CONTENTS

INTRODUCTION

Background

7.1 This chapter of the EIAR provides a description of the surface water and groundwater conditions within the application area and surrounding area and within the context of the regional setting.

7.2 The baseline surface water and groundwater conditions are identified and described, and the potential impacts arising from the proposed development will have on surface water and groundwater are assessed, and if required mitigation measures are proposed.

Proposed Development

7.3 The proposed development is described in detail in Chapter 2: Project Description of this EIAR and only those elements which relate to water and water management are presented here. The proposed site layout is shown on **Figure 7-1**.

7.4 The planning application area is identical to that of planning permission P. Ref. 12/101 and covers approximately 4.9 hectares (c. 12.1 acres) out of a total landholding interest area of c. 39.7 hectares (c. 98.1 acres). No rock extraction has been carried out within the previously permitted 12/101 extraction area to date and this planning permission is due to expire in early 2023.

7.5 As the site is within the landholding of an existing and established operation, there is no requirement for any new site infrastructure or facilities as part of this application.

7.6 Extraction will be carried out in the same format as is currently practiced, by way of blasting, crushing and screening of the rock. The quarry will be developed using a conventional benching system (steps), with working faces being progressively advanced in a westerly direction.

7.7 The current ground elevations across the proposed development area are between c. 140 – 175 mOD. It is proposed that the extraction area will be worked to a depth of c. 110m AOD, which is the previously permitted depth (P. Ref. 12/101). Groundwater in the existing quarry void to the south of the application area rests at c. 163m AOD and it can be expected that groundwater will be encountered at a similar depth within the current application area once extraction commences. As such dewatering of groundwater will be required during extraction operations.

7.8 When extraction operations commence, it is proposed that water inflows to the extraction area will be diverted to a sump within the quarry floor of the extension area and then pumped to the discharge point. This will ensure the quarry area remains dry for the duration of extraction operations.

Existing and Proposed Water Management at the Site

7.9 There is extensive water management and processing infrastructure on the site to deal with surface water, groundwater and any process water. This infrastructure will require maintenance and upgrading prior to its re-use at the new proposed extraction area. Additional water management infrastructure will also be required to connect the proposed extraction area to the existing framework and to the discharge point.

7.10 Within the existing planning permission area for P. Ref. 07/827, there is an existing quarry void to the south of the landholding (and southeast from the planning application area), as shown on **Figure 2-1** of this EIAR. Extraction operations within the 07/827 quarry void area were paused in c. 2014/2015 and the quarry void is flooded.

7.11 No rock extraction has been carried out within the previously permitted P. Ref. 12/101 extraction area to date. Future extraction at depth will breech the water table and there will be a need to provide for discharge of water off-site. This will require:

- Provision of a sump on the quarry floor;
- Pumping of water from the sump to the discharge point in the adjacent drainage channel; and
- Quarry water will be discharged to the adjacent drainage channel which flows northwest to the Mullymagowan Stream and eventually into the Erne River downstream.

7.12 P&S Civil Works Ltd. currently hold a discharge licence (Ref. **SS/W005/11**), granted by Cavan Co. Co. and approved for both the existing quarry operations (P. Ref. 07/827) and the proposed extension area (previous P. Ref. 12/101).

7.13 It is not proposed to increase production at the site within the proposed extension extraction area. Therefore, there will be no change in water requirements at the overall landholding site for the new development compared to the previous quarry area extraction situation.

Site Drainage

Existing Quarry Area – P. Ref. 07/827

7.14 Water from the existing quarry void (when operational) is pumped from a sump on the quarry floor which provides retention, by use of an electric 4" pump on float switches. The water is discharged directly to the surface water drainage channel located to the north of the landholding and running along the eastern boundary of the application site for the quarry extension. The drainage channel flows into the Mullymagowan Stream, which flows north to Corfad Lough (c. 600m north of the quarry extension area), and subsequently the Stradone River. On occasion and as required, a limited volume of the discharge water is directed to the existing settlement lagoons for use as a top-up water supply at the washing plant, located to the north of the existing quarry void.

7.15 Within the general central aggregate processing / concrete plant / chip washing areas, all surface water is returned via 3 no. ramped settlement sumps at the forementioned areas before being piped to the settlement tank and at sand washing plant before final discharge to the adjacent channel.

Application Area – which was previously covered by planning permission P. Ref. 12/101

7.16 There are two minor surface water features within the proposed extension area consisting of:

- A drainage ditch feature that flows along the southern boundary of the extension area in an easterly direction where it joins the stream that flows along the eastern boundary and into the Mullymagowan stream; and
- A drainage ditch feature that flows adjacent to the northern boundary of the extension area and joins the stream that flows along the eastern boundary at the northern-most corner of the extension area.

7.17 When extraction operations commence, it is proposed that water from within the proposed extension area will be diverted to a sump within the quarry floor of the extension area and then pumped to the discharge point.

Existing Discharge Licence

7.18 The applicant currently holds a discharge licence (Ref. **SS/W005/11**) from Cavan Co. Co. in relation to discharges from the existing quarry operations (P. Ref. 07/827) and the proposed extension area (P. Ref. 12/101).

Wheelwash

7.19 There is currently a wheelwash present at the site, located within the main site entrance gates and adjacent to the weighbridge. The area leading to the wheelwash and beyond towards the site entrance is hard surfaced.

7.20 In addition, the existing quarry has a dust suppression system which can be utilised, and all processing equipment has inbuilt dust suppression systems.

7.21 The above measures have proven to be effective and acceptable to-date and will be maintained in the future. The applicant will continue to regularly monitor the situation and will notify the Local Authority of any change in circumstances.

Wastewater Systems

7.22 Site staff will use existing toilet, hand washing, and welfare facilities provided at the existing site. Wastewater from these facilities is currently managed through a dedicated wastewater treatment system.

7.23 The wastewater from the administration building is diverted to an existing septic tank and percolation area which are located near the carpark at the quarry entrance. Details of an assessment were previously submitted to the Planning Authority with the Further Information response (within Appendix D) in relation to the previous planning permission (P. Ref/ 12/101). There continues to be no issues with this system to date.

Potable Water

7.24 The potable (drinking water) for the site originates from the Billis-Lavey Group Water Scheme (0200PRI0210) which serves a total population of 1,500 (600 domestic connections) with 950 m^3/d drinking water.

Water Supply Wells

7.25 There are two existing on-site supply wells, located within the general processing plant area, to the southwest of the main quarry entrance gates and therefore located northeast of the application site itself. Water from one of these wells (Well A) is used for processing activities at the existing quarry, as the other well (Well B) has insufficient yield.

Monitoring Boreholes

7.26 Seven boreholes were drilled in 2010 on the existing quarry floor and within the proposed extension area, in order to provide additional information on the hydrogeology of the area. However, these boreholes are no longer accessible on site for more recent groundwater monitoring works to be undertaken.

Process Water

7.27 The 6mm dust product requires a washing process to allow for its use as sand for sports pitches / arenas, as well as its use in the manufacture of concrete products at the processing plant in the

existing quarry. The silt produced from the washing process is pumped to the site's settlement lagoon system and dried for its ultimate use in restoration of the overall site.

7.28 Water for use in the washing of aggregate will be pumped from either the existing flooded quarry void to the south of the application area or will be sourced from the dewatering of the proposed extraction area.

7.29 It is proposed that the same processing methods will be utilised going forward. There is no requirement for any additional processing plant as part of this planning application.

Fuel and Oil Storage

7.30 Chemicals that are stored on site include lubricating oil, hydraulic oils and diesel fuel.

7.31 Fuel is required on site for plant and machinery. No vehicles will be fuelled on the quarry floor, with the exception of one mobile machine, as a designated fuelling area is located in the central processing area of the quarry. All staff are trained in the use of spill kits which are available at the quarry in the case of an accidental discharge.

7.32 Oils and lubricants stored in drums including waste oils will be kept on spill trays inside the existing storage area. Spill kits are to be provided in the unlikely event of a spillage occurring.

7.33 Oils and other wastes will not be permitted to accumulate on site in large quantities. The waste oils will be stored for collection and recycling off site by an approved contractor.

Scope of Work

7.34 The scope of this chapter includes:

- an assessment of the existing water (hydrology and hydrogeology) within c. 2 km the application area at the site;
- an assessment of the potential impact of the proposed development on surface water and groundwater; and
- where necessary, recommendation(s) of mitigation measures to reduce or eliminate any potential impacts.

Project Team

7.35 This chapter of the EIAR was prepared by SLR Consulting Ireland. The project team consists of:

- Orlaith Tyrrell Graduate (Hydrogeology) BSc, MIGI, MIAH
- Dominica Baird Technical Director (Hydrogeology) BSc, MSc, CGeol, EurGeol, MIAH
- Peter Glanville Technical Director (Hydrology) BA, MSc, PhD, PGeo, EurGeol

REGULATORY BACKGROUND

Legislation

7.36 The key European Directives / European Union Legislation which apply to this Chapter of the EIAR, and the hydrology and hydrogeology assessment presented herein are:

- Environmental Impact Assessment Directive (2011/92/EU); and

- Directive of the European Parliament and of the Council amending Directive 2011/92/EU on assessment of effects of certain public and private projects on the environment (2014/52/EU).

7.37 Other European Directives to which this EIAR makes reference, or has had regard, are listed in **Appendix 7-A**.

7.38 Irish Government Acts, National Legislation and Regulations which apply to this Chapter of the EIAR, and the hydrology and hydrogeology assessment presented herein are also listed in **Appendix 7-A**.

Planning Policy and Development Control

7.39 The Planning Policy and Development Control relating to water at the site in this EIAR is set out in the:

- Cavan County Development Plan 2022 - 2028.

Guidelines and Technical Standards

7.40 The following key guidelines apply to this hydrology and hydrogeology assessment:

- Institute of Geologists of Ireland. Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements, April 2013; and
- National Roads Authority, 2008. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

7.41 Additional guidelines and technical standards which apply to this Chapter of the EIAR, and the hydrology and hydrogeology assessment presented herein are listed in **Appendix 7-A**.

RECEIVING ENVIRONMENT

Study Area

7.42 For the purposes of this assessment, the study area comprises the application site the surrounding area up to 2 km reflect the sensitivity of the hydrology and hydrogeology; this is in line with the Institute of Geologists of Ireland's (IGI) guidelines (2013).

7.43 The IGI guidelines state that the minimum distance of 2 km should be reviewed in the context of the geological / hydrogeological environment as well as the scale of development and increased to reflect the sensitivity of the subsurface. The IGI guidelines also state that maps should be sourced to allow for the review of the geological and hydrogeological conditions that exist within a minimum of 2 km of the site boundary (from the outer limit of the planning and/or licence area) and presented at a scale of 1:25,000. The baseline maps produced in this EIAR are at a scale of 1:25,000 and include an area up to c. 3.5 km from the lands under the control of the applicant, although the actual study area only extends up to 2 km as stated above.

Baseline Study Methodology

7.44 Existing information on the geology, hydrology, and hydrogeology of the Stradone area and its surrounds was collated and evaluated.

7.45 The methodology involved in the assessment of the hydrology and hydrogeology at the site can be summarised as follows:

- A desk study, in which existing data and relevant regional data sources for the area were examined;
- A site walkover and review of the on-site surface water features and water management infrastructure;
- Surface water quality from the quarry void water and from the discharge point in the adjacent Mullymagowan Stream; and
- Analysis of the information gathered.

Sources of Information

7.46 The desk study involved the examination of several datasets to determine the geological and hydrogeological setting of the area, as detailed in **Table 7-1**.

Table 7-1
Regional Data Consultation

Data	Dataset
Soils	• Irish Soils Information System - Teagasc
Subsoil Geology	• Teagasc/GSI/EPA Subsoil Mapping
Bedrock Geology	• GSI Groundwater Data Viewer - Bedrock Geology
Surface Water	• OSi Discovery Series mapping; • Environmental Protection Agency; • Water Framework Directive; • OPW CFRAM; and • Current County Development Plan.
Groundwater	• GSI Groundwater Data Viewer - bedrock and gravel aquifers, vulnerability, water supplies, groundwater recharge; • GSI Groundwater body description documents; • Environmental Protection Agency water maps; and • National Federation of Group Water Schemes (NFGWS) Data Viewer.
Climate	• Met Eireann
Protected Areas, Environmental Pressures	• Environmental Protection Agency, • National Parks and Wildlife Service
Protected Areas, Environmental Pressures	• Environmental Protection Agency, • National Parks and Wildlife Service

Rainfall and Climate

7.47 The nearest rainfall gauging station is Ballyhaise, located c. 13.5km to the north-west of the site. The Long-Term Average (LTA) annual rainfall in the area at the Ballyhaise weather station is c. 1006.9 mm/yr for the period 1981-2010 (Met Eireann, 2023). The LTA monthly rainfall for the period 1981-2010 are shown in

7.48 **Table** 7-2 below.

Table 7-2
LTA (1981-2010) Monthly Rainfall (mm) for Ballyhaise

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
100.5	72.6	84.8	68.0	67.8	67.9	73.4	90.7	79.4	104.4	95.3	102.1

Soils and Geology

7.49 Soils and geology are discussed in detail in Chapter 6 of this EIAR.

Soils and Subsoils

7.50 The Irish Soil Information System project has developed a national association soil map for Ireland, the project is co-funded by Teagasc and the Environmental Protection Agency (EPA).

7.51 The soils and subsoils within the overall landholding have already been removed in areas to facilitate bedrock extraction. The soils within the application area are still intact and consist of typical surface water gleys on fine loamy drift with siliceous stones, known as the Kilrush (0700h) Soil Association. Soils are shown on **Figure 6-1**.

7.52 The EPA website publishes subsoil maps created by the Spatial Analysis Unit and Teagasc in collaboration with the Geological Survey Ireland (GSI).

7.53 The subsoils underlying the application area are predominantly till derived from Lower Palaeozoic sandstones and shales (TLSsS) with minor areas identified as having bedrock at or near the surface. Subsoils are shown in **Figure 6-2**. The soils and subsoils at the at the application area will be removed to facilitate extraction.

Local Bedrock Geology

7.54 The GSI online map viewer (1:100,000 geology map) shows the site at Stradone to be underlain by Silurian age massive sandstone and microconglomerate of the Lough Avaghon Formation. Bedrock is exposed at the existing quarry void to the south of the application area. The local bedrock geology is shown in **Figure 6-3**.

Karst

7.55 There are no known karst features within the wider area of the proposed site (GSI online map viewer). The nearest listed karst feature is over 28km away to the east of the site.

Surface Water - Hydrology

Catchments

7.56 On a regional scale, the overall landholding area its environs are located in the Erne River Catchment area. Further details on the catchment are provided as part of the Water Framework discussion in Section 7.106.

7.57 The Erne Catchment (ID 36) includes the area drained by the River Erne and all streams entering tidal water between Aughrus Point and Kildoney Point, Co. Donegal. This is a cross border catchment with a surface area of 4,415km², 2,512km² of which is located within The Republic.

Surface Water Bodies

7.58 The surface water features at the application site are mapped on **Figure 7-1** and consist of the following:

- Mullymagowan Stream: Stream that flows along the north eastern boundary of the extension area;
- Drainage Ditch A: Feature that flows along the southern boundary of the extension area in an easterly direction where it joins the stream; and
- Drainage Ditch B: Feature that flows adjacent to the northern boundary of the extension area and joins the stream at the northern-most corner of the extension area to flow towards Corfad Lough.

7.59 The closest surface water body to the site is an adjacent stream known locally as the Mullymagowan Stream. The Mullymagowan Stream is referred to on the EPA database as 'STRADONE_010' (EPA code: IE_NW_36S020075). The Mullymagowan Stream is located just downstream of the site discharge point within a drainage channel, and to the north of the area, see **Figure 7-1**. The Mullymagowan Stream which flows north to Corfad Lough (c. 600m north of the quarry extension area), and subsequently the Stradone River (EPA code: IE_NW_36S020200). The Stradone River is a tributary to the Erne River which it meets further downstream and then continues to the north-east. The local surface water bodies are shown in **Figure 7-3**.

7.60 The application area is slightly elevated within the wider landholding area, with the discharge point location at the start of the Mullymagowan Stream slightly downgradient at 142.9 m AOD.

7.61 There are several surface water bodies in the wider vicinity surrounding the application site, all flowing in a general north/northwest direction and to join as tributaries to the Stradone River and Erne River downstream.

Flooding

7.62 The Office of Public Works (OPW) is the government agency with statutory responsibility for flooding in Ireland. Flooding is a natural river channel / floodplain process designed to accommodate larger flows than can be passed by the river channel alone.

7.63 The OPW website (www.floodinfo.ie) indicates that there are no recorded flood events at the site.

7.64 There are no reported past fluvial or pluvial flood events within a 2km radius of the site.

7.65 The GSI Groundwater Flood database does not show any historical groundwater flooding in the area.

7.66 The OPW mid-range future scenario flood modelling indicates that the nearest floodplain extents are located c. 2.6 km northeast of the site along the banks of the Laragh River at Clifferna, and 2.7 km northwest of the site along the banks of the Stradone River at Drumhirk. These flood plains are not extensive and are not expected to have any impact at the site.

Source Protection Area

7.67 The EPA Water maps have records of the NFGWS group scheme source protection areas, and the closest scheme on the EPA Water maps is the Billis-Lavey Group Water Scheme which supplies potable (drinking water) for the site. The source for this group water scheme is a large lake waterbody, Nardreegeel Lough. The source protection area is c. 1.1 km southwest from the application area at the closest point. The scheme supplies a local population of 1500 people (600

connections) with a 950m^3/d abstraction rate. The other surface water schemes are >5km from the application area.

Surface Water Quality

7.68 There are a number of water quality monitoring locations monitored by the EPA at locations downstream of the site. The most recent Biological Water Quality Ratings at stations downstream of the site are outlined in **Table 7-3** only for stations where Q-value data is available. Q rating is Q4 at both stations, which indicates "unpolluted" status. The most recent data for both stations is from 2019.

Table 7-3
EPA Biological Water Quality Ratings

Station ID	Station Name	Watercourse	Distance Downstream of Site	2013	2017	2019
RS36S020075	2nd Br D/S Lough Alion	STRADONE_010	c. 5.5 km	Q4	Q4	Q4
RS36S020200	Br u/s Laragh R confl	STRADONE_020	c. 9 km	Q4	Q4	Q4

7.69 There is no available continuous surface water flow data from EPA/OPW hydrometric stations in the immediate environs of the proposed quarry extension.

Site Specific Surface Water Quality Data

7.70 Two surface water samples were taken to assess the quality of the surface waters on site, one from the Mullymagowan Stream at the proposed discharge point adjacent to the site (sample SW1), and a second from the flooded quarry void to the south of the application area (sample QV1).

7.71 Samples were collected on the 22nd of November 2022 by an SLR Hydrogeologist and tested for the following standard range of surface water quality parameters by ALS Laboratories:

- inorganics;
- metals (dissolved, filtered);
- Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG); and
- Volatile Organic Compounds (VOCs).

7.72 The baseline surface water quality results are shown in **Appendix 7-K** screened against the Environmental Quality Standards (EQS) for surface water, as well as the 2016 Groundwater Regulations (S.I. No. 366/2016). The sulphate concentration exceeded the GW Regs criteria for the quarry void sample, with 534mg/l reported compared to the GW Regs criteria of 187.5mg/l. Based on the screened results, the surface water quality in both the Mullymagowan Stream and flooded quarry void are generally of good quality. There are no reported exceedances of the EQS limits and only one exceedance of the Groundwater Regulations for sulphate at the quarry void.

Groundwater - Hydrogeology

Aquifer Characteristics

7.73 The application site is underlain by sandstone and microconglomerate bedrock of the Lough Avaghon Formation.

7.74 The GSI online map viewer classifies the bedrock at the site as a poor bedrock aquifer which is generally unproductive except for local zone (Pl), see **Figure 7-4**. The aquifer extends to a regional scale and is heavily faulted, though the GSI online map viewer does not show any faulting at or in close proximity to the site. The GSI have classified this bedrock aquifer as "Pl" based on lithology, dry weather flows, well yields and productivities.

Groundwater Bodies

7.75 The landholding at Stradone, including the proposed extension of the extraction area, is located entirely within the Cavan Groundwater Body (GWB). A description of the Cavan GWB is published by the GSI (EU Code IE_NW_G_061).

7.76 The Cavan GWB includes the aforementioned poorly productive bedrock aquifer and extends further southwest and north/northeast from the site boundary, covering a total area of c. 1410 km^2. The GWB description states that the GWB is composed primarily of low transmissivity rocks. Most of the groundwater flux is in the uppermost part of the aquifer: comprising a broken and weathered zone typically less than 3m thick; a zone of interconnected fissuring typically less than 10m; and a zone of isolated fissuring typically less than 150m.

7.77 Only one transmissivity value is available for this GWB: 0.23m^2/d for a low yielding well. The national transmissivity data for these rocks are also low (<20m^2/d in most rocks) or possibly moderate in the Silurian rocks, as present at the site. (20-80m^2/d).

Groundwater Supply Wells

GSI Well Database

7.78 Geological Survey Ireland (GSI) has an online database of wells and springs in Ireland; however, it should be noted this database is not extensive.

7.79 According to the GSI well database, there are no wells within a 2km radius of the site. There are three wells in total within a 5km radius of the site, all located within the Cavan GWB, and these are shown on **Figure 7-6**.

7.80 The closest well is an agricultural & domestic well c. 3 km northeast of the site (GSI name 2329NEW009). It is classed as having poor yield of 13 m^3/d.

7.81 There is a second well for agricultural and domestic use located c. 3.6 km north of the site (GSI name 2329NEW005) which is classed as having a failed yield of 3.3 m^3/d.

7.82 The remaining well within 5km of the site is an industrial use well located c. 3.3 km north of the site (GSI name 2329NEW007) which has a moderate yield of 92.7 m^3/d.

7.83 As yield is one of the main concerns in aquifer development projects, yields from existing wells are conceptually linked with the main aquifer categories. Poor aquifers, such as the one underlying the site, would generally have 'Moderate' or 'Poor' well yields - less than 100 m^3/d, and this is consistent with the well data outlined above.

7.84 Well productivity data for the area generally confirm the Silurian rocks to be poor aquifers.

Well Survey

7.85 An historical well survey of the area within 500m of the extension area was conducted by Tobin Consulting and P&S Civil Works Ltd. from January to March 2010[1]. Wells within this area were identified as:

- Redundant Wells (2);
- Residents on Group Water Scheme (Lavey Billis Water Supply Scheme) (12); and
- Existing Wells (8).

It is noted that the Group Water Scheme is a domestic connection supplied by a surface water source.

7.86 The nearest private well identified in the survey was located at a distance of 415m from the quarry extension boundary. There is no history of any impacts on private wells outside the quarry boundaries.

7.87 It should be noted that this region is in an area that overlies a poor aquifer and, therefore, the zone of contribution to each well will be localised.

On-Site Supply Wells

7.88 Two water supply wells are included within the existing processing area (Well A and Well B) which were drilled in 2003. Details are provided in the 2012 Environmental Considerations Report[1], and it should be noted that Well A has also been referred to as BH1 and similarly Well B as BH2.

7.89 The report states that Well A was drilled to a depth of 115m and the hole has a diameter of 150mm. The yield from this well was approximately 2000 litres per hour (2m^3 /hr). Specific capacity within the well is estimated at 0.05 m^3/m/d (1.5 m^3/d abstraction and 30m drawdown) which is extremely low. Any abstraction above 1.5m^3/day caused the well to run dry and recharge is slow.

7.90 Subsequently, Well B was drilled in the corner beside the precast shed about 150m away from Well A. It was drilled to the same depth (115m) and was reamed out from 150mm to 200mm. The yield from this well was approximately 900 litres per hour (0.9m^3 /hr) but this well is not in use as the yield was too low. The locations of both wells are included in **Figure 7-2** and borehole details are included in **Table 7-4** below. Borehole logs are not available for the two supply wells.

Table 7-4
Details of existing boreholes Well A and Well B (Environmental Considerations Report 2012)

Well ID	Grid Reference	Location	Well Details	Elevation	Water Inflow	Water Level (2010)
Well A (BH1)	252578, 299946	Near Batching Plant within permitted quarry area	Water Supply Well	167mOD	Not Known	166mOD 30mbgl during pumping (137mOD)

[1] P&S Civil Works Ltd. – Quarry Extension. Environmental Considerations Report (TOBIN, 2012)

Well ID	Grid Reference	Location	Well Details	Elevation	Water Inflow	Water Level (2010)
Well B (BH2)	252664, 300041	In permitted processing area	Un-used Water Supply Well. This area is dug out to 6.1m below natural ground level.	172mOD - 4.5m to top of casing. Casing is 1.6m above excavated ground level.	Not Known	Artesian (167.50 mOD)

7.91 During the site walkover in November 2022, groundwater levels could not be obtained from either Well A or Well B and the previous site investigation boreholes across the site were not accessible. Therefore, an estimate of groundwater levels beneath the proposed development area are based on the previous investigative works (discussed in the following section), information obtained from the desktop study and existing reports, and with reference to the water level in the existing quarry void.

7.92 It is expected that groundwater will be intercepted close to the current ground surface on the commencement of extraction operations in the new quarry area, at approx. 0.5 – 3 mbgl.

On-Site Monitoring Wells

7.93 As part of site investigation works undertaken in 2010[1], seven 110mm diameter boreholes were drilled on the existing quarry floor and within the proposed extension area, in order to provide additional information on the hydrogeology of the area. BH3 – BH6 are located on the footprint of the proposed extension. Groundwater was noted to be close to the surface at BH3 to the east of the proposed extension. BH4 in the northern corner reported a groundwater level of 1.3m bgl. BH5 and BH6 reported groundwater levels of over 2-3m bgl. The water inflow in the proposed extension area varies from 5.5m bgl to 15mbgl. Volumes encountered during the site investigations were not significant (approximately 1-3m^3 /hr).

7.94 Information gathered from these site investigation boreholes are detailed in **Table 7-5** below and locations are mapped on **Figure 7-2**. These boreholes are no longer accessible on site. Borehole logs are also not available for these historical monitoring boreholes.

Table 7-5
Details of existing on-site monitoring boreholes (2010)

BH ID	Grid Reference	Location	Well Details	Elevation	Water Inflow	Water Level (2010)
BH1	252724, 299446	On floor of existing quarry	Borehole Diameter:110mm Depth: 6m total	130mOD	2.2mbgl 27th Jan. 2010 (127.8mOD)	0.42mbgl (129.58mOD)
BH2	252683 299437	On floor of existing quarry	Borehole Diameter:110mm Depth:12m	130mOD	11.89mbgl 27th Jan. 2010 (118.11mOD)	0.45mbgl (129.55mOD)

BH ID	Grid Reference	Location	Well Details	Elevation	Water Inflow	Water Level (2010)
BH3	252434 299839	Eastern extension area	Borehole Diameter:110mm Depth – 6m	164mOD	5.5mbgl 27th Jan. 2010 (158.5mOD)	0.46mbgl (163.54mOD)
BH4	252364 299910	Eastern extension area	Borehole Diameter:110mm Depth: 24m	148mOD (actual g. level at opening of well =146.94mOD due to removal of material for base of rig)	5.5mbgl 27th Jan. 2010 (141.5mOD)	1.3mbth (1st Feb. 2010) 1.21mbth (145.73mOD)
BH5	252303 299652	Southern extension area	Borehole Diameter:110mm Depth: 24m	173 mOD	12.1mbgl 1st Feb. 2010 (160mOD)	2.99mbgl (170.01mOD)
BH6	252315 299615	Southern extension area	Borehole Diameter:110mm Depth: 24m	178 mOD	15.0mbgl 2nd Feb. 2010 (163mOD)	2.78mbgl (175.22mOD)
BH7	25247 299581	Southeast of the proposed extension area	Borehole Diameter:110mm Depth:18m	174 mOD (actual g. level at opening of well =172.9mOD due to removal of material for base of rig)	11.8mbgl 2nd Feb. 2010 (161.1mOD)	1.34mbth (171.56mOD)

7.95 It is noted that the water table was high beneath the extension area as it had not been affected by the extraction works at the existing quarry area, which was operational at the time of the site investigations works. As such, it can be expected that the impact to the water table will be limited to the area underlying the extension area.

Dewatering and Groundwater Inflow

7.96 Quarrying both within the existing and proposed quarry is below the water table. Based on the groundwater inflows measured in 2010, it will be necessary to dewater throughout the operational phase of the proposed development from between c. 5.5 – 15m bgl (163m – 141.5m AOD) to the proposed final floor level of c. 110m AOD. All groundwater removed from the quarry void will be directed to the discharge point in the adjacent Mullymagowan Stream.

7.97 In relation to estimated groundwater inflows to the proposed extension area and required dewatering volumes, the Environmental Considerations Report[1] completed for the site by Tobin Consulting in 2012 concluded the following:

- Overall permeability, storage capacity, recharge acceptance, length of flow path and base flow are low.
- Typically, groundwater flow is limited and there is a poorly-connected network of fractures, fissures and joints in the top 5m to 10m of the bedrock geology. Little groundwater flow is encountered at 10 mbgl;

- Groundwater volumes are minimal based on the findings of site investigation works carried out during the drilling of 2 no. onsite wells in 2003 and a detailed groundwater assessment including site investigations works carried out in 2010.
- The well recharge 'slug tests' and aquifer properties including permeability and specific capacity indicated that groundwater inflow to the quarry is/will be minimal and that less than 10m^3/day of groundwater dewatering will be required.

Source Protection Areas

7.98 The site is not located within any source protection areas for groundwater supplies. The GSI does not have a record of any source protection areas in the wider area.

Groundwater Quality

7.99 Groundwater quality sampling could not be undertaken during the November 2022 site visit as both Well A and Well B were flooded with stagnant water and could not be pumped due to the nature of their headworks/locations. It was determined that it would not be beneficial to attempt to obtain a grab sample as this would not be representative of the groundwater.

7.100 It was also determined during this site visit that Well B is blocked close to the top of the headworks as the dip meter would not sink in the well. The well has previously been noted as unproductive and so it is likely that rainwater has built up above this blockage.

Groundwater Vulnerability

7.101 Groundwater vulnerability maps published on the GSI website (www.gsi.ie) indicate that the site processing area and the quarry void at the site is classified as an area of Extreme (X) groundwater vulnerability where bedrock is exposed at the surface, see **Figure 7-7**. The areas within the landholding where extraction has previously been undertaken have a groundwater vulnerability which is classed as "Rock at or near surface", showing that the soils and subsoils have been removed from the quarry footprint.

7.102 This indicates that rock there is less than 3m of subsoil cover. The GSI's Vulnerability Mapping Guidelines are shown in **Table 7-6**.

Table 7-6
GSI Vulnerability Mapping Guidelines

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 - 10.0m	3.0 - 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

Groundwater Recharge

7.103 The GSI online map viewer shows groundwater recharge at the proposed extension of the quarry extraction area is 644.70mm/yr; the effective rainfall (rainfall after evaporation) is 758.50mm/yr and the recharge coefficient is 85%. The groundwater recharge at the quarry area is shown as been subject to a maximum recharge capacity of 100 mm/yr due to the removal of soils and subsoils, see **Figure 7-8**.

7.104 The actual annual recharge (i.e. potential recharge less surface water runoff) depends on the relative rates of infiltration and surface runoff, which is, in turn, influenced by subsoil permeability and saturation.

7.105 Groundwater movement in sandstone aquifers is primarily along bedding planes, with joints and fractures cutting across bedding and providing avenues for the vertical movement of water between bedding planes.

Water Framework Directive

7.106 The EU Water Framework Directive[2] (WFD) became EU law in December 2000 and provides for a single European framework to assess water quality (Ecological status) and allows for the comparison of results across Europe. The WFD covers rivers, lakes, estuaries or transitional waters, coastal waters as well as groundwaters. Details on the WFD are presented in **Appendix 7-O**.

Surface Water

7.107 On a regional scale, the overall landholding area is located in the Erne River Catchment area in Hydrometric area HA36. The site is within the Laragh Sub-Catchment (ID 36_9), which covers an area of 98.7 km^2. The rivers Laragh and Stradone are in the vicinity of the site.

7.108 The section of the Stradone River called 010 is located in the same sub-basin (EU Code IE_NW_36S020075), which covers an area of 15.5 km^2 extending to the northwest from the site. The application site is located towards the top of the sub-basin.

7.109 Under the Water Framework Directive (WFD) 2013-2018 River Water Quality, the rivers within the Laragh Sub-catchment are all good status based on their physio-chemical and biological quality. All are listed by the EPA as being not at risk of not meeting their objectives by 2027 (WFD), however these specific objectives are not outlined by the EPA.

7.110 The three remaining surface waterbodies within this sub-catchment are three currently unassigned lakes located in the upper reaches of the sub-catchment. The 2013-2018 WFD report revised the three lakes to Review due to the presence of potential pressures in the sub-basin and the reporting of algal blooms in the lakes by Cavan Co. Co.

7.111 The potential significant pressures within this sub-catchment are diffuse agriculture and abstractions. It is important to note the soils in this region are very poorly drained and are wet.

7.112 None of the rivers are drinking water protected rivers under the Water Framework Directive (WFD).

[2] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Groundwater

7.113 The Cavan GWB is good status under the WFD 2016-2021 Groundwater Quality. The GWB is listed by the EPA as not being at risk of not meeting its objectives by 2027 (WFD). Furthermore, the GWB has consistently been reported as having good status since the initial WFD assessment in 2007-2012.

WFD Assessment Summary

7.114 In summary, based on the evidence and assessment undertaken herein, it is considered that the proposed development of the quarry will not be contrary to the objectives of the WFD to maintain Good Ecological Status in the surface waterbodies of the Laragh sub-catchment or in the Cavan GWB by 2027.

Protected Areas

7.115 There are no Special Areas of Conservation (SAC), Special Protection Areas (SPA), or Natural Heritage Areas (NHA) in the vicinity of the site.

Water Environment Receptors

7.116 From the baseline study undertaken here, the following water environment sensitive receptors have been identified in the receiving environment:

- Mullymagowan Stream at the north eastern boundary of the extension area;
- Poor bedrock aquifer; and
- Local groundwater supply wells (GSI database and historical well survey).

7.117 For each identified receptor, the significance and sensitivity of the receptor is assessed in **Table 7-7** below and a rating (High/Medium/Low/Negligible) applied, based on the methodology outlined in existing guidance and reproduced in **Appendix 7-P**.

Table 7-7
Existing Environment - Significance and Sensitivity/Importance

No.	Existing Environment	Significance	Sensitivity	Existing Environment Significance/Sensitivity Rating (H/M/L/N)
1	Mullymagowan Stream	Located at north eastern boundary of the site. Good status (WFD 2013-2018)	River may be in hydraulic continuity with the groundwater aquifer underlying the site. Not at risk of not meeting their objectives by 2027 (WFD) Stream flows north to Corfad Lough	**Medium** - Attribute has a medium quality or value on a local scale

No.	Existing Environment	Significance	Sensitivity	Existing Environment Significance/Sensitivity Rating (H/M/L/N)
2	Poor bedrock aquifer / Cavan GWB	Generally unproductive except for local zones and good status (WFD 2016-2021).	No known local groundwater abstractions for drinking water supplies. Local residences are supplied by the nearby NFGWS, the source of which is a lake waterbody. Two on-site supply wells for process water. Cavan GWB is good status and is not at risk of not meeting its objectives by 2027 (WFD).	**Low** - Attribute has a low quality or value on a regional scale
3	Groundwater supply wells in surrounding area	There are two on-site supply wells – one is unproductive and the other supplies water to the aggregate screening and washing plant. The well survey identified 8 no. existing wells within a 500m radius of the site, the closest being 415m distance. The GSI records three private water supply wells within a wider 5km radius of the site – one was a failed supply, one is a poor yield, and the third a moderate yield.	Local groundwater abstractions for agricultural/domestic and industrial supplies	**Low** - Attribute has a medium quality or value on a local scale The site is not located within a source protection area.

Baseline Summary

7.118 The soils and subsoils over much of the landholding have already been removed in areas to facilitate bedrock extraction. The soils within the application area are still intact and consist of typical surface water gleys on fine loamy drift with siliceous stones, known as the Kilrush (0700h) Soil Association. The subsoils underlying the application area are predominantly till derived from Lower Palaeozoic sandstones and shales (TLSsS) with minor areas identified as having bedrock at or near the surface. The bedrock underlying the site is identified as Silurian age massive sandstone and microconglomerate of the Lough Avaghon Formation. Bedrock is exposed at the existing quarry void to the south of the application area.

7.119 On a regional scale, the overall landholding area its environs are located in the Erne River Catchment area and Laragh Sub-Catchment (ID 36_9). Under the Water Framework Directive (WFD) 2013-2018 River Water Quality, the rivers within the Laragh Sub-catchment are all good status based on their

physio-chemical and biological quality. All are listed by the EPA as being not at risk of not meeting their objectives by 2027 (WFD).

7.120 There are no recorded flood events at or near the site, nor is there any potential flooding.

7.121 EPA water quality monitoring stations on the Stradone River report Q value ratings of Q4 at both stations, which indicates "unpolluted" status. The surface water samples collected on site in both the Mullymagowan Stream and flooded quarry void produced results showing generally good quality.

7.122 The application area is underlain by a poor bedrock aquifer which is generally unproductive except for local zone (Pl). The groundwater vulnerability at the application area is classed as "Extreme".

7.123 The Cavan GWB underlies the site and includes the aforementioned poorly productive bedrock aquifer and extends further southwest and north/northeast from the site boundary. The Cavan GWB is good status under the WFD 2016-2021 Groundwater Quality. The GWB is listed by the EPA as *not* being at risk of not meeting its objectives by 2027 (WFD).

7.124 The site is not located within a source protection area. The potable (drinking water) for the site originates from the Billis-Lavey Group Water Scheme, which is also the closest group water scheme to the site and is supplied by surface water. The source protection area for this supply is located c. 1.1 km southwest of the application area. There are no other surface water or groundwater source protections areas within a 5km radius of the site.

7.125 According to the GSI well database, there are no wells within a 2km radius of the site. There are three wells in total within a 5km radius of the site, all located within the Cavan GWB. Two water supply wells are included within the existing processing area (Well A and Well B). It is expected that groundwater will be breached close to the current ground surface on the commencement of extraction operations in the new quarry area, at approx. 5.5 - 15 mbgl where inflows were noted during drilling.

IMPACT ASSESSMENT

Evaluation Methodology

7.126 The potential direct and indirect impacts to surface water and groundwater associated with the proposed development at the site are discussed below.

7.127 The methodology applied here is a qualitative risk assessment methodology in which the nature of the potential impacts are described in terms of the character, magnitude, duration, probability and consequence of the impact, see **Appendix 7-Q** and **Appendix 7-R**.

7.128 The potential impact is then screened against the sensitivity of the receiving environment to establish the overall significance of the potential impact (without mitigation). Appropriate mitigation measures for the potential impacts identified are discussed, and the identified potential impacts reassessed assuming the identified mitigation measures in place.

Construction Stage Impacts (No Mitigation)

7.129 In the context of the proposed development, the Construction Stage is taken to be site preparation which involves the stripping of soil and subsoil using earth moving machinery. The topsoil and any overburden material will be stored in temporary overburden storage berms ready to be used in the restoration of the site to agricultural land use.

7.130 The potential direct and indirect impacts to surface waters and groundwater are discussed below.

Direct Impacts

7.131 Soil and overburden material will be removed and so surface waterbodies adjacent to the site and the groundwater beneath the extraction area will be more vulnerable to potential pollution.

7.132 During soil removal, direct rainfall and the dust suppression of stockpiles could increase the fine sediment which could infiltrate into groundwater. Any fine sediment will pass through the unsaturated zone before reaching the underlying poorly productive bedrock aquifer.

7.133 Accidental fuel leakage/spillage at the site is a potential impact during the Construction Stage. Any fuel leakage/spillage will pass through the unsaturated zone before reaching the underlying aquifer.

Indirect Impacts

7.134 No indirect impacts associated with the construction stage of the proposed development have been identified.

Operational Stage Impacts (No Mitigation)

7.135 During the site operational stage, the direct and indirect impacts described above during the Construction phase will also apply. In addition, the following potential impacts specifically relating to the operational stage could occur.

7.136 The proposed extension area will be excavation from current floor level which is up to c. 175m AOD to c. 110m AOD in four benches. The reduction in floor level in the quarry will require dewatering to maintain dry working conditions on the quarry floor.

7.137 The dewatering at the quarry will require the provision of a sump on the quarry floor, and the pumping of water from the sump to the discharge point in the adjacent Mullymagowan Stream which flows north to pass through Lough Corfad and join with the Stradone River downstream of the site.

7.138 The operational stage will be approximately 15 years in duration, plus 2 years to complete restoration works (total duration sought 17 years).

Direct Impacts

7.139 During quarry dewatering, water will be discharged to the adjacent Mullymagowan Stream which flows north to the Stradone River. Without treatment, contaminated water discharge could impact on the surface water quality in the adjacent stream and, in turn, the downstream surface waterbodies.

7.140 Surface water runoff across the site will naturally recharge to groundwater and a bund will be constructed around the sump. This will minimise the volume of surface water runoff entering the sump.

7.141 The discharge will increase the baseflow in the adjacent Mullymagowan Stream during quarry dewatering. This could be a positive impact during low flow periods in the stream.

7.142 During dewatering, a cone of drawdown will occur and could cause the lowering of the water level in local groundwater supply wells. The historical well survey identified 8 no. 'existing' wells within 500m of the application site. The nearest private well is located 415m from the quarry extension boundary. The GSI wells database does not record any offsite groundwater supply wells within 2km of the site. It is noted that this region is in an area that overlies a poor aquifer and, therefore, the zone of contribution associated with the proposed dewatering will be localised and is not likely to extend from beneath the quarry floor.

Indirect Impacts

7.143 No indirect impacts associated with the operational stage of the proposed development have been identified.

Post - Operational Stage Impacts (No Mitigation)

Direct Impacts

7.144 During this stage the groundwater level in the quarry will be allowed to rebound naturally.

Indirect Impacts

7.145 There are no indirect impacts anticipated.

Rating of Identified Potential Impacts

7.146 The potential impacts outlined above during the construction and operational stages have been described in terms of the character, magnitude, duration, probability and consequence, and each impact is rated in terms of High (H), Medium (M), Low (L) and Negligible (N) based on the magnitude, extent, duration and consequence of the identified effects.

7.147 The description of the effects and rating for each identified impact is shown in **Table 7-8** below.

Significance of Impacts

7.148 The significance of impacts is based on the significance and sensitivity of the existing environment (**Table 7-7** above), and the description of identified potential impacts with likely significant effects outlined in **Table 7-8** below. The significance of Impact is determined from the Classification of the Significance of Impacts in **Appendix 7-R**.

Table 7-8
Description of Impacts and Impact Rating

No.	Potential Impacts	Description of Impact (No Mitigation)	Significance of Impact (No Mitigation)
Construction Stage - Direct			
1	Reduction in groundwater quality in bedrock aquifer from increase in suspended solids	**Low.** Potential to affect groundwater quality in underlying aquifer from vertical migration through unsaturated zone. Impact to groundwater is unlikely due to short term nature of works. Removal of soils and subsoils could result in elevated suspended solids from disturbed ground entering groundwater.	**Slight**
2	Reduction in groundwater quality in bedrock aquifer from accidental fuel leakage/spillage	**Medium to Low.** Potential to affect groundwater quality in underlying aquifer from vertical migration through unsaturated zone. Impact to groundwater is unlikely due to short term nature of works. Any leakage / spillage would be accidental only and of limited volume.	**Slight**
3	Reduction in groundwater quality in the local water supplies from increase in suspended solids and accidental fuel leakage/spillage.	**Low.** Potential to affect groundwater quality in underlying aquifer through vertical migration followed by lateral migration. Nearest off site water supply well is 415m away. Impact to groundwater is unlikely due to short term nature of works. Any leakage / spillage would be accidental only and of limited volume.	**Slight – Not Significant**
4	Reduction in surface water quality from increase in suspended solids and accidental fuel leakage/spillage	**Low to Negligible.** Potential to affect surface water quality through hydraulic continuity with groundwater in underlying aquifer. Groundwater quality could be impacted from vertical migration through unsaturated followed by lateral migration. Impact to groundwater is unlikely due to short term nature of works.	**Slight – Not Significant**
Operational Stage – Direct			
5	Reduction in surface water quality from untreated discharge of contaminated water pumped from quarry sump	**Medium to High.** Potential to affect surface water quality through discharge. Without treatment, contaminated water discharge could impact on the surface water quality in the adjacent Mullymagowan Stream.	**Moderate**

No.	Potential Impacts	Description of Impact (No Mitigation)	Significance of Impact (No Mitigation)
6	Reduction in groundwater quality in bedrock aquifer from increase in suspended solids	**Low to Medium.** Potential to affect groundwater quality in underlying aquifer through vertical migration through unsaturated zone (where present) and direct contact in quarry floor.	**Slight**
7	Reduction in groundwater quality in bedrock aquifer from accidental fuel leakage/spillage	**Medium**. Potential to affect groundwater quality in underlying aquifer through vertical migration through unsaturated zone (where present) and direct contact in quarry floor. Any leakage / spillage would be accidental only and of limited volume.	**Moderate - Slight**
8	Reduction in groundwater quality in the local water supplies from increase in suspended solids and accidental fuel leakage/spillage	**Low**. Potential to affect groundwater quality in underlying aquifer through vertical migration through unsaturated zone and direct contact in quarry floor followed by horizonal migration of impacted groundwater to water supplies. The nearest offsite groundwater supply well is 415m away. Any leakage / spillage would be accidental only and of limited volume.	**Slight – Not Significant**
9	Lowering of the water level in local groundwater supply wells due to dewatering and abstraction.	**Low.** During dewatering when the quarry is deepened, a cone of drawdown will occur and could cause lowering of the water level in local groundwater supply wells. However, the nearest offsite groundwater supply well is 415m away.	**Slight – Not Significant**
10	Impact of discharge quantity on surface water	**Low.** Discharge of water from the quarry sump will be required during the proposed excavation of the quarry. The discharge will increase the baseflow in the adjacent Mullymagowan Stream during quarry dewatering.	**Slight – Not Significant**

Cumulative Impacts

7.149 There are no developments within a 5km radius of the site that are considered to have a potential cumulative impact.

Unplanned Events

7.150 It is highly unlikely that any unplanned events within the application site would result in a noticeable impact on the hydrology and hydrogeology. Accidents could result in the spillage of fuel, which has been considered in the assessment above.

'Do-nothing Scenario'

7.151 If the proposed extension development is not permitted, the site will remain undeveloped as agricultural land.

MITIGATION MEASURES

7.152 Mitigation measures required to reduce the significance of potential impacts associated with the proposed extension area from Slight/Moderate to Not Significant to the water environment receptors are identified in the following sections of this EIAR Chapter.

Existing and Proposed Mitigation Measures

7.153 In order to mitigate against the risk of pollution to groundwater and surface water occurring arising during the proposed extension of the quarry, the following water / environmental control measures will be implemented:

- The dewatering at the quarry will require the provision of a sump on the quarry floor, the pumping of water from the sump to the discharge point in the adjacent Mullymagowan Stream which flows north to the Stradone River. A bund will be constructed around the sump. This will minimise the volume of surface water runoff entering the sump.
- Measures will be taken to ensure that all diesel fuel oil storage will be in a double skinned fuel tank in a secure container to prevent contamination of groundwater;
- A spill kit including high absorbency mats and pig tails will be available on site to be used in the event of a hydrocarbon spill;
- A programme of surface quality monitoring will be implemented, with samples taken from the sump and the discharge point on a monthly basis. If there is a deterioration in surface water quality as a result of construction related activities then measures to manage and reduce fines / fuels in any runoff will be implemented;
- Groundwater monitoring wells will be installed around the site and samples will be taken from the wells on a quarterly basis. If there is a deterioration in groundwater quality as a result of construction related activities then, as above, measure will be implemented; and
- The Environmental Management System will continue to be implemented at the site.

Assessment of Impacts with Mitigation Measures in Place

7.154 With the above mitigation measures in place at the application site, it is projected that the following reduction in the assessed significance of impacts will result:

Construction Stage:

- Reduction of the potential impact on groundwater quality in the bedrock aquifer from an increase in suspended solids and accidental fuel leakage/spillage from **'slight'** to **'not significant'** (No. 1&2).
- Reduction of the potential impact on local groundwater supplies from accidental fuel leakage/spillage at the site and migration within the groundwater body from **'slight/not significant'** to **'not significant'** (No. 3).
- Reduction of the potential impact on surface water quality from an increase in suspended solids and accidental fuel leakage/spillage from **'slight/not significant'** to **'not significant'** (No. 4).

Operational Stage - Direct:

- Reduction of the potential impact on surface water quality from untreated discharge of contaminated water pumped from the quarry sump from **'moderate'** to **'slight'** (No. 5).
- Reduction of the potential impact on groundwater quality in the bedrock aquifer from an increase in suspended solids from **'slight'** to **'not significant'** (No. 6).
- Reduction of the potential impact on groundwater quality in the bedrock aquifer from accidental fuel leakage/spillage from **'moderate-slight'** to **'slight'** (No. 7).
- Reduction of the potential impact on groundwater quality in the domestic water supplies from increase in suspended solids and accidental fuel leakage/spillage from **'slight/not significant '** to **'not significant'** (No. 8).

7.155 For the potential impacts of lowering of the water level in local groundwater supply wells due to dewatering and abstraction (No. 9) and impact of discharge quantity on surface water (No. 10), the potential impact will remain as '**slight/not significant**' for both.

Post-Operation Stage

7.156 It is not considered that there are any direct or indirect impacts on surface water or groundwater during the Post-Operation Stage.

RESIDUAL IMPACT ASSESSMENT

7.157 Examination of the identified potential impacts on the receiving environment show that provided appropriate mitigation measures are put in place, there are no significant residual impacts with respect to groundwater and/or surface water during the Construction, Operation, Post-Operation Stages.

7.158 It is therefore considered that with the implementation of the mitigation measures outlined above, the proposed development will not cause any significant, or likely significant, impact on groundwater and/or surface water.

MONITORING

7.159 The following monitoring activities will be carried out to demonstrate that the development is not having an adverse impact on the surrounding environment:

- Groundwater monitoring wells will be installed around the application area. Groundwater quality and levels will be monitored, with frequency and parameters of sampling to be agreed with Cavan Co. Co. for the duration of the proposed development; and
- The water quality in the quarry sump and in the adjacent Mullymagowan Stream will be monitored, with frequency and parameters of sampling to be agreed with Cavan Co. Co. for the duration of the proposed development. This will include sampling at the discharge point on the Mullymagowan Stream.

Surface Water Monitoring

7.160 It is recommended that the surface water quality in the quarry sump and in the adjacent Mullymagowan Stream is monitored on a monthly basis to ensure the quarry operations do not adversely impact on the local surface water environment.

7.161 Samples will be taken from two points along the stream; at the discharge point and further downstream before the stream reaches Lake Corfad. These proposed monitoring points are mapped on **Figure 7-9**.

7.162 The three samples will be tested for a standard surface water quality suite at an appropriate laboratory and results will be screened against relevant legislation and guideline concentration limits for all parameters.

7.163 In addition, a flow meter will be installed at the point of discharge to control and monitor water volumes being discharged off site during the operational phase of the proposed development.

7.164 Any additional surface water monitoring requirements will be agreed with Cavan Co. Co. prior to the commencement of any operations on site. Any conditions set out in the discharge licence will also be considered as part of the surface water monitoring programme.

Groundwater Monitoring

7.165 The quarry extension will initially be worked dry above the water table and thereafter through the use of pumps within the quarry void after the groundwater table has been intercepted.

7.166 Groundwater level and quality monitoring will be carried out during the construction and operational stages. This will allow for groundwater quality sampling (quarterly) and groundwater level data (continuous or monthly) to be collected from the proposed development site.

7.167 Any additional groundwater monitoring requirements will be agreed with Cavan Co. Co. prior to the commencement of any operations on site.

FIGURES

APPENDICES

Appendix 7-A
EU Directives / National Legislation and Regulations / Guidelines / Technical Standards

Appendix 7-B
Screened Surface Water Quality Results

Appendix 7-C
Surface Water Quality Results Laboratory Certificates

Appendix 7-D
Surface Water Sampling Field Record Sheets

Appendix 7-E
County Cavan Groundwater Protection Scheme Report

Appendix 7-F
Water Framework Directive

Appendix 7-G
Rating of Existing Environment Significance / Sensitivity

Appendix 7-H
Descriptions of Effects (EPA, 2022)

Appendix 7-I
Classification of the Significance of Impacts

Appendix 7-A
EU Directives / National Legislation and Regulations / Guidelines / Technical Standards

European Directives

- Environmental Impact Assessment. Directive (2011/92/EU) on the assessment of the effects of certain public and private projects on the environment;
- Environmental Impact Assessment Directive (2014/52/EU) on the assessment of the effects of certain public and private projects on the environment;
- Water Framework Directive (2000/60/EC);
- Groundwater Directive (2006/118/EC);
- Flooding Directive (2007/60/EC)
- Integrated Pollution and Prevention Control Directive (2008/1/EC); and
- The management of waste from extractive industries (2006/21/EC).

Irish Government Acts, National Legislation and Regulations

- S.I. No. 349 of 1989, European Communities (Environmental Impact Assessment) Regulations, and subsequent amendments (S.I. No. 84 of 1994, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001);
- The Planning and Development Acts, 2000 to 2009, The Planning and Development (Amendment) Act 2010, S.I. 600 of 2001 Planning and Development Regulations and subsequent amendments including, S.I. No. 364 of 2005 and S.I. 685 of 2006.

National legislation on the protection of the water environment. Since 2000 water management in EU member states has primarily been directed by the Water Framework Directive (2000/60/EC) and the associate 'daughter' Groundwater Directive (2006/118/EC). Irish legislation implementing these, and other relevant directives currently includes:

- S.I. No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010 and amendments (S.I. No. 389 of 2011 and S.I. No. 149 of 2012);
- European Union (Drinking Water) Regulations 2014 (S.I. No. 122 of 2014);
- S.I. No. 278 of 2007 European Communities (Drinking Water) (No. 2) Regulations;
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009 and amendment (S.I. No. 327 of 2012);
- S.I. No. 684 of 2007 Waste Water Discharge (Authorisation) Regulations, 2007, as amended (S.I. No. 231 of 2010);
- S.I. No. 122 of 2010 European Communities (Assessment and Management of Flood Risks) Regulations 2010;
- S.I. No. 457 of 2008 European Communities (Environmental Liability) Regulations which bring into force the European Liability Directive (2004/35/EC);
- European Union (Planning and Development) (Environmental Impact Assessment) (No. 2) Regulations 2018 (S.I. No. 404 of 2018);
- Local Government (Water Pollution) Acts 1977 to 1998;
- European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988);
- European Communities (Quality of Shellfish Waters) Regulations, 2006 (S.I. No. 268 of 2006) and amendments (S.I No. 55 and 464 of 2009), and;

- Bathing Water Quality Regulations, 2008 (S.I. No. 79 of 2008) and amendments (S.I No. 351 of 2011 and S.I. No. 163 of 2016);

Guidelines

- CIS (2007). Common Implementation Strategy (CIS) for the Water Framework Directive (2000/60/EC) Guidance on preventing or limiting direct and indirect inputs in the context of the Groundwater Directive 2006/118/EC. Guidance Document No. 17.
- CIS (2010). Common Implementation Strategy (CIS) for the Water Framework Directive (2000/60/EC). Guidance on risk assessment and the use of conceptual models for groundwater. Guidance document No. 26.
- DEHLG (2004). National Urban Waste Water Study. National Report.
- DEHLG (2009). Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities.
- DELG/EPA/GSI (1999). Groundwater Protection Schemes. Document prepared jointly by the Geological Survey of Ireland (GSI), the Environmental Protection Agency, and the Department of Environment, Heritage and Local Government.
- EPA (Draft May 2017) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- EPA (2010b). Methodology for Establishing Groundwater Threshold Values and the Assessment of Chemical and Quantitative Status of Groundwater, Including and Assessment of Pollution Trends and Trend Reversal.
- EPA (2011). Guidance on the Authorisation of Discharges to Groundwater. Version 1, December 2011.
- EPA (2003). Towards Setting Guideline Values for the Protection of groundwater in Ireland. Interim Report.
- EPA (2006). Ireland Water Framework Directive Monitoring Programme.
- Fitzsimons, V., Daly, D. and Deakin, J. (2003). Draft GSI guidelines for assessment and mapping of groundwater vulnerability to contamination. Groundwater Chapter, Geological Survey of Ireland.
- GSI (2006). Criteria used in aquifer classification. 1Available from http://www.gsi.ie/Programmes/Groundwater/Aquifer+Classification.htm
- IGI (2007). Guidelines on Water Well Construction. Available from http://www.igi.ie/assets/files/Water%20Well%20Guidelines/Guidelines.pdf
- Kilroy, G., Dunne, F., Ryan, J., O'Connor, A., Daly, D., Craig, M., Coxon, C., Johnston, P. and Moe, H. (2008). A Framework for the Assessment of Groundwater – Dependent Terrestrial Ecosystems under the Water Framework Directive. Environmental Research Centre Report Series No. 12.
- Institute of Geologists of Ireland, 2007. Recommended collection, presentation and interpretation of geological and hydrogeological information for quarry developments.

Technical Standards

- British Standards (2015). Code of Practice for Ground Investigations BS5930:2015;.
- CIRIA (2007). The SuDS Manual. (C697). CIRIA publication, February 2007.

Appendix 7-B
Screened Surface Water Quality Results

Appendix 7-C
Surface Water Quality Results Laboratory Certificates

Appendix 7-D
Surface Water Sampling Field Record Sheets

Appendix 7-E
County Cavan Groundwater Protection Scheme Report

Appendix 7-F
Water Framework Directive

Introduction

The EU Water Framework Directive[3] (WFD) became EU law in December 2000 and provides for a single European framework to assess water quality (Ecological status) and allows for the comparison of results across Europe. The WFD covers rivers, lakes, estuaries or transitional waters, coastal waters as well as groundwaters.

Surface waters are classified into five quality classes (Ecological status) under the WFD; High, Good, Moderate, Poor and Bad Ecological status. Groundwater is classified into just two quality classes, Good and Poor Ecological status. High Ecological status is when the water is unpolluted, while at the opposite end of the classification Bad Ecological status is when the water is highly polluted.

The WFD required baseline water quality in all waterbodies to be established for biological, chemical and hydromorphology quality. These three quality variables are combined to give the overall Ecological status classification of the waterbody; good or high ecological status and good chemical status for surface waters and good chemical and quantitative status for groundwaters.

The two principal objectives of the WFD are:

- that all water bodies must reach at least 'Good' overall status by 2027, at the latest. For surface waters, good overall status is a combination of good ecological status (or potential) and good chemical status; and
- that the status of each water body, including all the quality elements which make up the overall status, must not deteriorate relative to the baseline reported in the relevant RBMP.

The WFD identifies where actions are required to achieve Good Ecological status or maintain waterbodies which are already Good or High Ecological status. Waterbodies can be restored Good and High Ecological status by using targeted actions and measures to reduce the impact of human activities on them.

For heavily modified or artificial water bodies, which are incapable of achieving Good Ecological status without impairing an existing specified water use, the environmental objective is to achieve good ecological potential.

The WFD requires that management plans are prepared on a river basin basis and specifies a structured method for developing these plans

River Basin Management Plans

The River Basin Management Plans (RBMP) provide a single system of water management based on the natural delineation of river catchments and is the method by which the aims of the WFD are achieved.

For each river basin district in Ireland a RBMP plan needs to be established and updated every six years, to provide the context for the co-ordination requirements of the WFD key aims which are to:

- Provide for protection to all waters, surface waters and groundwater;

[3] **Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.**

- achieving Good Ecological status for all waters by 2027;
- establish water management measures based on river basin catchment areas;
- establish a combined approach of emission limit values and quality standards for waters;
- involving citizen more closely in the WFD and RMBMP; and
- streamlining and aligning national legislation.

The RBMP provides a detailed account of how the objectives set for each river basin in terms of ecological status, quantitative status, chemical status and protected area objectives are to be reached within the timescale of the plan. The plans include the results of the catchment analysis including the river basin's characteristics, a review of the impact of human activity on the status of waters in the basin, estimation of the effect of existing legislation and the remaining gap to meeting these objectives; and establish a set of measures designed to meet the objectives.

River Basin Management Plan for Ireland 2022-2027

The current RMBP report for Ireland is at the draft stage[4]. The draft report states that while substantial progress has been made in the management of water services and how we work together to protect, restore and improve water quality with the improvement in some areas and aspects of water quality, many waterbodies are still subject to mounting environmental pressures and overall water quality is in decline primarily due to nutrient pollution.

The RMBP states that due to the overall decline in water quality stronger measures are now required which will improve overall water quality; the sustainable management of water resources is important to address and adapt to the impacts of climate change, with many of the required measures having co-benefits for climate mitigation and biodiversity. Protecting and restoring water quality in Ireland will most of all need measures to address:

- the loss of agricultural nutrients to water;
- continue to improve waste water treatment; and
- to re-establish natural free-flowing conditions in more rivers.

The plan states that Ireland's water resources and services face challenges on a number of fronts including a continued need for investment in infrastructure and an ever increasing demand for water services due to urbanisation, population and economic growth. These challenges are set against a backdrop of widespread, rapid, and intensifying climate change.

[4] Draft River Basin Management Plan for Ireland 2022-2027, Government of Ireland

Appendix 7-G
Rating of Existing Environment Significance / Sensitivity

Rating of Existing Environment Significance / Sensitivity (IGI, 2013 Guidelines)

Importance	Criteria	Typical Example
High	Attribute has a high quality or value on an international scale	Groundwater/ Surface Water supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – e.g. NHA status. Regionally important potable water source supplying >2,500 homes Inner source protection area for regionally important water source. Drinking water supply from river. Amenity use of waterbody
	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes. Outer source protection area for locally important water source. No specific recreational use of waterbody
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer. Potable water source supplying <50 homes. No water supply from surface water, no abstraction designation for watercourse No amenity value of waterbody
Negligible	Attribute has negligible quality or value on a local site scale	No groundwater supply from a bedrock aquifer inn vicinity of site. Surface water not used for any specific purpose.

Appendix 7-H
Descriptions of Effects (EPA, 2022)

Descriptions of Effects (EPA, May 2022)

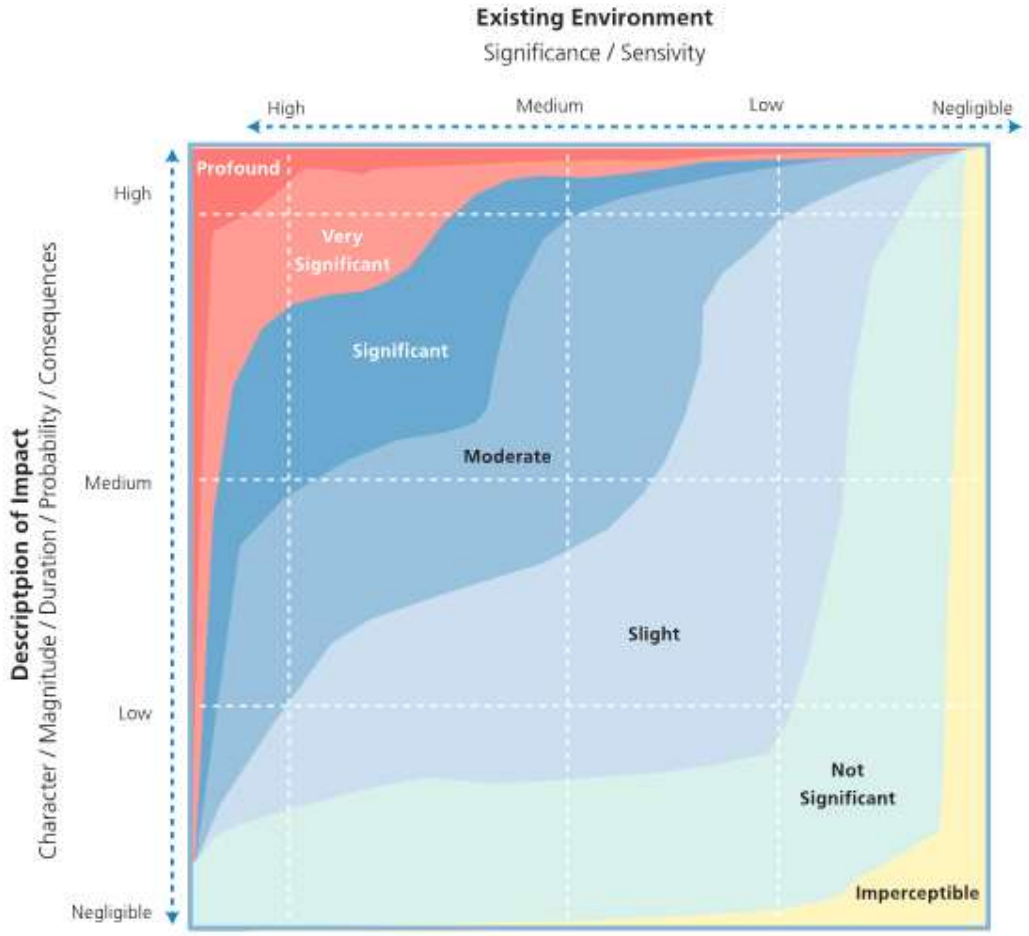
Impact Characteristic	Term	Description
Quality of Effects	Positive Effects	A change which improves the quality of the environment
	Neutral Effects	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative / Adverse Effects	A change which reduces the quality of the environment
Describing the Significance of Effects	Imperceptible	An effect capable of measurement but without significant consequences
	Not significant	An effect which causes noticeable2 changes in the character of the environment but without significant consequences.
	Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound Effects	An effect which obliterates sensitive characteristics
Describing the Extent and Context of Effects	Extent	Describe the size of the area, the number of sites, and the proportion of a population affected by an effect
	Context	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Describing the Probability of Effects	Likely Effects	Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Unlikely Effects	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)

Impact Characteristic	Term	Description
Describing the Duration and Frequency of Effects	Momentary Effects	Effects lasting from seconds to minutes
	Brief Effects	Effects lasting less than a day
	Temporary Effects	Effects lasting less than a year
	Short-term Effects	Effects lasting one to seven years
	Medium-term Effects	Effects lasting seven to fifteen years
	Long-term Effects	Effects lasting fifteen to sixty years
	Permanent Effects	Effects lasting over sixty years
	Reversible Effects	Effects that can be undone, for example through remediation or restoration
	Frequency of Effects	Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually.
Describing the Types of Effects	Indirect / Secondary Effects	Likely, significant effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	Do-Nothing Effects	The environment as it would be in the future should the subject project not be carried out.
	Worst Case Effects	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
	Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

Appendix 7-I
Classification of the Significance of Impacts

Determining Significance

The diagram below shows how comparison of the character of the predicted impact to the sensitivity of the receiving environment can determine the significance of the impact.



(Source: Environmental Protection Agency (May, 2022), *'Guidelines on the Information to be contained in Environmental Impact Assessment Reports'*).