water top-up requirement of 24 m3/day, and an occasional maximum of 42 m3/day, by:
  - Recycling of at least 80% of process water within an integrated mobile washing plant (which comprises feeding, screening, sand washing and stockpile conveyors (CDE CDE M2500 E5)) and primary water treatment plant (CDE AquaCycle Thickener). This avoids losses by leakage and evaporation associated with collection and conveyance to and storage in, open water settlement ponds;
  - Recycling of all stockpile water to process top-up, from a stockpile de-watering system;
  - Recycling of approximately 33% of sludge water to process top-up, from a sludge settlement pond.

- **M16:** Minimisation of groundwater abstraction by combined usage of surface and groundwater resources. At the average material processing rate, groundwater abstraction comprises an average 37% of total water supply requirement, ranging from a minimum of 0% to a maximum of 68% across a year. At the occasional maximum material processing rate, groundwater abstraction ranges from 38% to 83% of total water supply requirement across a year.

Impact Assessment

The Groundwater Body comprising the contiguous Regionally Important Karst bedrock aquifer underlying the site has a recharge area of 590 km^2.

An area of 0.0155 km^2 (1.55 ha) is required to supply sufficient recharge for a continuous annual supply (at the July rate) of 17 m^3/day. This corresponds to the area of ZOC 1.

An area of 0.032 km2 (3.2 ha) is required to supply sufficient recharge for a continuous annual supply (at the intermittent July rate) of 35 m3/day. This corresponds to the area of ZOC 2.

The areas of ZOC 1 and ZOC 2 comprise 0.002% and 0.003% of the recharge area of the GWB. The recharge removed as groundwater usage at the site is therefore an insignificant percentage of the GWB recharge, that will not impact on the ability of the resource to provide supply to domestic, farmyard, group water scheme or public water supply. Equally it will not have any likely, significant impact on the current 'good' WFD classification status (2013-2018) of the groundwater body, as it relates to groundwater quantity and characteristics dependent on quantity and groundwater regime.

The residual impact assessment result is therefore:

A neutral, not significant, unlikely, long term, direct, residual, impact.

8.6.2 Assessment of Impacts on Groundwater Quality

Potential Impact

Potential, likely, significant, direct and indirect impact on groundwater quality in the aquifer resource.

Source-Pathway-Receptor

Source

Leaked or accidentally spilled fuels, lubricants or flocculants.

Pathway

The vertical pathway through the unsaturated zone of material overlying the groundwater table and subsequent groundwater flow pathways. Site vulnerability is currently classified as high. The actual classification, based on the presence of sand and gravel, is likely to be extreme.

Receptor

Groundwater quality in the sand and gravel body and the underlying Regionally Important, Karstified bedrock aquifer

Mitigation Measures

Avoidance

- **M19:** Extraction will be to a depth of at least 1 m above the estimated highest winter groundwater level across the extraction area, to which is added a climate change uncertainty allowance of 10% of annual groundwater level variability across the site. Groundwater levels at the site decrease by 1.5 to 2 m depth seasonally. Pollutants would therefore be attenuated by a minimum depth of 1 m, increasing seasonally to approximately 3 m depth of unsaturated subsoil material, before reaching the groundwater table and associated flowpaths. There is therefore no potential for direct discharge of pollutants to the groundwater.

  Electric processing and integrated primary water treatment plant and gravity stockpile drainage system, significantly reducing fuel usage on site.

  No storage of fuels on site. Extraction plant (comprising an excavator and a wheeled loader) fuelled by a mobile fuel bowser brought to site. Fuelling occurs within a designated, impermeable bunded fuelling area, provisioned with a hydrocarbon interceptor. Drainage from the re-fuelling area is isolated from the surface water system and is conveyed directly to the storm water attenuation/sediment settlement pond. Handling of fuels and oils brought to site will be in accordance with UK Guidance for Pollution Prevention (2019) and Pollution Prevention Guidance (pre 2019).

  Location of the designated re-fuelling area on an area of the site where no excavation (or soil stripping) will occur. This location will have a minimum depth of 3 m of unsaturated material above the maximum recorded winter groundwater level, with a climate change allowance of plus 10% of average annual variation. This will increase by up to 5 m depth of unsaturated material during seasonal low groundwater levels.

- Where plant allows, environmentally considerate lubricants, such as synthetic non-toxic biodegradable hydraulic fluids, will be used.
- Scheduled visual checking for leaks and mechanical issues will occur, in order to minimise leakage and breakdowns on site. General servicing of site machinery takes place off-site.
- Storage of primary water treatment system polymer flocculant in a locked, fully watertight shed, from which no outflow of stored volume can occur.

Prevention

- **M8**: The site Environmental Management Plan (EMP), which sets out all environmental controls, including inter alia:
  - Correct site management procedures,
  - Monitoring and maintenance methods, schedules and recording
  - Accident responses.

  All staff will be trained to understand their roles and responsibilities as set out in the EMP.

Reduction

M15: Controls which will treat water polluted by fuels, lubricants or flocculant in the case of accidental spillage or escape are:

- Spill kits, which will be stored on site. Staff will be fully trained in the correct and appropriate use, monitoring and removal of spill kits;
- Shutting off of the flow control valves on the discharge point from the storm water attenuation/settlement ponds which receive site surface water drainage. Immediate subsequent removal of contents for off-site disposal with an appropriately licensed waste disposal company.

M20: Accidental spillages which occur within the Zone of Contribution of the well and which are likely to have reached groundwater, could, in the unlikely event of a significant spillage, be remediated by pumping of the abstraction well. Pumping of polluted water could prevent migration of certain pollutants down the groundwater pathway and contain the impacts within the site. Polluted water would be directed to the sludge management system, which has additional capacity and subsequently treated.

Impact Assessment

There is no change in the classification of vulnerability at the site, as a sand and gravel aquifer with an unsaturated zone of <10 m (i.e. the water table within 10 m of the surface) is classified as extreme. There is, however, an effective increase in vulnerability, due to the removal of part of the unsaturated zone.

The range and sequence of mitigation measures being implemented will reduce the probability of pollutants reaching groundwater, by accidental leakage or spillage, to very low.

In the low probability event that small concentrations of pollutants did reach the groundwater table and travel north north-eastwards in the sand and gravel along the groundwater flow path and off of the site, there are no domestic, farmyard, group water scheme public supply wells on the groundwater flow pathway between the site and the groundwater discharge zone approximately 350 m to the north of the site boundary. Attenuation of all pollutants before they reach the tributary of the Stradbally river is almost certain, based on estimates of aquifer transmissivity.

The depth of the sand and gravel deposit (10-15 m below the excavation depth) and the height of the groundwater level within it, ensures that any pollutant will travel via predominantly horizontal flowpaths, along the hydraulic gradient, within the sand and gravel body. There is effectively no likelihood that pollutants would reach the underlying regionally important, karstified bedrock aquifer.

The probability of this source of pollutants impacting on groundwater water quality in the bedrock aquifer resource is therefore extremely low. There will not be any likely, significant impact on the WFD chemical status of the groundwater water body.

The residual impact assessment result is therefore:

A neutral, not significant, unlikely, short-term, direct, residual, impact.

8.6.3 Assessment of Potential Impacts on SAC Qualifying Interest Supported by the Hydrological Regime

Potential Impact

Potential, likely, significant, indirect impact of groundwater abstraction on the hydrological regime which supports the River Barrow and River Nore SAC qualifying interest 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*.

Source-Pathway-Receptor Assessment

Source

Groundwater supply of part of the site water requirements. At the average material extraction rate, the estimated requirement for groundwater supply is an annual average of 9 m^3/day. Supply requirement will range from 1 m^3/day in January to a maximum of 17 m^3/day in July. Occasional material extraction at the maximum proposed extraction rate, would require an intermittent groundwater supply rate ranging from 19 m^3/day in January to a maximum of 35 m^3/day in July.

Pathway

Groundwater flow paths.

Receptor

The hydrological regime which supports qualifying interest 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*, downstream of the confluence of the tributary with the Stradbally River. This regime comprises the generalised hydrological regime. The hydrological regime includes baseflow contributed by groundwater, specifically during low flow periods, when groundwater baseflow is the dominant source of flow.

Mitigation Measures

Avoidance

- **M1:** The site water usage requirement is minimised to an average daily process water top-up requirement of 24 m3/day, and an occasional maximum of 42 m3/day, by:
  - Recycling of at least 80% of process water within an integrated mobile washing plant (which comprises feeding, screening, sand washing and stockpile conveyors (CDE CDE M2500 E5)) and primary water treatment

plant (CDE AquaCycle Thickener). This avoids losses by leakage and evaporation associated with collection and conveyance to and storage in, open water settlement ponds;

- Recycling of all stockpile water to process top-up, from a stockpile de-watering system;
- Recycling of approximately 33% of sludge water to process top-up, from a sludge settlement pond.

- **M15:** Minimisation of groundwater abstraction by combined usage of surface and groundwater resources. At the average material processing rate, groundwater abstraction comprises an average 37% of total water supply requirement, ranging from a minimum of 0% to a maximum of 68% across a year. At the occasional maximum material processing rate, groundwater abstraction ranges from 38% to 83% of total water supply requirement across a year.

Impact Assessment

The Zones of Contribution to the proposed groundwater abstraction are confined within the site. Groundwater flow paths across the site are from the south south-east towards the north north-east. Groundwater flow is towards the discharge zone at the tributary of the Stradbally river approximately 350 m to the north of the site boundary. The abstraction draws from the area delineated as the ZOC, intercepting groundwater which would have travelled along this flow path, to discharge at the discharge zone close to or within the tributary. There is therefore no direct discharge to the Stradbally River of baseflow originating at the site. Losses of this groundwater discharge are likely to occur along the length of the tributary of the Stradbally river, particularly during summer months, when groundwater baseflow is an important component of flow in the Stradbally River.

The extremely conservative assumption is made, for the purposes of impact assessment, that all water abstracted from the site, would have reached the Stradbally river, via the tributary and also that all of low flow in the Stradbally river is groundwater baseflow. The average annual abstraction is used for this comparison. This is appropriate due to the buffered, slow rate of response of groundwater levels and flows in high permeability to changes in inputs and outputs. The average groundwater abstraction 9 m^3/day (average working rate), represents 0.05% of the low (95%ile) flow of 17,884 m^3/day at Derrybrock. It represents 0.02% of the 70%ile flow and 0.009% of the average (50%ile) flow.

An arbitrary 10% reduction in summer groundwater baseflow at Derrybrock applied as a climate change allowance. The 95%ile flow becomes 17,705 m^3/day, the abstraction represents 0.05% if this low flow and represents 0.02% of the adjusted 70%ile flow.

These flow reductions are insignificant. Give that they represent a significant overestimate of the actual impact on groundwater baseflows in the Stradbally river, due to the assumptions made, the groundwater abstraction is considered to cause an imperceptible impact on groundwater baseflow in the Stradbally river.
The residual impact assessment result is therefore:

A neutral, imperceptible, unlikely, long term, indirect, residual, impact.

Potential Impact

Potential, likely, significant, indirect impact of groundwater abstraction on the hydrogeological regime supporting qualifying interest *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (91E0)*

Source-Pathway-Receptor Assessment

Source

Groundwater supply of part of the site water requirements. At the average material extraction rate, the estimated requirement for groundwater supply is an annual average of 9 m^3/day. Supply requirement will range from 1 m^3/day in January to a maximum of 17 m^3/day in July. Occasional material extraction at the maximum proposed extraction rate, would require an intermittent groundwater supply rate ranging from 19 m^3/day in January to a maximum of 35 m^3/day in July.

Pathway

Groundwater flow paths

Receptor

Spring discharge and baseflow components of the hydrological regime at the Stradbally river supporting *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (91E0)*

Mitigation Measures

Avoidance

- **M1:** The site water usage requirement is minimised to an average daily process water top-up requirement of 24 m3/day, and an occasional maximum of 42 m3/day, by:
  - Recycling of at least 80% of process water within an integrated mobile washing plant (which comprises feeding, screening, sand washing and stockpile conveyors (CDE CDE M2500 E5)) and primary water treatment plant (CDE AquaCycle Thickener). This avoids losses by leakage and evaporation associated with collection and conveyance to and storage in, open water settlement ponds;
  - Recycling of all stockpile water to process top-up, from a stockpile de-watering system;
  - Recycling of approximately 33% of sludge water to process top-up, from a sludge settlement pond.
- **M15:** Minimisation of groundwater abstraction by combined usage of surface and groundwater resources. At the average material processing rate, groundwater abstraction comprises an average 37% of total water supply requirement, ranging from a minimum of 0% to a maximum of 68% across a year. At the occasional maximum material processing rate, groundwater abstraction ranges from 38% to 83% of total water supply requirement across a year.

Impact Assessment

Groundwater flow to the springs identified within the area of alluvial forest is from the west north-west. The springs are supplied by recharge occurring to the east south-east of the no-flow groundwater divide located to the west north-west. Groundwater supplying the abstraction point within the site, is derived from the area to the north of this divide and flows towards the north and north -east. Neither of the two conservative Zones of Contribution delineated, extend to the groundwater divide and therefore do not intercept groundwater flows towards the springs There is therefore no pathway between the groundwater supplying the abstraction and the groundwater supplying the springs. The groundwater level and quantity of discharge at the springs cannot therefore be impacted by the presence of the site groundwater abstraction.

Groundwater flow supporting the baseflow component of the section of the Stradbally river along which the alluvial forest is located is, as above, supplied by recharge occurring to the east and south-east of the no-flow groundwater divide located to the west north-west. within the site, is derived from the area to the north of this divide and flows towards the north and north -east. Neither of the two conservative Zones of Contribution delineated, extend to the groundwater divide and therefore do not intercept groundwater flows towards the discharge zone providing baseflow to the Stradbally River. There is therefore no pathway between the groundwater supplying the abstraction and the groundwater supporting the baseflow component of the Stradbally river. The quantity or level of the baseflow component of flooding cannot therefore be impacted by the presence of the site groundwater abstraction.

The residual impact assessment result is therefore:

A neutral, imperceptible, unlikely, long term, indirect, residual impact.

8.6.4 Groundwater/Hydrological Impact Assessment

A summary of the surface water impact assessment is provided in Table 8.17 below.

Table 8.17: Summary of the Groundwater / Hydrogeological Impact Assessment

Potential Impact	Source	Pathway	Receptor	Mitigation Measures	Result of Impact Assessment
Assessment of Impacts on Group and Domestic Water Supplies and the Regional Aquifer Resource					
Potential, likely, significant, direct impact on Group Water Scheme and domestic well supplies.	Groundwater supply of part of the site water requirements.	Groundwater flow paths within intersecting zones of contribution.	Water supply provided by four small group water schemes and ten domestic/farm properties in the vicinity of the site, which are not connected to a Group Water Scheme or public water supply network.	Avoidance: M1, M16, M17, M18	Neutral, imperceptible, unlikely, long term, direct, residual, impact.
Potential, likely, significant, direct and indirect impact on the aquifer groundwater resource.	Groundwater supply of part of the site water requirements.	Groundwater flow paths.	Groundwater resource in the Regionally Important Karstified (diffuse) bedrock aquifer	Avoidance: M1, M16	Neutral, not significant, unlikely, long term, direct, residual, impact.

Potential Impact	Source	Pathway	Receptor	Mitigation Measures	Result of Impact Assessment
Assessment of Impacts on Groundwater Quality					
Potential, likely, significant, direct and indirect impact on groundwater quality in the groundwater aquifer resource.	Leaked or accidentally spilled fuels, lubricants or flocculants.	The vertical pathway through the unsaturated zone of material overlying the groundwater table and subsequent groundwater flow pathways.	Groundwater quality in the sand and gravel body and the underlying Regionally Important, Karstified bedrock aquifer	Avoidance: M19 Prevention: M8 Reduction: M15, M20	Neutral, not significant, unlikely, short-term, direct, residual, impact.
Assessment of Potential Impacts on SAC Qualifying Interests supported by the Hydrological Regime					
Potential, likely, significant, indirect impact of groundwater abstraction on the hydrological regime of the River Barrow and River Nore supporting SAC qualifying interest 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels.*	Groundwater supply of part of the site water requirements.	Groundwater flow paths.	Generalised hydrological regime in Stradbally river, including baseflow contributed by groundwater, specifically during low flow periods, when groundwater baseflow is the dominant source of flow.	Avoidance: M1, M16	Neutral, imperceptible, unlikely, long term, indirect, residual, impact.
Potential, likely, significant, indirect impact of groundwater abstraction on the hydrological regime of the River Barrow and River Nore SAC supporting qualifying interest *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (91E0)*	Groundwater supply of part of the site water requirements.	Groundwater flow paths .	Spring discharge and baseflow components of the hydrological regime in the Stradbally supporting the Q.I. *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (91E0)*	Avoidance: M1, M16	Neutral, imperceptible, unlikely, long term, indirect, residual impact.

8.7 Monitoring Proposals

8.7.1 Groundwater Monitoring

Groundwater Abstraction Rates

Weekly groundwater abstraction rates will be recorded. The purpose is to validate the proposed water usage rates.

Groundwater Levels

One of the four site investigation groundwater monitoring points will be retained for operational phase groundwater level monitoring. Groundwater levels will be measured daily using an in-borehole water level monitor. The purpose is to identify whether any significant changes in groundwater level occur as a result of the presence and operation of the quarry.

Groundwater Quality

Groundwater samples from this borehole will be analysed and compared against key baseline groundwater parameters as set out in this report and the relevant standards, annually. The purpose is to identify whether any significant changes in groundwater quality occur as a result of the presence and operation of the quarry.

Sampling will also be carried out in according to the provisions of any grant of permission.

Borehole Decommissioning

Boreholes not used in operational monitoring will be back filled with suitable material. The purpose is to ensure that the boreholes cannot act as preferential flow paths into the sand and gravel body and the underlying bedrock aquifer.

8.7.2 Surface Water Monitoring

Discharge Rate

Discharge rate will be recorded weekly from the discharge meter installed on the outflow. The purpose is to validate the proposed discharge rates.

Discharge Quality

Quality of the surface water discharge from the site will be monitored according to any planning conditions imposed.

Surface Water Monitoring

Water samples from the onsite man-made drain (when water occurs) and the drain downstream where permanent flow occurs, will be taken four times yearly.

These will be compared against key baseline surface water parameters as set out in this report and the relevant standards. The purpose is to identify whether any significant changes in water quality occur as a result of the presence and operation of the quarry.

Sampling will also be carried out in according to the provisions of any licensing or grant of permission.

8.7.3 Plant and Process Checks

- Scheduled visual checking of mechanical plant for leaks and mechanical issues will be carried out and recorded, in order to minimise leakage and breakdowns on site. The purpose is to identify any need for pre-emptive maintenance, so as to avoid any accidental spillage of hydrocarbons.
- Scheduled visual checks for leakage or structural instability will be carried out and recorded at the top-up balancing, sludge settlement and storm water attenuation/settlement ponds as well as at conveyance structures. The purpose is to identify any need for pre-emptive maintenance, to avoid accidental spills of water containing suspended sediments and any associated pollutants.
- Scheduled visual checking of hydrocarbon interceptors will be carried out and recorded. The purpose is to identify any need for pre-emptive maintenance, to avoid accidental spills of water containing hydrocarbons..
- Scheduled visual checks for leakage of the closed tank integrated primary water treatment plant as wells as conveyance structures.
- Scheduled checks of drains and the discharge area will be carried out and recorded. Th purpose is to identify the commencement of any erosion or scouring, in order to initiate mitigation measures.

8.8 Flood Risk Assessment

A Flood Risk Assessment was prepared for the proposed Project and is provided in Appendix 8.7.

Stage 1 of the Flood Risk Assessment concluded that there was no risk of coastal flooding, or fluvial flooding from the Stradbally River or its tributary.

No risk of pluvial flooding was identified at the site on the PFRAM mapping (Office of Public Works flood maps).

However, in accordance with the precautionary principle, some small areas of pluvial risk were estimated to occur to the north and north-east of the site and these were given further consideration. The assessment concluded that there will be no additional risk of pluvial flooding or downstream fluvial flooding associated with the presence of the proposed Project. Refer to Appendix 8.7 for full details.

8.9 References

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9. Air Quality and Climate

This Chapter assesses the potential air quality and climate impacts which may be generated during the construction, operational and restoration phases of the proposed Project. The main air quality impacts will be primarily associated with dust and transport emissions.

Given the nature of the proposed works, the construction and operational phases have been considered as the one phase/process. Dust emissions during this phase will arise primarily from the movement of site plant within the site, soil stripping, processing of aggregates (sand & gravels) and exposed soil surfaces during dry periods. Transport emissions are associated with vehicles travelling to and from the site, taking material from the site.

During the restoration phase, the lands will be graded and sloped to meet the existing levels at the site edges. The area will be re-seeded with agricultural grass seed mixture. Once the restoration works are complete, the source of emissions (dust and vehicle) will be removed.

An Environmental Management Plan (EMP) will be implemented on site, which will detail mitigation measures to minimise air emissions from the site (dust and vehicle). The EMP will allow for the implementation of appropriate environmental practises and it was considered that any effects associated with dust or vehicle emissions would be imperceptible (not significant).

Climate was given consideration in terms of greenhouse gas emissions and future weather events such as dry periods, flood risk and high winds. Climate change allowances were made, such as in the design of the surface water system to account for flood events and also for the storage of water during long dry spells. Overall the effects from the proposed Project, on climate were considered not significant, with the potential for some benefits. Benefits can be gained by reducing the dependency on facilities elsewhere in County Laois and the distances travelled by their heavy goods vehicles (HGVs). By servicing areas, such as Portlaoise and Kildare from the Garrans location, it was estimated that there would be a reduction of c. 200,000km per annum of HGV road trips within the Laois and Kildare regions (with the Garrans site in operation).

This equates to c. 180 tonnes less carbon dioxide (CO_2) per year being emitted with operation in place – c. 3,600 tonnes over the lifetime of the proposed Project.

9.1 Introduction

This Chapter of the EIAR has been compiled by Rowan Engineering Consultants Ltd. (Rowan). This Chapter considers the potential air quality and climate impacts which may be generated by the proposed Project.

9.2 Methodology

The assessment involved a desk-based study to examine available information relating to air quality in the vicinity of the proposed Project. The following sources were consulted in order to identify and assess the potential impacts on air quality and climate from the proposed Project:

- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, National Roads Authority (now Transport Infrastructure Ireland);
- Climate Change Adaptation Strategy 2019-2024 (Draft), Laois County Council, 2019;
- Air Quality in Ireland 2018 (Indicators of Air Quality) Report, Environmental Protection Agency (EPA);
- http://www.epa.ie/air/quality/; and
- https://www.epa.ie/air/quality/data/pl/.

A site visit within the proposed Project boundary and surrounding environment was also undertaken to support the understanding and inform the identification of potential sensitive receptors in relation to air quality.

9.2.1 Relevant Guidance

Relevant guidance taken into consideration in the development of this Chapter includes:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, Draft, August 2017); and
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA, September 2015);
- UK ODPM (2000) Controlling Environmental Effects: Recycled and Secondary Aggregates Production; and
- Quarries and Ancillary Activities (Guidelines for Planning Authorities), (DEHLG, 2004).

9.2.2 Criteria for Rating of Environmental Impacts

The criteria used to rate the potential environmental effects of the proposed Project on air quality was based on the criteria outlined in the EPA document, Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Draft, August 2017). Table 3.3, Description of Effects in the Guidelines outlines how specific effects can be described in relation to quality, magnitude and extent.

9.2.3 Air Quality Standards

The Clean Air for Europe (CAFE) Directive (Council Directive 2008/50/EC) sets out limit and target values for named air quality parameters and it was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). The 4th Daughter Directive, which also defines limit values for pollutants, was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009). This Directive and the Irish Regulations set out the main standards for air quality in Ireland. These standards are summarised in Table 9.1.

In addition to the Air Quality Standards Regulations and the Directive Standards, there are also World Health Organisation (WHO) Guidelines relating to air quality. These guidelines were developed by the WHO to provide appropriate air quality targets worldwide, based on the latest health information available. Whilst the WHO Guidelines are not mandatory, they represent current informed opinion on the levels to which we should be aspiring in order to minimise the adverse health impacts of air pollution. The WHO air quality standards and guidelines referenced in this report are summarised in Table 9.2.

Table 9.1: Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011; based on EU Clean Air For Europe [CAFE] Directive 2008/50/EC)

Pollutant	EU Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	None	200 µg/m³ NO_2
		Annual limit for protection of human health	None	40 µg/m³ NO_2
		Annual limit for protection of vegetation	None	30 µg/m³ NO +NO_2
Sulphur Dioxide (SO_2)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	150 µg/m³	350 µg/m³
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m³
		Annual & Winter limit for the protection of human health and ecosystems	None	20 µg/m³
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 µg/m³
		Annual limit for protection of human health	20%	40 µg/m³

Pollutant	EU Regulation	Limit Type	Margin of Tolerance	Value
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health (Stage 1)	20% from June 2008. Decreasing linearly to 0% by 2015	25 µg/m³
		Annual limit for protection of human health (Stage 2)	None To be achieved by 2020	20 µg/m³
Carbon Monoxide (CO)	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	60%	10 mg/m³ (8.6 ppm)
Benzene	2008/50/EC	Annual limit for protection of human health	0% by 2010	5 µg/m³

Table 9.2: WHO Air Quality Guidelines

Pollutant	Limit Type	Value
Nitrogen dioxide	Hourly limit for protection of human health	200 µg/m³ NO_2
	Annual limit for protection of human health	40 µg/m³ NO_2
Sulphur dioxide	Daily limit for protection of human health	20 µg/m³
	10-minute limit for protection of human health	500 µg/m³
Particulate Matter (as PM_{10})	24-hour limit for protection of human health	50 µg/m³
	Annual limit for protection of human health	20 µg/m³
Particulate Matter (as $PM_{2.5}$)	24-hour mean for protection of human health	25 µg/m³
	Annual mean for protection of human health	10 µg/m³

9.2.4 Dust Emissions

There are currently no national or European Union air quality standards relating to dust deposition. The standard of 350 mg/m²/day (as measured using Bergerhoff type dust deposition gauges in line with the *German Standard Method for determination of dust deposition rates, VDI 2119*) is typically applied to confirm that there are no nuisance effects from site activities. Recommendations outlined in the Quarries and Ancillary Activities (Guidelines for Planning Authorities) Guidance (2004) apply the 350 mg/m²/day in relation to the management of quarries.

9.2.5 Climate Agreements

Ireland is party to a number of climate agreements which all have the aim of lowering annual greenhouse gases emissions (GHG). These include:

- Kyoto Protocol: This protocol was one of the first international agreements, with a commitment in relation to the reduction of emissions of 6No. GHG.
- Paris Agreement: This agreement was signed in December 2015 and sets out a long term goal to limit global warming to below 2 degrees centigrade above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees. Member States commit to a 40% reduction in EU wide emission by 2000 compared to 1990. The Katowice Climate Change Conference in December 2018 was held to confirm rules to implement the Paris Agreement; and
- EU Agreement " 2000 Climate and Energy Policy Framework": There are a number of key targets in this agreement, including 40% reduction in GHG emissions from the 1990 levels. Ireland's 2020 target was to achieve a 20% reduction of non emissions trading[7] sector GHG emissions based on 2005 levels. The 2019 Sustainable Energy Authority of Ireland (SEAI) Report on energy targets documented that there was an expected shortfall in reaching the binding 20% GHG reduction target, with Ireland likely to reach 16% by this year;
- The Climate Action Summit: This summit was held in September 2019 in New York where a number of climate initiatives were launched. These included putting climate risk at the centre of planning and investment decision, adaptation to climate change, energy efficiency, conservation and finance. The aim of these initiatives is to support the continued drive in international cooperation on climate change with a view to achieving a downward trend in emissions and an improvement in climate change resilience for those that are most effected. Among the commitments included a commitment from the European Union & 65 other countries to cut GHG's to zero by the year 2050.

At national level, Ireland, via the Joint Committee on Climate Action, became the second country in the world to declare a climate emergency in May 2019. Resulting from this declaration are actions for the State to examine how it can improve its response to climate and biodiversity loss. There are a number of national and regional climate change related policy or position papers including:

- Climate Action and Low Carbon Development, National Policy Position Ireland;
- National Mitigation Plan, Department of Communications, Climate Action and Environment (July 2017);
- Ireland's Transition to a Low Carbon Energy Future 2015-2000;
- Low Carbon Energy Roadmaps for Ireland;
- Delivering a Sustainable Energy Future for Ireland: the Energy Policy Framework 2007-2020; and
- The Climate Action Plan, 2019.

[7] Non emission trading sectors are those that don't fall under sectors identified in Directive 2003/87/EC

These climate policy documents set out emission reduction measures and actions, contributing to the reduction of greenhouse gases but also addressing investment, research, implementation and engagement with the public and other national strategy documents.

Specifically, at county level, the Climate Change Adaptation Strategy 2019-2024 (Draft) acknowledges the risks presented by climate change within County Laois. On this basis, the Strategy document seeks to integrate climate change adaptation considerations into all '*functions and activities of the local authority*'.

9.3 Baseline Conditions

9.3.1 Influences on Air Quality

The existing activities at and in the vicinity of the proposed Project have the potential to influence ambient air quality, by the release of emissions to atmosphere. The site is currently greenfield and would be considered rural.

However, some existing influences in the area would be:

- Emissions of PM_{10} and $PM_{2.5}$, SO_2, NOx, CO and benzene from traffic on the adjacent road network; and
- Emissions of PM_{10} and $PM_{2.5}$, SO_2, NOx and CO from domestic and any commercial/ industrial heating systems that may be located in the vicinity.

The site is located in the townland of Garrans, Co Laois, approximately 500m east from Garrans Cross Road and the regional road R427. The site encompasses approximately 12 hectares and is accessed by the local road, L7939 which is running west-east, towards the R428. The site would be described as hummock topography, with an elevation ranging between 67.1-80m Above Ordnance Datum (AOD). There is a slight slope downwards towards the north easterly corner of the site. The land is currently used intermittently for farming activities.

The site is located c. 2km north east of Stradbally and c. 7km east of Portlaoise.

There are private residences in the vicinity of the proposed Project, with some located on the local road L7939 from which the proposed Project will access. Within 500m of the site boundary, there are c. 20 private residences (Refer to Figure 9.1).

Figure 9.1: Residences within 500m of the proposed Project (site boundary)

9.3.2 Influences on Air Quality – from the proposed Project

Activities associated with the proposed Project may impact on air quality. The main activities relevant to air quality include:

- The on-site processing of the material which would include extraction of aggregate, washing, sizing, screening and stockpiling;
- Intermittent crushing of oversized aggregate material;
- Loading, movement and dispatch of the aggregate material off-site;
- Traffic movements at the site entrance and on the internal site access road; and
- Final restoration works associated with the site – movement of topsoil and seeding of soils.

Wind erosion of stockpiles or any exposed surfaces may also influence air quality in the vicinity of the proposed Project.

9.3.3 Sensitive Receptors

The type of receptor will indicate its sensitivity with regard to air quality and dust deposition. The immediate vicinity of the proposed Project is greenfield, rural with a number of one off houses within 500m of the site boundary. The site is located c. 2km north east of Stradbally.

Local residences would be considered as medium sensitivity, with receptors such as hospitals and retirement homes considered as high sensitivity.

There are c. 20 residences within 500m of the proposed Project site boundary (Refer to Figure 9.1 above).

9.3.4 Long Term Air Quality Monitoring Data

The Environmental Protection Agency (EPA) and local authorities maintain and operate a number of ambient air quality monitoring stations throughout Ireland in order to implement EU Directives and to assess the country's compliance with national air quality standards.

For ambient air quality management and monitoring in Ireland, four zones, A, B, C and D are defined in the Air Quality Standards (AQS) Regulations (S.I. No. 180 of 2011) and are defined as follows:

- **Zone A:** Dublin Conurbation.
- **Zone B:** Cork Conurbation.
- **Zone C:** 24 cities and large towns. Includes Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Newbridge, Mullingar, Letterkenny, Celbridge and Balbriggan, Portlaoise, Greystones and Leixlip.
- **Zone D:** Rural Ireland, i.e. the remainder of the State excluding Zones A, B & C.

The air quality in the area of the proposed Project is best described as Zone D, Rural Ireland.

Representative background data is presented by the EPA in their Air Quality in Ireland 2018 (Indicators of Air Quality) Report published in 2019. This report concluded that no levels for any of the EPA monitoring sites, were above the EU legislative limit values in 2018. Parameters monitored included nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone, particulate matter (PM_{10} and $PM_{2.5}$), dioxins, a range of heavy metals and Polycyclic aromatic hydrocarbons (PAHs) Some of the World Health Organisation (WHO) guideline values were exceeded at a number of monitoring sites for PM_{10} and $PM_{2.5}$, ozone, and NO_2..

The Report outlines that the main problem pollutants for Ireland includes PM_{10}, $PM_{2.5}$ and NO_2 and that it is likely that Ireland will exceed NO_2 limits in the 'near future'.

The EPA manages the National Ambient Air Quality Network and as part of this programme, the closest monitoring station to the facility was located in Portlaoise Town (beside the fire station on the Dublin Road) where monitoring is currently being undertaken. Portlaoise Town would be classified as a Zone C (Cities and Large Towns). The data for air monitoring is received automatically from the monitoring site and is often subject to validation. However, in summary, there are no exceedances of the limit values, with no exceedances of the lower assessment thresholds for NO_2, SO_2, CO and particulate matter in recent times.

The EPA also generate an Air Quality Index for Health which outlines the air quality in regions, where 10 means air quality is very poor and a reading of one to three inclusive means that air quality is good.

This is updated regularly on the EPA website. On the date of retrieval (11th June 2020), the air quality in the Leinster and Portlaoise region was described as good (Refer to Figure 9.2a).

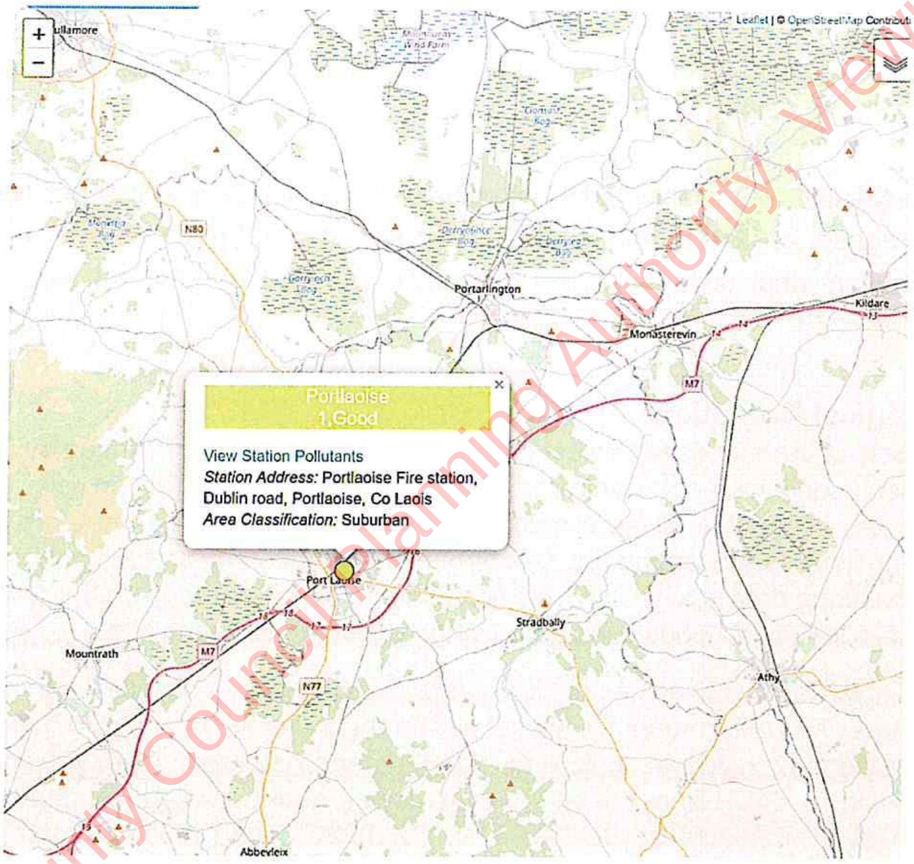

Figure 9.2a: EPA Air Quality Index for Health relevant to Portlaoise Town (Ref: https://www.epa.ie/air/quality/)

9.3.5 Dust Deposition

A UK study by the ODPM in 1986 estimated likely dust deposition levels in particular types of environments. A level of 39 mg/m^2/day was assigned to open country in the study. This figure was seen as representative of current levels likely to be experienced at the location of the proposed Project.

9.3.6 Summary of Background Air Quality

With the site being located in a predominantly rural location and being within Zone D, the air quality would be expected to be good for all air quality related pollutants, including dust deposition.

Given the nature of the proposed Project and the surrounding environment, the main substances which are of interest in terms of existing air quality would be sulphur dioxide, nitrogen oxides (nitric oxide, NO and NO_2, collectively referred to as NOx), PM_{10} and $PM_{2.5}$ which could originate from combustion sources, traffic and any existing commercial and industrial activities in the wider area. CO is also potentially of interest, and benzene may also be of interest from traffic sources.

Also of interest are the activities associated with the disturbance, stripping, excavation and movement of aggregates at the site and material being transported from the site. These activities could result in windblown dust being developed on site and in the surrounding area.

9.3.7 Meteorological Conditions

The potential impacts of the proposed Project on air and climate can be influenced by the local meteorological conditions, in particular by wind speed and direction and by precipitation rates. An evaluation of the climatic conditions at the site can therefore be useful. There is no long-term continuous meteorological monitoring at the proposed Project site but monitoring data is available from Met Éireann which provides an indication of the expected meteorological conditions that could be experienced at the site.

Oakpark in Co. Carlow was identified as the closest Met Éireann meteorological station to the proposed Project. The mean monthly rainfall from January 2017-January 2020 was recorded as 65mm/month. When reviewing, longer term datasets, the Kilkenny meteorological station (c. 60km from the site) was reviewed and the data indicated that the mean monthly rainfall from January to December 1978-2007 was 71.45mm/month.

Wind speed and direction are also important in determining how potential air emissions are dispersed. The prevailing wind direction at the site would be westerly to southerly in direction. 30 year averaged monitoring records for the Kilkenny station were available for the period of 1978-2007. The average annual wind speed was recorded at 7.45m/s.

9.4 Predicted Impacts

Given the nature of the proposed works at the site, the construction and operational phases have been considered as the one phase/process.

9.4.1 Do-Nothing Scenario

Under the Do-Nothing Scenario, the site would remain in its current state (a greenfield site) and continue to be used for agricultural activities. The baseline conditions would change very little, other than any natural variation in air quality conditions, over time.

9.4.2 Air Quality – Dust Emissions

There will be dust emissions resulting from the activities on-site. Dust emissions are expected to arise from the:

- Movement of site plant within the site on an unpaved internal access road;
- Transport vehicles arriving to and exiting the site, using the local road network;
- Disturbance, stripping, excavation and processing of aggregates on site;
- Stockpiling of aggregates on site;
- Movement and loading of aggregates on site; and
- Dust emissions resulting from dry periods, on exposed surfaces combined with windy conditions.

There is potential for dust emissions to result in dust nuisance impacts on local receptors.

An assessment of potential dust emissions was undertaken having consideration for the *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* published by the National Roads Authority (now Transport Infrastructure Ireland (TII)).

The distance within which impacts from dust deposition may arise are detailed in Figure 9.3, taken from the TII Guidance. The Guidance indicates that the potential for significant effects, from dust emissions would occur within 100m. This is assuming a large construction project with a high use of haul roads.

Box A8.1: Assessment Criteria for the Impact of Dust Emissions from Construction Activities, with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	**Description**	**Soiling**	**PM_{10} a**	**Vegetation effects**
Major	Large construction sites, with high use of haul routes	100 m	25 m	25 m
Moderate	Moderate sized construction sites, with moderate use of haul routes	50 m	15 m	15 m
Minor	Minor construction sites, with limited use of haul routes	25 m	10 m	10 m

[a] Significance based on the 2005 standard, which allows 35 daily exceedences/year of 50 µg/m^3

Figure 9.3: Assessment Criteria for Dust Emissions taken from NRA Air Quality Guidance.

There are c. 20 residences within 500m of the proposed Project boundary and 2 residences within 100m. This includes the:

- Residence on the southern boundary – close to the Phase 3 section of the works;
- Residence c. 100m from the southern boundary, of the Phase 2 section of the works – across the local road, L7939.

For the 2No. residences within 100m of the proposed Project, the potential impacts resulting from dust deposition would be considered long term (duration), adverse and of a slight effect without the implementation of mitigation measures (Refer to Section 9.5 below for those).

For receptors beyond the 100m boundary, it was considered unlikely that dust deposition impacts would result from the proposed Project.

As detailed in Chapter 2 of the EIAR, works relating to the excavation of aggregates and associated restoration works, would be phased, with stripping and excavation works occurring across only small sections of each phase, as they are active – i.e. phased stripping and excavating within each phase. On this basis, works would localised within the site boundary, reducing the potential for dust emissions outside of the site boundary.

9.4.3 Air Quality Impact from Site Plant, Equipment and Traffic Emissions.

There will be some exhaust emissions associated with the movements of site plant/vehicles and heavy goods vehicles (HGV) transporting material to and from the site and staff travelling to and from the site.

The levels of expected traffic movements have been reviewed. It is expected that there will be 2-3No. of plant on the site, c. 15No. HGV movements, 2No. staff car movements and 6 miscellaneous to and from the site per day.

In terms of the local road network, whilst there will be 3No. parking bays added along the local road L7939, there will be no changes to the road alignment and no speed changes. The Traffic and Transport Assessment (Appendix 5.1) concluded that the HGV flow increases were not significant, and that the existing junction would provide more than adequate capacity, with no queuing problems on the road network.

It was concluded that the additional site plant, equipment and traffic movements will not generate significant emissions in terms of air quality and no measurable change from the existing conditions is predicted.

The effect on air quality from site plant, equipment and traffic emissions was considered to be imperceptible.

9.4.4 Air Quality during the Restoration Phase

Following the cessation of extraction activities within each phase, restoration works for the relevant phase will commence. The lands will be graded and sloped to meet the levels at the site outline/edges. The area will be re-seeded with agricultural grass seed mixture native to the local area.

Once the restoration works are complete, the source of emissions (dust and traffic) will be removed. Following the completion of the restoration phase works, there will be no works undertaken at the site and no regular traffic access into/out of the site. The effect on air quality from this phase of the proposed Project was considered to be imperceptible.

9.4.5 Climate

Ireland's climate change targets require a reduction in GHG emissions by 20% by 2020 (based on the 2005 emission levels).

The proposed Project in terms of climate change considerations was discussed in Chapter 2 Proposed Project Description (Section 2.13.2). In this regard, the following areas were considered.

- Greenhouse gas emissions from plant and vehicles associated with the proposed Project. It was considered that the emissions from the proposed Project are of a minor scale with little contribution to overall emission levels on a regional or national scale;
- Mitigation in relation to future flood events, where storm water attenuation on the site incorporated a 20% climate change allowance in rainfall calculations;

- Mitigation in relation to future extended dry periods, where storm water attenuation has accounted for 40 days of summer period surface water usage (400m^3) and this volume of water will be in continuous storage in the surface water settlement ponds in the event of an extended dry period;
- The implementation of an Environmental Management Plan on-site which details dust suppression mitigation which will be enabled as required, during/following high wind speed events; and
- During extreme weather events (such as a cold event), works on site and dispatching of material on the local road network will be ceased.

Refer to Chapter 2 for full details.

Chapter 4 Planning and Policy Context refers to the contribution that the proposed Project would make to achieving a low carbon society. The need for aggregates is recognised and the provision of planned and local sources of aggregates into their surrounding regions will be important in contributing towards national climate change targets. The emerging short supply of aggregates in the midland area has been recognised by the Irish Concrete Federation. The secure supply of aggregates at this local level will be a lower carbon approach, reducing the carbon emissions that would other wise be emitted by vehicles travelling from across country or abroad to supply local construction and manufacturing industries.

With the proposed Project in operation, it would reduce the dependency on facilities elsewhere in County Laois to service the Portlaoise, North Laois and Kildare regions. On this basis alone, it is currently estimated that there would be a reduction of c. 200,000km per annum of HGV road trips within the Laois and Kildare regions, with the Garrans site in operation. At 900 grams [8] CO_2 per km, this would be 180 tonnes less CO_2 per annum being emitted with operation in place – c. 3,600 tonnes over the lifetime of the project

Overall the effects from the proposed Project, on climate were considered not significant, with the potential for some benefits, in reducing the dependency on further afield facilities and the distances travelled by their HGVs, to access the Portlaoise and Kildare regions.

9.5 Mitigation Measures

An Environmental Management Plan (EMP) (Appendix 2.2) has been prepared setting out a framework in relation to the management of environmental nuisances when the proposed Project is operational.

The EMP will be updated prior to the commencement of the works on site and compliance with the EMP will be mandatory.

The EMP details the mitigation measures that will be implemented on site to minimise environmental impacts and specifically relating to dust emissions will include:

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[8] Ref: https://www.transportenvironment.org/sites/te/files/publications/2015%2009%20TE%20Briefing%20Truck%20CO2%20Too%20big%20to%20ignore_FINAL.pdf

- Vehicles delivering materials (to and from the site), with dust potential will be enclosed or covered with tarpaulin;
- All HGV's leaving the site will directed through a wheelwash in order to prevent mud and soils being tracked onto public roads;
- Restricted speed limits will be implemented on site to reduce the generation of dust from moving HGV's within the site;
- All stockpiles on site will be monitored and treated with water to minimise dust emissions where required;
- Hard surfaces on-site will be swept to remove any mud or aggregate build up to minimise dust emissions;
- During prolonged dry or windy periods, any areas with the potential to generate dust will be watered, in particular areas next to the site entrance and at the excavation and storage locations;
- Material handling and stockpiling of materials will be designed and laid out to minimise the exposure to wind;
- Materials will not be moved on-site if they are too dry or when there is unusually windy or rainy weather conditions;
- Works shall be ceased during excessively high winds;
- Planted screening mounds (from the stripped top soil) close to the site entrance and along the southern boundary;
- Public roads will be inspected regularly for cleanliness and cleaned as necessary.
- With regard to exhaust emissions and GHG emissions:
    - Vehicles on the site will be not left idling for more than a few minutes;
    - Plant and equipment on site will be regularly maintained and records retained in this regard; and
    - Energy consumption & emissions data will be considered in the purchasing new plant and vehicles.

9.6 Monitoring

A monthly dust monitoring programme will be implemented at the site boundaries for the duration of the site activities and records maintained on-site.

The monthly measurements will be undertaken using the TA Luft/VDI 2119 Bergerhoff Method and levels shall not exceed the 350 mg/m^2/day standard. Records of the monthly measurements will be maintained on-site. Refer to Appendix 2.2 EMP for more details.

9.7 Residual Impacts

The EMP will allow for the implementation of appropriate environmental practises and it was considered that there will be no significant residual impacts associated with dust deposition, vehicle/plant emissions and climate change.

9.8 References

National Roads Authority (now Transport Infrastructure Ireland) (Revision 1 May 2011). Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes.

Laois County Council (2019). Climate Change Adaptation Strategy 2019-2024 (Draft).

Environmental Protection Agency (2019). Air Quality in Ireland 2018 (Indicators of Air Quality) Report.

http://www.epa.ie/air/quality/; and https://www.epa.ie/air/quality/data/pl/ (accessed 12th November 2019).

10. Landscape and Visual

This Chapter assesses the potential landscape and visual impacts which may be generated during the construction, operational and restoration phases of the proposed Project.

Given the nature of the proposed works, the construction and operational phases have been considered as the one phase/process. Landscape impacts are associated with the change in topography of the site, the removal of hedgerows and changes associated with the presence of the plant and equipment on the site. All boundary hedgerows will be protected and remain in place. Their longevity will be increased with appropriate maintenance and management when the site is operational. During the restoration phase, new hedgerow planting will be undertaken within the site and this will reflect the historical landscape pattern evidenced in historical mapping for the area.

Visual impacts are associated with the extent of the area over which the proposed Project would be visible and changes such as stripping of soils, the presence of plant and equipment and the construction of the site entrance and access road.

Due to the site location, the intervening undulating topography and screening from vegetation, it was concluded that the proposed Project will have no visual impacts on designated scenic roads and viewpoints listed in the Laois County Development Plan 2017-2023 or on tourism routes or attractions within the County.

As part of the design process, the proposed Project has included for the construction of berms at the site entrance and along the southern boundary. The construction and planting of these berms reduces the impact of viewpoints in this area. Management of the hedgerow on the western boundary of the site will support its function as a screen for viewpoints to the west of the site (close to the regional road, R427).

Mitigation for the landscape and visual assessment includes

- Development of a Landscape Plan for the operational and restoration phases which outlines planting and maintenance requirements;
- Planting, shaping and contouring requirements for the constructed berms;
- The retention and management of the boundary hedgerows; and
- Replacement of the internal site hedgerows in line with the historical field pattern as part of the restoration works.

There are no significant effects associated with the landscape and visual assessment, with some impacts of a positive nature associated with the ultimate restoration of the historical field pattern within the landscape.

10.1 Introduction

This Chapter of the EIAR was written by Hayes Ryan, Landscape Architects. The assessment is based on a desktop study and a survey of the site and receiving environment in December 2019 with a follow up visit in June 2020. Although interlinked, the landscape impact and the visual impacts are assessed separately and with their own sets of criteria.

The landscape and visual impact assessment (LVIA), concerns itself with landscape, landscape values, aesthetic and visual amenity and landscape as a resource which provides society with cultural, economic and environmental benefits. Landscape has come to be defined according to the European Landscape Convention as '*an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*'.

The assessment is informed by EPA draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2017 and the methodology prescribed in the Guidelines for Landscape and Visual Impact Assessment, 3rd edition, 2013 (GLVIA) published by the UK Landscape Institute and the Institute for Environmental Management and Assessment.

10.1.1 Landscape

The effects on landscape are studied with Landscape Character Assessment (LCA) as the guiding principal. This is concerned with the identification of and assessment of the importance of landscape characteristics, landscape quality and the condition of the landscape. According to the Guidelines for Landscape Visual Impact Assessment (GLVIA)[9], 'Landscape' results from the interplay between the physical, natural and cultural components of our surroundings. Different combinations and spatial distribution of these elements create variations in landscape character. Landscape character assessment is how landscape is described. It is the means by which we understand the effects of development on the landscape as a resource.

The impact of the development itself is studied as the impact of the proposals and development on the landscape, whilst 'effect' describes the changes brought about these impacts e.g. a change to landscape character.

10.1.2 Visual

The visual assessment aims to assess the extent of visibility of a development, define the sensitivity of receptors and set out the likely perception of viewers and visually sensitive receptors. This is largely to do with views and visual amenity. 'Visual' addresses the effects on specific viewpoints of the proposed development as it is experienced by general viewers and those inhabiting the local area. The effect on the views and general visual amenity is assessed. In short, visual assessment is concerned with changes that arise in

[9] Landscape Institute and the Institute of Environmental Management and Assessment, 2013 Guidelines for Landscape and Visual Impact Assessment 3rd Edition (GLVIA)

the composition of available views, the response of people to these changes and the overall effects on the area's visual amenity.

10.2 Methodology

Landscape assessment, of potential landscape effects, involves assessing and classifying the sensitivity of the landscape as a resource and then describing and classifying the magnitude of landscape change which would result from the development. The combination of sensitivity and magnitude of change gives a classification for the significance of the landscape effects. The 'impact' of the development is the action which results in landscape and visual changes, 'effect' refers to the changes brought about by such an impact. The effect may result in the alteration of the landscape character of the area. 'Effect' is defined as the change or changes resulting from those actions, e.g. a change in landscape character, or changes to the composition, character and quality of views in the receiving environment. This report focusses on these effects.

10.2.1 Thresholds of Magnitude of Change

A set of viewpoints were studied for the visual section of the report and a general landscape photographic study was conducted to examine and confirm the landscape character, its form and pattern in the area of the site. This was part of a field study conducted.

Various tools, techniques and criteria are used to judge landscape capacity and sensitivity. Thresholds of magnitude of change are established by using such tools. In addition to examining local LCA's, the field study was conducted to establish the magnitude of change to the landscape and views.

Assessment of "significance of landscape effects" requires a review of landscape character assessments at local level and establishing sensitivity against which any predicted change can then be measured. This involves a desk study review of published landscape characterisation studies and assessment of sensitivities for the case in hand.

Field observations are used to confirm decisions to assess landscape character and confirm landscape character against the desk top study. It is also used to assess the appropriateness of the landscape character type for this landscape.

Subjective information on less tangible characteristics are also recorded to inform the impressions or perceptions of the landscape and landscape value.

Ordnance Survey and other published information such as historical maps are also useful in examining the landscape and its capacity for change.

The character, quality, scale and value of the landscape is assessed according to the criteria below.

10.2.2 Landscape Quality

Landscape quality is primarily a matter of how clearly the distinctive character of a landscape is expressed in an area, and of the state of repair or condition of landscape elements and the integrity and intactness of the landscape. There are three categories of quality ranging from high to medium to low.

- High – landscapes strong in character or distinctive character, in good condition and very few or no incongruous features. Excellent example of a landscape type.
- Medium – moderate strength of character and retain many key characteristics. Such a landscape will typically have suffered some decline and is marked by the occasional incongruous feature/s.
- Low – landscapes with weak strengths of character, fragmented and/or featuring significant atypical incongruous or discordant features.

10.2.3 Value

The value of a landscape reflects its value to society and in estimating this, the report sets out to establish levels of importance of the potentially affected landscape aspects of the landscape that are valued, to whom and for what reason. It refers to the relative value we attach to different landscapes and is the basis for designating or recognising certain highly valued landscapes. The reasons a landscape is valued are many and varied. It can include a landscapes' scenic quality, its tranquillity or its wilderness attributes. It may be highly valued at a national or local level due to conservation reasons or cultural associations.

Landscape value is categorised from high to medium to low.

- 'High' value landscapes covered by a national designation for landscape value and display a high number of locally valued features present or are very highly valued as a landscape for other reasons.
- 'Medium' value landscapes are landscapes not covered by designation for landscape value. These landscapes may have a moderate number of locally valued features present or they are moderately valued as a landscape for other reasons.
- 'Low' value landscapes are those not covered by a local or national designation for landscape with very few locally valued features present and not locally valued as a landscape for any other reason. A landscape with a low value may be degraded, display numerous incongruous features and have no obvious local association.

Landscape can also be seen to be valued at community level or for intangible reasons can be perceived to be valuable to a particular community. It may be valued for the elements that remain of a once more finely articulated landscape, with all its associations and connections over time.

10.2.4 Landscape Sensitivity

Landscape sensitivity refers to the degree to which a landscape can accommodate change without adverse effects on the landscape or its character. It has regard for the value placed on the landscape at all levels, how it is used, the patterns of the landscape, its sense of enclosure or openness and all, of its visual receptors.

The nature and scale of development also reflects on sensitivity. The sensitivity of the landscape to a particular development considers the susceptibility of the landscape and its value. This susceptibility is referred to in the GLVIA3 as;

> *"the ability of the landscape to accommodate the Proposed Development without undue consequences for maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies".*

It goes on to state the level of sensitivity in LVIA

> *'is specific to the particular project or development that is being proposed and to the location in question'* p88.

To establish landscape sensitivity professional judgement is used to define the sensitivity of the receiving landscape by combining the judgments of landscape susceptibility to the development with its value.

The nature and scale of development also reflects on sensitivity. Five categories are used to classify sensitivity.

Sensitivity Descriptions

Very High Areas;

Such landscapes are unique both nationally and internationally and are usually designated due to their biological diversity or heritage status. The landscape features are well, defined and the landscape exhibits very strong, positive character with valued elements and characteristics. Historical character and time depth combine with natural features to give an experience of unity, richness and harmony. The landscape character is such that its capacity to accommodate change in the form of development is very low as it is highly important to and contributes strongly to excellent representation of its landscape character type or types. Such landscape may represent areas of exceptional scenic beauty with exceptional perceptual and scenic qualities. The priority for such unique and rare landscapes is the protection of their existing characters from change.

High Areas;

Where the landscape exhibits strong, positive character with valued elements, features and characteristics and is locally, regionally, nationally rare. Such landscapes are quite often designated for reasons of heritage biodiversity or the existence of important features. The landscape character has a limited or low capacity to accommodate change in the form of development given its strongly defined features making a large contribution to their intrinsic characters. High levels of scenic beauty pertain combining with features and character give a strong sense of place. Vulnerable to a lot of change, the principle objective for the area is the conservation of existing landscape character.

Medium Areas;

Undesignated landscapes, where the landscape has certain valued elements, features or characteristics but where the character is mixed or not particularly strong, or has evidence of alteration, degradation or erosion of elements and characteristics. The landscape in such an area may exhibit potential for replacement or substitution. The landscape of these areas will also retain some of its original or intrinsic character but has also been affected by modern/ recent influences. The landscape character is such that there is some capacity for change in the form of development. With good representation of the landscape character type and a moderate historical influence, these areas may be recognised in landscape policy at local or county level and the principle management objective may be to consolidate landscape character or facilitate appropriate, necessary change. Typically, these landscapes will have moderate levels of scenic beauty, common in their locality but may be locally valued. They will have some resilience or tolerance to certain types of change.

Low Areas;

Undesignated landscapes, where the landscape has few valued elements, features or characteristics and the character is weak or has potential to be replaced. Considerable erosion of landscape character indicates such landscapes have capacity for change; where development would make no significant change or would make a positive change. There is little historical landscape character in evidence. With low or no scenic beauty, the principle management objective may be to facilitate change through development, repair, restoration or enhancement.

Negligible Areas;

Undesignated landscapes, where the landscape exhibits negative character, with no valued elements, features or characteristics, making it a good candidate for replacement. The landscape character has a high capacity to accommodate change. With negative aesthetic and perceptual factors in evidence, development would make no significant change or would make a positive change. Such landscapes include derelict industrial lands or extraction sites, as well as sites or areas that are pinpointed for a particular type of development. With no scenic beauty, the principle management objective for the area is to facilitate change in the landscape through development, repair or restoration.

10.2.5 Geographical Extent

Having regard to the geographical extent of landscape effects, it is important to iterate the effects which may have an influence on differing scales at landscape level.

The effect at (a) site level will refer to the effect within the site itself and at (b) the level of the immediate setting of the site and (c) at the scale of the landscape type or character area. Some effects may have a geographical extent (d) ranging over several landscape character areas.

10.2.6 No Loss of Landscape Elements

In addition to effects which result in the loss of landscape elements, it is possible to have effects which cause no loss of landscape elements and no removal of existing components but there is an introduction of new elements e.g. buildings which alter the skyline or arise over the tree line. In such a case, scale can be seen to alter the landscape character and quality of visual amenity.

In this report landscape elements primarily relate to topography, hedgerows and field patterns on a wider scale. Partial loss of landscape elements is examined.

10.2.7 Magnitude of Landscape Change

Magnitude of change is a factor of the scale, extent and degree of change imposed on the landscape by a development, with reference to its key elements, features and characteristics ('landscape receptors'). Five categories are used to classify magnitude of change.

Description of the Categories of Landscape Change Magnitude

- **Very High**

  Change that is large in extent, resulting in the loss of or major alteration to key elements, features or characteristics of the landscape and/or introduction of large elements considered totally uncharacteristic in the context. Such development results in fundamental change in the character of the landscape with a loss of landscape quality and perceived value. .

- **High Change**

  Change that is moderate to large in extent, resulting in major alteration to key elements, features or characteristics of the landscape and/or introduction of large elements considered uncharacteristic in the context. Such development results in change to the character of the landscape.

- **Medium Change**

  Change that is moderate in extent, resulting in partial loss or alteration to key elements, features or characteristics of the landscape, and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic in the context. Such development results in change to the character of the landscape but not necessarily reduction in landscape quality and perceived value.

- **Low Change**

  Change that is moderate or limited in scale, resulting in minor alteration to key elements, features or characteristics of the landscape, and/or introduction of elements that are not uncharacteristic in the context. Such development results in minor change to the character of the landscape and no reduction in landscape quality and perceived value.

- **Negligible Change**

  Change that is limited in scale, resulting in no alteration to key elements features or characteristics of the landscape, and/or introduction of elements that are characteristic of the context. Such development results in no change to the landscape character, its quality or perceived value.

10.2.8 Significance of Effects

To classify the significance of effects, the magnitude of change is measured against the sensitivity of the landscape using the guide in Table 10.1 below. The matrix is only a guide. The assessor also used professional judgement informed by their expertise and experience to arrive at a classification of significance that is reasonable and justifiable.

Table 10.1: Guide to Classification of Significance of Landscape and Visual Effects

		Sensitivity : Landscape/View				
		Very High	High	Medium	Low	Negligible
Magnitude of Change : Landscape/View	Very High	Profound	Profound to Very Significant	Very Significant to Significant	Moderate	Slight
	High	Profound to Very Significant	Very Significant	Significant	Moderate to Slight	Slight to Not Significant
	Medium	Very Significant to Significant	Significant	Moderate	Slight	Not Significant
	Low	Moderate	Moderate to Slight	Slight	Not Significant	Imperceptible
	Negligible	Slight	Slight to Not Significant	Not Significant	Imperceptible	Imperceptible

10.2.9 Duration of Effects

The duration of effect is categorised in this report as short term 0-5 years, medium term 5-10 years and long term 10-20 years whilst greater than 20 years is regarded as a permanent effect.

10.2.10 Guidelines

The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, Draft, 2017 describes the significance classifications as follows:

- **Imperceptible**: An effect capable of measurement but without significant consequences.
- **Not significant**: An effect which causes noticeable changes in the character of the environment but without significant consequences.
- **Slight:** An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.

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

10.3 Methodology for Visual Effects Assessment

Assessment of visual effects involves identifying a number of key/representative viewpoints in the site's receiving environment, and for each one of these classifying the viewpoints sensitivity and the magnitude of change which would result in the view. These factors are combined to arrive at a classification of significance of the effects on each viewpoint.

Viewpoint sensitivity is a function of two main considerations which are described below

10.3.1 Susceptibility of the Visual Receptor to Change

This depends on the occupation or activity of the people experiencing the view, and the extent to which their attention is focussed on the views or visual amenity they experience at that location. Visual receptors most susceptible to change include residents at home, people engaged in outdoor recreation focused on the landscape (e.g. trail users), and visitors to heritage or other attractions and places of community congregation where the setting contributes to the experience. Visual receptors less sensitive to change include travellers on road, rail and other transport routes (unless on recognised scenic routes), people engaged in outdoor recreation or sports where the surrounding landscape does not influence the experience, and people in their place of work or shopping where the setting does not influence their experience.

10.3.2 Value Attached to the View

This depends to a large extent on the subjective opinion of the visual receptor but also on factors such as policy and designations (e.g. scenic routes, protected views), or the view or setting being associated with a heritage asset, visitor attraction or having some other cultural status (e.g. by appearing in arts). Five categories are used to classify a viewpoint's sensitivity.

10.3.3 Viewpoint Sensitivity and Categories of Viewpoint Sensitivity

The sensitivity of the visual receptors to a particular development is a combination of, the susceptibility of the viewpoint and its value. According to the GLVIA 3 sensitivity is a:

> "*term applied to specific receptor, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value to that receptor.*" p 158.

001 Killeshin Rossmore

002 The Windy Gap

003 Aharney

004 Slieve Bloom Mountains

005 Rock of Dunamaise

006 Grange, Mountmellick

007 The Heath

008 Raheen

009 Killamuck

010 Raheenleagh

011 Castletown

012 Clonaslee

013 Oughaval Woods, Stradbally

With respect to protected views and prospects, it is the policy of LCC "*to protect these views and prospects and to discourage development which would materially affect these amenity views and prospects and ensure that appropriate standards of location, siting, design, finishing and landscaping are achieved.*"

Of these viewpoints and prospects, the closest is situated in Oughaval Woods, near Stradbally. The views are in the west to north westerly direction and in the north east to south easterly direction.

This combined with the distance from the site means that these viewpoints will not be affected by the proposed Project

10.4.6 Hedgerow Policy

The LCC policy objectives in relation to hedgerows are as follows;

- **NH27**
  Protect existing hedgerows from unnecessary removal in order to preserve the rural character of the countryside and promote biodiversity;
- **NH28**
  Insist on the use of native species when planting new hedgerows;
- **NH29**
  Ensure cutting of hedges within the control of the Council only takes place at pemitted times unless absolutely necessary in the interests of safety.
- **NH30**
  Recognise the historical and archaeological importance of townland boundaries,

including hedgerows, and promote their protection and retention

The hedgerow policy as outlined above and the landscape policies marry neatly in their application to this site.

The field pattern surrounding the site is defined and enclosed by the hedgerow system. Therefore, both policies are treated together for the purposes of this report.

10.4.7 Tourism Policy

The Laois CDP, examines tourism and with respect to landscape has iterated that:

> *"there is provision for a wide range of outdoor active pursuits including golfing, walking, vintage car-rallies, music events, heritage tours and equestrian sports. Emo Court and Gardens, Heywood Gardens, Rock of Dunamaise, Donaghmore Famine Musuem, Sliabh Bloom Mountains and Abbeyleix Heritage House are the main tourist destinations in the county". The policy notes that infrastructure has and will allow access to the Greater Dublin Area making Laois "a very accessible and attractive destination for short breaks for visitors in Ireland or as part of a longer stay by visitors from abroad."*

The proposed Project will not affect the Co. Laois tourism policy objectives as they relate to landscape.

10.4.8 Characteristics of the Proposed Project

The site consists of an area which is currently subject to agricultural use and was in a crop of winter cereal at the time of writing this report (December 2019) and in a ripening cereal crop later in June 2020.

The proposed activity, which includes the removal of overburden and extraction of underlying sand and gravel, will result in the lowering of the contours down to 69.19m OD at lowest point to 72.919m OD.

The proposed works will consist of the following:

- Quarry activities for the extraction of and processing of sand and gravel within a c. 12ha site at Garrans;
- On site processing of the material to include extraction, washing, sizing, screening and stockpiling;
- Intermittent crushing of oversized aggregate material;
- Dispatch of the processed materials off-site on Heavy Goods Vehicles (HGVs);
- Installation of site wheel wash, refuelling area, oil interceptors and storm water attenuation/sediment settlement and sludge settlement ponds;
- Development of a, 3No. lay-bys on the local road L7939, a new site entrance and internal site access road;
- Landscaping works to include a planted berm running next to the site entrance and southern boundary of the site;

- Provision of site office, welfare facilities and all ancillary development infrastructure; and
- Final restoration of the site.

The wash plant for the washing, screening and sizing of the sand and gravels will be remain in the one location for the duration of the works. There will be other mobile plant and vehicles used on-site for activities such as stripping, excavation, soil movement and stockpiling etc.

There will be no blasting required on-site and the intermittent crushing activities will be undertaken at the back of the site (towards the northern boundary).

The landscape and restoration plan will be implemented during the operational and decommissioning phases of the proposed Project. The excavation volume is c. 1.22 million tonnes over c. 20 years with an average of 200 tonnes per day. Operations are to be conducted in four phases.

The landscape of this part of County Laois, is characterised by long views across terrain ending in wooded hill tops. This proposed Project will not affect any such landscape characteristics as quarrying by its nature does not result in protrusions or buildings arising out of or into the landscape. The fact that excavation descends rather than ascends, means that long or distant views won't be affected by the proposed Project.

The natural landscape characteristics of undulating rolling terrain, dense hedgerows and good tree lined areas means that the proposed Project is well screened within the overall landscape context and the effects of the project are limited to a small area of the County.

The proposed Project will not have any impacts on designated tourism routes and the viewpoints identified as above in Laois County Development Plan.

The main tourism plan to which the County subscribes is "Irelands Ancient East". This branding by Failte Ireland is recognised in the County Development Plan. The Laois County Development Plan states;

> "*The aim of the branding is to inspire visitors to travel to the Ireland's Ancient East by appealing to their interest in local culture and heritage. Under the Ireland's Ancient East Programme, signage has been installed at the following sites: Emo Court, the Rock of Dunamaise, Heywood Gardens, Timahoe Round Tower and Abbeyleix Heritage House. It is the aim of Laois County Council to facilitate and encourage signage at further sites of importance including Donaghmore Workhouse and Agricultural Museum, Aghaboe Abbey, Killeshin Romanesque Church and others.* "

It also states that;

> *"County Laois is home to a number of nationally renowned visitor attractions including; the Rock of Dunamase, The Round Tower Timahoe Aghaboe Abbey;*

the Slieve Bloom Mountains, the Rivers Nore and Barrow" recognised" *as Important Tourism Attractions."*

None of the above named attractions will be affected in any way by the proposed Project given their distances from the site.

The proposed Project won't be seen from the nearby Inch House and Ballyrider House which offer accommodation locally.

The visual aspects of the proposed Project are primarily concerned with views from the closest residences and roads within the area. No amenities, hotels, other roads or residences will be affected.

In examining the proposed Project, the extent of the area of landscape subject to change was considered along with the extent to which existing landscape elements will be lost and the extent to which perceptual aspects of the landscape are altered and whether the effect, changes the key characteristics of the landscape.

Additionally, for both the landscape and visual assessment of the proposed Project, the scale at which effects may have influence (e.g. site level, immediate setting, landscape type/character area) and the duration of the effect and at restoration whether full or partial reversibility is possible, was considered.

A general photographic survey was conducted to establish the general adherence with the LCA as described and to note particularities of the specific landscape.

Still shots were taken with a Cannon Eos 60D at circa 1.5 m above ground level.

10.5 Predicted Impacts

10.5.1 Landscape: Construction Phase

The construction phase of the proposed Project is in unison with the operational phase, given the nature of extraction.

10.5.2 Landscape: Operational Phase

The operational phase of extraction constitutes stripping soil, generating bunds and stockpile storage areas and then extraction, washing and screening of the sand and gravel. This will require a material crushing and screening area, a material aggregate washing area (which will stay in place for the duration of the works), a wheel wash and weigh bridge. Sludge settlement and surface water collection ponds will also be constructed. A site entrance and internal access road will also be provided. There will also be a site office with welfare facilities. Refer to Appendix 2.1 for Site Layout Plan details.

The proposed Project will change the landscape. The primary change will be the change to the topography and the removal of some of the hedgerow on site. In terms of loss of landscape elements, the portion of hedgerow running through the interior of the site constitutes the main loss. The boundary hedgerows will be protected and remain and their longevity increased by a careful maintenance and management strategy.

The landscape plans and the mitigation strategy will ensure that new planting will increase the strength of the boundaries for future years. The topography will change as will its form, but the landscape pattern can remain and be enhanced and protected over a period of greater than twenty years. The north western boundary will remain unchanged and free of any damage as there will be no excavation in this portion of the site. The landscape pattern and current low lying topography and tree and hedgerow line will remain unchanged in this section.

Sensitivity

The landscape sensitivity was rated medium as lowland agricultural typology has capacity for change with careful management of the change.

Magnitude of Change

By referring once again to the definition by which medium change is defined;

> "*change that is moderate in extent, resulting in partial loss or alteration to key elements, features or characteristics of the landscape, and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic in the context. Such development results in change to the character of the landscape but not necessarily reduction in landscape quality and perceived value*",

The extraction activities fit neatly into this category for this landscape type.

The magnitude of change is therefore medium.

Significance

Setting the magnitude of change, medium, against a medium landscape sensitivity as outlined in Table 10.1 above gives an effect that is moderately adverse in significance in the medium to long term.

This is accordant with the EPA definition of moderate effect as:

> *"an effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends. "*

10.5.3 Landscape: Restoration Phase

Sensitivity

The landscape sensitivity was rated low at the restoration phase as by definition such a landscape is so rated "*where development would make no significant change or would make a positive change. Such landscapes are generally unrecognised in policy and the principle management objective may be to facilitate change through development, repair, restoration or enhancement.*"

Magnitude of Change

As outlined above the definition for medium magnitude of change is change:

> *'that is moderate in extent, resulting in partial loss or alteration to key elements, features or characteristics of the landscape, and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic in the context. Such development results in change to the character of the landscape but not necessarily reduction in landscape quality and perceived value.'*

The change at the restoration phase will be positive and will also result in the restoration of the landscape in a manner that will mean there is no large reduction in landscape quality and perceived value from its current status.

The magnitude of change for the restoration phase was therefore considered medium and positive.

Significance of Effects

Setting the magnitude of change, medium, against a low landscape sensitivity as outlined in Table 10.1 above, gives an effect that is slight and positive in significance in the medium to long term. This is accordant with the EPA definition of slight effect as an

> "*effect which causes noticeable changes in the character of the environment without affecting its sensitivities.*"

This rating was given with the expectation that the crucial role of the boundary hedgerow system and hedgerow trees will enshrine the landscape pattern in a strong cohesive manner. The final restored profile of the site will also be important in confirmating this rating for significance of effects.

10.5.4 Visual Assessment

In conducting the visual assessment for the proposed Project issues relating to views and viewpoints were considered including the amount of time over which a view would be experienced, the angle of the view and whether views would be full partial or glimpsed. The distance from the proposed Project was considered and the extent of the area over which the proposed works would be visible.

Again, as for the landscape effect, the duration of the construction, operation and restoration phases were considered. As previously iterated short term was identified as 0-5 years, medium term as 5-10 years, long term as 10-20 years whilst greater than 20 years was considered permanent. For the restoration phase the potential for full or/and partial reversibility was also considered.

As described in Table 10.1 above the magnitude of change is judged according to a set of criteria with results ranging from very high to negligible. Judgements were made based on the size of the proposed works and the geographical extent of the viewpoints. Consideration was also given to duration of effects as outlined above. Reversibility was considered at restoration phase. In choosing the viewpoints to be assessed the scale at which the proposed Project will have influence was considered and this was considered within the magnitude of change as assessed.

Deriving from the photographic survey, the viewpoint survey was undertaken which involved taking still digital photographs from a number of locations. The photographs were taken at eye level (c. 1.5 metres above ground level) at the points indicated, towards the site. The viewpoint locations are shown in Appendix 10.1. The photographs are contained in Appendix 10.2. The standing position is +- 5m of the position indicated on the viewpoint location map. The most representative photographs were chosen for each location.

Overall, it was considered that the potential for negative visual impacts arising from the construction, operation and restoration of the proposed Project will generally be limited due to:

- Its distance from sizeable populations;
- The existing undulating topography and the manner in which the site in question is nestled between hills;
  The phasing of excavation and backfilling from construction and operational phases to restoration works;
- Site infrastructure is temporary and mobile with the wash plant and weighbridge obscured within the site for the duration of the works and removed afterwards.
- The presence of well planted woodlands and forestry along with a generous, rich hedgerow network, further ensures limited negative visual impact from the proposed Project.

10.5.5 Visual: Construction Phase

As for the landscape assessment, the nature of excavation combined with the intent to phase the operations means that it is better to consider the construction phase and the operational phase as one for the purposes of the visual assessment.

10.5.6 Visual: Operational Phase

In addition to the stripping of overburden and storage of topsoil and sub soils, the operational phase will involve a material crushing and screening area, a material aggregate washing area, a wheel wash to remain en situ for the duration and a weigh bridge. Sludge settlement and surface water collection ponds will also be constructed.. The site entrance and internal access is to be upgraded. There will also be a site office with welfare facilities. Each phase is to be completed consecutively with its own set of access and stockpile points.

The operational phase will not have any impacts on designated scenic roads and viewpoints listed in the Laois County Development Plan, because of its location and the intervening undulating topography and screening by a thick network of hedgerows, woodlands and trees.

The selected viewpoints were assessed as outlined in Table 10.2 below.

The sensitivities at each viewpoint is set against the magnitude of change to arrive at a significance of effects as outlined in Table 10.1 above.

As part of the iterative design process, the construction of temporary berms has been examined with respect to their form and shape. The improvement of the form and shape of the berms significantly improves the visual impact of the proposed Project for PL1. PL2, PL3, PL4 and PL6. The construction of these temporary berms will reduce the impact of the excavation at the affected viewpoints and this has been accounted for, when undertaking the assessment.

Table 10.2 Predicted Visual Impact on Viewpoints Assessed for the Construction/Operational Phases

Refer to Appendix 10.1 for Viewpoint Location Map (with a screenshot provided below in Figure 10.1.

Viewpoint No.*	Location	Sensitivity	Magnitude of Change	Significance of Effects	Nature of effects
PL 1	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Adverse
PL 2	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Adverse
PL 3	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Adverse
PL 4	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Adverse
PL 5	Garrans, Btwn R427 R428	Medium	Low	Slight	Adverse
PL 6	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Adverse
PL 7	Garrans, Btwn R427 R428	Medium	Low	Slight	Adverse
PL 8	Garrans, Btwn R427 R428	Medium	Low	Slight	Adverse

Viewpoint No.*	Location	Sensitivity	Magnitude of Change	Significance of Effects	Nature of effects
PL 9	Garrans, Btwn R427 R428.	Medium	Low	Slight	Adverse
PL10	Garrans, Btwn R427 R428	Medium	Low	Slight	Adverse
PL11	Garrans, Btwn R427 R428	High	Negligible	Slight to Not Significant	Adverse
PL12	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 13	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 14	Garrans	Medium	Negligible	Not Significant	Neutral
PL 15	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 16	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 17	Garrans	Moderate	Negligible	Not Significant	Neutral
PL 18	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 19	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 20	Garrans	High	Low	Moderate to Slight	Adverse
PL 21	Garrans	High	Low	Moderate to Slight	Adverse

Viewpoint No.*	Location	Sensitivity	Magnitude of Change	Significance of Effects	Nature of effects
PL 22	Garrans	High	Low	Moderate to Slight	Adverse
PL 23	Garrans	High	Negligible	Slight to Not Significant	Neutral

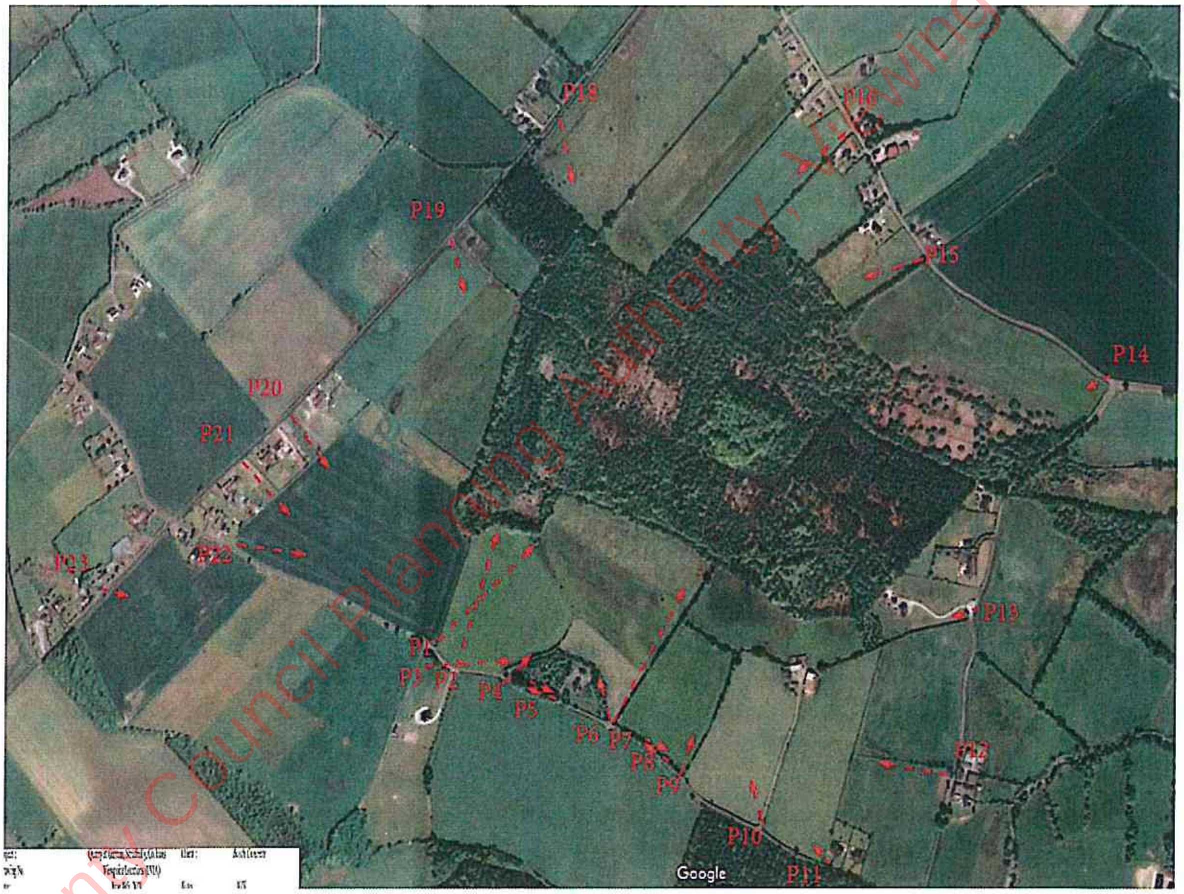

Figure 10.1: Viewpoint Locations (Refer to Appendix 10.1)

Summary Text for Viewpoints

Viewpoints PL1-PL3, PL4 and PL6 and PL22 experience the highest level of visual impact significance. Given that these viewpoints have a high level of visual sensitivity, it has been necessary to mitigate the visual effects of the proposed Project as part of the iterative design process and to introduce an interim Landscape Plan which will coincide with the construction and operation phase. Viewpoints PL1-3, (across from the site entrance on the local road L7939) and PL4 and 6 (bounding the project on the same side of the road) represent the closest residential viewpoints to the project. Viewpoint 22 also represents residential viewpoints which, whilst further away, also require mitigation as outlined in the interim landscape plan to allow for screening into the site. According to the matrix as outlined above in Table 10.1, setting a high level of visual sensitivity against an ultimately low level of impact yields a moderate to slight significance of visual effects. In the case of these residential viewpoints, this should read as a moderate level of significance given their proximity to the proposed Project.

PL5, PL7-Pl10 represent road users whose landscape experience is fleeting or glimpsed depending on the speed of travel (walking, cycling, driving). The sensitivity of such receptors at these viewpoints is medium. Setting this sensitivity against the magnitude of impact low as outlined in Table 10.1 above, yields a significance of effect that is slight.

PL11 is a residential viewpoint at the base of a slope. The sensitivity of the viewpoint is high. The topographical situation of the viewpoint coupled with its distance from the proposed Project and the intervening hedgerows means that the magnitude of change here will be negligible. Setting the magnitude of change against the viewpoint sensitivity results in a slight to not significant effect as outlined in the matrix in Table 10.1 above.

The location points from PL12 to PL19 read as having "slight to not significant" effects following the matrix as outlined in Table 10.1. However, there are no effects among the receptors at these viewpoints and therefore in each of these cases the category "not significant" is most appropriate. The topography, the mature nature of the intermediate forestry and woodlands, and the distance of the visual receptors from the site means that, although viewpoint sensitivity is high at the residential viewpoints and medium for road users, the magnitude of change is negligible as the project won't be seen. The visual effect therefore is not significant.

Viewpoints PL20-PL21 will benefit from the strengthening of the western boundary hedgerow and although they have a high level of viewpoint sensitivity, the magnitude of change is low. Setting this magnitude of change against the viewpoint sensitivity as in Table 10.1 above this means that significance of effect is moderate to slight. The greater distance of these viewpoints from the project means in the case of viewpoints PL20 and PL21 the significance should read as slight.

PL23 represents visual receptors with high viewpoint sensitivity. Because of the distance from the site and the very well, established network of intervening hedgerows, the magnitude of change is negligible. This results in a significance of effect that is slight to not significant as in the matrix in Table 10.1. Given the distance of the receptor from the site, this should read as not significant

10.5.7 Visual: Restoration Phase

The phasing of the operation and construction process and the construction of temporary berms during this time means that the work at restoration phase is also screened for as long as possible. This will minimise the views into the area being actively restored and open to public view at any one time. The deep excavation and levels attained in the excavation phase also help with screening at the restoration phase. This means that the views into the site at restoration stage will be limited and temporary. This constitutes a very small impact.

As discussed, for the operational and construction phases, most visual receptors be they residents of local dwellings or road users are already fully or partially screened from the site by a combination of layers of hedgerows, the undulating nature of the surrounding topography, the hedgerow trees, afforestation and woodland. The direction of backfilling will also minimise the impacts on views from nearby residences.

The restoration phase will not have any impacts on designated scenic roads and viewpoints listed in the Laois County Development Plan, because of its location and the intervening undulating topography and screening by a thick network of hedgerows, woodlands and trees.

Throughout the restoration phase, plant, equipment and backfilled soil may potentially be slightly visible immediately beyond the boundaries but given that most of the work will be within the site and this will have been excavated down at this stage, the impact will be slight, adverse and temporary for some of the viewpoints (such as PL1, PL2, PL3,PL6, PL7).

For the purposes of this visual impact assessment, the end result of the restoration phase and its visual impact on the selected viewpoints is what was measured for each location point selected in Table 10.3 below.

This assessment takes into consideration that mitigation measures will be adhered to and a Landscape Plan will also be implemented at restoration phase.

Table 10.3 Predicted Visual Impact on Viewpoints Assessed for the Restoration Phase

Viewpoint No.	Location	Sensitivity	Magnitude of Change	Significance of Effects	Nature of effects
PL 1	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Positive
PL 2	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Positive

Viewpoint No.	Location	Sensitivity	Magnitude of Change	Significance of Effects	Nature of effects
PL 3	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Positive
PL 4	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Positive
PL 5	Garrans, Btwn R427 R428	Medium	Low	Slight	Positive
PL 6	Garrans, Btwn R427 R428	High	Low	Moderate to Slight	Positive
PL 7	Garrans, Btwn R427 R428	Medium	Low	Slight	Positive
PL 8	Garrans, Btwn R427 R428	Medium	Low	Slight	Positive
PL 9	Garrans, Btwn R427 R428.	Medium	Low	Slight	Positive
PL10	Garrans, Btwn R427 R428	Medium	Low	Slight	Neutral
PL11	Garrans, Btwn R427 R428	High	Negligible	Slight to Not Significant	Positive
PL12	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 13	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 14	Garrans	Medium	Negligible	Not Significant	Neutral
PL 15	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 16	Garrans	High	Negligible	Slight to Not Significant	Neutral

Viewpoint No.	Location	Sensitivity	Magnitude of Change	Significance of Effects	Nature of effects
PL 17	Garrans	Moderate	Negligible	Not Significant	Neutral
PL 18	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 19	Garrans	High	Negligible	Slight to Not Significant	Neutral
PL 20	Garrans	High	Low	Moderate to Slight	Positive
PL 21	Garrans	High	Low	Moderate to Slight	Positive
PL 22	Garrans	High	Low	Moderate to Slight	Positive
PL 23	Garrans	High	Negligible	Slight to Not Significant	Neutral

The visual impacts of the construction and operation phases are essentially reversed by the restoration phase. That is not to say that there is no net impact on landscape rather the visual impact is mostly mitigated and negative impacts reversed by the restoration process.

10.6 Mitigation Measures

The following landscape protection and landscape impact mitigation measures shall be put in place to avoid, eliminate or minimise any potential landscape and visual impact associated with the construction, operation and restoration phases for the proposed Project.

10.6.1 Avoidance

The hedgerows on the site boundary will be retained.

Any damage to the existing hedgerows which form the boundary of the site will be avoided. There will be no loading of soil, excavate, spoil or any materials onto the root system of the hedgerows or any of the hedgerow trees.

A root zone protection barrier will be set up and marked with signage indicating its purpose before any heavy vehicles move on site.

Trees on the north west corner of the site are currently vulnerable as there is a drop away outside the site boundary and they may suffer from vibrations at the root zone. To avoid the potential loss of these trees, they will be protected from disturbance to the root system to ensure longevity, for as long as possible. In the interim, additional tree planting as per the Landscape Plan recommendations will ensure that there is substitute trees ready to strengthen this existing stand in the landscape in the long term and as a permanent aspect of the landscape pattern. The Landscape Plan is provided in Appendix 10.6.

All hedgerows and tree stands will be reinforced with new planting wherever the opportunity presents itself.

Fraxinus excelsior will be avoided in new planting due to the current risk this poses to the spread of the fungal disease, *Chalara fraxinea (Hymenoscyphus fraxineus)* to existing stands of ash or ash as hedgerow trees in the area.

10.6.2 Over management

The hedgerow along the western boundary is key to screening the site but is currently overmanaged.

It will the subject of a different maintenance approach to become a more effective screen. The excessive bramble will be removed to permit whitethorn *Crataegus monogyna*, Blackthorn, *Prunus spinosa*, existing ash *Fraxinus excelsior* and Sycamore *Acer pseudoplatanus* to emerge. There may also possibly be beech, *Fagus sylvatica* hazel *Corylus avellana* and holly *Ilex aquifolium* in the hedgerow if it is allowed to emerge.

Bramble will be controlled as will grass species for a short time until the hedge re-emerges.
One tree shall be allowed to grow into a hedgerow tree at approximately 5m intervals.

A second hedgerow to be established parallel to this to future proof the landscape pattern and strengthen screening for visual receptors along this alignment of hedgerow. This to be done with no damage to the root system of the existing hedge. As part of the iterative design process an interim Landscape Plan has been prepared and this section of hedgerow is included as part of this plan.

Where the opportunity presents itself, the hedgerow will be thickened with new planting to reinforce the existing hedgerow.

10.6.3 Hedgerow Replacement

Where it is not possible to avoid the loss of hedgerow in the centre of the site, this is to be replaced as per the Landscape Plan (Appendix 10.6) at the restoration phase. This may require construction of a typical low field ditch to allow for changed drainage conditions and to attain initial height. This will also help maintain the spatial field and landscape pattern.

10.6.4 Historical Pattern Restoration

In mitigating the effects of excavation there is also an opportunity to restore the historical cultural landscape pattern as evidenced by the Ordnance Historical maps of Garrans in (i) Six inch colour 1837-1842 (ii)1888-1913 Black and White 25 inch maps (iii)Cassini 6 inch and (iv) Ordnance Survey historical flood plain records.

The evidence in the historical maps indicates the size of the field systems and the position of the hedgerows which define them. The central hedgerow which is seen from the western boundary hedgerow is currently almost obliterated with only one or two whitethorn in evidence along its length. The position of the hedgerow is still apparent but the hedgerow itself is of very low quality. The central hedgerow towards the eastern boundary is of good condition and this will be replaced as outlined in the Landscape Plan. All the boundary hedgerows will be protected. The Landscape Plan will replace the landscape trees lost due to field expansion during increased agricultural productivity over the years. This will replace the landscape pattern as evidenced in the Ordnance Survey maps. The tree planting will also ensure that the use of younger trees will guanantee the longevity of this landscape pattern into the future with the potential for this pattern to last in excess of two hundred and fifty years.

This evidence provides the basis for replanting the original landscape patterns and ensuring that this portion of the county has reinstated an example of the field spatial pattern. This will not only help mitigate the excavation work but will have a positive impact on landscape spatial patterns.

Tree and hedgerow planting also increase visual amenity and improve views from adjacent residential dwellings.

10.6.5 Landscape Form

In examining the landscape of the site, it is clear, particularly in the winter photographs of the field study (See Appendix 10.2 & 3), that the land form which underlies the landscape pattern generated by hedgerow and trees is a fine, softly contoured undulating landscape at the macro and micro scales. Just as the greater landscape form is undulating the form at field scale is also similarly wave like in shape. It runs slightly west to north east.

It will not be possible to replicate this form during the restoration phase but by softening the contours and making a less angular landform and instilling a little of the wave like pattern where possible and where materials underlying the topsoil permit, it is possible to mitigate somewhat for the loss of form.

Earthworks during the restoration works shall address as much as possible, the issue of landscape form in the reinstatement and reconfiguration of the subsoil and topsoil to development a natural appearance in the topographical flow of the new landscape as it emerges.

10.6.6 Temporary Berms

The use of temporary berms will assist greatly with reducing visual impact at the construction and operational phases and these shall be kept in place for as long as practicable until the landscape nears restoration completion. This is especially true for the first berm near the site entrance on the south.

Given that the extraction period is to be of the order of 20 years with the average extraction of 200 tonnes per day, then the berms constructed at each phase play an important role in screening. Because they will be in place for some time the visual receptors will benefit from some contouring of the berm facing the road giving it a softer less angular profile. It will appear more naturalistic and less anthropogenic and still effectively screen off the activity behind.

10.6.7 Landscape Maintenance and Management Plan

A Landscape Maintenance and Management Plan will detail the work to be undertaken to protect the hedgerow and hedgerow trees at the outset and the work involved with infill planting and all new planting.

This Plan will be maintained over the life of the operation and subsequently until the plantings are fully established. The Plan will involve irrigation where necessary, pruning, weeding, fertilising, trimming, removal of dead and diseased wood, hedgerow cutting, hand laying where required and general maintenance. Defects periods will be established and maintenance requirements during this period will also be established.

The mitigation measures as outlined are conducted throughout the life of the operation and its restoration. Placing each measure into its timeline according to construction, operational and restoration phases produces the following inventory;

Construction Phase

- Shaping, contouring and planting of berms.
- Establishing root protection barriers and avoiding any damage to hedgerow and hedgerow trees.
- Commencing hedgerow maintenance especially on western boundary.
- Assessing individual maintenance needs for all hedgerow trees and hedgerows.
- Infill planting to strengthen existing hedgerows.

Operational Phase

- Continue to maintain and manage hedgerows replacing any losses.
- Combine maintenance irrigation with foliage dust cleaning if required.
- Maintain all new plantings.

Restoration Phase

- Provide for off-site removal, re-use and/or recovery of all buildings, plant, infrastructure and paved surfaces on completion of restoration activities.
- Landscape Form Restoration: The final restoration landform will be graded at a shallow angle so as to merge in with the surrounding agricultural landscape. These mitigation measures are in accordance with the recommendations provided in the

DoEHLG (2004) publication Quarries and Ancillary Activities: Guidelines for Planning Authorities. Additionally, contouring and curving of the earthworks to soften angular profiles and reduce the appearance of straight edges will simulate to some extent the natural undulating landscape.

- Historical landscape pattern and spatial configuration to be restored.
- The Landscape Plan will be fully implemented (See Appendix 10.6).
- New hedgerow planting and associated soil preparation.
- A new Landscape Management Plan will be devised and implemented in the case of the existing hedgerows, during the life of the proposed Project and for the new landscape planting, after the restoration phase.
- Continue to maintain and manage the trees and hedgerow system, establish a defects period and hand over at the end of the restoration phase to ensure the permanent preservation of the landscape works.

10.7 Interaction of the Impacts

The main impacts which will interact will be noise, dust and air quality, biodiversity and soils. The Environmental Management Plan, put in place for air quality will simultaneously reduce the effect of dust on plant foliage which will ultimately affect tree and hedgerows (both new plantings and existing plant material). The inclusion of a Landscape Management Plan as part of the mitigation measures means that effective plant care especially irrigation can also negate the effect of dust.

Biodiversity, both floral and faunal will benefit from the maintenance and enhancement of the field system pattern and the use of native species. The avoidance of *Fraxinus excelsior*, in the planting plan species mix will not only protect existing landscape trees from the biologically infectious chalara disease, it will also protect the local habitats that ash supports for as long as possible, by avoiding this biosecurity risk.

The careful storage and stock piling of soils and the careful separation of sub soils and top soils is essential for the final restoration of the landscape. Without the careful management of the soils over the life of the proposed Project, the end result of a pleasantly restored landscape is not possible. Good soil is essential for all plant growth, grassland and tree and hedgerow establishment. This is reliant on the reestablishment of the correct soil profile.

10.8 Residual Impacts

The restoration of the landscape field pattern, with the new hedgerows will ultimately have a permanent positive impact on this aspect of landscape. Mitigation will be implemented to soften the effect of excavation on the undulating form of the site. However, this form as it currently exists will be changed. A new landscape form, will emerge, but it will not be the same as the existing.

With the implementation of the Landscape Plans (Appendix 10.6) and the Landscape Maintenance and Management Plan during the operational and restoration phases, there will be no significant residual impacts on the visual receptors and the surrounding landscape.

11. Biodiversity

This Chapter assesses the potential biodiversity and ecological impacts which may be generated during the construction, operational and restoration phases of the proposed Project.

Given the nature of the proposed works, the construction and operational phases have been considered as the one phase/process.

The proposed Project is not within or directly adjacent to any European or national designated sites. The site is connected to the River Barrow and Nore Special Area of Conservation (SAC) through a man-made drain on the site. This drain ultimately flows via a tributary to the Stradbally River. The Stradbally River meets the River Barrow and Nore SAC around 4.4km from the site.

The habitats on the site range from low- high value on a local basis. The treelines and hedgerows are important features, providing nesting sites and shelter for birds, bats and badgers. Badger presence was detected on and in proximity to the site and some of the trees on site offer roosting and hibernating potential for bats.

Impacts are mainly associated with habitat loss and fragmentation, disturbance to the local wildlife from machinery and site activities and impacts to hedgerows and treelines in the event of damage to their root protection areas.

Key mitigation for biodiversity includes:

- **Setting up a root protection barrier to protect the boundary hedgerows and treelines;**
- **Vegetation clearance will be undertaken outside of the bird nesting season (March – August inclusive) or under the supervision of a qualified ecologist;**
- **Prior to the removal of any trees, it shall be checked for the presence of roosting bats. If bats are present, the tree will be removed by derogation licence or when the bats are no longer using the tree;**
- **The site will be re-surveyed for badger activity prior to the commencement of each phase of quarrying;**
- **The badger sett in Phase 4 of the works will be resurveyed and excluded (if required) prior to the commencement of works in this phase; and**
- **An Environmental Management Plan (EMP) will be implemented on-site. This Plan will incorporate measures relating to the management of fuels, storage of flocculants, requirements for visual checks and emergency response (amongst others) (to protect the quality of surface water and groundwaters).**

Stradbally River & River Barrow and Nore Special Area of Conservation

The potential impacts on the Stradbally River which supports the River Barrow and Nore Special Area of Conservation (SAC) were considered.

Whilst proposed Project will use 70% of the collected surface water on-site, the remaining 30% will still reach the existing drain to the north of the site, at an appropriate greenfield rate, in line with existing conditions. This drain is intermittently connected via a tributary to the Stradbally River at certain times during the year (mainly winter).

In addition, the volume of collected surface water which will be used on-site (the collected 70%) represents a very small proportion of the overall flow already in the Stradbally River and the site area of c. 12 hectares, is very small when compared to the overall 10,400 hectare land catchment, providing run-off to the River. The loss of surface water will not impact surface water flows to the River and qualifying features of the SAC.

In terms of groundwater, the zone of contribution (ZOC) relating to the water supply borehole was assessed. The ZOC for the proposed borehole will be confined within the site boundary, flowing from the south south-east towards the north north-east. The loss of groundwater to the abstraction will not impact the groundwater flows to the River and qualifying features of the SAC.

The significance of any effects to the SAC, its catchment and the qualifying interests were considered imperceptible.

11.1 Introduction

11.1.1 Background

This Ecological Impact Assessment (EcIA) addresses the potential impacts of a proposed development that may occur in the future on the biodiversity and ecological integrity of a site at Garrans, Stradbally, Co. Laois. It has been prepared on behalf of Pat Booth to accompany a planning application for the development of a proposed quarry development on a c. 12.84 hectare site.

It follows a standard approach based upon the description of the existing baseline conditions within the development site. An evaluation of the likely habitats and species currently present within the proposed development site is also given, along with the identification of the potential ecological impacts arising from the construction and operation of the proposed Project. An assessment of the likely significance of the identified impacts on valued ecological receptors (VERs), both within and close to the development site was also made. Where a significant negative impact has been identified, then mitigation measures are provided in order to prevent, reduce or offset the impact.

Personnel

The site survey and report was carried out by Noreen McLoughlin. Noreen is the owner and main ecologist at Whitehill Environmental. Noreen holds a BA (Hons) in Natural Science (Mod) Zoology and an MSc in freshwater ecology (TCD, Dublin). She has been a full member of the CIEEM (Chartered Institute of Ecology and Environmental Management) for over 13 years.

11.1.2 Location and Setting

The site is located in a low-lying and rural area, in the townland of Garrans, approximately 2km north-east of Stradbally village. Access to the site will be via a proposed entrance that will be created just off the local road L7939.

A site location map is shown in Figure 11.1.

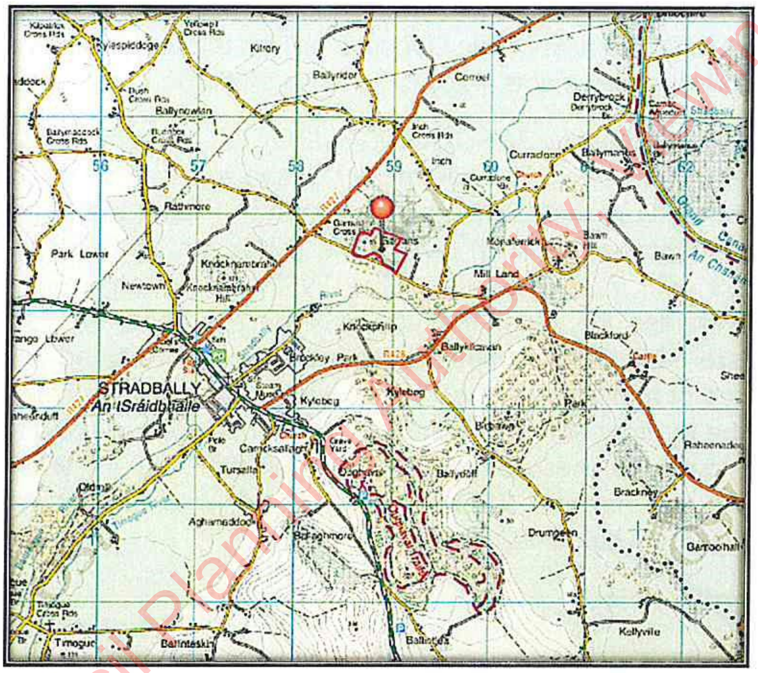

Figure 11.1: Map Showing the Location of the Site (Pinned)

11.1.3 Legislative and Policy Context

Legislative Context

The Irish Wildlife Act 1976 (and its amendment of 2000) provides protection to most wild birds and animals. Interference with such species can only occur under licence. Under the act it is an offence to "*wilfully interfere with or destroy the breeding place or resting place of any protected wild animal*".

The basic designation for wildlife is the Natural Heritage Area (NHA). This is an area considered important for the habitats present or which holds species of plants and animals whose habitat needs protection. Under the Wildlife Amendment Act (2000) NHAs are legally protected from damage. NHAs are not part of the Natura 2000 network and so the Appropriate Assessment process does not apply to them.

The Flora Protection Order 1999 provides statutory protection in Ireland to a number of rare plant species from being wilfully cut, picked, uprooted or damaged. It is also illegal under this order to alter, damage or interfere with their habitats.

The EU Birds Directive (Council Directive 79/409/EEC) implies that particular protection is given to sites (Special Protection Areas) which support certain bird species listed in Annex I of the Directive and that surveys of development sites should consider the status of such species.

The EU Habitats Directive (92/43/EEC) gives protection to sites (Special Areas of Conservation) which support particular habitats and species listed in annexes to this directive. Articles 6(3) and 6(4) of this Directive call for the undertaking of an Appropriate Assessment for plans and projects likely to have an effect on designated sites.

The Water Framework Directive (WFD) (2000/60/EC), which came into force in December 2000, establishes a framework for community action in the field of water policy. The overall aim of the WFD is the eventual achievement of good status in all waterbodies. The WFD was transposed into Irish law by the European Communities (Water Policy) Regulations 2003 (S.I. 722 of 2003). The WFD rationalises and updates existing legislation and provides for water management on the basis of River Basin Districts (RBDs). RBDs are essentially administrative areas for coordinated water management and are comprised of multiple river basins (or catchments), with cross-border basins (i.e. those covering the territory of more than one Member State) assigned to an international RBD. Ireland is now within the 2nd cycle of the WFD (2015 – 2021), where previous RBDs were merged into one national RBD. This cycle will also facilitate a greater input of communities at the local catchment level.

11.1.4 Planning Policies

National

Nationally, the Government's commitment to sustainable development is set out in the National Planning Framework (NPF) (Project Ireland 2040). The objective of this document is to address the future development and direction of cities, towns and rural areas in Ireland. Within this document, the importance of biodiversity is recognised as a 'natural asset' which can be promoted to support industries such as tourism but as an asset, it also requires appropriate protection.

Regional

The Regional Spatial & Economic Strategy (Eastern and Midland Regional Assembly) 2019-2031 is the strategic plan aimed at shaping future growth and better manage regional planning and economic development in the Eastern and Midlands Regions. This document is linked to the NPF 2040, in that it sets out at a regional scale, how to best achieve the

National Strategic Outcomes (NSOs) detailed in the NPF 2040. It sets out 16No. Regional Strategic Outcomes (RSO) that are linked to the NSOs, where RSO 11 specifically states

> *'Promote co-ordinated spatial planning to conserve and enhance the biodiversity of our protected habitats and species including landscape and heritage protection'*

Local

Planning policy at the local level is provided by the Laois County Development Plan 2017–2023. This plan contains a number of objectives and policies relevant to ecology, biodiversity and nature conservation. Some of the relevant measures for nature conservation that are outlined in this Plan are summarised in Table 11.1.

Table 11.1: Local Policies Relevant to Ecology and Nature Conservation

Reference	Objective / Policy
OBJ 1	To maintain, protect and where possible enhance the conservation value of existing European and national designated sites (SAC, SPA, NHA) in the county and any additional sites that may be proposed for designation during the period of this Plan;
OBJ 5	Ensure the protection of terrestrial, aquatic and soil biodiversity throughout the county and protect against invasive species.
BIO 2	Contribute, as appropriate, towards the protection of designated ecological sites including candidate Special Areas of Conservation (cSACs) and Special Protection Areas (SPAs); Ramsar Sites; Wildlife Sites (including Natural Heritage Areas, proposed Natural Heritage Areas and Nature Reserves); Salmonid Waters; Flora Protection Order sites; and Freshwater Pearl Mussel catchments (the River Nore Freshwater Pearl Mussel sub-basin management Plan should be referenced in this regard).
NH 2	Ensure that the following guidance is taken into account when assessing planning applications for extractive industry "Notice Nature Biodiversity Guidelines for Extractive Developments".
NH 3	Ensure that landscaping plans incorporate features or measures to foster biodiversity and enrich ecological networks.
NH 4	Preserve the County's extensive network of hedgerows and eskers which are of landscape and ecological importance.
NH 6	Implement the Habitats' Directive requirement to preserve other types of ecological linkages or stepping stones, such as railway embankments, road verges and ditches, riparian lands etc.
NH 9	No projects giving rise to significant cumulative, direct, indirect or secondary impacts on Natura 2000 sites arising from their size or scale, land take, proximity, resource requirements, emissions, transportation requirements, duration of construction, operation, decommissioning or from any other effects shall be permitted on the

Reference	Objective / Policy
	basis of this plan (Either individually or in combination with other plans or projects).
NH 16	Maintain and enhance the quality of the natural environment in its entirety as wildlife heritage is not just confined to designated areas.
NH 17	Minimise the impact of new development on habitats of natural value that are key features of the County's Ecological network.
NH 18	Ensure that proposals for development protect and enhance biodiversity, wherever possible, by minimising adverse impacts on existing habitats and by including mitigation and / or compensation measures, as appropriate, which ensure that biodiversity is enhanced.

Biodiversity and Heritage Plans

Ireland's National Biodiversity Plan identifies actions that need to be taken in order to understand and protect biodiversity in Ireland. It states that biodiversity and ecosystems in Ireland should be conserved and restored, to deliver benefits that are essential to all sectors of society and that Ireland should contribute to the efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally.

11.2 Methodology

11.2.1 Study Area

The study area encompasses all the land within the area defined in the plans submitted for planning consent, i.e., the proposed site. In addition, important ecological habitats and receptors within the zone of influence of the proposed Project were also studied.

11.2.2 Desk Based Studies

The desk study involved the examination of aerial photographs, current and historical maps and plans and drawings of the site. In addition, information was collated on designated nature sites within a 15km radius of the proposed site and on protected and rare species within the 1km square of the site.

The following data sources were accessed in order to complete a thorough examination of all impacts:

- National Parks and Wildlife Service - aerial photographs and maps of designated sites, information on habitats and species within these sites and information on protected plant or animal species; conservation objectives, site synopses and standard data forms for relevant designated sites.
- Environmental Protection Agency (EPA)- Information pertaining to water quality and geology within the area;

- National Biodiversity Data Centre (NBDC) – Information pertaining to protected plant and animal species within the study area;
- Pat Booth – Information regarding the proposed development including site plans and specifications;
- Tynan Environmental – Environmental Impact Assessment Reporting : Water & Supporting Hydrogeology and Hydrology for accompanying NIS;
- Laois County Council – Information on planning history in the area.

11.2.3 Field Based Studies

Visits to the site at Garrans and the protected habitats within the Zone of Influence of the site were undertaken by Whitehill Environmental on October 21st 2019 and 9th December 2019. On these occasions, field notes were taken and habitats within the site were classified and coded according to Level 3 of *A Guide to Habitats in Ireland* (Fossit, 2000). Mammal and bird activity within the site and its Zone of Influence was also noted.

A separate mammal survey of the site was conducted by Brian Keely of Wildlife Surveys Ireland on 12th November 2019. These surveys focused on terrestrial mammals, including badgers and otters. An assessment of the habitat suitability of the site for bats was also undertaken. The weather was deemed too cold and unsettled for a bat activity survey at this time.

11.2.4 Seasonal Constraints

Given the range of habitats on the site, no significant seasonal constraints were identified due to the timing of the survey, however it is likely that some common herbaceous plants that occur in the site would not have been observed. In addition, breeding bird activity on the site at this time would be low. Terrestrial mammal activity is generally easily observed during winter months when vegetation has died back. However, November is a sub-optimal to carry out a bat survey.

11.2.5 Assessment Methodology

Evaluation of Ecological Features

The methodologies used to determine the value of ecological resources, to characterise the impacts of the proposed Project, and to assess the significance of impacts and any residual effects are described below. This approach is in accordance with EPA guidance and the CIEEM's (Chartered Institute of Ecology and Environmental Management) guidelines.

CIEEM suggest that to ensure a consistency of approach, ecological features are valued in accordance with their geographical frame of reference, as defined below:

- International
- National (Ireland)
- Regional (Midland)
- County (Laois)
- District (Stradbally)

- Local/Townland (Garrans)

The above categories are then applied to the ecological features identified. Ecological features can be defined as:

- Designated sites (i.e., SACs, SPAs, NHAs, pNHAs, National Nature Reserves) or non-statutory locally designated sites and features.
- Non-designated sites and habitats and features of recognised biodiversity value, such as rivers and streams. The features being evaluated can be considered in the context of the site and locality and thus a more accurate assessment of the impacts in the locality can be made.

The criteria used in evaluating ecological habitats follow the NRA (2009) and CIEEM (2006). The site evaluation criteria are detailed in Table 11.2.

Table 11.2: Conservation Evaluation (after Natura Site Evaluation Scheme, NRA, 2009).

SAC = Special Area of Conservation SPA = Special Protection Area NHA = Natural Heritage Area.

Ecological Valuation	Description
Internationally Important	• Sites designated (or qualifying for designation) as an SAC* or SPA* under the EU Habitats or Birds Directives. • Undesignated sites that fulfil criteria for designation as a European Site. • Features essential to maintaining the coherence of the Natura 2000 network. • Sites containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations of birds listed in Annex I of the Birds Directive and species listed in Annex II and/or Annex IV of the Habitats Directive. • Ramsar Sites, World Heritage Sites or Biosphere Reserve. • Site hosting significant species populations under the Bonn Convention or Berne Convention. • Biogenetic Reserve or European Diploma Site. • Salmonid waters.
Nationally Important	• Sites or waters designated or proposed as an NHA*or Statutory Nature Reserve. • Refuge for fauna and flora protected under the Wildlife Acts.

Ecological Valuation	Description
	• National Park. • Undesignated sites fulfilling criteria for designation as a NHA. • Statutory Nature Reserve. • Refuge for Fauna and Flora protected under the Wildlife Act. • Resident or regularly occurring populations (assessed to be important at the national level) of species protected under the Wildlife Acts and/or species listed on the relevant Red Data list). • Site containing viable areas of the habitat types listed in Annex I of the Habitats Directive.
County Importance	• Areas of Special Amenity. • Area subject to a Tree Preservation Order. • Area of High Amenity, or equivalent, designated under the County Development Plan. • Resident or regularly occurring populations (assessed to be important at the County level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed on the relevant Red Data list. • Site containing area(s) of the habitat types listed in Annex I of the Habitats Directive that do not fulfil criteria for valuation as of International or National Importance. • County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or local BAP. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (higher value)	• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP. • Resident or regularly occurring populations (assessed to be important at the Local level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed in the relevant Red Data list.

Ecological Valuation	Description
	• Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality. • Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (lower value)	• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife. • Sites of features containing non-native species that are of some importance in maintaining habitat links.

<u>Assessment of Impacts</u>

The assessment of potential ecological impacts has been carried out using guidelines published by the EPA and the CIEEM. They can be summarised as:

- The identification of the range of potential impacts which can reasonably be expected to occur should the proposed developments receive consent;
- The consideration of the systems and processes in place to avoid, reduce and mitigate the possible effects of these impacts;
- The identification of opportunities for ecological enhancement within the site
- Impacts are defined as being positive, negative or neutral. A significant impact is defined as an impact upon the integrity of a defined ecosystem and/or the conservation status of a habitat or species within a given area.
- Where a potential negative impact has been identified, mitigation measures have been formulated using best practices techniques and guidance to prevent, reduce or offset the impact.

11.3 Development Description

The proposed works will consist of the following:

- Quarry activities for the extraction of and processing of sand and gravel within a c. 12ha site at Garrans;
- On site processing of the material to include extraction, washing, sizing, screening and stockpiling;
- Intermittent crushing of oversized aggregate material;
- Dispatch of the processed materials off-site on Heavy Goods Vehicles (HGVs);

- Installation of site wheel wash, refuelling area, oil interceptors, sludge settlement ponds and storm water attenuation/settlement ponds;
- Development of a, 3No. lay-bys on the local road L7939, a new site entrance and internal site access road;
- Landscaping works to include a planted berm running next to the site entrance and southern boundary of the site;
- Provision of site office, welfare facilities and all ancillary development infrastructure; and
- Final restoration of the site.

No blasting will be undertaken at the site, with site operations such as crushing, which would be required intermittently, undertaken towards the rear of the site (at the northern boundary).

The proposed site plans are shown in Figure 11.2.

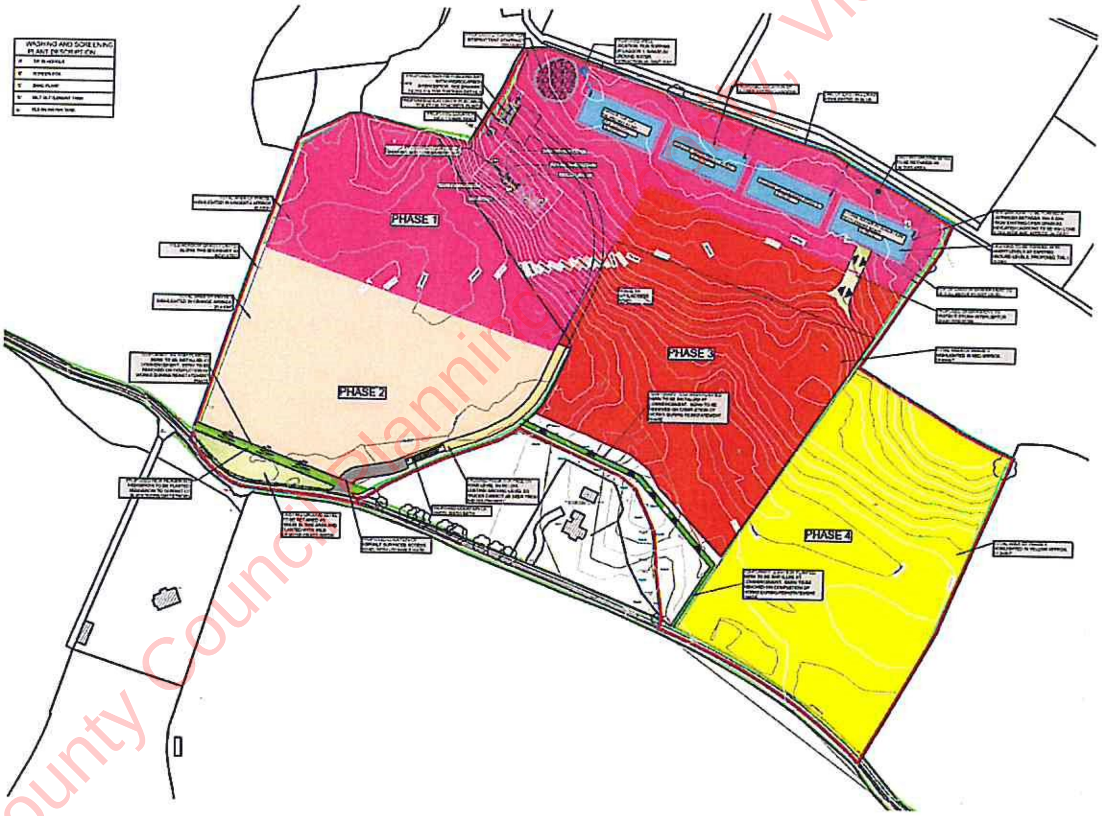

Figure 11.2: Extract from Planning Drawings Showing Planned Phases of the Development

Overall it is estimated that in the region of 1.22million tonnes of aggregate material will be extracted from the site over c. 20 years (61,000 tonnes/ annum). On this basis, assuming 300 working days per year, there would be an average extraction rate of c. 200 tonnes per day.

However, during peak times, the daily rate may increase to 350 tonnes per day (which equates to an average of 15 heavy good vehicles (HGV's) arriving and exiting the site daily). The 350 tonnes per day would allow for occasional extraction at a rate in excess of the typical average rate.

11.3.1 Hours of Operation

The proposed maximum working hours for the site activities subject to agreement with the planning authority are:

- Monday – Friday: 0700-2000hrs; and
- Saturday: 0800-1800hrs.

11.3.2 Site Facilities, Plant and Equipment

Office and welfare facilities will be provided on site.

The main plant, equipment and infrastructure on site will include the following:

- Security Gates;
- Site office, welfare facilities and car parking area;
- Oil interceptors;
- Wheelwash;
- Washing and screening plant; and
- 4No. ponds for sludge settlement and storm water attenuation/sediment settlement;
- Mixture of fixed and mobile equipment such as front loaders (with onboard weighing systems), extractors, dumper trucks, dozers and a mobile crusher and screener.

11.3.3 Site Enabling

<u>Site Enabling</u>

Some site enabling works will be required at the outset prior to activities commencing on-site. These will include:

- Undertaking archaeological test trenches to determine if any sub surface archaeological remains are located within the proposed extraction area (Refer to Chapter 13 Cultural Heritage for more details);

- Upgrade of the site entrance and internal road into the site. It is proposed to provide a new site entrance directly from the local road L7939. An internal access road will be constructed from crushed rock moving into the centre of the site.
- Provision of the 3No. lay-bys on the local road L7939;
- Installation of site office and welfare facilities (portacabin);
- Installation of the washing and screening plant;
- Installation of the planted berm next to the site entrance and on the southern boundary; and
- Installation of wheel wash, electricity connection to the site, hardstanding plinth, refuelling area, settlement ponds and oil interceptors.

There are no proposed wastewater discharges associated with the site. All wastewater generated will be captured and tankered off-site (i.e. holding tank / chemical toilet). A management contract will be in place with an approved waste contractor.

Mains water will not be provided into the site. Bottled water will be provided for site staff needs.

It is proposed that groundwater will be abstracted from an on-site groundwater supply well, to support the site's processing needs. The well will be located close to the north western boundary of the site. Abstraction will equate to c. 9m^3 per day, at the average abstraction rate of 200 tonnes per day.

The site wheelwash will be installed on the internal road into the site. The washwater will be recycled through an in-built water recycling system which will be topped us as required from the settlement ponds. All HGV's will be required to exit through the wheelwash to mitigate material and dust deposition from spreading onto the local road network.

The designated refuelling area will be located in the north west corner of the site. This area will facilitate the refuelling of mobile equipment on the site.There will be no storage of fuel at the site, with refuelling being undertaken with a mobile tanker that will access the site as needed. The refuelling area will be a concrete hardstanding area with a gully to collect any spillages. The gully will be connected to an oil interceptor.

11.4 Site Operations

11.4.1 Site Phasing

The operation of the proposed Project has been designed to operate on a phased basis – Phases 1-4. Refer to Appendix 2.1 for copies of the Site Layout Plan and the Operational Phasing Plan.

The overall area of the site is c.12.84 hectares / 128,408m^2. The four phases incorporate the following areas:

- Phase 1 (Pink): 40,825 m^2
- Phase 2 (Orange): 20,410 m^2

- Phase 3 (Red): 29,995 m^2
- Phase 4 (Yellow): 27,250 m^2

The site will be stripped of overburden (topsoils and subsoils) and extracted on a phase by phase basis, with all aggregate material, removed from one phase before moving to the next.

There is a buffer area in the northern section of the site i.e. surrounding the 4No. ponds and the refuelling area which will not be stripped or excavated during the lifetime of the proposed Project.

All extraction works will move in essentially a southerly direction towards the local road L7939.

The washing and screening plant will remain in location (in Phase 1, next to the hardstanding area) for the duration of the works on-site. All site vehicles and other mobile equipment will be move and operate within the void of each individual phase, as required.

For full details on the proposed Project description, refer to Chapter 2 Project Description.

11.5 Receiving Environment

This section provides an overview of the existing ecological conditions within the site and the surrounding environment.

11.5.1 General Site Description

The site is located in the townland of Garrans. It consists of one large and one small agricultural field, both of which are currently used for the growing of crops. Historical maps indicate that the site was previously comprised of a number of smaller fields and the associated boundaries. The site is located just off a local road, L7939 and it is 480m east of Garrans Cross Roads, where the L7939 intersects with the R427 Regional Road. The site is bounded to the south by the L7939 and by the northern boundary of a dwelling site. It is bounded to the east by an earth-bank and treeline, to the north by a treeline and a man-made drain and to the west by a hedgerow and treeline.

Beyond the northern site boundary there is a mixed forestry habitat, containing a previously felled area of coniferous woodland. There are also two small, inactive quarries located just to the north-west of the north-western corner of the site (outside of the site boundary). There is an access road servicing this quarry area which then extends eastwards into the forest.

The dominant land use surrounding the site is high intensity agriculture and improved agricultural grasslands and tillage lands are the dominant habitats. Other habitats present locally include areas of broadleaved / mixed woodlands, treelines, hedgerows and watercourses. There is a relatively low level of one-off rural dwellings in the area and these are associated with amenity grasslands and gardens. A site location map is provided in Figure 11.3, whilst an aerial photograph of the site and its surrounding habitats is shown in Figure 11.4.

Figure 11.3– Site Location Map

Figure 11.4– An OSI Aerial Photograph of the Site (Outlined in Red) and Surrounding Habitats

11.6 Designated Sites

11.6.1 Natura 2000 Sites

The proposed site is not within nor adjacent to any site that has been designated as a Special Area of Conservation (SAC) or a Special Protection Area (SPA) (Natura 2000 sites), under the EU Habitats or EU Birds Directive.

There are two Natura 2000 sites within 15km of the proposed Project. These sites are summarised in Table 11.3. The location of this site in relation to these designated areas are shown in Figure 11.5 and Figure 11.6 and a full synopsis of the sites can be read online on the website of the National Parks and Wildlife Service (www.npws.ie). In addition, any other sites further than 15km, but potentially within its Zone of Influence (ZoI) were also considered. The ZoI may be determined by an assessment of the connectivity between the site and the designated areas by virtue of hydrological connectivity, atmospheric emissions, flight paths, ecological corridors etc. No additional sites were identified within the ZoI.

Table 11.3: Natura 2000 Sites of Relevance to the Proposed Development

Site Name & Code	Distance	Qualifying Interests	Connectivity
River Barrow and Nore SAC 002162	271m south	• *Vertigo moulinsiana* • Freshwater pearl mussel (*Margaritifera margaritifera*) • White-clawed crayfish (*Austropotamobius pallipes*)	*Yes – there is a hydrological link between the site and the SAC via the man-made drain that flows along the northern site boundary.*

Site Name & Code	Distance	Qualifying Interests	Connectivity
		• Sea lamprey (*Petromyzon marinus)* • Brook lamprey *(Lampetra planeri)* • River lamprey (*Lampetra fluviatilis)* • Allis shad *(Alosa alosa)* • Twaite shad (*Alosa fallax fallax)* • Salmon *(Salmo salar)* • Estuaries • Mudflats and sandflats not covered by seawater at low tide • Salicornia and other annuals colonizing mud and sand • Spartina swards • Atlantic salt meadows • Otter *(Lutra lutra)* • Mediterranean salt meadows • Killarney fern (Trichomanes speciosum) • Pearl mussel *(Margaritifera durrovensis)* • Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation • European dry heaths • Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels • Petrifying springs with tufa formation (Cratoneurion) • Old sessile oak woods with *Ilex* and *Blechnum* in British Isles • Alluvial forests with Alnus glutinosa and Fraxinus excelsior	*The direct downstream distance is 1.25km.* *Potential groundwater connectivity must also be considered.*
Ballyprior Grassland SAC 002256	3.8km south	• Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	*No connectivity between the site and the terrestrial habitats of this SAC.*

The generic conservation objectives of these sites are:

- To maintain the favourable conservation status of the qualifying interests (outlined above) of these SACs.
- To maintain the extent, species richness and biodiversity of the entire site.
- To establish effective liaison and co-operation with landowners, legal users and relevant authorities.
- The favourable conservation status of a habitat is achieved when:
- Its natural range and area it covers within that range is stable or increasing and the specific structure and functions which are necessary for its long term maintenance exist and are likely to continue to exist for the foreseeable future;
- The conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- The population dynamics data on the species concerned indicate that it is maintaining itself on a long -term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future;
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

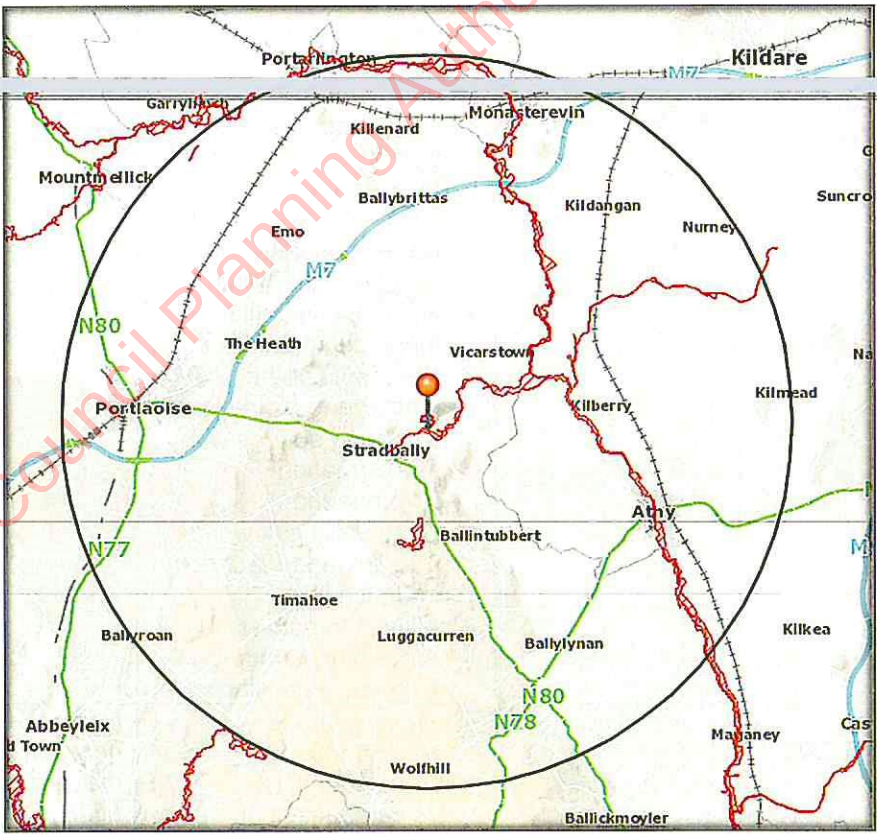

Figure 11.5: The Application Site (Pinned) in relation to the Relevant Designated Sites. SACs - Red Cross Hatching, SPAs – Red Vertical Hatching

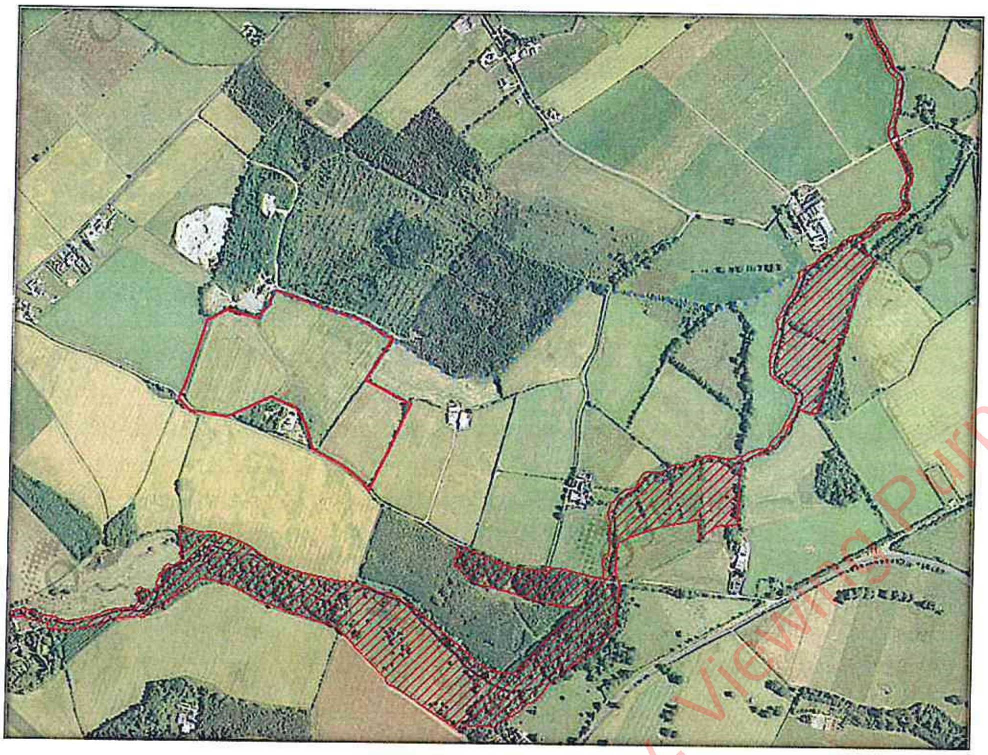

Figure 11.6: The Application Site (Outlined) in relation to the River Barrow and Nore SAC (Red Hatching). The Surface Water Connectivity Pathway is Shown with a Dotted Blue Line.

11.6.2 Nationally Important Sites

The site is not within any nationally designated site, such as a Natural Heritage Area or a proposed Natural Heritage Area (pNHA). It is within 15km of fifteen sites that have been designated as pNHA's These sites are summarised in Table 11.4 and maps / aerial photographs showing their locations relative to the site are shown in Figure 11.7.

Table 11.4: Nationally Important Sites within 15km of the Proposed Development

Site Name	Distance	Connectivity
Stradbally Hill pNHA 001800	1km south	*No connectivity*
Grand Canal pNHA 002104	2.9km east	*No connectivity*
Kilteale Hill pNHA 000867	4km east	*No connectivity*
Rock of Dunamase pNHA 000878	5.4km west	*No connectivity*
Derries Wood pNHA 000416	5.6km north	*No connectivity*
Dunamase Woods pNHA 001494	6km west	*No connectivity*
Great Heath of Portlaoise pNHA 000881	6.3km north-west	*No connectivity*
Clopook Hill pNHA 000860	6.7km south	*No connectivity*
Timahoe Esker pNHA 000421	7km south-west	*No connectivity*

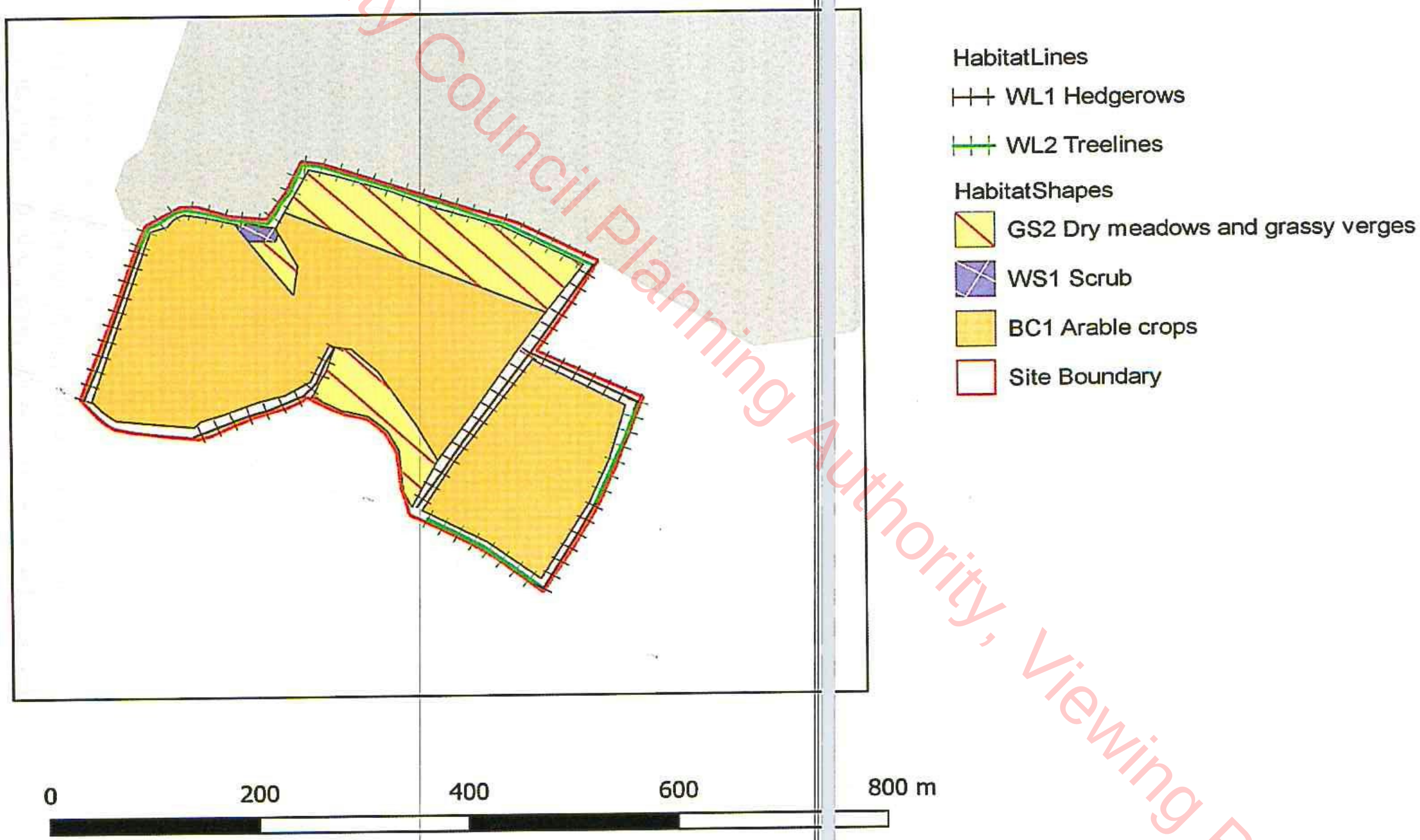

Figure 11.8: Map of the Main Habitats within the Application Site

11.8 Fauna

11.8.1 Protected Mammals

Records Returned from Desk Study

Records from the National Biodiversity Data Centre reveal the presence of the following protected mammals from within the 10km square (S59) of this site:

- Badger *Meles meles*
- European Hedgehog *Erinaceus europaeus*
- Otter *Lutra lutra**
- Irish Hare *Lepus timidus subsp. Hibernicus*
- Irish stoat Mustela erminea subsp. hibernica
- Pine Marten *Martes martes*
- Daubenton's bat *Myotis daubentonii*
- Pipistrelle *Pipistrellus pipistrellus sensu lato*
- Lesser Noctule *Nyctalus leisleri*
- Natterer's Bat *Myotis nattereri*
- Soprano *Pipistrelle Pipistrellus pygmaeus*
- Whiskered bat Myotis mystacinus
- Brown long-eared bat *Plecotus auratus*
- Pygmy shrew *Sorex minutus*
- Red squirrel *Sciurus vulgaris*

* indicates records available for 1km square – S5897 and S5997

All these species are protected under the Irish Wildlife Acts.

In addition, the otter *Lutra lutra* is protected under Annex II of the European Habitats Directive

Field Surveys - Terrestrial Mammals

Badgers

A terrestrial mammal survey of the site was undertaken by Brian Keely. Badger presence was determined by:

- The identification of setts or structures likely to be setts;
- Badger tracks, paw prints, dung and hairs.

One badger sett was confirmed for the site (on the eastern boundary) (Sett 1), whilst there is a second sett within lands behind the site (Sett 2) where there has been some previous quarrying excavations.

There is a third potential sett (Sett 3) which is most probably a rabbit burrow within the site (on the northern boundary), and finally a probable sett close to the other confirmed sett (Sett 4), outside of the site.

The confirmed and probable setts, located outside the site boundary could potentially be impacted should excavations reach the edge of the site in this area.

The sett within the site (Sett 1 on the eastern boundary) has two entrances, neither of which showed activity at the time of survey. However, this was a dry period and it is difficult at such times to identify badger activity into and out of a sett.

The more active sett (Sett 2) lies within the surrounding lands and there were clear tracks leading from here both to the north and south of the sett.

In addition to setts, there was a number of well worn badger tracks in the site. The full mammal report is presented in Appendix 11.3. Figure 11.9 summarises the badger findings from the application site.

Figure 11.9: Badger Activity in the Site (taken from Mammal Report)

Bats

Due to the timing of the EcIA, no on-site bat survey of the site was carried out. However, an overall assessment of potential bat habitats within the site was undertaken. There are a small number of trees in the site which would provide ideal roosting and hibernating habitats for bats. These trees provide features such as cracks, hollows and ivy which are all suitable locations for bat roosts.

The National Biodiversity Data Centre (NBDC) has produced a landscape suitability index for bat species in Ireland, and this is based on work by Lundy et al (2011). The results are provided as maps, where the area of concern is coloured to indicate the overall suitability of the landscape for bats. The index ranges from 0 to 100 with 0 being least favourable and 100 most favourable for bats. The overall assessment of bat habitats for the current study area is given as 30.67, which is above average suitability. Table 11.5 gives the suitability of the study area for the bat species found in the study area (based on NBDC.

Table 11.5: Bat Suitability Index for the Application Site (NBDC)

Bat Species	Suitablity Index
Brown long-eared bat *Plecotus auritus*	45
Soprano pipistrelle *Pipistrellus pygmaeus*	35
Natterer's bat *Myotis nattereri*	40
Nathusius' pipistrelle *Pipistrellus nathusii*	8
Daubenton's bat *Myotis daubentonii*	25
Whiskered bat *Myotis mystacinus*	43
Leisler's Bat *Nyctalus leisleri*	40
Lesser Horseshoe Bat *Rhinolophus hipposideros*	0
Common pipistrelle Pipistrellus pipistrellus	40

It can be seen from the above table that the species most likely to occur in this area is the brown long-eared bat. Overall, local populations of bats are likely to roost in the trees within and surrounding the site. They are also likely to use the existing treelines and watercourses as safe commuting corridors.

Otters

There were no signs of otters within the site and no suitable resting or breeding habitat for the otter exists here.

The site is c. 300m north of the Stradbally River. This river corridor was walked as part of the assessment of habitats and species beyond the site but within its potential ZoI.

There was ample evidence of the presence of the otter along the Stradbally River, i.e., well-worn tracks and paths, resting places along the river along with numerous sliding points into the river. No otter spraints were noted however; extremely heavy rain had persisted the night before they survey, possibly washing away any deposited spraints.

Other Mammals

Other mammals noted during the mammal survey included rabbits *Oryctolagus cuniculus*, wood mouse *Apodemus sylvaticus* and fox *Vulpes vulpes*.

11.8.2 Birds

Species observed / heard included:

- Blackbird *Turdus merula;*
- Starling *Sturnus vulgaris;*
- Wren *Troglodytes troglodytes;*
- Robin *Erithacus rubecula;*
- Blue tit *Cyanistes caeruleus;*
- Great tit *Parus major;*
- Chaffinch *Fringilla coelebs;*
- Sparrow *Passer domesticus;*
- Magpie *Pica pica;*
- Pheasant *Phasianus colchicus;*
- Pied wagtail *Motacilla alba yarrellii;*
- Pigeon *Columba livia domestica;*
- Rook *Corvus frugilegus;* and
- Jackdaw *Corvus monedula.*

11.8.3 Amphibians, Reptiles, Invertebrates

No amphibians, reptiles or invertebrates were observed during the course of the field survey. However, it is likely that the common frog *Rana temporaria* occurs in certain wetter areas around the site. This species is protected under the Irish Wildlife Acts. The presence of the smooth newt *Lissotriton vulgaris* is also possible within the drain on the northern boundary and close to the site, or in old quarry ponds that are close to the site. The presence of the viviparous lizard *Lacerta vivipara* close to the area of the proposed works is also possible.

Few invertebrate species observed on the day with the exception of small diurnal moths and midges, however; a range of invertebrates and pollinating insects would be present in the site in the spring and summer months.

11.9 Aquatic Environment

11.9.1 Water Features and Quality

The site is located within the Barrow Hydrometric Area, Catchment and Sub-Catchment and the Stradbally Sub-Basin. There is a small unnamed drain flowing along the northern boundary of the site. This stream flows east, north and then east again until it joins the Stradbally River at a point c.1.25km downstream (north-east) of the site. The Stradbally River flows north / north-east until its confluence with the River Barrow, at a point c. 4.4km north-east of the site. The drain has intermittent seasonal flow and it therefore creates a seasonal connection between the site and the Stradbally River.

The Stradbally river (EPA Code Stradbally (Laois)_030 and WFD Code IE_SE_14S020350) has a total catchment area of 123 km^2 (EPA Hydrotool, https://gis.epa.ie/EPAMaps/Water). A catchment area of 104 km^2 drains to the Stradbally river at the point where the tributary linked to the site enters the Stradbally River (pro-ratad hydrometric station data).

Water Framework Directive (WFD) status (2013-2018) for the Stradbally river upstream and downstream of the site for is classified as 'Moderate'. Surface water risk status is 'At Risk'. A single significant river pressure of 'Urban Waste Water' is identified in the Stradbally River. Stradbally town urban waste water discharges, comprising two storm drainage and one waste water treatment plant, are the point source pressures. The waste water treatment plant (Licence No. D0292-01) is currently in compliance with the required standards. No other significant pressures are identified along the length of the Stradbally River (https://gis.epa.ie/EPAMaps/Water), including no river significant pressures resulting from abstraction or the extractive industries. The Stradbally River is not classified as a Nutrient Sensitive Area under the Urban Waste Water Treatment Directive (UWWT).

The two upstream inputting surface water bodies, the Crooked (Stradbally)_010 and the Stradbally (Laois)_020 are classified as having good status (2013-2018). The River Barrow, into which the Stradbally River discharges, at a distance of c. 4.4 km downstream of the site, has a current status of 'Good'. The River Barrow is Classified as a Nutrient Sensitive Area under the Urban Waste Water Treatment Directive (UWWT). The single generalised significant river pressure of anthropogenic pressure is identified in the section of the River Barrow through Athy town, approximately 15 km downstream of the site. The sub-catchment to this river section is designated as an area for action.

WFD operational monitoring is carried out in the Stradbally River at station RS14S020350, where the local road, L7939 crosses the Stradbally River described here as Mill Land bridge. This is located at a distance of 0.9 km upstream of the tributary which seasonally connects the site with the Stradbally river. The most recent Q value at this location (2017) is 3-4, resulting in moderate ecological status/potential at this location. No WFD monitoring of general physico-chemical parameters is carried out at this location.

The nearest downstream WFD physico-chemical monitoring is carried out at Derrybrock Bridge RS14S020400 approximately 4 km downstream. The results (2008 – 2018) of key parameters, total ammonia and orthophosphate, are indicative of 'high' quality water. Ammonia levels show a slight trend upwards from the dataset 2007 baseline. Ortho-Phosphate levels are trending downwards. Total oxidised nitrogen indicates 'moderate' quality water. Total Oxidised Nitrogen levels are trending upwards from the baseline. The most recent Q value at this location (2017) is 3-4, resulting in moderate ecological status/potential at this location.

Physico-chemical water sampling was carried out for this study area by Tynan Environmental on 23rd January 2020, at six locations on and surrounding the site. Results for analysed parameters were used to:

- Characterise site and off-site waters and,
- Provide a baseline record of water conditions supporting ecological and quality status.

These results are presented in full in the Chapter 8 Hydrology and an extract of the results are included below in Figure 11.10.

Table 4.XXXX Hydrochemistry	Stradbally river			Tributary of Stradbally river		Site	Standards supporting BQEs (SBQE) Salmonid Standards (SS) Drinking Water Limit (DWL)
Parameter	SW1	SW2	SW3	SW5	SW6	Drain (SW4)	
Oxygenation Conditions							
Biochemical Oxygen Demand (BOD) (mg O_2/l)	<0.1	1.6	1.7	2.0	<0.1	2.0	High status ≤1.3 (mean) or ≤2.2 (95%ile) (SBQE) Good status ≤1.5 (mean) or ≤2.6 (95%ile)
Dissolved Oxygen							Lower limit 95%ile >80% saturation Upper limit 95%ile <120% saturation (SBQE)
Acidification Status							
pH	8.0	8.1	8.1	8.0	8.1	7.9	Hard Water 6.0< pH < 9.0 (SWO)
Nutrient Conditions							
Phosphate (Ortho/MRP) (mg P/l)	0.035	0.046	0.028	0.024	0.023	0.015	High status ≤0.025 (mean) or ≤ 0.045 (95%ile) Good status ≤0.035 (mean) or ≤0.075 (95%ile) (SBQE)
Total Ammonia (mg/l N)	0.023	<0.005	<0.005	0.006	0.005	0.009	High status ≤0.040 (mean) or ≤ 0.090 (95%ile) Good status ≤0.065 (mean) or ≤0.140 (95%ile) (SBQE)
Total Oxidised Nitrogen (mg N/l)	4.9	4.1	4.7	6.5	6.2	5.1	[-]
Quality of Salmonid Waters							
Suspended Solids (mg/l)	6	8	8	<5	<5	8	≤25 (SS)
Nitrite (mg/l N)	0.011	0.167	0.009	<0.005	0.006	<0.005	<0.05 (SS)
Hydrocarbons (EPH C8-C40)	<LOQ[1]	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	[-]
Drinking Waters							
Nitrate (mg/l N)	4.9	4.1	4.6	6.4	6.2	5.1	50 (DWL)
Ammonium (mg/l NH_4)	0.029	<0.006	<0.006	0.008	0.006	0.011	0.3 (DWL)
Total Coliforms (MPN[1]/100 ml)	1733	2420	1733	579	1300	218	0 (DWL)
Faecal Coliforms (cfu/100 ml)	520	510	300	140	880	180	0 (DWL)

Figure 11.10: Hydrochemistry Results (Taken from Chapter 8 Hydrology).

Results have been compared with standards for general physico-chemical parameters, to support the status of the Biological Quality Elements, as set out in S.I. No. 272 of 2009 the European Communities Environmental Objective (Surface Waters) Regulations. Water quality was also compared with standards set out in S.I. No. 293/1988 — European Communities (Quality of Salmonid Waters) Regulations as these parameters give an indication of general water quality supporting biological elements.

The Stradbally River and its tributary are not designated as a drinking water protected area under European Communities (Drinking Water) (No. 2) Regulations 2007 (SI no. 278/2007). Results were compared with drinking water limits (DWL) from S.I. No. 122 of 2014 Drinking Water Regulations as an overall indicator of water quality.

Parameter values in the Stradbally River, its tributary and the site, recorded during the single sampling event, were within the range of values indicative of an overall 'good' waterbody status, with 'high' status values for total ammonia. This is consistent with the results of WFD monitoring results at Derrybrock Bridge.

There was one exceedance of the standards for salmonid waters for nitrite, at SW2 in the Stradbally River. Drinking water parameters analysed were below the limits, with the exception of total and faecal coliforms. This is not unexpected in a surface water body in an agricultural area.

11.10 Ecological Evaluation

11.10.1 Summary of the Value of the Application Site

The site at Garrans is within 15km of two sites designated under the Natura 2000 network (SACs / SPAs). The closest of these is the River Barrow and Nore SAC, which is 271m south of the site. The hydrological connectivity between these areas is 1.25km, via the drain that flows along the northern site boundary. There is also potential ground-water connectivity between these two areas.

The Ballyprior Grassland SAC is 3.8km east of the site. There is no connectivity between the site and the terrestrial habitats of this SAC.

The site is also within 15km of fifteen sites designated as Natural Heritage Areas (NHAs and pNHAs). The closest of these is Stradbally Hill pNHA and this is 1km south of the site. This pNHA is an important woodland site containing oak and hazel. There is no connectivity between the site and the terrestrial habitats of this pNHA.

The habitats on the site range from low value to high value locally. The treelines and hedgerows are the most important ecological features in the site, providing nesting sites and shelter for a range of passerine birds and small mammals.

They also form a vital part of the ecological network for badgers and there are also badger setts in the site along these features. The mature trees on the site provide ample roosting opportunities for bats and they also form part of the local commuting corridor for bats during their hunting for aerial insects. The flowering trees and shrubs provide a variety of pollen throughout the year for insects, as do the herbaceous plants that occur in the dry meadow and verge habitats in the site.

The NRA guidelines on the Assessment of Ecological Impacts on National Road schemes (NRA, 2009) provides a rationale for the evaluation of ecological receptors within a site. Table 11.6 lists the habitats that have been described within the site and their associated ecological value, based on the NRA guidelines.

Table 11.6: Ecological Features and their Evaluation

Habitat	Rating	Criteria
Arable Crops – BC1	No Value	No Biodiversity Value
Dry Meadows and Grassy Verges – GS2 Poorly Structured Hedgerows (WL1)	Local Importance (Lower Value)	Limited biodiversity value although may provide some habitat opportunities for invertebrates and birds
Well Structured Hedgerow – WL1 Well Structured Treelines – WL2 Scrub – WS1 Trees with Bat Roosts	Local Importance (Higher Value)	Semi-Natural Habitat that is higher in biodiversity value in a local context. Provides value for local populations of bats and birds.

11.11 Potential Impacts

11.11.1 Introduction

Significant Effects

The information gathered as part of the desk study and field survey for this proposed application has been used to develop this Ecological Impact Assessment (EclA). This EclA has been undertaken following the latest guidelines set out by CIEEM (2018) and the EPA.

The identification of potential impacts and the assessment of their significance typically requires the identification of the type and magnitude of the impacts. For example, will the impacts be short term or long term, direct, indirect or cumulative and will they occur during construction or operation. This section outlines whether ecological impacts of the proposed development at Garrans are likely to occur and whether or not they are significant. These potential impacts will be examined with respect to the ecological receptors identified in the previous sections.

The emphasis in EclA is on "significant" effects, rather than all ecological effects (CIEEM, 2018). For the purpose of EclA, a "significant effect" is an effect that either supports or undermines biodiversity conservation objectives for important ecological features for biodiversity in general. Conservation objectives may be specific (e.g., for a designated site) or broad (e.g., national / local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local.

A significant effect is an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. In broad terms, significant effects encompass impacts on structures and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution). (CIEEM, 2018).

11.11.2 Impacts upon Designated Sites

Natura 2000 Sites : Development / Operational Phase

The closest designated site to the site is the River Barrow and Nore SAC, which is 271m south of the site. It is also 1.25km downstream of the site. Due to the nature of the proposed Project and its proximity to the SAC, significant negative effects upon this SAC arising from the development and operation of this quarry could not be ruled out.

Therefore, in accordance with Article 6 (3) of the Habitats Directive, an Appropriate Assessment (AA) for this site was carried out and prepared as a Natura Impact Statement (NIS). The NIS has been submitted as part of the planning application.

The NIS assessed the proposed development in terms of the potential impacts that may arise on certain Qualifying Interests (QI's) of the River Barrow and Nore SAC. Given the extent of the SAC, many of the QI's are located in a separate catchment to the site (i.e, in the Nore catchment) or at significant distances, in the case of the estuarine and marine habitats from the site. On this basis, a number of QIs were screened out of the NIS.

The relevant QIs that were screened in for the purpose of the NIS included:

- White-clawed crayfish (*Austropotamobius pallipes*)
- Brook lamprey (*Lampetra planeri*)
- River lamprey (*Lampetra fluviatilis*)

- Salmon (*Salmo salar*)
- Otter (*Lutra lutra*)
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation
- Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*

The main threat to these QIs arising from the proposed development comes from potential decreases in water quality locally and potential pollution of local water courses with sediment and polluting chemicals. Impacts upon the favourable hydrological regime of the designated habitats were also considered. These inputs were assessed by a hydrologist, who prepared a detailed hydrological impact assessment for the designated habitats within the ZoI of the site (Refer to Chapter 8 Hydrology for full details of this assessment).

The potential impacts upon the River Barrow and River Nore SAC include:

- Impacts arising on the hydrological regime of the SAC due to the collection and usage of surface water run-off from the site – 70% of the average daily site surface water run-off from the site will be used to top up the sand and gravel processing plant. As there is an intermittent, seasonal pathway between the man-made drain on the site and the tributary of the Stradbally River, which eventually drains to the Stradbally River 1.25km downstream of the site, this may affect the hydrological regime which supports the QIs of the SAC, notably the hydrophilous tall herb fringe communities of plains and water courses of montane to alpine levels.
- Impacts arising on the hydrological regime of the SAC due to groundwater abstraction for site water requirements. This could affect the baseflow of the Stradbally River which is contributed to by groundwater, particularly during low flow periods when groundwater baseflow is the dominant source of flow.
- Impacts on the quality of surface water in the tributary of the Stradbally River and Stradbally River itself arising from pollution with process waters that are used on site for screening and washing, as well as water contained in stockpiles and process sludge. These waters may contain suspended sediments, organic matter, ammonia or nitrogen. This may affect water quality locally in the drain on the northern boundary that intermittently leads to the Stradbally River and its tributaries and subsequently it could give rise to significant effects on QIs of the SAC.
- Impacts on surface waters and/or groundwaters arising from leaked or accidently spilled fuels, lubricants or flocculants entrained in the site surface run-off. This may affect water quality locally in the drain on the northern boundary of the site that intermittently leads to the Stradbally River and its tributaries and subsequently it could give rise to significant effects on QIs of the SAC.

<u>Natural Heritage Areas: Development / Operational Phase</u>

The site is also within 15km of fifteen sites designated as NHAs and pNHAs. None of these sites are hydrologically connected to or downstream of the site nor are any within the ZoI of the site. There will be no impacts upon any NHA / pNHA arising from the proposed development.

11.11.3 Impacts Upon Non-Designated Habitats

Development / Operational Phase

Should the proposed development at Garrans be allowed to proceed then the following impacts are likely to occur during the development/operational phase:

- Habitat Loss and Fragmentation – The proposed development will take place on existing areas of grassland, most of which has been improved for agriculture and is of low biodiversity value. These habitats will be lost due to the phasing of the quarrying activities within the site. Remnants of these habitats will remain around the verges of the fields.
- The use of machinery around the treelines and within the root protection area of trees of high value could result in direct damage to or root compaction of the trees. This could decrease the life of the tree, resulting in indirect habitat loss and fragmentation of the treelines, that are to be retained.
- Impacts on Pollinators – The grassland habitats, verges and hedgerows of the site currently offer some resources for local pollinators. These habitats may be lost or fragmented without proper mitigation.
- Disturbance to Local Wildlife – During site preparation and construction, local populations of birds and mammals may be disturbed by the increase in noise, traffic and human activity on the site.

11.11.4 Impacts on Mammals

Badgers

As confirmed by Brian Keeley, there is at least one badger sett on the site, and there is a second confirmed sett within the lands behind the proposed development (outside of the site boundary). This sett outside the application site boundary could be affected by excavation works associated with the proposed Project.

The main sett (Sett 1) on site will be removed to facilitate the quarry during the course of works in the Phase 4 section of the site. This will be the only sett directly impacted by the proposed Project.

Other setts (Setts 2,3,4) close to the site may also be indirectly affected by the ground disturbance from the quarrying activities. However, the area closest to these setts will not be quarried or stripped. This is the northern area where the refuelling area and 4No. ponds will be located. This stretch of land will act as a buffer between the site works and these setts.

Along with direct loss of the sett (Sett 1), badger movement and traditional commuting corridors within the site will be altered by the presence of the quarry and there will also be a loss of foraging area within the site. Whilst this may lead to an alteration of badger movement within the site, it is unlikely to cause the loss of the badger social group from that area.

Bats

Although no dedicated bat survey was undertaken for the site, it is likely that bats will roost or hibernate in some of the mature trees that surround the site. Any loss of these trees may result in direct mortality of bats or loss of their habitat. In addition, noise / human activity may also directly affect local bat populations. The loss of open grassland habitats will also reduce the potential foraging area for bats.

Otters

There is no evidence that otters use the site, however they do use the Stradbally River south of the site. Any deterioration in the quality of water in this river may lead to effects upon the otter.

Other Mammals

Impacts upon rabbits, wood mice and fox will include habitat loss and loss of commuting and foraging habitat. These species will relocate to unaffected areas.

11.11.5 Impacts on Bird, Amphibians, Reptiles and Invertebrates

Birds

The loss or fragmentation of treelines and hedgerows will result in the direct loss of bird nesting and perching sites. Inappropriate tree removal could result in direct the mortality of the birds, or the loss of eggs. In addition, the noise, vibrations and human activity arising from the quarry works could also affect birds. It is likely that they will avoid the area during the height of quarrying activities.

Amphibians, Reptiles and Invertebrates

The quarrying activities will result in the loss of habitat used by these species.

The noise, vibrations and human activity associated with these works may also affect these species.

General

- Dust deposition - The extraction and processing of rock and the associated traffic and human movement has the potential to generate dust. Where large amounts of dust are deposited on vegetation over a long time-scale (a full growing season for example) there may be some adverse effects upon plants, e.g., restricting photosynthesis, respiration and transpiration. The overall effect may be a decline in plant productivity, which may then have indirect effects on the quality of the surrounding habitats and associated fauna. The amounts of dust deposited and its effects are also dependent upon weather conditions as in wet weather less dust will be generated and that which has been deposited upon foliage is likely to be washed off.
- Deteriorations in Water Quality - If appropriate mitigation measures are not taken during the quarrying works, then there is the possibility that water quality in the drain that is adjacent to the site may be negatively impacted upon. Possible direct impacts include the pollution of the waters during operation with silt, oil, hydraulic fluid etc. This would directly affect the habitat of aquatic species by reducing water quality. These substances would also have an impact on the ecology of the water in general, directly

affecting certain species and their food supplies. In addition, an increase in the siltation levels of local waterbodies could result in the smothering of fish eggs, an increase in the mortality rate in fishes of all ages, a reduction in the amount of food available for fish and the creation of impediments to the movement of fish. Pollution of the water with hydrocarbons during the development/operation of the proposed development could also have a significant negative effect on the aquatic invertebrate populations.

11.11.6 Restoration and Post-Operational Impacts

Following the cessation of quarrying activities, the proposed development will be restored for agricultural purposes. There will ample opportunity at this stage to create a range of habitats with positive benefits for wildlife and local biodiversity.

11.11.7 Cumulative Impacts

The planning section of the website of Laois County Council was examined for any recent decisions for other developments within the Stradbally area. In the five years previous to this, a number of other developments have been granted planning permission. These were mostly for domestic / agricultural developments. The proposed development will have no cumulative ecological impacts when considered in combination with these or any other domestic developments.

Overall, housing density in the area is at a medium level. All houses in the area are serviced by the public wastewater system or by private septic tanks or treatment plants. Owners of these systems are required to properly operate and maintain their systems as required under the Water Services Act, 2007 and Water Services (Amendment) Act 2012. There will be no cumulative impacts arising from the operation of the proposed development along with the operation of properly maintained septic tanks / treatment plants.

Agriculture is a dominant feature of the area and most fields in and outside of the site are managed for grassland. All agricultural activities within the Barrow catchment area are required to operate within the legislation defined in the European Union (Good Agricultural Practice for Protection of Waters) Regulations 2017 (S.I. 605 of 2017). This legalisation covers practices regarding manure storage and land-spreading, minimisation of soiled water and general good agricultural practice. Cumulative impacts arising from the combined operation of these agricultural activities with proposed development will be negligible.

11.11.8 Impact Summary in the Absence of Mitigation

Overall, the impacts of the proposed deelopment in the absence of mitigation are summarised in Table 11.7.

Table 11.7: Predicted Impacts

Impact Description	Significance of Effects (Pre Mitigation)
Impacts upon Natura 2000 Sites	Significant - Moderate Negative

Impact Description	Significance of Effects (Pre Mitigation)
Impacts upon NHAs / pNHA	No Effects
Habitat Loss and Fragmentation Improved Grasslands / Tillage Lands Treelines / Hedgerows	 Minor Negative Moderate Negative
Impacts upon Pollinators	Minor-Moderate Negative
Disturbance to Local Wildlife Badgers Bats Otters Other Mammals Birds Amphibians, Reptiles and Invertebrates	 Moderate Negative Moderate Negative Moderate Negative Moderate Negative Moderate Negative Moderate Negative
Deterioration in Water Quality	Moderate Negative
Cumulative Impact	Neutral

11.12 Mitigation Measures

The principal objective of mitigation is to take measures that will avoid and reduce the negative effects of the proposals upon the existing ecological value of the site. For the site at Garrans, the following mitigation measures will be implemented:

General Biodiversity Mitigation

- An Environmental Management Plan (EMP) (Appendix 2.2) has been prepared setting out a framework in relation to the management of environmental mitigation when the proposed development is operational. Mitigation from this biodiversity assessment has been incorporated into the EMP. The EMP will be updated prior to the commencement of the works on site and compliance with the EMP will be mandatory.
- Prior to any works commencing on site, site personnel will be made aware of the ecological sensitivity of the treelines in the site and of the measures required to protect the biodiversity of the site and the water quality of the local aquatic receptors. They will be made familiar with the mitigation outlined in the assessment and incorporated into the EMP;
- All site works will be confined to the site boundaries.
- All quarrying activities on site will follow current best practice guidelines, including the Geological Heritage Guidelines for the Extractive Industry produced by Geological Survey of Ireland and Environmental Management in the Extractive Industry produced by the EPA;
- Any vegetation clearance shall be undertaken outside of bird nesting season (March to August Inclusive) or under the supervision of a suitably qualified ecologist;
- All excavated topsoil shall be stored appropriately on site and retained for future reinstatement of th[illegible] quarry, on a phased basis and at the end of its operational phase, to support the final restoration works. Measures will be taken to minimise sediment generation during the storage of these soils.
- The exposed surfaces shall be minimised and reinstated or re-vegetated as soon as possible.
- Verges of undisturbed habitat will be left around the field margins of the site. This verge must include the root protection zone of trees that are to be retained. This should be fenced off prior to the commencement of quarrying activities. The verge should be managed in accordance with traditional hay meadow practices, i.e., cutting in autumn and removing the topped grass. The maintenance of this corridor will also allow mammals to continue commuting throughout the site if required.
- The fencing around the quarrying activities will be mammal proof. There shall be no gaps at the bottom.

Treelines and Hedgerows

- The removal of trees, treelines and hedgerows within the site has been avoided where possible. All boundary hedgerows/treelines will be retained and protected. The hedgerow between Phase 3 & 4 operations will be removed during the course of the excavation works.
- A Landscape Plan for the Operational and Restoration Phases has been developed and is provided in Appendix 10.6. It outlines proposals for the protection, planting and

provision of compensatory treelines/hedgerows over the lifetime of the proposed development.

- The treelines remain the most important ecological features within the site. These shall be protected from direct habitat loss though removal and indirect loss through damage through root compaction. Therefore, the following measures should be considered prior to any grant or permission:
    - There is a buffer area in the northern section of the site i.e. surrounding the 4No. ponds and the refuelling area which will not be stripped or excavated within, during the lifetime of the proposed Project. The 4No. ponds will be located c.15-22m from the boundary. These measures will protect the treeline along this northern boundary;
    - Any damage to the existing hedgerows/treelines which form the boundary of the site will be avoided. There will be no loading of soil, excavate, spoil or any materials onto the root system of the hedgerows or any of the hedgerow trees;
    - A root zone protection barrier will be set up and marked with signage indicating its purpose before any heavy vehicles move on site;
    - In the event that tree removal works are required during the course of site activities, these shall be guided under the advice of an arboriculturist. They will only be carried out outside of the bird nesting season;
    - If trees need to be removed, it shall be done through the soft felling method, and this will reduce the risk of harming fauna during the felling process. Soft-felling involves the whole of the tree and any large branches being cut down in sections, with each section being carefully lowered to the ground. Once on the ground the timber will be left in-situ on the ground for a minimum of 24 hours before being chipped or removed in order for any fauna to disperse without harm.
- Treelines and hedgerows shall be supplemented with suitable native species where necessary. Refer to mitigation in Chapter 10 Landscape and Visual and the Landscape Plan (Appendix 10.6) for full details;

Bats

- Prior to the removal of any tree, it shall be checked for the presence of roosting bats by a suitably qualified person.
- If there are bats present, the tree will be removed when the bats are no longer using the tree, or else a derogation license will be sought from NPWS for the relocation of the bats.
- Minimal lighting will be required at the site and will be focused on the main working areas only, when the site is in operation. The lighting will aim to maintain any opportunities around the site for nocturnal and crepuscular species by using timers, cowls and hoods. Lighting shall not be directed at any tree, hedgerows or woodland habitats.

Badgers

- The site will be re-surveyed for badger activity prior to the commencement of each phase of the quarrying activities.
- There is a badger sett (Sett 1) located within the Phase 4 area. Extraction activities will not commence in this area of the site for a number of years. If upon review, this sett

is still active, badgers will be excluded from the sett and any other setts that may be identified and considered vulnerable.

- Approval to exclude and excavate the sett(s) will be sought from the NPWS prior to the commencement of any quarrying works in the relevant area.
- Any setts that require to be excluded/removed shall be monitored by a suitably qualified person prior to exclusion. If the sett is shown to be a breeding sett, exclusion shall not be undertaken between December and July.
- Other setts (Setts 2,3,4) close to the site may also be indirectly affected by the ground disturbance from the quarrying activities. However, the area closest to these setts will not be quarried or stripped. This is the northern area where the refuelling area and 4No. ponds will be located. This stretch of land will act as a buffer between the site works and these setts.
- Dust mitigation measures as outlined in the EMP (Appendix 2.2) will be followed on site at all times, e.g., the dampening of internal haul roads, surface material and stockpiles; the presence of vehicle washing facilities and the vegetation of earthen berms and screening bunds.

Surface water and Groundwater Quality

- It is important to protect the quality of surface water and groundwater locally. The following measures must be adhered to:
    - There will be minimal requirement for the storage of chemicals, oils, greases and hydraulic fluids. Where required, these will bestored in bunded compounds, located away from the drain on the northern boundary;
    - The designated refuelling area will be located in the north west corner of the site. This area will facilitate the refuelling of mobile equipment on the site .There will be no storage of fuel at the site, with refuelling being undertaken with a mobile tanker that will access the site as needed. The refuelling area will be a concrete hardstanding area with a gully to collect any spillages. The gully will be connected to an oil interceptor.
    - Stockpile storage areas and the site office are located away from the drain on the northern boundary;
    - An effective spillage procedure will be incorporated as part of the EMP and all staff will be properly briefed.
    - Any waste oils or hydraulic fluids will be collected and stored in appropriate containers and disposed of offsite in an appropriate manner.
    - All plant and machinery shall be regularly maintained and serviced (off-site) to minimise release of hydrocarbons.
    - Spill kits shall be present in all plant machinery.
    - Oil booms and oil soakage pads shall be kept on site to deal with any accidental spillages.
    - Waste oils and hydraulic fluids should be collected in leak-proof containers and removed from site for disposal and recycling
- Chapter 8 Hydrology & Hydrogeology has detailed a number of measures that will be incorporated as part of the operation of the site. These measures have the aim of avoiding, reducing and preventing impacts and effects upon surface water and groundwater hydrology and quality. These measures have been summarised in Table 11.8 below:

Table 11.8: Summary of Mitigation Measures from Chapter 8 Hydrology (Tables 8.16 & 8.17)

Mitigation Reference No.	Mitigation Principle	Description
M1	Avoidance	The site water usage, sourced from a combination of surface water runoff and groundwater, is minimised to an average daily process water top-up requirement of 24 m^3/day, and an occasional maximum of 42 m^3/day by: • Recycling of at least 80% of process water within an integrated mobile washing plant (which comprises feeding, screening, sand washing and stockpile conveyors (CDE CDE M2500 E5)) and primary water treatment plant (CDE AquaCycle Thickener). This avoids losses by leakage and evaporation associated with collection and conveyance to and storage in, open water settlement ponds; • Recycling of all stockpile water to process top-up, from a stockpile de-watering system; • Recycling of approximately 33% of sludge water to process top-up, from a sludge settlement pond. Approximately 30% of the average daily site surface water run-off will reach the man-made drain.
M2	Avoidance	No alterations to the man-made drain will occur, therefore the intermittent, seasonal pathway from the site, to the tributary of the Stradbally River and the Stradbally River is retained. The drain and its banks are protected by the retention of a minimum width of 60m wide buffer zone of the natural vegetation, in which no quarrying or related activities will occur.
M3	Prevention	Surface water run-off generated on the operational site from the critical 20 year return period storm with climate change allowance (and lower return period storms), are attenuated in 1054 m3 of storage and discharged at the greenfield run-off rate. This ensures that the discharge rate for storm water occurs at the natural, pre-development rate and flow rates contributing to flood conditions in the Stradbally river are maintained at natural, pre-development levels.
M4	Avoidance	Water discharged from the site to the man-made drain, comprises only water from the natural sub-catchment of the site and the tributary of the Stradbally river. No surface water arising in any other catchment or sub-catchment is transferred to and discharged in this catchment.
M5	Avoidance	No discharge of process water to the water environment occurs. Process water which leaves the process in material and in sludge is recycled back into the process in a system loop, or exported off site in material, and is not discharged to the water environment. This is achieved via the: • Stockpile dewatering system; This comprising collection of all stockpile gravity drainage and any direct rainwater, followed by direct, closed recycling into the process top-up water balancing pond. This avoids entrainment of stockpile material in surface water run-off. • Recycling of clarified water from the sludge settlement ponds and recycling into the process top-up water balancing pond.
M6	Avoidance	Stripped soil stockpiles will be located at the southern end of the site, at the maximum available distance from the man-made drain and a minimum of 60 m from the man-made drain. Stripped soil stockpiles/berms, will be immediately re-seeded with appropriate grassland species. This is in order to minimise entrainment of suspended sediments in surface water run-off.
M7	Prevention	Closed tank system treatment of at least 80% of process water, within the primary water treatment plant (CDE AquaCycle Thickener) and subsequent closed, direct recycling back to the integrated processing plant (screening, sand washing and stockpile conveyors in a CDE M2500 E5) This avoids requirement for large open sediment settlement ponds (and conveyance to them) to treat the full daily process water volume, therefore decreasing risk of unintended spillages or overflow of process water.
M8	Prevention	The site Environmental Management Plan (EMP), which sets out all environmental controls, including inter alia: • Correct site management procedures, • Monitoring and maintenance methods, • Accident responses.

Mitigation Reference No.	Mitigation Principle	Description
		All staff will be trained to understand their roles and responsibilities as set out in the EMP.
M9	Reduction	Controls which will treat water polluted by suspended sediment and associated pollutants in the case breakdown of the integrated primary water treatment system or accidental spillage from the sludge management system are: • Temporary bunding and diversion to the sludge-settlement ponds, which have sufficient excess capacity to store, settle and recycle the average daily process water and/or to the storm water attenuation/settlement pond, if sufficient storage exists at the time of the accident. • Reduction in outflow or stopping flow at the discharge point from the storm water attenuation/settlement ponds, in order to increase retention time, if required. • Location of the sludge management system and primary water treatment system a minimum distance of 20 m from the site man-made drain. In the case of accidental discharge from the pond, this buffer zone, which is fully vegetated, will retain sediment.
M10	Avoidance	Minimisation of exposed ground by stripping of soils only at the commencement of a quarrying phase and immediate re-seeding of the worked out phase, in order to minimise entrainment of sediment and associated pollutants in surface water run-off. Stripped soil stockpiles/berms, will be re-seeded with appropriate grassland species. Retention of a vegetated (non-stripped) buffer zone to a distance of 60 m from the man-made drain which occurs on site, in order to avoid entrainment of sediment in any surface water run-off draining directly to the drain.
M11	Avoidance	e emplacement of a flexible, reactive, surface water interceptor drainage system which will be modified to be effective for each phase of the development. It comprises separated 'clean' water and 'dirty water elements as follows: • 'Clean water' interceptor drainage, which collects clean surface water runoff from areas of the site which have not been stripped of vegetation and from re-instated areas of the site, which are fully re-vegetated. This minimises the volume of water in which pollutants could be entrained; If necessary, geotextile lining or french drains will be implemented to prevent erosion and improve conveyance. • Dirty water' interceptor drainage which collects surface water run-off from areas of the site [illegible] entrainment may occur. This includes working areas of the quarry and recently re-instated areas, where vegetation is not yet established, but excludes the bunded re-fuelling area. If necessary, geotextile lining or french drains will be implemented to prevent erosion and improve conveyance. • Conveyance of all collected drainage to the storm water attenuation/sediment settlement pond.
M12	Prevention	Combined storm water attenuation/sediment settlement pond. This comprises: • Impermeable pond(s) with sufficient storage (1,054 m^3) to attenuate the site run-off resulting critical 1 in 20 year storm rainfall event; • Retention time c. 30% in excess of that required to settle fine silt size particles and designed to maximise settlement efficiency; • Discharge of treated water to the environment actively controlled, via a flow control and a discharge meter, to the greenfield run-off rate. The discharge will occur onto an area of natural vegetation, at approximately 19 m distance upgradient of the man-made drain, in the form of a level spreader. The greenfield discharge rate is very low and unlikely to cause erosion. Erosion control measures such as rip-rap will be emplaced if commencement of erosion is observed.
M13	Reduction	Controls which will treat water polluted by suspended sediment and associated pollutants in the case of accidental spillage/overflow from the storm water attenuation pond/settlement pond: • Temporary bunding and diversion to the sludge-settlement ponds, which have excess capacity sufficient to contain a 1 in 10 year storm water run-off event. • Location of the storm water attenuation pond a minimum distance of 20 m the site man-made drain. In the case of accidental discharge from the pond, this buffer zone, which is fully vegetated, will retain sediment.
M14	Avoidance	Electric processing and integrated primary water treatment plant and use of a gravity stockpile drainage system, significantly reducing fuel usage on site. No storage of fuels on site. Extraction plant (comprising an excavator and a wheeled loader) fuelled by a mobile fuel bowser brought to site. Fuelling occurs within a designated, impermeable bunded fuelling area, provisioned with a hydrocarbon interceptor. Drainage from the re-fuelling area is isolated from the surface water system and is conveyed directly

Mitigation Reference No.	Mitigation Principle	Description
		to the storm water attenuation/sediment settlement pond. Handling of fuels and oils brought to site will be in accordance with UK Guidance for Pollution Prevention (2019) and Pollution Prevention Guidance (pre 2019). Where plant allows, environmentally considerate lubricants, such as synthetic non-toxic biodegradable hydraulic fluids, will be used. Scheduled visual checking for leaks and mechanical issues will occur, in order to minimise leakage and breakdowns on site. General servicing of site machinery takes place off-site. Storage of primary water treatment system polymer flocculant in a locked, fully watertight shed, from which no outflow of stored volume can occur.
M15	Reduction	Controls which will treat water polluted by fuels, lubricants or flocculant in the case of accidental spillage or escape are: • Spill kits, which will be stored on site. Staff will be fully trained in the correct and appropriate use, monitoring and removal of spill kits; • Shutting off of the flow control valves on the discharge point from the storm water attenuation/settlement ponds which receive site surface water drainage. Immediate subsequent removal of contents for off-site disposal with an appropriately licensed waste disposal company
M16	Avoidance	Minimisation of groundwater abstraction by combined usage of surface and groundwater resources. At the average material processing rate, groundwater abstraction comprises an average 37% of total water supply requirement, ranging from a minimum of 0% to a maximum of 68% across a year. At the occasional maximum material processing rate, groundwater abstraction ranges from an occasional 38% to 83% of total water supply requirement.
M17	Avoidance	Placement of the abstraction well at the north west corner of the site. This ensure that the zone contributing groundwater to the abstraction is contained within the site boundary (with the exception of c. 6 m across the northern boundary) and does not intersect the area contributing either of the two domestic house supplies (assumed to abstract a conservative 1 m^3/day) to the south of the site.
M18	Avoidance	Zones of Contribution (zones contributing groundwater to the abstraction) delineated for the average and occasional maximum material extraction groundwater requirements are extremely conservative. • A conservative ZOC (ZOC 1) has been delineated for the maximum (July) required groundwater abstraction rate of 17 m^3/day, for the average material processing rate. By convention, ZOCs are delineated for a continuous 'steady state' average abstraction rate over a year, which assumes maintenance of the same pumping rate throughout a year. Withdrawal of groundwater from the full extent of the ZOC will only occur if that abstraction rate is continuous throughout the year. According to best practise, a ZOC is delineated for 150% of annual average usage (i.e. 13.5 m^3/day) to provide a factor of safety. Defining the ZOC for the maximum July rate of 17 m^3/day, rather than 150% of the average annualised daily abstraction rate, therefore significantly .overestimates the extent of the area which will contribute groundwater to the borehole, by an additional factor of safety of approximately 25%. • An additional ZOC (ZOC 2) has been delineated for the intermittent maximum (July) required groundwater abstraction rate of 35 m3/day, for the occasional maximum material processing rate. This is a notional ZOC, which would only occur, if water were to be extracted at this maximum rate, throughout the year. This will not occur, since this is an intermittent processing rate. A factor of safety of the order of >50% is likely to be associated with this ZOC area. This is delineated only for the purposes of a very conservative assessment of risk to sensitive ecological receptors
M19	Avoidance	• Extraction will be to a depth of at least 1 m above the estimated highest winter groundwater level across the extraction area, to which is added a climate change uncertainty allowance of 10% of annual groundwater level variability across the site. Groundwater levels at the site decrease by 1.5 to 2 m depth seasonally. Pollutants would therefore be attenuated by a minimum depth of 1 m, increasing seasonally to approximately 3 m depth of unsaturated subsoil material, before reaching the

Mitigation Reference No.	Mitigation Principle	Description
		groundwater table and associated flowpaths. There is therefore no potential for direct discharge of pollutants to the groundwater. • Electric processing and integrated primary water treatment plant and gravity stockpile drainage system, significantly reducing fuel usage on site. • No storage of fuels on site. Extraction plant (comprising an excavator and a wheeled loader) fuelled by a mobile fuel bowser brought to site. Fuelling occurs within a designated, impermeable bunded fuelling area, provisioned with a hydrocarbon interceptor. Drainage from the re-fuelling area is isolated from the surface water system and is conveyed directly to the storm water attenuation/sediment settlement pond. Handling of fuels and oils brought to site will be in accordance with UK Guidance for Pollution Prevention (2019) and Pollution Prevention Guidance (pre 2019). • Location of the designated re-fuelling area on an area of the site where no excavation (or soil stripping) will occur. This location will have a minimum depth of 3 m of unsaturated material above the maximum recorded winter groundwater level, with a climate change allowance of plus 10% of average annual variation. This will increase by up to 5 m depth of unsaturated material during seasonal low groundwater levels. • Where plant allows, environmentally considerate lubricants, such as synthetic non-toxic biodegradable hydraulic fluids, will be used. • Scheduled visual checking for leaks and mechanical issues will occur, in order to minimise leakage and breakdowns on site. General servicing of site machinery takes place off-site. Storage of primary water treatment system polymer flocculant in a locked, fully watertight shed, from which no outflow of stored volume can occur.
M20	Reduction	Accidental spillages which occur within the Zone of Contribution of the well and which are likely to have reached groundwater, could, in the unlikely event of a significant spillage, be remediated by pumping of the abstraction well. Pumping of polluted water could prevent migration of certain pollutants down the groundwater pathway and contain the impacts within the site. Polluted water would be directed to the sludge management system, which has additional capacity and subsequently treated.

11.13 Monitoring

Monitoring is generally required where there may be significant residual impacts despite the implementation of the mitigation measures. The following monitoring measures are recommended:

- Badger activity within the site should be monitored annually, with a survey undertaken prior to the commencement of works within each new phase.
- It is recommended that a surface water quality monitoring programme is initiated on receptors downstream of the site. Monitoring shall be undertaken in accordance with the details provided in Chapter 8 Hydrology and Hydrogeology. This Chapter details the requirement for quarterly monitoring in the drain at the north of the site and in the tributary to the Stradbally River.

11.14 Residual Impacts

With the recommended mitigation measures, it can be concluded that the proposed Project at Garrans will have a neutral to slight negative impact upon the biodiversity of the local area. Overall, the retention of existing habitat features in this site and the buffer zone along the treelines and drain will lessen the impact. The creation of new habitats on the site will be a positive benefit to local ecology and with proper management of the site and its green areas, then local areas of biodiversity will be allowed to develop.

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12. Population and Human Health

This Chapter assesses the potential effects of the proposed Project on the people in the surrounding community. The assessment considered the construction, operational and restoration phases of the proposed Project, taking into account the potential for impacts on the areas of economy, employment, amenity, tourism and local resources.

Generally, the proposed Project will have positive impacts in terms of both employment and economy. The operation will have in the region of 2 staff employed directly at the site. Additionally, the provision of a secure supply of aggregate to the local manufacturing and processing industries, will help to sustain and potentially grow employment levels at these facilities.

To achieve the development objectives outlined in regional and national documents such as the Laois County Development Plan 2017 – 2023 and the National Planning Framework 2040, in the region of 1.5 billion tonnes of aggregate will be needed across the country. In this regard, the proposed Project will have positive impacts on the economy, by providing a secure aggregate supply, to support future housing and infrastructure developments in the surrounding region.

Tourism resources such as the Rock of Dunamase are located sufficiently far away from the proposed Project and it was considered that there would be no impact on these assets.

There is the potential for some impacts on local residences and resources in terms of air quality, noise and traffic. However, increased traffic levels when the proposed Project is operational were considered minimal and any effects would be not significant. Additionally, an Environmental Management Plan (EMP) will be implemented on site, which will detail mitigation measures to minimise emissions from the site (dust, air quality, noise etc.). The EMP will allow for the implementation of appropriate environmental practises and it was considered that any effects associated with site emissions would be imperceptible (not significant).

Once the restoration works are completed, the site will be returned to an agricultural use and there will be no impacts on the local community.

12.1 Introduction

This Chapter of the EIAR has been compiled by Rowan Engineering Consultants Ltd. (Rowan). This Chapter assesses the potential effects of the proposed Project on the people in the surrounding community.

12.2 Methodology

The following sources were consulted in order to identify, map and assess the potential impact to the surrounding population from the proposed Project:

- National and Regional Planning Policy;
- Laois County Development Plan (CDP) 2017-2023;
- Midland Regional Planning Guidelines 2010-2022 (RPG's);
- Eastern & Midland Regional Assembly, Regional and Spatial Economic Strategy (RSES)2019-2001;
- Central Statistics Office (CSO): https://www.cso.ie/en/databases/; and

- All Ireland Research Observatory: http://airo.maynoothuniversity.ie/.

A visit of the site and surrounding environment was also undertaken to support understanding and inform the identification of local resources and amenities.

12.2.1 Relevant Guidance

Relevant guidance taken into consideration in the development of this Chapter include:

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, August 2017);
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA, September 2015); and
- Quarries and Ancillary Activities: Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government, April 2004).

12.2.2 Criteria for Rating of Environmental Impacts

The criteria used to rate the potential environmental effects of the proposed Project on population and human health was based on the criteria outlined in the EPA document, *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (Draft, August 2017). Table 3.3, Description of Effects in the Guidelines outlines how specific effects can be described in relation to quality, magnitude and extent.

12.3 Baseline Conditions

12.3.1 Land Use

The site is located in the townland of Garrans (Electoral Division: Curraclone), approximately 500m east from Garrans Cross and the regional road R427 and c. 2km north east of Stradbally Town. The site is currently greenfield and encompasses approximately 12 hectares and is accessed by the local road, L7939, which runs west to east, towards the R428.

The site is bound to the north by a section of Coillte owned forestry. There is history of previous quarrying activities for sand and gravel to the north west of the proposed Project, registered under Stradbally Quarries Ltd (QY05/74/1)..

The site is largely surrounded by agricultural lands on the west, eastern and southern boundaries, with the Stradbally River is located c. 300m south of the site. There is a tributary to the Stradbally River at a distance of c. 400m north of the site.

The site would be described as hummock topography, with an elevation ranging between 67.1-80m Above Ordnance Datum (AOD). There is a slight slope downwards towards the north easterly corner of the site

12.3.2 Population and Employment

Population figures for the electoral divisions of Stradbally and Curraclone are presented in Table 12.1 below. Both electoral divisions have observed population increases from the April 2011 to April 2016 (census periods). These divisions have exhibited stronger increase trends (11&16% respectively) when compared to County Laois as a whole which experienced an increase of c.5% from 2011 to 2016. Nationally, an increase of 3.7% in population was recorded during this period.

Table 12.1: Population Changes in Stradbally, Curraclone and County Laois

Area	April 2011	April 2016	Percentage Increase
Stradbally	1,626	1,807	11.1%
Curraclone	229	266	16.2%
Portlaoise*	18,312	20,009	9.3%
County Laois	80,559	84,732	5.2%

*: Urban and rural ED's combined

Overall in Ireland this year, the Central Statistics Office (CSO) reported that there has been a continued annual increase in employment of 2.2% (to Quarter 1 2020). This compares to an annual increase of 3.7% for the year up to Quarter 1 of 2019. In terms of employment, the population (aged 15 years and over) in employment within County Laois increased from 2011 to 2016 by 3204 people, which represents an increase of 10.6% (Table 12.2).

Table 12.2: Total at Work in Co. Laois (2011-2016)

Area	April 2011	April 2016	Percentage Increase
County Laois	30,337	33,541	10.6%

With regard to employment, the Laois CDP 2017-2023 identifies that County Laois fails to provide enough jobs for its population with a significant percentage commuting to counties including Kildare, Dublin and Carlow.

The Surrounding Population

The main population centres in proximity to the proposed Project would be Stradbally (c. 2km away) and Portlaoise Town (c.7km away).

Additionally, there are a number of one-off private residences located along the R427 at Garrans Cross Road and off the surrounding local roads. Within 500m of the site boundary, there are c. 20 private residences (Refer to Figure 12.1).

Figure 12.1: Residences within 500m of the proposed Project (site boundary)

12.3.3 Economy

Economic activity in the areas surrounding the proposed Project would be related to primarily agricultural uses and agri-business. The closest significant residential, retail, commercial and industrial economic activities would be associated with the centres of Stradbally and Portlaoise.

The National Planning Framework 2040 acknowledges the rapid expansion that Portlaoise town has experienced in recent years with regard to residential and retail development, with population statistics indicating a 45% population increase from 2002 to 2016 for the Town. Within the RSES, Portlaoise is recognised as a 'Key Town' and there is an objective to support the development and regeneration of these towns.

In terms of economic development, the RSES acknowledges the presence of the '*Global Business and ICT Sectors, agri-business and the public services sector*' in the town and also refers to the potential for the future development of the J17 National Enterprise Park.

The policies and objectives of the Laois CDP 2017-2023 seek to build on the role of Portlaoise Town as a key driver for the County alongside enhancing and sustaining the economic health of all towns and villages. There are objectives in the CDP relevant to Stradbally, which is identified as a Service Town. It is noted that the town is capable of continued '*managed* *population growth.. together with employment opportunities, business, industry and tourism and infrastructural development.'*

Within the CDP, there is also continued support '*in principle*' for the expansion of the aggregates and concrete products as they do offer the potential for employment and economic development within the county. A number of policies (RUR8 – RUR12) are detailed in this regard.

12.3.4 Local Resources

Garrans Cross, Stradbally Town and the surrounding environment is currently serviced with community resources and amenities including the following:

- Local businesses including shopping facilities, small local industries, service stations, restaurants and pubs;
- Credit Union
- Post Office;
- Garda Station facilities;
- Health Centre;
- Library and Arthouse;
- Sports Clubs including Gaelic Athletic Association Clubs (GAA) clubs and Laois Cricket Club (located at Stradbally);
- Children's preschool/creche & playground facilities; and
- Educational and Religious centres.

There are a number of one-off private residences located along the R427 at Garrans Cross Road and off the surrounding local roads. These would be serviced by private septic tanks and percolation areas.

12.3.5 Tourism and Amenities

Visitor numbers and revenue to County Laois have grown steadily since 2013. Fáilte Ireland reported[13] that tourism in County Laois generated €34m in 2017 from overseas and domestic visitors. County Laois markets a number of key tourism facilities across the county relating to arts, museums, heritage and garden trails (amongst others). None of these assets or sites or trails are in the immediate vicinity of the proposed Project.

Within the town of Stradbally, the following tourism and amenity related features are present:

- Stradbally Steam Museum;
- Stradbally Hall (outdoor venue including music festivals, paint balling & fishing facilities); and
- Stradbally children's playground.

[13]:http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/2_Regional_SurveysReports/2017-topline-regional-performance-(003).pdf?ext=.pdf

Ballykilcavan Farm and Brewery is located outside of Stradbally and c. 1km south east of the proposed Project.

Ballintubbert Gardens and House is located outside of Stradbally and c.4.9km south east of the proposed Project. This venue facilitates weddings, corporate retreats and short stays and is also identified on the County Laois Garden Trail. Other accommodation facilities in the area include Inch House and Ballyrider House.

The Grand Canal Waterway is located c. 2.7km north east of the proposed Project site.

As part of the Ireland's Ancient East programme, the Laois Heritage Trail was launched and takes in a range of sites across Laois, which includes the Stradbally Steam Museum and the Rock of Dunamase. The Rock of Dunamase is an historic attraction, located c. 5km west of the proposed Project site and offers significant views of the surrounding countryside.

The Laois Tourism Strategy 2018-2023 was published in 2018 with the objective of implementing a strategic tourism strategy for the county and allowing the tourism sector in Laois to become a '*buoyant economic sector…*'. In summary, some key items of note within the Strategy include:

- A number of key targets are set for the County, including attracting an additional 32,500 domestic and oversees visitors into the region by 2023;
- The importance to County Laois of its historical and cultural assets is highlighted, which is the brand on which Ireland's Ancient East is built;
- Recognition is given to assets such as Stradbally House and the Rock of Dunamase for the county. The Rock of Dunamase is specifically identified as a catalytic project which has the potential to stimulate significant tourism activity for County Laois;
- There are future proposals to develop the offering for visitor experiences relating to the County Laois Garden and Heritage Trails; and
- The future development of accessible waterways (which includes the Grand Canal and the River Barrow) for the likes of walking, fishing and biking trails is a key part of the Strategy.

Section 5.11 of the Laois CDP 2017-2023 addresses the tourism sector. It sets a similar tone to that of the Laois Tourism Strategy recognising the potential of the county to grow the tourism sector significantly. In support of the tourism sector, the CDP sets out a number of tourism policies, which are framed around supporting, promoting and enhancing the potential for tourism sector growth in the county.

12.3.6 Importance of Receptors

The importance of receptors relevant to this assessment are outlined in Table 12.3 below.

Table 12.3: Importance of Receptors

Receptor Theme	Importance	Description
Landuse	High - Medium	The lands would be viewed as good quality agricultural lands, suitable for grazing. It is also currently under tillage for cereal crops.
Population, Employment & Economy	High- Medium	A high sensitivity was would typically be applied to receptors (such as local residents) where disruption from the proposed Project could result in a significant effect to the resident or premise. Whilst some commercial properties would be considered to be resilient (i.e. medium importance) to the proposed Project, there are also other local commercial properties that would be considered dependent on the future development of the proposed Project (i.e. local manufacturing and processing facilities).
Local Resources	High	Local resources were considered of high importance, as any impact or disruption to them, could result in significant effects for the local communities.
Tourism & Amenities	High	The surrounding tourism and amenities were considered of high importance as any impact to them could result in significant effects for the operators and may impact overall future revenue for tourism in the area.
Human Health	High	A high sensitivity was applied, as disruption from the proposed Project could result in significant effects on human health.

12.4 Predicted Impacts

Given the nature of the proposed works at the site, the construction and operational phases have been considered as the one phase/process for this assessment.

12.4.1 Land Use

There will a loss of agricultural lands to facilitate the extraction activities, with the proposed Project site taking up c. 12ha. The land is currently grazed intermittently and is divided with mature hedgerows. The loss of lands for extraction activities (c.12ha) is relatively small considering the abundance of agricultural lands in the immediate surroundings. The impact would be considered long term, adverse and with slight effects. The site would be returned to an agricultural resource on cessation of the extraction activities which ultimately presents a positive benefit from a land use perspective.

12.4.2 Population and Employment

There will be a small increase in the daily number of persons working in the immediate area, with in the region of 2 staff employed directly at the facility. It is envisaged that these roles would be serviced by local persons with the necessary quarrying/construction experience.

Quarter 1 results for 2020 from the CSO, indicate that c. 148,000 persons are currently employed in Ireland in the construction sector[14]. Any impacts relating to direct employment from the proposed Project, whilst positive, would be considered long term and with imperceptible effects.

The provision of a secure supply of aggregate is critical to support existing local manufacturing and processing industries, primarily in the County Laois region. Aggregate from the proposed Project will help sustain and potentially grow employment levels within these local industries. These impacts were considered indirect, positive, long term and with moderate-significant effects.

It was considered that there would be no impacts on population growth associated with the proposed Project.

12.4.3 Economy

Chapter 4 Planning and Policy summarises a number of plans which identify:

- A range of policies and objectives focused on continued sustainable development and growth within County Laois and at wider regional and national scales; and
- That the aggregates industry is an important contributor to the Irish economy and that there is a future need for up to 1.5billion tonnes of aggregates through to 2040.

The proposed Project represents a c. €1.5 million investment and contributes to the long term viability of the local aggregate, construction and manufacturing industries, with the provision of c. 1.22 million tonnes of aggregate. It thereby aligns itself with local and national policies which support *'in principle'* the continued and sustainable development of the aggregate industry.

The proposed Project is also supportive of wider county and national commitments, providing c. 1.22 million tonnes of aggregate into the market, and thereby physically enabling the development and construction of future housing, infrastructure and economic developments, that are prescribed in published plans at local, regional and national levels.

The proposed Project is beneficial to the future economy, allowing access to utilise the available aggregate of the site, presenting minimal environmental disturbance, with no significant residual or cumulative impacts. The extracted area will be brought back to a beneficial agriculture and ecological afteruse upon restoration.

Overall this is considered a long-term, positive and with moderate- significant effects.

Some benefits to the local economy would be expected in terms of the increased spend in the local area, with the use of local businesses for items such as fuel, site supplies and maintenance and food. This would be an indirect impact. Given the scale of the proposed Project, whilst it is positive, the effects would be long term and imperceptible for the duration of the site operations.

[14] Construction sector was taken to include the quarrying industry.

12.4.4 Surrounding Population, Tourism, Local Resources and Amenity (Dust, Noise, Visual and Traffic Generation)

During the operation of the proposed Project, there is potential that some of the processes, may have adverse impacts on the surrounding population and environment, primarily with regard to dust deposition, visual, noise emissions and traffic and transport.

The main activities associated with the proposed Project are the extraction of sand and gravel from the ground, washing and storing of the extracted material, intermittent rock crushing and traffic movements within, to and from the site. The site will be extracted on a phased basis (Phases 1-4) which reduces the area being worked at any one time. This also means that the potential for adverse impacts remains localised, within certain sections of the site during it's life cycle.

Potential impacts have been assessed and are detailed further in the following chapters:

- Chapter 5: Traffic
- Chapter 6: Noise
- Chapter 9: Air Quality and Climate
- Chapter 10: Landscape and Visual

The Grand Canal, River Barrow, Ballykilcavan Farm and Brewery, Ballintubbert Gardens and the Rock of Dunamase tourism assets are located sufficiently far away from the proposed Project, so it was considered that there would be no impact on these. There are no views afforded from these assets into the proposed Project site.

There is the potential for some impacts on local residences resulting from potential increases in noise, traffic and/or the generation of dust and noise emissions from site activities. Increased traffic levels when the proposed Project is operational would be considered minimal, with c. 15 daily heavy good vehicles (HGVs), during the occasional peak extraction phases. On average, it's expected that the HGV volumes will be less than 15 on a day to day basis.

Overall, these potential impacts would be considered long-term, adverse and slight.

12.4.5 Impacts during the Restoration Phase

Following the cessation of extraction activities within each phase, restoration works for the relevant phase will commence. The lands will be graded and sloped to meet the levels at the site outline/edges. The area will be re-seeded with agricultural grass seed mixture native to the local area.

Once the final restoration works are complete, there will be no works undertaken at the site and no regular traffic access into/out of the site. There will be no impact resulting from this phase of the proposed Project.

12.5 Human Health

12.5.1 Health and Safety

The proposed Project will be designed and operated and decommissioned in accordance with best practise and in line with applicable legislation.

12.5.2 Health Impacts

Mitigation impacts relating human health and specifically air quality, noise, traffic and transport are detailed in these Chapters, 9, 5 and 6 respectively.

Table 12.4: Human Health Considerations

Human Health Topic	Construction / Operational/ Decommissioning Phase Impacts	Mitigation Proposed	Conclusion for Human Health	Reported in the EIAR
Air Quality	Potential impacts on human health: • Release of gases from road traffic and plant/equipment associated with the proposed Project. • Potential for nuisance from dust emissions, arising from stripping/excavation & soil stockpiling activities on-site.	An Environmental Management Plan (EMP) will be implemented on-site. The EMP details the mitigation measures that will be implemented on site to minimise dust emissions. Refer to Section 9.5 of the EIAR for details on those proposed measures.	There will be no significant human health impacts resulting from air quality or dust emissions from the proposed Project.	Air quality and dust emissions have been considered for the construction/operation and restoration phases of the proposed Project and have been reported in the EIAR. Refer to Chapter 9 of the EIAR.
Landscape and Visual	Potential impacts on human health: • Impacts to existing views and general visual amenity. • Changes to elements of existing landscape.	In terms of landscape, whilst the topography of the site will change its form, the landscape pattern can remain and be enhanced and protected over a period of greater than twenty years. The existing boundary hedgerows will be retained and strengthened, There are two earth berms incorporated as part of the 'design' of the site, which reduce the potential visual impacts. One is a 5m berm to the west of the site entrance and the other berm ranges from 2.5m – 3.5m, on the southern boundary of Phase 3.	There will be no significant human health impacts resulting from landscape and visual amenity changes.	Landscape and visual effects during the construction/operation and restoration phases of the proposed Project have been considered and reported in the EIAR. Refer to Chapter 10 of the EIAR.
Economy & Employment	Potential impacts on human health Impacts: • Positive impacts from direct & indirect employment opportunities. • Positive impacts from the boost to the local economy – providing a stable aggregate supply to local industries.	**<u>Employment</u>** There will be a small increase in the daily number of persons working in the immediate area, with in the region of 2 staff employed directly at the facility. The provision of a secure supply of aggregate is critical to support existing local manufacturing and processing industries. Aggregate from the proposed Project will help	There is potential for indirect human health benefits as a result of the additional employment and economic opportunities presented by the proposed Project.	Effects on employment and economy during the construction, operation and restoration phases of the proposed Project have been

Human Health Topic	Construction / Operational/ Decommissioning Phase Impacts	Mitigation Proposed	Conclusion for Human Health	Reported in the EIAR
		sustain and potentially grow employment levels within these local industries **<u>Economy</u>** The proposed Project contributes to the long term viability of the local aggregate, construction and manufacturing industries, with the provision of c. 1.22 million tonnes of aggregate. It thereby aligns itself with local and national policies which support '*in principle*' the continued and sustainable development of the aggregate industry. The proposed Project is also supportive of wider county and national commitments, providing c. 1.22 million tonnes of aggregate into the market, and thereby physically enabling the development and construction of future housing, infrastructure and economic developments, that are prescribed in published plans at local, regional and national levels.		considered and reported in the EIAR. Refer to Chapter 12 of the EIAR.
Local Resources, Tourism & Amenity	Potential impacts on human health: • Impacts on local resources, amenities and tourism assets, that would result in indirect impacts for the local population/communities.	Local amenity and tourism assets were concluded to be located sufficiently far away from the proposed Project and that there would be no impact on these. There are no views afforded from these assets into the proposed Project site. Proposed mitigation was largely associated with the implementation of the EMP to reduce the potential for impacts (such as air quality, landscape & visual). A Landscape Plan has been developed for the operational and restoration phases that identifies proposals for the management, protection and planting of treeline/hedgerows on the boundary and within the site.	There will be no significant human health impacts resulting on local resources, tourism and amenity.	Effects on local resources, tourism & amenity during the construction, operation and restoration phases of the proposed Project have been considered and reported in the EIAR. Refer to Chapter 12 of the EIAR.

Human Health Topic	Construction / Operational/ Decommissioning Phase Impacts	Mitigation Proposed	Conclusion for Human Health	Reported in the EIAR
Traffic and Transport	Potential impacts on human health: • Increase in traffic volumes, composition and speeds within the existing environment. • Release of gases from road traffic associated with the proposed Project (refer to Air Quality above).	With the construction of the proposed lay-bys on the local road L7939, no other specific mitigation measures were identified with respect to traffic and transport when the proposed Project is operational. Traffic volumes generated as a result of the proposed Project are very low. In the region of 15 heavy good vehicles (HGVs) will make trips to/from the site each day. This was estimated based on the occasional peak extraction rate, so on average, the daily HGV trips will be less than this. The additional traffic generated as a result of the proposed Project will result in some increases to traffic flows on the local road network. However, even when operating at peak excavation volumes (which will be occasional), the additional traffic was considered to be of low volumes. The existing junction on the R427, will have sufficient capacity with no queuing, to cater for the traffic increases in a safe and appropriate manner	There will be no significant human health impacts resulting from road traffic associated with the proposed Project.	Road traffic effects during the construction, operation and restoration phases of the proposed Project have been considered and reported in the EIAR. Refer to Chapter 5 of the EIAR and the specific Transport and Traffic Assessment.
Noise	Potential impacts on human health: • Potential for noise emissions as a result of site based activities and road traffic generated by the proposed Project.	Noise levels were predicted at noise sensitive receptors in the vicinity of the proposed Project. No significant adverse impacts were identified. There are two earth berms incorporated as part of the 'design' of the site and which effect the noise propagation, resulting in reduced levels at the nearby residential dwellings. One is a 5m berm to the west of the site entrance and the other berm ranges from 2.5m – 3.5m, on the southern boundary of Phase 3.	There will be no significant human health impacts relating to noise emissions from the proposed Project.	Noise emissions during the construction, operation and restoration phases of the proposed Project have been considered and reported in the EIAR. Refer to Chapter 6 of the EIAR.

Human Health Topic	Construction / Operational/ Decommissioning Phase Impacts	Mitigation Proposed	Conclusion for Human Health	Reported in the EIAR
Water Quality	Potential impacts on human health: • Pollution of group water and/or domestic water supplies due to polluting substances such as oils, flocculants and fuels. • Impact on the water levels or volumes of group water and/or domestic water supplies due to abstraction & extraction activities at the site	There will be no discharge of process wash waters from the site. Process wash water will be captured on-site and recycled back into the washing process. The EMP details the mitigation measures that will be implemented on site to minimise impacts to surface water and groundwater quality in the event of incidents, such as spills/ leaks of oils & fuels. Refer to Chapter 8 (Tables 8.16 & 8.17) of the EIAR for details on those proposed measures. Groundwater supply is required as part of the site water requirements. The proposed abstraction will have no impacts on the quantity or level of water at surrounding group water and domestic water supplies. The zone of contribution (ZOC) relating to the abstraction on-site will not interact with these water supplies and there is no groundwater flow from the site to these water supplies.	There will be no significant human health impacts resulting to water quality/level/volumes associated with the proposed Project.	Water quality impacts during the construction, operation and decommissioning of the proposed Project have been considered and reported in the EIAR. Refer to Chapter 8 of the EIAR.

12.6 Mitigation Measures

Impacts relating to dust, visual traffic and noise are addressed fully in the respective chapters.

It is noted that an Environmental Management Plan (EMP) (Appendix 2.2) has been prepared setting out a framework in relation to the management of environmental nuisances when the proposed Project is operational.

The EMP will be updated prior to the commencement of the works on site and compliance with the EMP will be mandatory.

The EMP details the mitigation measures that will be implemented on site to minimise environmental impacts and specifically relating to dust, visual, traffic and noise will include:

- Vehicles delivering or exiting with materials with dust potential will be enclosed or covered with tarpaulin;
- All HGV's leaving the site will directed through a wheelwash in order to prevent mud and other wastes being tracked onto public roads;
- All stockpiles will be monitored and treated with water to minimise dust emissions;
- Hard surfaces on-site will be swept to remove any mud or aggregate build up to minimise dust emissions;
- During prolonged dry or windy periods, any areas with the potential to generate dust will be watered, in particular areas next to the site entrance; and
- Public roads will be inspected regularly for cleanliness and cleaned as necessary.
- A Landscape Plan has been developed for the Operational and Restoration Phases. This identifies plans for the protection, management and restoration of treelines/hedgerows at the site. In addition, the provision of planted berms will reduce the visual impact for receptors in the vicinity of the proposed Project. Refer to Appendix 10.6.

12.6.1 Human Health

No other mitigation measures, in addition to what has been detailed in the EIAR assessment chapters, were deemed required with regard to human health.

12.7 Residual Impacts

The EMP will allow for the implementation of appropriate environmental practises and it was considered that any residual impacts when the site is active would be not significant.

12.8 Monitoring

Monitoring proposals relating to dust and water quality are detailed in the respective chapters and are incorporated into the EMP (Appendix 2.2).

12.9 References

All Ireland Research Observatory, retrieved October 2019, http://airo.maynoothuniversity.ie/;

Central Statistics Office, retrieved October 2019, https://www.cso.ie/en/databases/;

Failte Ireland : retrieved October 2019, http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/2_Regional_SurveysReports/2017-topline-regional-performance-(003).pdf?ext=.pdf

Department of Business, Enterprise and Innovation. (July 2017) County Employment Overview;

Environmental Protection Agency, Draft, 2017, Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;

Environmental Protection Agency, Draft 2015, Advice Notes for Preparing Environmental Impact Statements;

Laois Tourism Company. (2018) Laois Tourism Strategy;

Laois County Council (2017) Laois County Development Plan 2017-2023;

Midlands Regional Authority. (2010) Regional Planning Guidelines for the Midland Region 2010 to 2022;

archaeological testing of the monument area, did not find any evidence of this site (Table 13.1).

Table 13.1: Archaeological Monuments Adjacent to the Proposed Project

Cultural Monument	Townland	Distance to Boundary of the Proposed Project	RMP
Mass House	Garrons	60m	LA 014056
Enclosure	Garrons	470m	LA 14080
Enclosure	Garrons	500m	LA 014089
Enclosure	Knockphilip	685m	LA 014041
House	Ballykilcavan	650M	LA 014049

Further specific information on each of these monuments is detailed in Appendix 13.1.

13.3.3 Laois County Council Record of Protected Structures

The wider environs of the proposed Project include a number of structures listed on the County Laois Record of Protected Structures (RPS). These are at a distance from the site and are detailed in Table 13.2 below. References as relevant to the National Inventory of Architectural Heritage (NIAH) are also provided.

Table 13.2: County Laois RPS

Protected Structure	Townland	Distance to Boundary of the Proposed Project	RPS	NIAH No.	NIAH Rating (if applied)
Ballykilcavan House	Garrans	1020m	600	12801409	Regional
Ballykilcavan Bridge	Garrans	630m	599	12801410	Regional
Ballykilcavan Saw Mills	Garrans	830m	598	12801408	Local
Brockley Park Stradbally	Garrans	500m	708	12801411	Local
Inch House	Garrans	670m	605	12801416	Regional

Refer to Figures 13.1 & 13.2 for site location details relevant to the proposed Project and archaeological monuments.

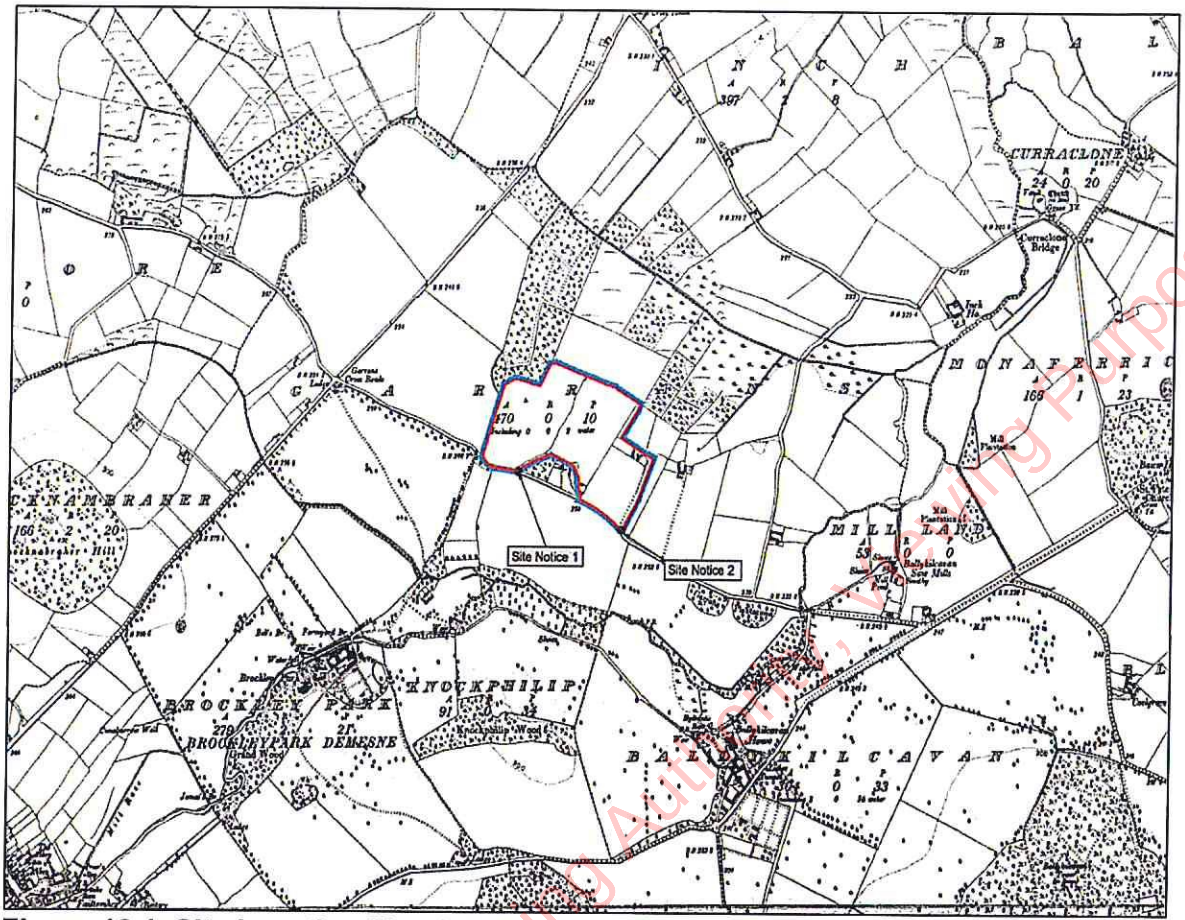

Figure 13.1: **Site Location Map (Extracted from planning drawings)**

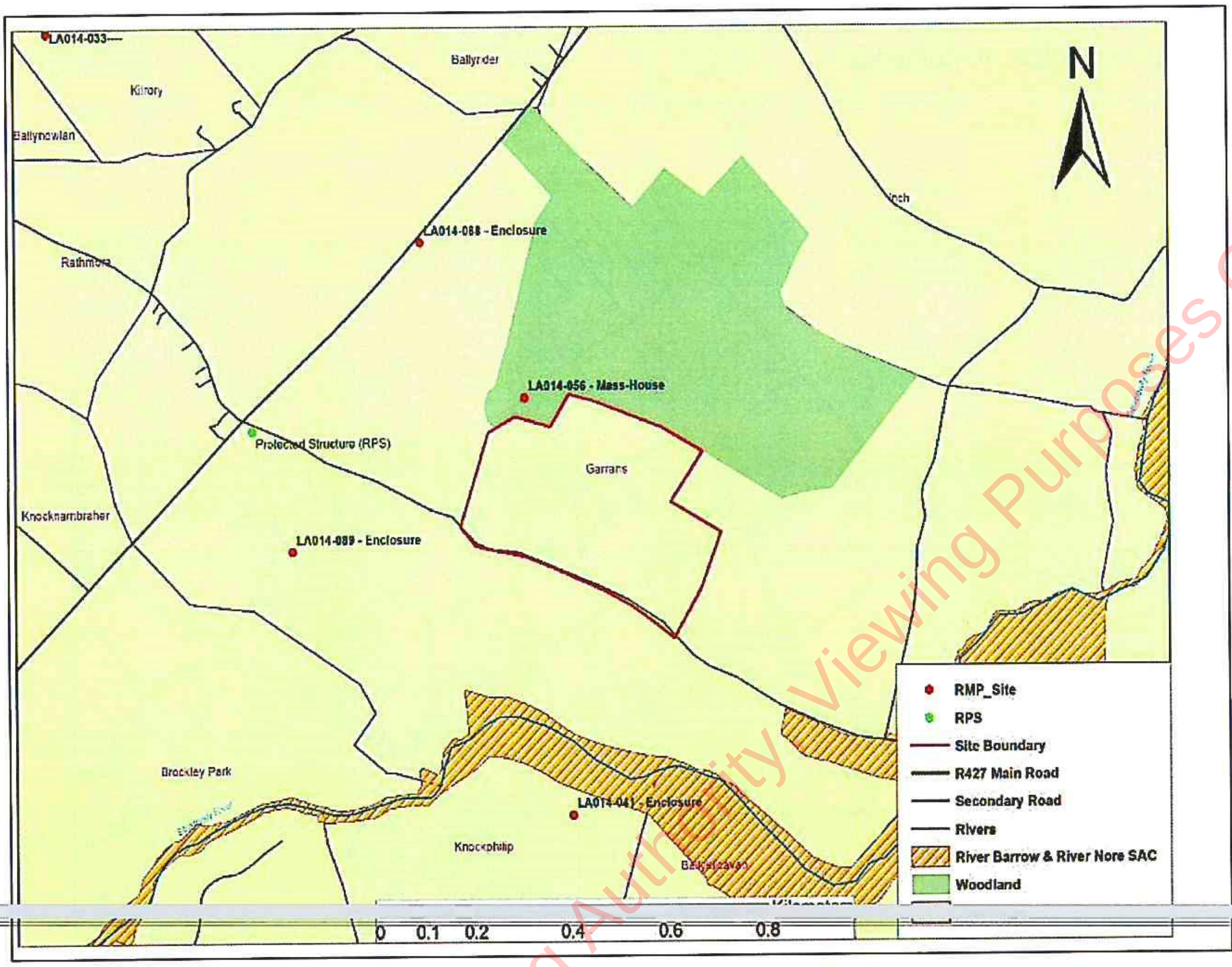

Figure 13.2: Location of Archaeological Monuments relevant to the proposed Project

13.3.4 Site Survey

A field inspection was undertaken by John Purcell on the 31st October 2019. This did not reveal any surface remains of unrecorded archaeological monuments.

The site had been recently ploughed allowing for high visibility of the soil. No features or finds indicative of archaeological remains were recorded.

Refer to the photographic plates provided in Appendix 13.2.

13.3.5 Cartographic Evidence

William Petty's Down Survey Map, 1654-56

This map does not show the area in great detail. The proposed Project area is within a rural setting. No features or structures are marked within the study area (Figure 13.3).

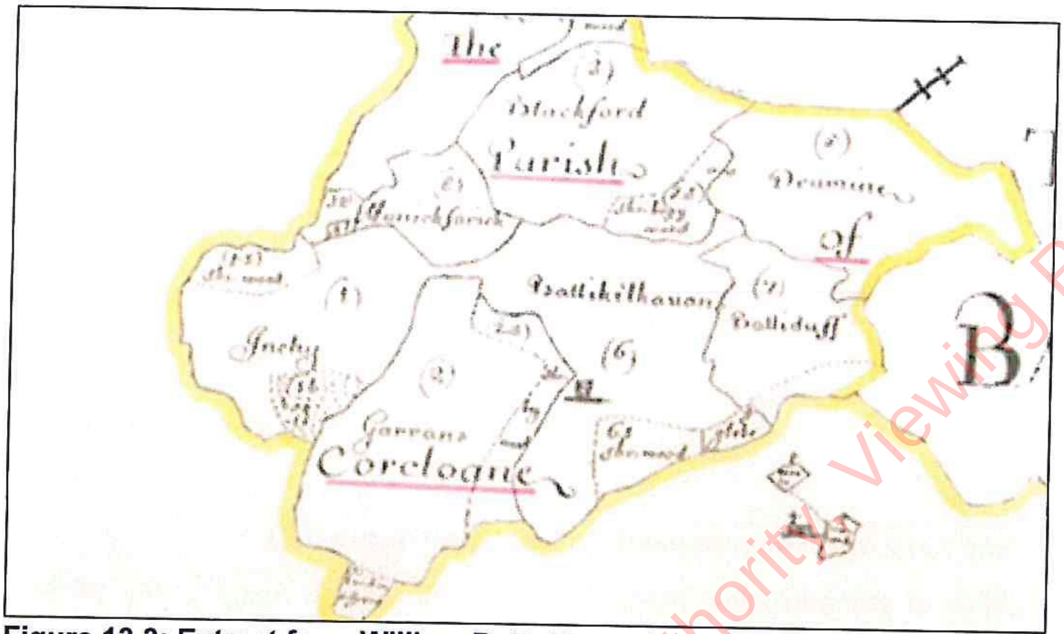

Figure 13.3: Extract from William Petty Down Survey Map

First edition OS Map, 1837

This is the first detailed mapping of the study area. This shows the site laid out in a series of fields. To the north of the site is the reference to the Mass House RMP (LA 014056) and access to it. (Figure 13.4).

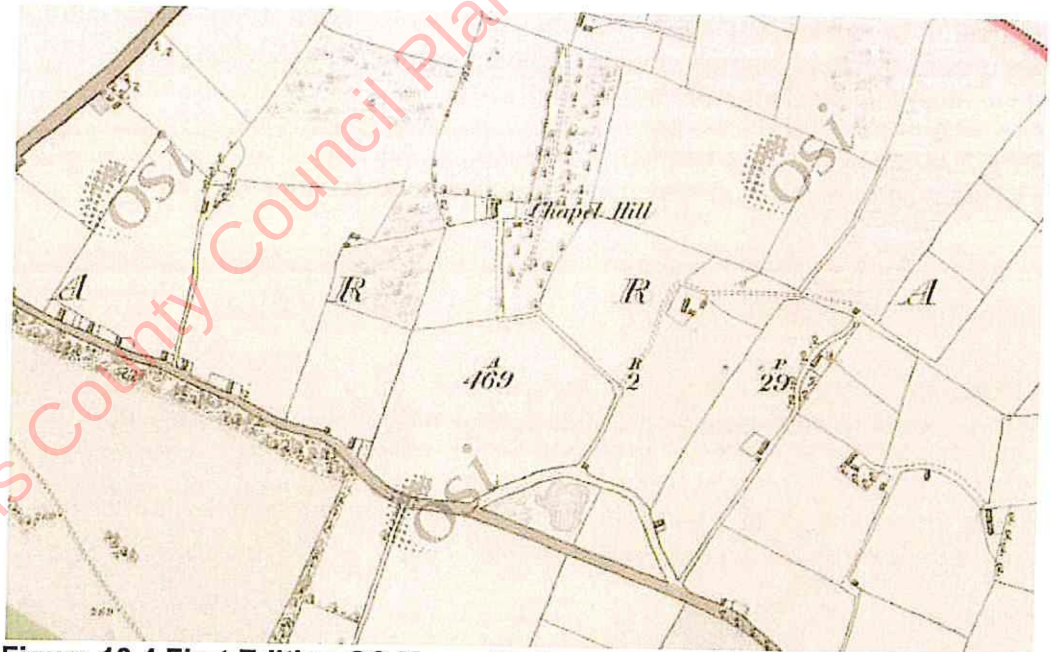

Figure 13.4 First Edition OS Map with the proposed Project marked (red dot)

Ordnance Survey Map, 1911

By the early 20th century land improvements in the form of hedgerow removals had taken place. The fields had been enlarged and the structure is no longer visible (Figure 13.5).

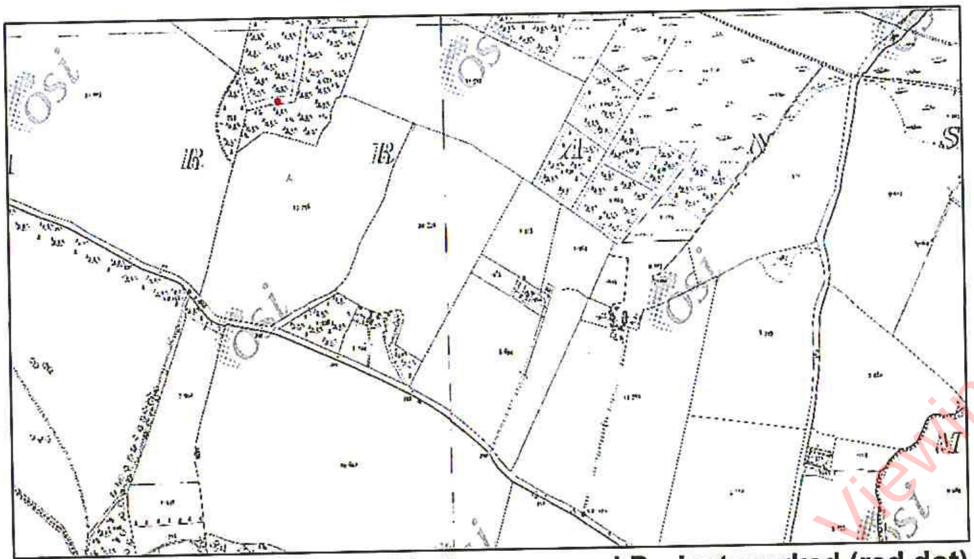

Figure 13.5: OS Map 1911, with the proposed Project marked (red dot)

No features indicative of archaeological remains were visible on the maps or the aerial photographs for the area.

13.3.6 Place name Evidence

Townland names can give an indication of previous activities at the area that have since been forgotten and leave no trace at ground level. They can contain information on previous ownership, land use or archaeological monuments such as churches or settlement sites. Townland boundaries may reflect ancient territories, and some have been associated archaeological features. Townland names and boundaries were first recorded in the 17th century and lay down the land divisions from this period.

The proposed Project is located in the townland Garrans, or An Garrain in Gaelic, which translates as the Grove and may relate to the small areas of woodland within the townland.

13.3.7 Cultural Heritage Potential

Archaeological Potential

The site does not include any archaeological remains and none were recorded during the October 2019 field walking.

Although no features were uncovered during the site visit there is further potential for sub surface remains to be uncovered during excavation works.

Architectural Heritage

The study area does not include any upstanding structures and is not directly adjacent to any structures listed in the Buildings of Ireland website.

The site of Ballykilcavan Bridge is located c.630m to the east of the site (Buildings of Ireland Ref; 12801409). The Bridge is located on the local road L7939. All traffic accessing and exiting the site will be directed to the R427, via Garrans Cross i.e. no traffic associated with the proposed Project will access/exit the site, over this bridge. No impact on this structure is predicted during the construction or operational phase of the proposed Project.

13.4 Predicted Impacts

13.4.1 Do-Nothing Scenario

Under the Do-Nothing Scenario, the site would remain in its current state (a greenfield site) and continue to be used for agricultural activities. The baseline conditions would change very little, other than any natural variation in site conditions, over time.

13.4.2 Construction & Operational Phase

Recorded Monuments

The proposed Project will have no direct or indirect impacts on the archaeological landscape or on any recorded monuments (Figure 13.1).

No recorded monuments exist in the environs of the site and none will be affected by the development of the proposed Project.

Unknown Archaeological Features

The proposed Project is located in an area that was in use for crops (carrots) at the time of the field inspection. Land improvements works have taken place at the site in the form of hedgerow removals and drainage works over the years.

Archaeological testing has been recommended within the Mitigation Measures Section. Should any archaeological features be uncovered during testing, the proposed Project would have a profound impact on them and archaeological excavation under licence and in line with agreed mitigation, wouldl be required.

Record of Protected Structures / National Inventory of Architectural Heritage

The proposed Project will have no direct or indirect impacts on these structures or their setting.

No structures exist on or in the immediate environs of the site and none will be affected by the development of the proposed Project.

Specifically, it is noted that no site traffic will access/exit the site over the Ballykilcavan Bridge.

Visual Impacts

During its operation, the proposed Project will not be visible from any of the recorded archaeological monuments or listed architectural remains. There will be no visual impacts on these features.

13.4.3 Restoration Phase

Following the cessation of extraction activities within each phase, restoration works for the relevant phase will commence. The lands will be graded and sloped to meet levels at the site outline/edges. The area will be re-seeded with agricultural grass seed mixture native to the local area.

Once the final restoration works are complete, there will be no works undertaken at the site and no regular traffic access into/out of the site. There will be no impacts on archaeological or cultural heritage during this phase.

13.5 Mitigation Measures

13.5.1 Site Enabling Phase

As part of the site enabling works it is recommended that archaeological test trenches be undertaken to identify any potential for sub surface remains.

Should any items that may have archaeological potential be encountered, all works will be immediately stopped and the archaeologist will detail and agree any potential mitigation with Laois County Council and the Department of AHRRGA.

13.6 Residual Impacts

There will be no residual impacts on the cultural heritage resource as a result of the proposed Project proceeding as planned and in line with the recommended mitigation strategies.

13.7 Monitoring

Monitoring is prescribed in the form of proposed test trenches that would be undertaken during the site enabling phase to identify any potential sub surface remains within the site boundary.

13.8 References

Archaeology.ie

Buildingsofireland.ie

downsurvey.tcd.ie

Excavations.ie

Policy and Guidelines on Archaeological Excavation (1999) Stationary Office

National Museum of Ireland, Advice notes for excavation

Edwards, N (1996) Archaeology of Early Medieval Ireland. RIA.

Fitzpatrick, E (2009) Native enclosed settlement and the problem of the Irish 'Ringfort'. IAP

Johnson, P. and J. Kiely (2015) Hidden Voices, The Archaeology of the M8. Wordwell

Leonard, K. (2014) Ritual in Late Bronze Age Ireland - Material Culture, Practices,

Landscape Setting and Social Context. IAP.

McCormick, F; Kerr, TR; McClatchie, M; O'Sullivan, A (2014) *Early medieval agriculture, livestock and cereal production in Ireland, AD 400-1100.* Oxford: British Archaeological Reports, Archaeopress.

Waddell, J (1998) The Prehistoric Archaeology of Ireland, GUP.

Thomas, A (1992) Irish walled Towns, IAP

14. Waste Management

14.1 Introduction

This Chapter of the EIAR has been compiled by Rowan Engineering Consultants Ltd (Rowan) and assesses the potential effects of the proposed Project and the waste that may occur as a result.

14.2 Methodology

The following sources were consulted in order to identify, current and potential future requirements for waste management:

- Quarries and Ancillary Activities (Guidelines for Planning Authorities), (DEHLG, 2004)
- Laois County Development Plan (CDP) 2017-2023;
- Eastern- Midlands Region, Waste Management Plan (EMRWMP) 2015-2021;
- National Waste Report 2012, Environmental Protection Agency (EPA), 2014;
- Ireland – Progress towards EU Waste Targets (National Statistics), EPA, http://www.epa.ie/nationalwastestatistics/targets/: updated October 2019;
- A Resource Opportunity, Waste Management Policy in Ireland, Department of Environment Community and Local Government (DoECLG), 2012;
- Taking Stock and Moving Forward, DoECLG, 2004; and
- Preventing and Recycling Waste – Delivering Change, DoECLG, 2002.

14.3 Baseline Conditions

14.3.1 Waste Management in County Laois

The EPA National Statistics website which published updates in October 2019 indicates that Ireland is continuing to achieve or is on target to achieve waste targets for packaging, electrical and electronic equipment, batteries, accumulators, the diversion of biodegradable municipal waste streams from landfill and targets for the recovery and recycling of end of life vehicles.

In terms of the baseline conditions, the environment is set out in the EMRWMP 2015-2021. This Plan has identified a number of policies which will be implemented to achieve the key Plan objectives of:

- 1% reduction per annum in the quantity of household waste generated per capita over the period of the Plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill in favour of higher pre-treatment processes and indigenous recovery processes.

The EMRWMP 2015-2021 presents a focus around the integration of a circular economy, in terms of viewing our waste material as valuable material resources and by also making better use of our resources to deliver economic and environmental benefits.

The Laois CDP identified that Laois County Council (LCC) *"..has actively been involved in facilitating the delivery of a more sustainable approach to waste management within the county. Key to this is the implementation of the Eastern-Midlands Regional Waste Management Plan 2015-2021…"*

Among the policies and objectives relating to waste management, LCC outlined the following:

- **ES 1** *" Facilitate and promote the implementation of the Eastern-Midlands Regional Waste Management Plan 2015-2021 within its functional area…."*

14.3.2 Waste Acceptance, Generation and Management at the Site

Minimal waste volumes are expected to be generated as a result of the proposed Project.

Regardless, the overarching waste management policies for the proposed Project will be to:

- Prevent wherever possible the generation of waste during the course of site activities;
- Where waste is generated, it will be segregated (where possible) for reuse and'or recycling
- All waste streams will be managed by appropriately licensed waste contractor.

Waste Streams Generated

It is considered that small volumes of municipal waste streams will be generated on site during the course of site activities. In addition, there may also be small volumes of waste oils, lubricants and flocculants generated during the course of site activities. All wastes would be generated in small volumes.

The expected waste streams are detailed in Table 14.1.

Table 14.1: Waste Streams

Description of Material	Management Options
Municipal waste	Waste segregation to encourage recycling will be implemented on site where possible. Disposal of some elements may be required.
Mixed recyclable waste	
Glass	
Plastics	
Waste electrical and electronic	Appropriate waste receptacles will be provided on site
Waste oils, lubricants and flocculants	
Wastewater (Portloo)	

Additionally, there may be small volumes of other waste streams, associated with the site activities being undertaken on site.

14.4 Predicted Impacts

In the absence of mitigation, impacts associated with the generation and management of waste streams at the site would be expected to be small adverse and long-term. However, given the extent of the operations and that volumes of waste generated would be small, any effects would be considered imperceptible.

14.4.1 Restoration Phase

Following the cessation of extraction activities within each phase, restoration works for the relevant phase will commence. The lands will be graded and sloped to meet the levels at the site outline/edges. The area will be re-seeded with agricultural grass seed mixture native to the local area.

Once the final restoration works are complete, there will be no works undertaken at the site and no regular traffic access into/out of the site. There will be no impacts associated with waste management, during this phase of the proposed Project.

14.4.2 Do-Nothing Scenario

Under the Do-Nothing Scenario, the site would remain in its current state (a greenfield site) and continue to be used for agricultural activities. The baseline conditions would change very little, other than any natural variation in site conditions. Remaining in its greenfield state, there would be no requirement to consider waste generation and management at the site.

14.5 Mitigation Measures

Site activities will be undertaken in accordance with the requirements of the:

- EIAR and any subsequent planning permissions;
- Environmental Management Plan (EMP); and
- Legislative requirements and environmental best practise.

An EMP (Appendix 2.2) has been prepared setting out a framework in relation to waste generation and management procedures for the proposed Project.

The EMP will be revised prior to the commencement of work on site. Compliance with the EMP will be mandatory.

The EMP has been developed to reflect the waste management hierarchy and details the measures that will be implemented on site to minimise waste generation, manage materials on-site effectively and to prioritise reuse and recycling opportunities at the site.

14.6 Residual Impacts

The implementation of the EMP will allow for more efficient waste management practises and it is considered that there will be no significant residual impacts associated with the operation of the proposed Project.

14.7 References

Department of Environment, Community and Local Government (now the Department of Communications, Climate, Action and Environment), 2002, Preventing and Recycling Waste – Delivering Change;

Department of Environment, Community and Local Government, 2012, A Resource Opportunity, Waste Management Policy in Ireland;

Department of Environment, Community and Local Government, 2004, Taking Stock and Moving Forward;

Dublin City Council, 2015, Eastern- Midlands Region, Waste Management Plan (EMRWMP) 2015-2021;

Environmental Protection Agency, 1998-2014, National Waste Reports;

Environmental Protection Agency, 2017, Ireland – Progress towards EU Waste Targets (National Statistics); and

Laois County Council. (2014) Laois County Development Plan 2017-2023.

15. Material Assets

15.1 Introduction

This Chapter of the EIAR has been compiled by Rowan Engineering Consultants Ltd (Rowan). This Chapter assesses the potential effects of the proposed Project on relevant material assets.

The material assets considered as part of the assessment were those major utilities associated with the proposed Project.

15.2 Methodology

The following sources were consulted in order to identify, current and potential future requirements for the major utilities:

- The applicant and project engineer.

15.3 Baseline Conditions

Refer to Table 15.1 for details on the current state and any proposed changes to these utilities.

Table 15.1: Summary of utility provision for the Proposed Project.

Utility	Utility Provider & Description
Surface water	• Surface water drainage will be provided via settlement ponds which will allow sediment to settle out, prior to being diverted back into the washing and screening plant. A surface water runoff discharge point will be maintained from Pond 4 into the man-made drain on the northern boundary (as per the existing conditions). • The works associated with the drainage system are detailed in Chapter 8 Hydrology and Hydrogeology
Effluent/ Wastewater	• There is no connection to a foul sewer and no wastewater treatment systems at the site. • It is proposed that all wastewater (welfare facilities) will be tankered off-site for the duration that the proposed Project is operational. • All 'process water' from the wash and screening plant will be recycled back into the washing process i.e. there will be no discharge of 'process water' from the site.
Electricity	• There are overheard lines crossing the proposed Project site. • It is proposed to seek a connection to the site, to service the wash and screening plant.
Mains water	• There is no mains water connection at the site; • There is no proposal to provide a mains water connection when the proposed Project is operational. • Water (such as for welfare requirements) will be brought onto site by bottles/containers. • Water for the washing process will be supplied from groundwater abstraction, surface water run-off collection, collection of water from the aggregate stockpiles & recycling of 'process water' from the wash and screening plant.
Gas	• There is no gas connection at the site; and • There is no proposal to provide a connection when the proposed Project is operational.
Telecommunications	• There is no telecommunications connection at the site. • There is no proposal to provide a connection when the proposed Project is operational.

15.4 Predicted Impacts

Site activities will be undertaken in accordance with the requirements of the:

- EIAR and any subsequent planning permissions;
- Environmental Management Plan (EMP); and
- Legislative requirements and environmental best practise.

Works relating to the provision of major utilities is limited to seeking an electricity connection to the site. Taking the above detail into account, it is not expected that there would be any impacts relating to the provision of utilities to the proposed Project site.

15.4.1 Restoration Phase

Following the cessation of extraction activities within each phase, restoration works for the relevant phase will commence. The lands will be graded and sloped to meet the levels at the site outline/edges. The area will be re-seeded with agricultural grass seed mixture native to the local area.

Once the final restoration works are complete, there will be no works undertaken at the site and no regular traffic access into/out of the site. There will be no impacts associated with major utilities, during this phase of the proposed Project.

15.4.2 Do-Nothing Scenario

Under the Do-Nothing Scenario, the site would remain in its current state (a greenfield site) and continue to be used for agricultural activities. The baseline conditions would change very little, other than any natural variation in site conditions. Remaining in its greenfield state, there would be no requirement to consider providing major utilities at the site.

15.5 Mitigation Measures

No further mitigation measures necessary to the details outlined above.

15.6 Residual Impacts

There will be no significant residual impacts to utilities as a result of the proposed Project.

16. Cumulative Impacts and Interaction of the Foregoing

16.1 Interaction of the Foregoing

The interaction of environmental aspects is an important factor which was considered in the full evaluation of the environmental impacts associated with the proposed Project. Consequently, these interactions were integrated into the individual Chapters 5 to 15 of this EIAR.

While all environmental factors are inter-related to some extent, the significant interactions and interdependencies were taken into consideration by the environmental team when preparing the assessments.

A summary of the general environmental interactions is presented in Table 16.1.

Table 16.1: Interaction of the Foregoing Mat

Inter-relationship Matrix	Traffic & Transport	Noise & Vibration	Cultural Heritage	Waste Management	Material Assets
Traffic & Transport					
Noise & Vibration	√ Noise emissions associated with traffic generation				
Soils & Geology					
Hydrology (FRA)					
Water Quality & Hydrogeology	√ Runoff associated with traffic generation – impacts on water quality				
Air Quality & Climate	√ Air emissions associated with traffic generation				
Landscape and Visual	√ Visual impacts associated with heavy goods/ construction vehicles.				
Biodiversity		Disturba from vi associa quarry			
Population & Human Health	√ Traffic levels – impacts on the local community Health & safety concerns of the local community with regard to heavy goods vehicles on local road network	Disturba communi and associa quarr			
Cultural Heritage					

Inter-relationship Matrix	Traffic & Transport	Noise & Vibration	Soils & Geology	Hydrology, Water Quality & Hydrogeology	Air Quality & Climate
Waste Management	√ Transport of any waste materials off site		√ Potential to encounter contaminated soils during extraction activities – Associated waste management activities required to remove material off-site	√ Storage of any waste on site – associated impacts on water quality including flood risk, surfacewater & groundwater	
Material Assets					

16.2 Cumulative Impacts

16.2.1 Introduction

This section considers and assesses the potential for cumulative impacts arising from the proposed Project in association with other projects. A significant cumulative impact can collectively occur at a location or on an environmental resource, when there are combined impacts (minor or significant) from more than one activity.

The proposed Project will be undertaken with extents of the site boundary, with limited views and this will reduce the potential for cumulative impacts when considered with other proposed developments.

16.2.2 Relevant Guidance

Relevant guidance taken into consideration in the development of this Chapter includes:

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, August 2017); and
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA, September 2015);
- Guidelines for the Assessment of Indirect and Cumulative Impact as well as Impact Interactions (European Commission 1999).
- Quarries and Ancillary Activities (Guidelines for Planning Authorities), (DEHLG, 2004)

16.2.3 Cumulative Assessment

The first stage of the assessment was to undertake a desk-based review to identify other existing developments which may have the potential to overlap with the proposed Project.

No developments were identified that are likely to result in significant cumulative impacts with the proposed Project.

There were a number of residential and agricultural developments noted in the general area. However, given the scale of these developments and any lack of interaction with the proposed Project, it was concluded that they will not result in significant cumulative impacts on the surrounding environment when considered together with the proposed Project.

Existing Quarrying/Extractive Industry Developments

Other existing quarrying developments were considered in more detail.

No other active quarries are located within 6km of the proposed Project site.

Other quarries within a 20km radius include:

- Wofhill, Athy (LSOO1): 18km to the south east, a hard rock (sandstone quarry);
- Roadstone Ballyadams, Ballyadams, Co. Laois, c.6.56km to the south west, rock quarry.

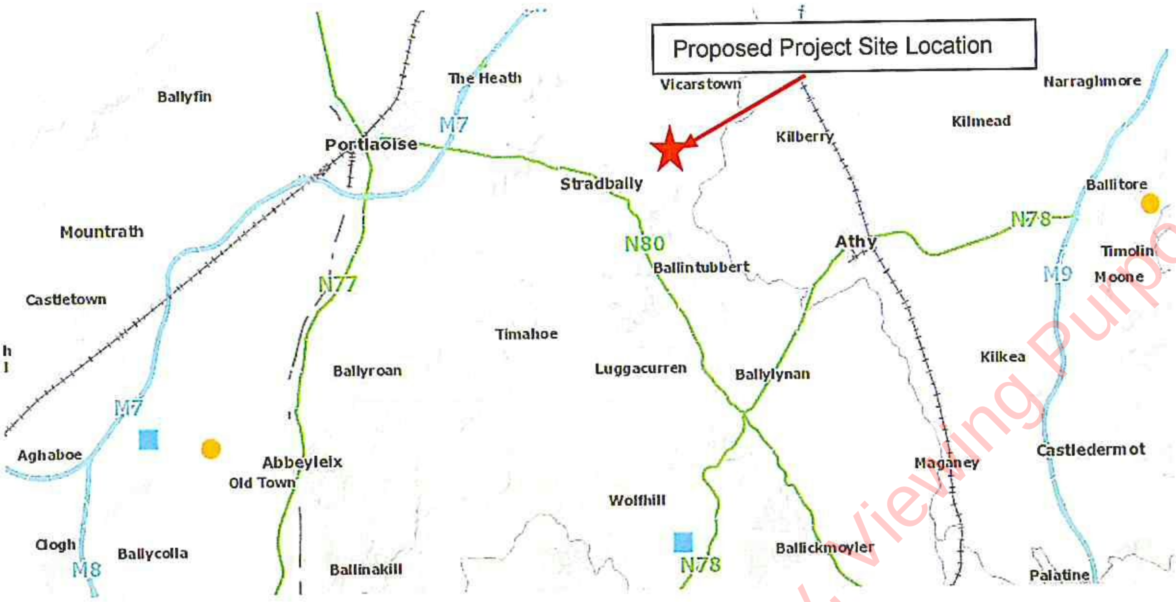

Figure 16.1: Closest active quarries (in blue & orange) (Ref: Extracted from the GSI[15])

Additionally, the following was noted:

- Laois Lime, Dysart, Co. Laois, c.7km to the west, limestone quarry (noted: currently not in use).

The following conclusions were made in relation to the cumulative assessment:

Table 16.2: Consideration of Cumulative Impacts

Environmental Aspects	Discussion
Traffic & Transport	The additional traffic generated as a result of the proposed Project will result in some increases to traffic flows on the local road network. However, even when operating at peak excavation volumes (which will be occasional), the additional traffic was considered to be of low volumes. It was concluded that the existing junction on the R427, will have sufficient capacity with no queuing, to cater for the traffic increases in a safe and appropriate manner. Taking into account the capacity for the surrounding road network to cater for the proposed Project and given the distance to the other developments (c. 6.56- 20km), it was concluded that there will be no significant cumulative impacts in terms of traffic and transport.
Noise & Vibration	The nearest noise sensitive receptors to the proposed Project are too far removed from the other developments to be impacted in terms of noise and vibration.

15 Ref: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228

Environmental Aspects	Discussion
	On this basis, there will be no cumulative impacts with regard to noise and vibration.
Soils & Geology	Soils and geology impacts are largely associated with activities within the site extents – such as soil exposure, soil extraction and striping of topsoil. The other developments are located c. 6.56- 20km from the proposed Project. Due to the extended distances between the sites, there will be no cumulative impacts with regard to soils and geology.
Hydrology & Hydrogeology inc. Flood Risk & Water Quality	The continued operation of the other existing quarry facilities in the surrounding area (in line with any relevant planning and/or licensing conditions) will have no cumulative impacts upon the water environment of the area when considered together with the proposed Project. None of the other existing quarries are located within the surface water catchment on the western side of the Stradbally River, or within the Bagnelstown Upper groundwater body. There are therefore no surface water or groundwater linkages between the proposed Project and the setting of these existing quarries. There is therefore no possibility for the potential impacts of the proposed Project to be cumulated with existing quarry impacts on the hydrogeological and hydrological setting.
Air Quality	The nearest receptors to the proposed Project, in terms of air quality and dust emissions are too far removed from the other developments to be impacted. The other developments are located c. 6.56- 20km from the proposed Project. On this basis, there will be no cumulative impacts with regard to air quality and dust emissions.
Climate	Greenhouse gases (GHG) emissions from the proposed Project are of a minor scale with little contribution to overall emission levels on a regional or national scale. It was concluded that there would be no significant cumulative impacts, when considered with the other developments. Mitigation has been incorporated in terms of future flood events and given that the other quarries are located c. 6.56- 20km from the proposed Project and not within the same surface water catchment, it was concluded that there will be no cumulative impacts with regard to climate, in this regard.
Landscape and Visual	The nearest receptors to the proposed Project, in terms of landscape and visual are too far removed from the other developments to be impacted. The other developments are located c. 6.56- 20km from the proposed Project. On this basis, there will be no cumulative impacts with regard to landscape and visual.
Biodiversity	Biodiversity impacts are largely associated with activities within the site extents – such as habitat loss, disturbance to bats/badgers etc. With the implementation of mitigation measures, the significance of any effects are not significant. The other developments are located c. 6.56- 20km from the proposed Project. Due to the extended distances between the sites and with the implementation of mitigation, there will be no significant cumulative impacts to biodiversity in this regard.

Environmental Aspects	Discussion
	With regard to Natura 2000 sites, none of the other existing quarries are located within the surface water catchment on the western side of the Stradbally River, or within the Bagnelstown Upper groundwater body. There are therefore no surface water or groundwater linkages between the proposed Project and the setting of these existing quarries. There is therefore no possibility for cumulative impacts between the proposed Project and the other quarries, relevant to Natura 2000 sites (River Barrow and Nore SAC).
Population and Human Health	There are some positive impacts associated with the proposed Project in terms of economy and employment. The other developments are likewise contributing in a similar positive manner. Any cumulative (adverse) impacts for the local communities, amenities and tourism resources would be associated with the potential for additional disruption in terms of noise, dust, traffic and visual amenity. However, mitigation has been applied for the proposed Project to minimise these impacts and given that the other developments are located c. 6.56- 20km away, it was concluded that there will be no significant cumulative impacts.
Cultural Heritage	The proposed Project does not result in any direct or indirect impact on recorded archaeological monuments or protected structures. There will be no access/exit from the site via Ballykilcavan Bridge. There will be no visual impacts from the proposed Project on the surrounding heritage resources. Taking this into account and given the distance to the other developments (c. 6.56- 20km away), it was concluded that there will be no significant cumulative impacts in terms of archaeological, architectural and cultural heritage.
Waste Management	Minimal waste volumes are expected to be generated as a result of the proposed Project. The implementation of the EMP and the waste management hierarchy will allow for efficient waste management practises and it was considered the effects of any residual impacts would be imperceptible when the proposed Project is active. Taking this into account and given the distance to the other developments (c. 6.56- 20km away), it was concluded that there will be no significant cumulative impacts in terms of waste management.

It was therefore considered that no additional mitigation measures above those already provided for in Chapters 5 – 15 were required to account for potential cumulative impacts with other development.

Table 16.1: Interaction of the Foregoing Matrix

Inter-relationship Matrix	Traffic & Transport	Noise & Vibration	Soils & Geology	Hydrology, Water Quality & Hydrogeology	Air Quality & Climate	Landscape & Visual	Biodiversity	Population & Human Health	Cultural Heritage	Waste Management	Material Assets
Traffic & Transport											
Noise & Vibration	√ Noise emissions associated with traffic generation										
Soils & Geology											
Hydrology (FRA)											
Water Quality & Hydrogeology	√ Runoff associated with traffic generation – impacts on water quality		√ Runoff from exposed ground impacting water quality								
Air Quality & Climate	√ Air emissions associated with traffic generation		√ Exposed ground resulting in dust emissions and impacting air quality								
Landscape and Visual	√ Visual impacts associated with heavy goods/ construction vehicles.		√ Exposed ground and any associated visual impacts from within the extracted site of the quarry. Requirement to appropriately manage the stripping of soils (i.e. topsoils) to facilitate effective restoration works.		√ Potential for dust emissions to impact on existing or proposed planting, with subsequent impacts in terms of landscape and visual						
Biodiversity		√ Disturbance to fauna from noise and vibration associated with the quarry activities	√ Runoff from exposed ground impacting water quality – associated impacts on flora and fauna resources Loss of feeding resources for fauna / Loss of flora habitat with soil stripping and removal of aggregate from the site	√ Water quality issues such as sediment or hydrocarbons in runoff impacting flora and fauna resources	√ Air quality impacts on flora and fauna resources, resulting from dust emissions generated by on-site activities	√ Proposed Landscape Plan for the site presents opportunities for biodiversity at the site					
Population & Human Health	√ Traffic levels – impacts on the local community Health & safety concerns of the local community with regard to heavy goods vehicles on local road network	√ Disturbance to local community from noise and vibration associated with the quarry activities	√ Exposed ground resulting in dust emissions and impacting air quality Associated impact of dust emissions on the local community	√ Impacts on water quality and potential for impact on the surrounding community. Flood risk impacts - potential for impact on the surrounding community	√ Air quality impacts on local community, resulting from dust emissions generated by on-site activities	√ Visual impacts associated with site extraction activities and the final landform on the local community					
Cultural Heritage						√		√			

Inter-relationship Matrix	Traffic & Transport	Noise & Vibration	Soils & Geology	Hydrology, Water Quality & Hydrogeology	Air Quality & Climate	Landscape & Visual	Biodiversity	Population & Human Health	Cultural Heritage	Waste Management	Material Assets
						Visual impacts associated with site extraction activities and the final landform on surrounding heritage assets		Potential impacts on heritage assets – resulting in an amenity value impact for the local community			
Waste Management	√ Transport of any waste materials off site		√ Potential to encounter contaminated soils during extraction activities – Associated waste management activities required to remove material off-site	√ Storage of any waste on site – associated impacts on water quality including flood risk, surfacewater & groundwater			√ Storage & movement of waste on-site could impact on flora and fauna resources – impacts on water quality, with resulting impacts on flora and fauna				
Material Assets											