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Acronyms and Abbreviations

CGS	County Geological Sites
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
GSI	Geological Survey Ireland
IFS	Irish Forestry Soils
IGH	Irish Geological Heritage
IGI	Institute of Geologists of Ireland
ISIS	The Irish Soil Information System
m AOD	meters Above Ordnance Datum
m bgl	meters below ground level
SHWW	Safety Health and Welfare at Work

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Introduction

Background

- 6.1 This chapter of the EIAR provides a description of the existing land, soils, and geology conditions in the application area of the site within the context of the regional setting. It assesses the potential impacts the proposed development will have on the land, soils, geological features, and other geological aspects of the development environment in the vicinity of the site. Mitigation measures, if required, are proposed.

Proposed Development

- 6.2 The proposed development is described in detail in Chapter 2: Project Description of this EIAR. It is shown on **Figure 2-2** and will comprise:
- Permission for continued use of the quarry development, currently permitted by P. Ref. 04/1479 and ABP PL20.215417, on c. 66.3 hectares, with an extraction area of c. 17.1 hectares and permanent overburden storage area of c. 3.9 hectares;
 - Permission for continued use of the permitted facilities consisting of: ESB substation (26m²), portacabin office facilities including canteen and washroom facilities (91m²), bunded fuel storage, vehicle circulation/access including wheelwash and weighbridge, settlement tanks/hydrocarbon interceptors for treatment of water, construction of overburden and screening mounds, all other associated site works and ancillary activities;
 - Permission for continued extraction of limestone using conventional blasting techniques and processing of rock using crushing and screening plant;
 - Upgrade of the existing WWTS and percolation area to new Secondary WWTS and constructed soil polishing filter area;
 - Provision of the permitted concrete block making facility and concrete batching plant, truck washdown facility with wash water recycled via a closed settlement tank system, the storage of aggregates; and workshop including storage room, canteen and washroom facilities (485m²); and
 - Restoration of the overall application site to a natural habitat including a permanent waterbody.

Scope of Work

- 6.3 This EIAR chapter is based on a desk study of the site and surrounding area using published geological data, consultation with Geological Survey of Ireland (GSI), available borehole information relating to the site and a visual inspection of the lands by way of a walkover survey.

Consultations / Consultees

- 6.4 The Geological Survey of Ireland (GSI) was consulted during the preparation of this EIAR and publicly available information from the GSI was also reviewed.

Project Team

- 6.5 This chapter of the EIAR was prepared by SLR Environmental Consulting (Ireland). The project team consists of:

- Michelle Sherry Graduate Hydrogeologist BSc.; and
- Peter Glanville Technical Director (Hydrology & Hydrogeology) PGeo. Eur.Geol, MCIWEM.

Regulatory Background

EU Directives

- 6.6 The following European Union (EU) Directive relate to Land, Soils and Geology at the site in this EIAR:
- Environmental Impact Assessment Directive (2014/52/EU);
 - The management of waste from extractive industries (2006/21/EC); and
 - European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. 296 of 2018);
- 6.7 The EU EIA Directive regulates the information impact assessment process and information in this EIAR. The management of waste Directive and the Environmental Liability Directive regulate the activities at the site.

Irish Legislation

- 6.8 The following legislation relating to Land, Soils and Geology at the site is referred to in this EIAR:
- 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 Act, 2000 (as amended); and
 - 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.
- 6.9 The above legislation regulates the information contained in an EIAR and planning at the site.

Planning Policy and Development Control

- 6.10 The following Planning Policy and Development Control relating to Land, Soils and Geology at the proposed development site is set out in the Roscommon County Development Plan (CDP) 2022-2028.
- 6.11 The County Development Plan, under Geological Heritage part, sets out objectives in relation to natural heritage and landscape, including geology, in the county.
- 6.12 Regarding Natural Heritage, two objectives of the development plan 2023-2029 are set out:
- **Objective NH 10.11** to “Preserve and protect sites of county geological importance from inappropriate development where they comprise designated sites or national heritage areas” and
 - **Objective NH 10.12** to “Promote and facilitate the development of geo-tourism in County Roscommon where it does not have a detrimental impact on designated sites or features of geological interest.”

- 6.13 The CDP 2022-2028 also recognises the importance of soil to the environment in the county.
- The Council supports the preservation and restoration of degraded lands, peatlands, organic soils and wetlands which serve to absorb and retain carbon dioxide.
- 6.14 The Roscommon County Development Plan 2022-2028 (Section 6.5) recognises the importance of the extractive industry to the local and national economy as valuable sources of raw material for industry in general and the construction industry in particular and as an important source of employment. Four objectives are set out in the County Development Plan 2022-2028:
- **Objective ED 6.17** to “Facilitate the extraction of minerals and aggregates and associated processing where such activities do not have a significant negative impact on the environment, landscape, public health, archaeology or residential amenities of neighbouring settlements and where such operations are in compliance with all national regulations and guidelines applicable to quarrying and mining activities.”
 - **Objective ED 6.18** to “Ensure that the development of aggregate resources (stone and sand/gravel deposits) is carried out in a manner which minimises effects on the environment, including the Natura 2000 network and its sustaining habitats (including water dependent habitats and species), amenities, infrastructure and the community, and can demonstrate environmental enhancement through habitat management plans/ecological restoration.”
 - **Objective ED 6.19** to “Support adequate supplies of aggregate resources to meet the future growth needs of the county and the wider region where there is a proven need for a certain mineral/aggregate and to exercise appropriate control, while addressing key environmental, traffic and social impacts” and
 - **Objective ED 6.20** to “Require appropriate restoration of quarried lands and encourage the reuse of worked out quarries for ecological and geological benefit and / or for recreational, educational and agricultural purposes.”
- 6.15 The development plan, states that the Council will seek to ensure that significant aggregate resources in the County are appropriately protected and, in this regard, will restrict the siting of incompatible developments that would interfere with the efficient development of such resources. Regarding quarry, aggregate and land reclamation, the imperative is to balance between the economic benefits of extraction and potential environmental impacts.
- 6.16 A total of 29 County Geological Sites in Roscommon have been identified by The Geological Survey of Ireland (GSI). The County Geological Heritage Sites are important heritage sites and some sites may be designated, in due course, as National Heritage Areas (NHAs)..

Guidelines

- 6.17 This Land, Soils and Geology chapter of the EIAR has been prepared with regard to the following guidelines:
- Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Environmental Protection Agency;
 - Geological Survey of Ireland, Irish Concrete Federation (2008) Geological Heritage Guidelines for the Extractive Industry;
 - Institute of Geologists of Ireland (2013) Guidelines for the preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;

- National Roads Authority (2008) Environmental Impact Assessment of National Road Schemes - A Practical Guide;
- National Roads Authority (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes; and
- The Institute of Quarrying Good (2021) Practice Guide for Handling Soils in Mineral Workings

Receiving Environment

Study Area

- 6.18 For the purposes of this assessment, the study area comprises the application site and the surrounding area up to 5 km to reflect the sensitivity of the Land, Soil and Geology; this is in line with the Institute of Geologists of Ireland's (IGI) guidelines (2013) for assessment in areas of limestone karst bedrock.
- 6.19 The IGI guidelines state that the minimum distance of 5 km should be reviewed in the context of the geological environment as well as the scale of development and increased to reflect the sensitivity of the subsurface karst environment.

Baseline Study Methodology

- 6.20 The baseline study undertaken for Land, Soils, and Geology here involves a review of published literature and information, boreholes drilled, and the findings from a walkover survey of the site and the context of the site within the surrounding area.
- 6.21 The baseline study is a qualitative assessment of the available information based on professional experience.

Sources of Information

- 6.22 The following sources of information were consulted in the preparation of the receiving environment baseline study for Land, Soils and Geology:
- Geological Survey of Ireland (www.gsi.ie);
 - Teagasc subsoil mapping for Irish Forestry Soils Project (www.epa.ie);
 - Irish Soils Information System (www.teagasc.ie/soils);
 - Irish Geological Heritage Programme (www.gsi.ie); and
 - Ordnance Survey of Ireland (www.osi.ie).
- 6.23 The exposed faces at the existing quarry also provide information on the local soils, subsoils and bedrock geology at the site.

Land Baseline

- 6.24 Within the EIA EU Directive (2014/52/EU) Land is recognised as a 'natural resource' and the Directive also refers to the importance of the sustainable use of soil and the need to address the unsustainable increase in settlement areas over time ('land take'). Therefore, the issues of land as both a natural resource and land take must be considered in an assessment.
- 6.25 The introduction section to the EU Directive (2014/52/EU) notes that the:

'final document of the United Nations Conference on Sustainable Development held in Rio de Janeiro on 20-22 June 2012, which recognises the economic and social significance of good land management, including soil, and the need for urgent action to reverse land degradation. Public and private projects should therefore consider and limit their impact on land, particularly as regards land take, and on soil, including as regards organic matter, erosion, compaction and sealing; appropriate land-use plans and policies at national, regional and local level are also relevant in this regard'.

- 6.26 Land can be considered to be a resource with a beneficial use to society, for example agricultural land-use, extractive industry land-use or urban residential land-use; unnecessary land take may result in the loss of this resource which has the potential to have adverse social and economic consequences for society.
- 6.27 The site of the quarry has an elevation of between 80 m AOD on the west of the quarry and 110m AOD in the mid to mid-east section of the quarry.
- 6.28 The existing permitted land use at the site is quarrying and associated activities, this is an established land use at this location. The existing site comprises four distinct activities, they are:
- The quarrying of rock;
 - The processing of aggregates;
 - Ancillary facilities including office / welfare associated with the quarrying aggregate processing; and
 - Remaining lands within ownership
- 6.29 The quarrying land use at the site is intrinsically linked to the presence and suitability of limestone resources. These strategically important limestone reserves are used to provide a range of aggregates and crushed rock materials for the construction sector in the local and regional area.
- 6.30 The land within the application area has been employed for quarrying; processing aggregates and ancillary value added manufacturing facilities for the last 20 years. In this regard, the proposed development comprising of continuing to use the quarry for another 25 years will not have any impact on existing landuse within the overall quarry site. No additional land is required for the proposed development.

Land Cover

- 6.31 The Corine land cover mapping is a standardised inventory of land cover across Europe which is split into 44 different land cover classes. The latest 2018 Corine land cover mapping for Ireland is based on the interpretation of satellite imagery and national in-situ vector data. Land cover is mapped to the standard CORINE classification system and data specifications.
- 6.32 The Corine land cover mapping reflects land use at the time of survey, in this case the latest available land cover data for Ireland is 2018. The land cover types in the vicinity of the site are shown in Figure 6-1, and includes the following landcover types:
- Agricultural pasture; and
 - Small areas of wetland including peat bogs and inland marshes.

Soils Baseline

- 6.33 Soil is defined as the top layer of the earth's crust and is formed by mineral particles, organic matter, water, air and living organisms. Soil is an extremely complex, variable, and living

- medium and its characteristics are a function of parent subsoil or bedrock materials, climate, relief, and the actions of living organisms over time.
- 6.34 Soil formation is an extremely slow process and can take thousands of years to evolve; soil can be considered essentially as a non-renewable resource.
- 6.35 As the interface between the earth, the air, and the water, soil performs many vital functions; it supports food and other biomass production (forestry, biofuels etc.) by providing anchorage for vegetation and storing water and nutrients long enough for plants to absorb them. Soil also stores, filters, and transforms other substances including carbon and nitrogen, and has a role supporting habitats serving as a platform for human activity.

National Soils

- 6.36 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).
- 6.37 This soil project has identified a number of Soil Associations across Ireland, which are each comprised of a range of soil types (or 'Series'), each of them different in properties, and in environmental and agronomic responses.
- 6.38 The soil association is classified as the Rathowen Association (1030RA) over the majority of the Roadstone landholding, composed of fine loamy drift with limestones, refer to **Figure 6-2**. These soils are classified as Stagnic Luvisols having formed mainly from shale drift from gravels of mixed origin. Stagnic Luvisols exhibit impeded subsoil drainage. In many of these soils, artificial drainage has improved water flow making them suitable for both grass and crop production.
- 6.39 According to Teagasc Drainage Manual 2022¹, Luvisols are distinguished by clay leaching from the topsoil into deeper layers, creating a subsoil richer in clay. Typically, they form over limestone bedrock or within limestone dominated glacial deposits. Due to the clay accumulation, these soils have moderate to imperfect drainage, especially in the subsoil layer. Despite this, Luvisol can be very productive for agriculture, particularly in areas where rainfall is moderate.
- 6.40 The remainder of the landholding, across the southwestern area of the site, is classified as Baggotstown Association (1150BG) which is composed of coarse loamy over calcareous gravels. These soils are classified as Brown Earths and are considered to be amongst the best soils for cultivation in Ireland, as they generally have good nutrient status and have good drainage capacity.

Site Soils

- 6.41 A majority of the soils within the existing overall quarry area have been removed in the past as part of the existing quarry operations. As the proposed development includes for the development of a concrete batching plant and a concrete block making facility and storage yard (permitted but not constructed) and a further lateral expansion to the existing quarry, further soil stripping will need to be undertaken.
- 6.42 The area of the quarry which will contain the concrete batch facility comprise of Rathowen Association (1030RA) soils and the area of the quarry labelled as Overburden Storage Area is comprised of Baggotstown Association (1150BG) soils.

¹ Teagasc Manual on Drainage and Soil Management - Teagasc | Agriculture and Food Development Authority (2022).

Subsoils Baseline

Regional Subsoils

- 6.43 The Quaternary (Subsoil) deposits were deposited during the last 2 million years and essentially comprise the unconsolidated materials overlying bedrock in Ireland. The two main types of quaternary subsoils in Ireland are glacial till, deposited at the base of ice sheets, and sand & gravel deposits associated with the melting of the ice sheets which are generally termed glaciofluvial outwash sands and gravels. Other extensive quaternary subsoils in Ireland include peat, river alluvium and coastal process deposits. Most Quaternary subsoils in Ireland were deposited since the maximum of the last glaciation, the Midlandian, which occurred approximately 17,000 years ago.
- 6.44 The subsoils across Ireland have been mapped on a national basis by Teagasc as part of the EPA Soil and Subsoil Mapping Project for the Irish Forestry Soils (IFS) project. The subsoil mapping was undertaken using existing Quaternary Geology maps, publications, remote sensing, field mapping and sampling. See Figure 6-3 for subsoils in the study area.
- 6.45 Limestone glacial tills are the most widespread subsoil type found in County Roscommon. These subsoils tend to have moderate to poor drainage.
- 6.46 From the Teagasc subsoil mapping the following subsoil types are located in the study area:
- Limestone glacial till is the main type of subsoil present in the area around the site.
 - Cutover peat at Cuilleenirwan Lough, located c. 1.6 km north/northwest of the site and also to c. 1.9km to the west of the site;
 - Karstified limestone bedrock is recorded close to or at the surface, indicating thin or the absence of subsoils, at the surface c. 1.2km northeast of the site; and
 - Marl (Silt/Clay) subsoils c.1.9 km southeast of site at Feacle Lough.
- 6.47 The subsoils beneath Feacle Lough, c.1.9k m southeast of site, are Marl (Mrl) which are clayey/silty in texture, see **Figure 6-3**.

Site Subsoils

- 6.48 The subsoils within the existing overall quarry area have been removed in the past as part of the quarry operations. As the proposed development comprises continuance of use of the existing quarry, no further subsoil stripping / removal of subsoils is required.

Bedrock Geology Baseline

- 6.49 The GSI 1:100,000 Geology Map Sheet 12 (2018) indicates that the quarry area is underlain mainly by undifferentiated, bedded Viséan Limestone and calcareous shale refer to **Figure 6-4**.
- 6.50 A rotary core drilling programme undertaken on site in 2004 as part of the geophysical survey carried out by APEX Geoservices Ltd. revealed that the rocks underlying the site are composed of clean, medium to coarse-grained, mid-grey bioclastic grainstones and packstones with occasional interbedded fine-grained mid to dark-grey packstones. Large brachiopods and colonial corals are present, indicating that the site is underlain by rocks high in the Viséan sequence.
- 6.51 The GSI geological maps show there are no major faults or changes in lithology in the vicinity of the site. The nearest fault is approximately 9.4km southwest from quarry, a fault trending NW -SE is seen.

- 6.52 Although not shown on the GSI Vulnerability map, bedrock is exposed within the existing quarry area. The proposed development comprises continuance of use of the existing quarry. The quarry is permitted for extraction to a depth of c. 40m AOD and currently, the quarry floor levels are c. 70-85m AOD so further extraction of bedrock at depth will be carried out.

Drilling data

- 6.53 Four wells (MW3, MW4, MW5 and MW6) were drilled in June 2023 as it was found that the older boreholes on site were no longer viable for monitoring. These boreholes were drilled by Peterson Drilling Ltd and supervised by SLR Consulting personnel. The boreholes each had a gravel pack installed in the annular space between the slotted casing and the borehole. A bentonite seal was installed above the gravel pack to prevent the entry of surface water runoff from surrounding areas flowing directly into the boreholes. They were fitted with a stand-up cover with a concrete surround. These borehole locations are shown on EIAR **Figure 7-5**. Borehole logs provide information on the bedrock geological within the quarry area. A copy of the borehole logs is included in **Appendix 7-B**.
- 6.54 The bedrock geology (lithological) details from the borehole logs are summarised in **Table 6-1** below:

Table 6-1: Geological (Lithological) Information from Boreholes (2023 only)

Borehole ID	GL Elevation (mOD)	Borehole Depth (mbgl)	Depth to Bedrock (mbgl)	Description
MW3	84.26	37	4.2	0.0 - 4.2m: Medium dense brown very silty gravelly SAND with frequent limestone cobbles and boulders 4.2 - 7.5m: Weak to Medium strong weathered grey LIMESTONE with occasional highly fractured joints 7.5 - 18.5m: Strong grey LIMESTONE occasional fractures 18.5 - 37m: Karst limestone with some voids and clay infill
MW4	90.05	60	6.10	0.0 - 0.2m: Firm brown TOPSOIL 0.2 - 6.1m: Medium dense fine brown silty gravelly SAND with frequent cobbles and boulders 6.1 - 8m: Medium strong weathered grey LIMESTONE 8 - 47m: Strong grey LIMESTONE rare fractures 47 - 60m: Medium strong occasional Weak brownish grey karst LIMESTONE frequent fractures
MW5	87.89	57	1.4	0.0 - 0.3m: MADEGROUND (Rock fill) 0.3 - 1.4m: Medium dense fine brown silty slightly gravelly SAND 1.4 - 15m: Weak occasional highly weathered karst light grey LIMESTONE some clayey karst joints 15 - 27m: Strong grey LIMESTONE, rare fractures 27 - 35m: Very weak highly weathered karst light grey LIMESTONE frequent calcite veins 35 - 57m: Medium strong light grey LIMESTONE occasional karst layers frequent calcite veins

Borehole ID	GL Elevation (mOD)	Borehole Depth (mbgl)	Depth to Bedrock (mbgl)	Description
MW6	86.38	67	4.80	0.0 - 0.2m: Firm brown TOPSOIL 0.2 - 4.8m: Medium dense fine brown very silty gravelly SAND with frequent cobbles and boulders 4.8 - 5.9: Very weak highly weathered grey LIMESTONE 5.9 - 20m: Strong grey LIMESTONE with occasional light brown fractured layers 20 - 67m: Strong grey LIMESTONE rare fractures

- 6.55 In 2004, O'Neill Ground Water Engineering carried out a hydrological investigation in Cam as part of an Environmental Impact Statement (EIS). In this EIS, it stated that Roadstone Provinces Ltd (now Roadstone Ltd) drilled nine cored boreholes in June 2003 and as part of the hydrological investigation. O'Neill Ground Water Engineering drilled five more boreholes between March and May 2004, although two of them were terminated and backfilled.
- 6.56 APEX Geoservices Ltd. was requested by Roadstone Provinces Ltd. to carry out an assessment of the borehole results and integrate them with the geophysical data. A list of these aforementioned boreholes and their details are presented in **Table 6-2** below.
- 6.57 A summary of the geological findings of the APEX Geoservices Ltd's Geological & Geophysical Report of Cam Quarry based on the borehole data is seen down below:
- **Quaternary Geology** - Nine boreholes were drilled across the site indicating from 3m to 12m of overburden material generally comprising boulder clay, pebbles, rubble and boulders. The western and northern parts of the site contain numerous large limestone blocky boulders both at the surface and partially buried. The sizes of these boulders range from 1-2 m diameter to up to 4–5 m diameter in places. Similar size boulders also occur in part of the southeast of the site.¹
 - **Bedrock Geology** - Borehole descriptions describe the bedrock as generally good clean grey crystalline limestone. Dolomitization was noted from 54m bgl on BH 5 to the southeast of the site and BH 7 in the west-southwest of the site recovered crumbly clays and 2m thick limestones to 60m bgl, with very poor core recovery. In the east-northeast of the site BH10 recovered overburden and broken rock to 26m bgl and stylolites were noted as not being horizontal within the core suggesting possible folding of the bedrock in this area.
- 6.58 The 2D Resistivity Profile 2DRES5 from the geophysical survey indicated a vertical major low resistivity zone in the bedrock to the northeast of the site to greater than 50m below ground level, interpreted as a possible karst feature or structural feature related to folding or faulting. BH10 in this area recovered overburden and broken rock to 26m bgl. A possible sinkhole was identified north-east of this zone. A possible fault NE-SW fault zone has also been inferred from the groundwater measurements.
- 6.59 Detailed borehole logs for boreholes BH1-BH11 are available in **Appendix 6-A**. The drillcore was logged by staff from University College Galway Geology Department and was also examined by Apex Geoservices.

Table 6-2: Previously drilled boreholes on site

BH Ref.	Easting, Northing	Year Drilled	Ground Level Elevation (m AOD)	Depth of well (m bgl)
BH1	E190455 N244044	June 2003	84.20	46
BH3	E190099 N244700	June 2003	101.58	61.40
BH5	E190606 N244222	June 2003	95.99	84.50
BH6	E190211 N244403	June 2003	99.48	60
BH8	E189939 N244576	June 2003	91.00	61.40
BH9	E189933 N244912	June 2003	96.48	62
BH10	E190273 N244912	June 2003	96.71	61.80
BH11	E189894 N245238	June 2003	87.35	56
MW1	E190056 N244348	22/03/2004	88.40	39
MW2	E190427 N245328	19/03/2004	90.28	39
PW2A	E190281 N2448897	26/04/04-10/05/05	96.84	80

Geological Heritage Baseline

- 6.60 The Geological Survey Ireland (GSI) Irish Geological Heritage (IGH) Programme of audited sites was reviewed to establish if any geological heritage issues were present in relation to the Cam Quarry site.
- 6.61 The Killeglan Karst Landscape (Site Code RO015) is an area consisting of three regions located c. 1.4km, 2.9km and 4.4km southwest of the quarry is designated as a County Geological Site (CGS) but is recommended for Geological NHA status. This site comprises an extensive area of bouldery terrain in southern Roscommon, covering an area of 5 by 2 kilometres, and includes a number of low amplitude, hummocky ridges. It is the only area of lowland, boulder-strewn, limestone glacial karst in the country, refer to the County Geological Site Report for Killeglan Karst Landscape provided in **Appendix 6-C**.
- 6.62 The area of Killeglan Karst Landscape, classified as County Geological Site is presented in **Figure 6-5**.
- 6.63 The Castlesampson Esker (Site Code RO010) is another CGS located south of the existing quarry. The top of the esker is found c. 1.5 km south to southeast of the site and continues on in a south easterly direction for a distance of just over 6 km. The esker is Quaternary in age and is Ireland's best example of a complex, multi-crested esker which is comprised of numerous beads. The esker comprises ten individual segments which interfingers with many flanking fans and deltas, with a pronounced kame-kettle topography in places. Many of the kettle holes host lakes. Refer to the County Geological Site Report for Castlesampson Esker provided in **Appendix 6-D**.
- 6.64 The Geological Survey of Ireland (GSI) has been consulted in relation to the proposed development at Cam Quarry, see copy of consultation response dated the 7th April 2025 in **Appendix 6-E**. In the consultation response the GSI has requested that the quarry operator assist with their geological heritage goals by:
- Allowing access to quarry faces by appropriate scientists (upon request and with due regards to Health and Safety requirements) during quarrying to check for scientifically significant new stratigraphies / relationships as they might become exposed and to

establish if the quarry site is worthy of recognition post extraction and through aftercare/restoration planning.

- If deemed appropriate based on the above, leaving a representative section of the quarry face at the end of the quarry life or inclusion of information panels to promote the geology to the public or develop tourism or educational resources if appropriate depending on the future use of the site. Natural exposures are few, or deeply weathered, this measure would permit on-going improvement of geological knowledge of the subsurface.

- 6.65 Roadstone Ltd. has reviewed this GSI request and will assist the GSI in relation to implementing these geological heritage goals.
- 6.66 The GSI in their consultation response recommended utilising and referencing their publicly available datasets for the environmental assessment and planning process, see **Appendix 6-E**.
- 6.67 This chapter addresses the relevant datasets recommended by the GSI pertaining to land, soils and geology.

Sensitive Receptors

- 6.68 In terms of land, soils and geology baseline considered here, the sensitive receptors identified from this baseline are:
- Land use;
 - Soils;
 - Bedrock geology; and
 - Geological Heritage site.
- 6.69 The proposed development comprises the continued use of the existing extraction area. There is a requirement for some additional land or soil / subsoil stripping within the existing permitted site area to facilitate rock extraction and the concrete block making area, see EIAR **Figure 2-1**. As a result there will be potential impact on land or soils arising from the proposed development and these are outlined below for further consideration as potential sensitive receptors.

Impact Assessment

Evaluation Methodology

- 6.70 The evaluation of impacts of the proposed development is based on a methodology similar to that outlined in the:
- 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' published by the IGI (2013).

Evaluation of Impacts

- 6.71 This assessment focuses on the potential impact of the proposed development on the land, soils, and geology at the site.
- 6.72 While this EIAR is for the continued use of the current quarry, there is a construction stage associated with the proposed development due to the development of a concrete batching

plant and associated concrete block making facility and block storage yard. The operational stage will involve the removal of rock from within the quarry void and will include the removal of soil and rock from within part of the quarry extraction footprint. The post-operational stage will include the restoration of the lands following permanent cessation of quarrying operations.

- 6.73 The importance of existing land, soil, and geology attributes identified at the application site is assessed in **Table 6-3** below.

Table 6-3: Importance of Attributes in Vicinity of Application-site

Attribute	Status / Occurrence	Significance/Sensitivity/Importance
Land	The land at the proposed deepening area comprises part of the existing quarry that is already used for rock extraction and the land that the proposed concrete batching plant and concrete block making facility was use.	Low importance at the local and regional scale only. Cam Quarry land has a long- established quarrying land use, and the quarry is of strategic importance for the supply of aggregates / construction materials to the Roscommon area. Its importance is High from a socio-economic perspective.
Soils	There are currently Luvisols and Brown Earths in the proposed development area, both of which are considered to be well drained. The Rathowen and Baggotstown soil associations are not considered unique to this site.	Moderate importance at a local and regional scale as the soils are considered well drained, fertile and productive for agriculture but are limited in depth.
Subsoils	There are no subsoils present within the quarry area.	Not applicable The subsoils surrounding the site (Tills derived from Limestone of moderate permeability) are considered to be of moderate importance at a local scale as they facilitate the development of well-draining soils
Geology	Bedrock is exposed in the existing extraction area and is / will continue to be removed as part of the quarrying process. The limestone bedrock at the site has an economic value as a potential aggregate resource. The bedrock does not have any particular status.	Low In terms of the proposed development, the bedrock geology is considered to be of High importance for economic development at a local, regional and national scale.
Geological Heritage	There are two County Geological Heritage Sites within a 2km radius of the existing quarry.	Negligible as the two sites are located away from quarry site so no removal of the Geological heritage sites will take place. Both features have a High importance at local county level, as well as at regional and national scale.

- 6.74 The magnitude of these impacts on the land, soils and geology attributes is assessed in **Table 6-4** below.

Table 6-4: Significance of Impacts on Land, Soil and Geology with no Mitigation

Attribute	Impact of Proposal on Land, Soil and Geology	Magnitude of potential impact
Land	Development of land for purposes of concrete batching facility and concrete	Positive economic impact due to character of development.

Attribute	Impact of Proposal on Land, Soil and Geology	Magnitude of potential impact
	block making facility economic benefits to the local community. Following permanent cessation of extraction lands to be restored for beneficial use including agriculture and biodiversity (lake / wetland habitat in the quarry void)	Positive impact in post-operational stage as land restored to beneficial use – agriculture and biodiversity including a lake / wetland habitat in the quarry void.
Soils	Stripping of soil, with storage and use in final restoration works.	Significant as the structure and quality of the soils could be degraded without mitigation. Short to medium term during lifetime of project with temporary loss of the use of soils across the site during the phased extraction and restoration. Impact considered to be negligible as the soils will be restored to agriculture use, as part of the restoration scheme.
Subsoils	Subsoils are not present at the application area.	No impact.
Geology	Permanent loss of bedrock extracted from within the proposed quarry area.	Moderate negative impact due to permanent loss of bedrock resource which has to be balanced against the High positive impacts arising from the strategically important supply of aggregates and construction materials for economic development in the Roscommon County.
Geological Heritage	No impact as quarrying and construction activities will have no effect on the geomorphological features at the closest IGH designated site.	No impact.

Indirect Impacts

- 6.75 It is considered that there will be no indirect impacts on land, soils, or geology as a result of the proposed development at the site.

Unplanned Events

- 6.76 Unplanned events within the application-site, such as accidents, have the potential to impact on the land, soils and geology adjoining the site.
- 6.77 Ground instability, particularly the long-term stability of quarry faces, has the potential to impact on adjoining lands. The quarry is designed for long term stability and operations at the site will adhere to the Health and Safety Authority Safe Quarry Guidelines in relation to the Safety Health and Welfare at Work (Quarries) Regulations 2008, as amended, and this will limit the potential for unplanned events such as instability of quarry faces or instability in adjacent lands.
- 6.78 With the continued implementation of the Quarry Regulations 2008, it is considered unlikely that instability of any quarry faces would result in an impact on the land, soils, and geology at the site.

Human Health

- 6.79 From a land, soils and geology perspective, any potential impacts on human health from the extraction and processing of the extracted rock at the site would not be via the land-use, soils and geology pathways but via other pathways such as air and water, which are addressed in the relevant Chapters of this EIAR.

Cumulative Impacts

- 6.80 A 17-turbine wind farm (Seven Hills Wind Farm) surrounding the quarry to the south, east and west, with the closest infrastructure c. 100m from the site boundary, has been granted planning permission by An Bord Pleanála in November 2023 (ABP Ref. 313750-22). The EIAR accompanying that planning application considered the quarry as it was in operation and concluded that the wind farm would not give rise to any significant adverse cumulative impacts in-combination with other plans or projects in the wider area, “including the nearby Cam quarry along the R363”, per the Inspector’s Report. With respect to land, soils and geology, the EIAR for the Seven Hills Wind Farm concluded that:

“The geological impact assessment undertaken above in this chapter outlines that significant effects are unlikely due to the localized nature of the construction works. Impacts on land soil and geology will not extend beyond the immediate vicinity of the Proposed Development (Wind Farm site, Grid Connection and TDR) footprint. Therefore, no cumulative impacts between the Proposed Development, the proposed construction access road and other existing, permitted or proposed projects, listed in Section 2.6 of this EIAR, on land soils and geology are predicted.”

- 6.81 As this planning application pertains to development consisting of the continued use of the existing quarry with an established land use, it is considered that there will be no significant adverse cumulative impacts on land, soil and geology of the receiving environment as a result of the proposed development.

‘Do-nothing’ Scenario

- 6.82 If the proposed development is not permitted, the proposed construction would not proceed and the existing quarry area would remain in its current state.

Mitigation Measures

- 6.83 Mitigation measures are outlined here for the construction stage, operational stage and post-operational stages for the proposed development:

Construction Stage

Soils

- 6.84 Soils will be managed on site in line with best practice. A specific Soil Management Plan will be developed for the proposed concrete batching plant, concrete block making facility and workshop for the stripping, storage and reuse of the soils in restoration at the site.
- 6.85 During the site preparation stage, the topsoil will be stripped off and will be stockpiled on site ready for use in the site restoration. The soils will be stripped and stored in accordance with best practice guidance as set out in The Institute of Quarrying guidelines².

² The Institute of Quarrying Good Practice Guide for Handling Soils in Mineral Workings, 2021.

- 6.86 The soil handling method can affect the quality of the restoration through severe soil deformation (compression and smearing); this is primarily caused through trafficking, the effects of which increase with soil moisture content.
- 6.87 The scheme will involve soil stripping across the proposed construction area. The soil stripping and storage operations will be undertaken in such a manner so as to minimise soil compaction.
- 6.88 In order to limit the effects of erosion and deterioration on the soil, material will not be removed during either periods of prolonged dry weather or excessively wet weather; this is to avoid the higher potential for dust generation during extended periods of dry weather, and conversely the greater potential for soil erosion during extended periods of wet weather.
- 6.89 Initial soils stripped will be used to create landscaped screening berms around the perimeter of the site in such a manner that they can be reused in restoration works for the pit. Thereafter soils will be appropriately stored on the pit floor, again for reuse in the restoration works when required.
- 6.90 Good practice measures will be implemented at the site in order to preserve the structure and integrity of the soils and limit the effects of erosion on the stored soil during excavation and storage.
- 6.91 Soil stripping is to be undertaken by the excavator standing on the surface of the topsoil and digging the topsoil to its maximum depth and loading it into dump trucks. The dump trucks draw alongside the exposed soil profile, standing and travelling only on the basal layer (see **Diagram 6-1** and **Diagram 6-2** below).

Diagram 6-1: Soil stripping using modified layer by layer practice (The Institute of Quarrying, 2021)

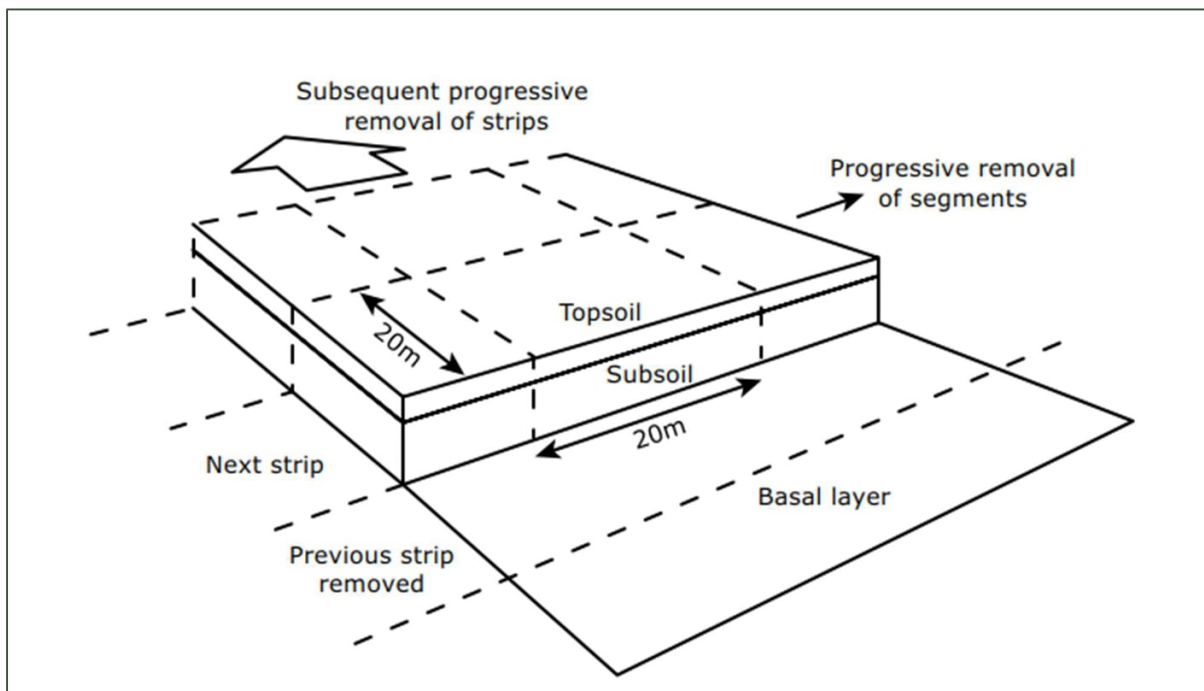
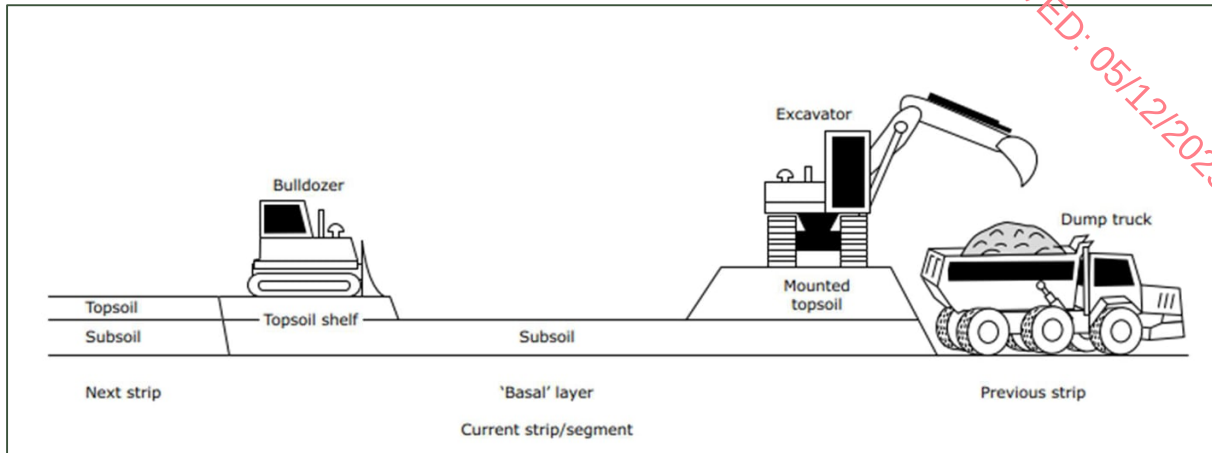


Diagram 6-2 Topsoil stripping using modified layer by layer practice (The Institute of Quarrying, 2021)



- 6.92 Topsoil storage will not exceed 3m in height in order to protect the structure of the soils for use in restoration and any subsoils, if present, will be stored at a maximum height of 5m.
- 6.93 Stripped soil will be re-vegetated where they are in place for a sufficient length of time to justify such a measure. The re-handling of soil material will be minimised as much as possible in order to preserve the integrity of the topsoil material. This is also an economically prudent practice.

Geology

- 6.94 Some limited bedrock excavation will be required for building foundations for the development at Cam Quarry. Standard best practice construction mitigation measures will be implemented at the site to manage any accidental fuel or oil leaks during construction. A comprehensive Environmental Management System (EMS) will be prepared prior to construction, see chapter 2 of this EIAR.
- 6.95 Quarry operations will adhere to the Health and Safety Authority Safe Quarry Guidelines in relation to the Safety Health and Welfare at Work (Quarries) Regulations 2008 and this will limit the potential for unplanned events such as instability of quarry faces or instability in adjacent lands.

Geological Heritage

- 6.96 There are no mitigation measures required for the geological heritage site during construction.

Operation Stage

- 6.97 During the operation stage the bedrock material will be excavated within the existing extraction area and processed into aggregates and crushed rock materials. The concrete batching plant, concrete block making facility and truck washdown facility will be constructed. The batching plant is permitted to produce 50,000m³/annum and 5 million concrete blocks.

Land

- 6.98 The existing extraction land use will continue, and no mitigation measures are required.

Soils

- 6.99 There are no soils within the extraction area and no mitigation measures are required.

Subsoils

- 6.100 There are no subsoils within the extraction area and no mitigation measures are required.

Geology

- 6.101 The existing extraction and processing operations currently carried out at the site will be maintained and continued over the operational phase.
- 6.102 Quarry operations will adhere to the Health and Safety Authority Safe Quarry Guidelines in relation to the Safety Health and Welfare at Work (Quarries) Regulations 2008 and this will limit the potential for unplanned events such as instability of quarry faces or instability in adjacent lands.

Geological Heritage

- 6.103 To facilitate geological knowledge Roadstone will allow access to quarry faces by appropriate scientists for the purpose of inspection upon receiving a written request in advance. In addition, a representative section of the quarry face will be retained at the end of the quarry life for educational and scientific purposes.

Post-Operation Stage

- 6.104 During the post-operation stage the quarry will be restored to original ground level for beneficial use – agriculture / natural habitat or other use (subject to planning permission).

Land

- 6.105 Land to be restored to beneficial use, and no mitigation measures are required. The extraction void will be left to naturally fill with water to create a valuable wetland habitat.

Soils

- 6.106 Land to be restored to beneficial use, and no mitigation measures are required.

Subsoils

- 6.107 Land to be restored to beneficial use, and no mitigation measures are required.

Geology

- 6.108 The restoration of the quarry will include a representative section of the quarry face which will be retained at the end of the quarry life for educational and scientific purposes.

Geological Heritage

- 6.109 The restoration of the quarry will include a representative section of the quarry face which will be retained at the end of the quarry life for educational and scientific purposes.

Residual Impact Assessment

- 6.110 The residual impacts on land, soil and geology are those impacts which remain following the implementation of the mitigation measures outlined above.
- 6.111 With the proposed mitigation measures in place at the site it is considered that there will be no significant residual impacts associated with the proposed development.

- 6.112 The stripped soils at the proposed development will be used in the restoration of the site. With this mitigation measure in place, it is considered that the residual impact on soils will be low to imperceptible.
- 6.113 As the majority of the site is used for extraction and processing purposes it is not feasible to restore any significant parts of the rock quarry void at an earlier stage. The extraction void will be left to naturally fill with water to create a valuable wetland habitat.

Monitoring

- 6.114 There are no specific monitoring requirements in relation to Land, Soils and Geology.

References

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Figures

Figure 6-1: Corine Land Cover

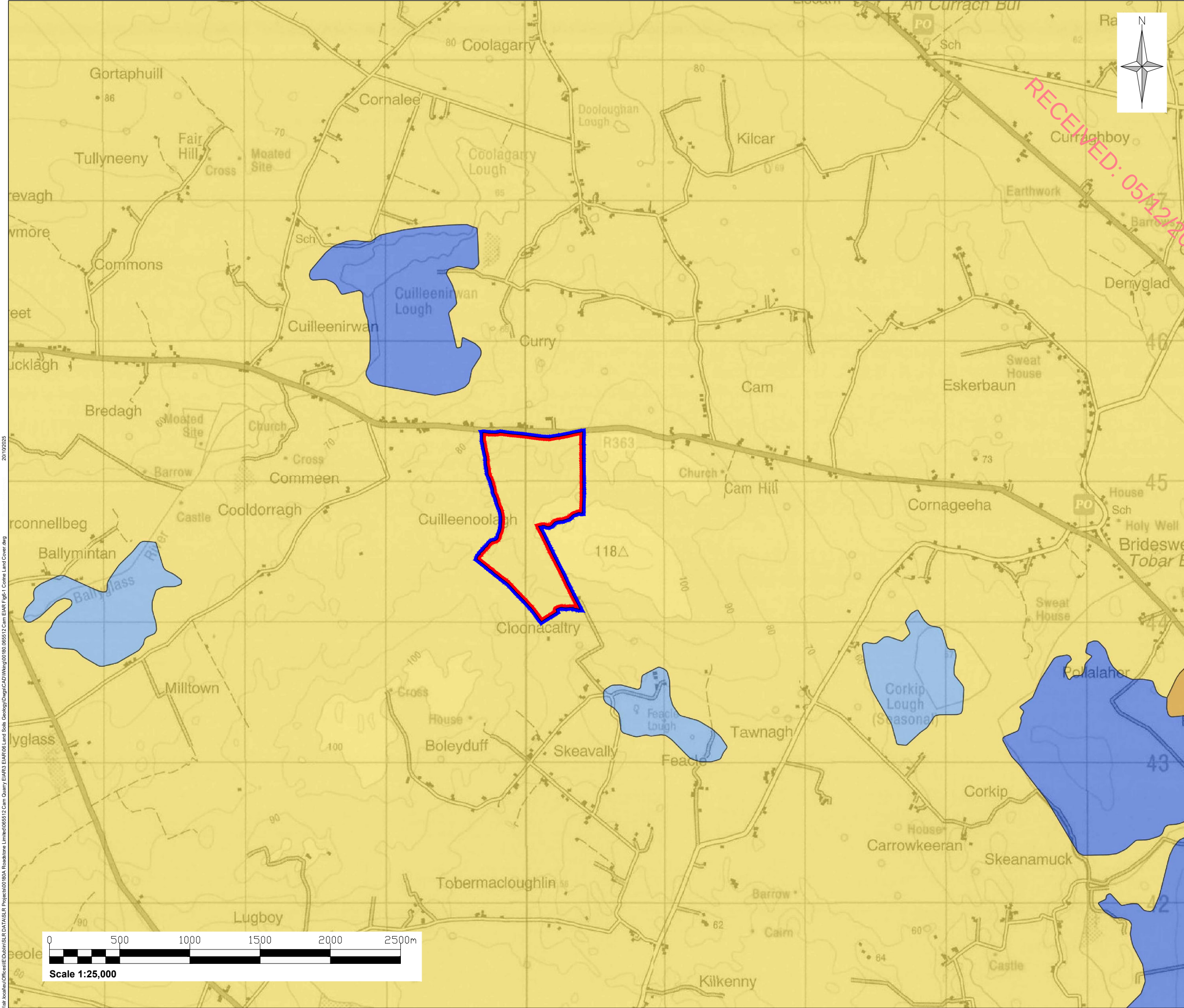
Figure 6-2: National Soils Map

Figure 6-3: National Subsoils Map

Figure 6-4: Bedrock Geology Map

Figure 6-5: County Geology Site

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Notes:
1. Based on 6 inch scale Tailte Eireann Discovery raster mapping RN047, RN048, RN050, RN051

Legend:

Landholding (c. 66.3 hectares)

Planning Application Area (c. 66.3 hectares)

Land Use Cover

Coniferous forest

Inland marshes

Land principally occupied by agriculture, with significant vegetation

Pastures

Peat bogs

Rev	Amendments	Date	By	Chk	Auth



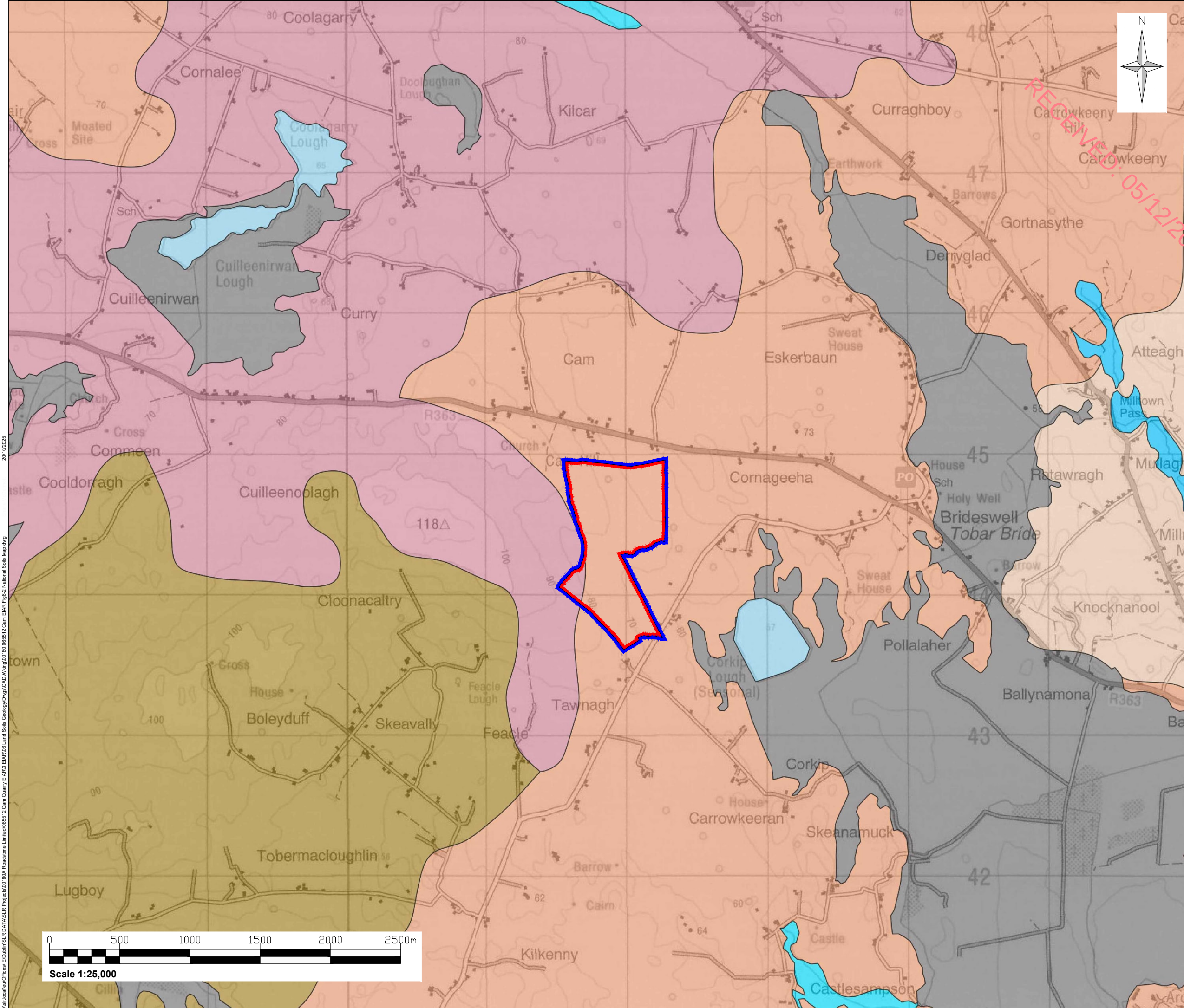
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Client
Roadstone Limited

Project
Continued Use of Existing Cam Quarry at Curry & Cloonacaltry townlands, Co. Roscommon

Figure Title
Corine Land Cover Map

Scale 1:25,000 @ A3		SLR Project No. 501.065512.00001	
Designed mcob	Drawn mcob	Checked pg	Authorised pg
Date 03/25	Date 03/25	Date 10/25	Date 10/25
Figure Number Figure 6-1			Rev. 0



Notes:

1. Based on 6 inch scale Tailte Eireann Discovery raster mapiing RN047, RN048, RN050, RN051

Legend:

Landholding (c. 66.3 hectares)

Planning Application Area (c. 66.3 hectares)

Soils

1xx - Peat

1000a - Elton

1030b - Rathowen

5RIV - River Alluvium

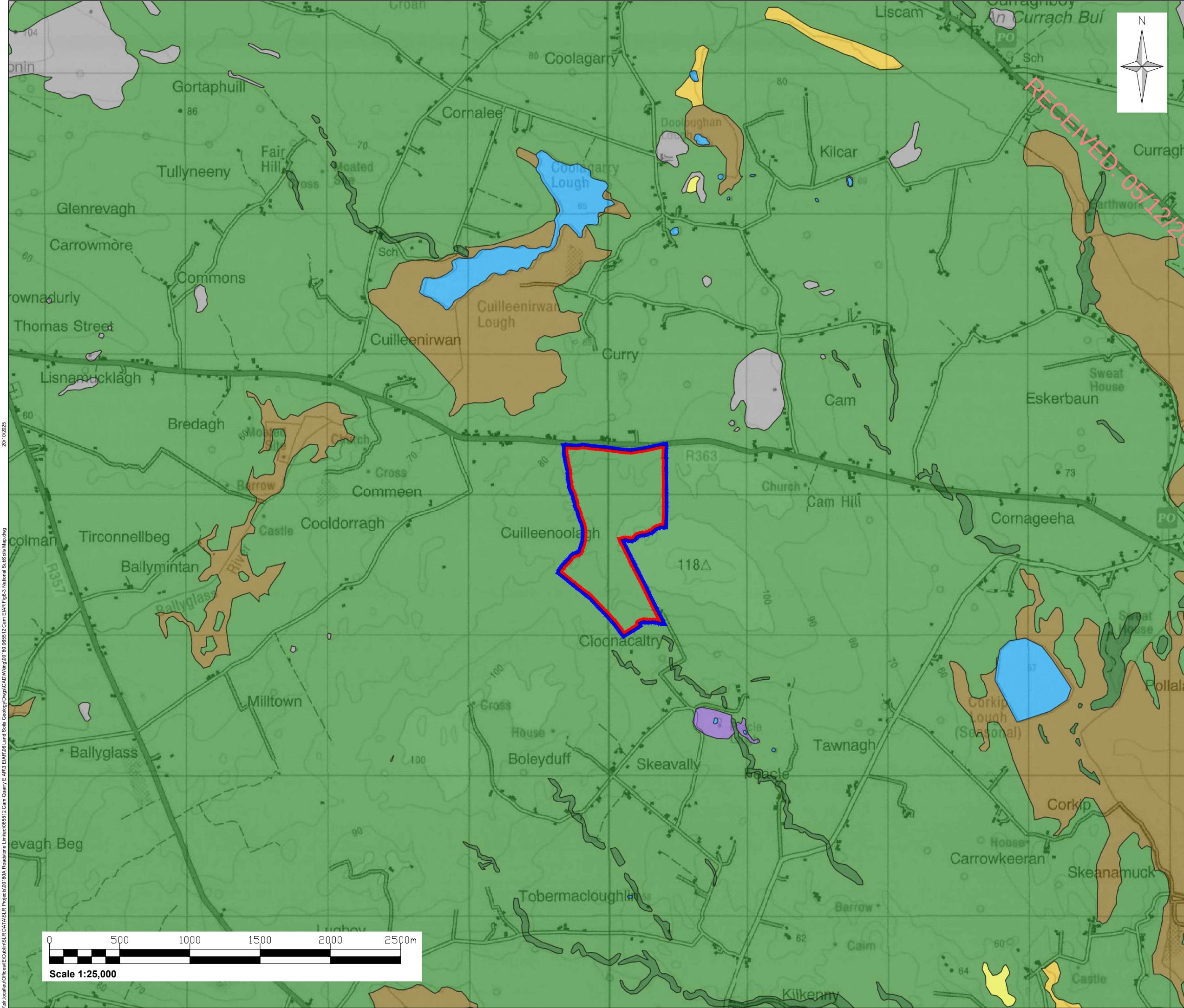
1100q - Mullabane

1150a - Baggotstown

Water body

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Project Continued Use of Existing Cam Quarry at Curry & Cloonacaltry townlands, Co. Roscommon					
Figure Title National Soils Map					
Scale 1:25,000 @ A3		SLR Project No. 501.065512.00001			
Designed mcob	Drawn mcob	Checked pg	Authorised pg		
Date 03/25	Date 03/25	Date 10/25	Date 10/25		
Figure Number Figure 6-2					Rev. 0

\\slr-local\au\Offices\IE\Dublin\SLR DATA\SLR Projects\00180A Roadstone Limited\065512 Cam Quarry EIA\R3 EIA\R3 EIA\Fig-2 National Soils Map.dwg
20/10/2025



Notes:

1. Based on 6 inch scale Tailte Eireann Discovery raster mapping RN047, RN048, RN050, RN051

Legend:

Landholding (c. 66.3 hectares)

Planning Application Area (c. 66.3 hectares)

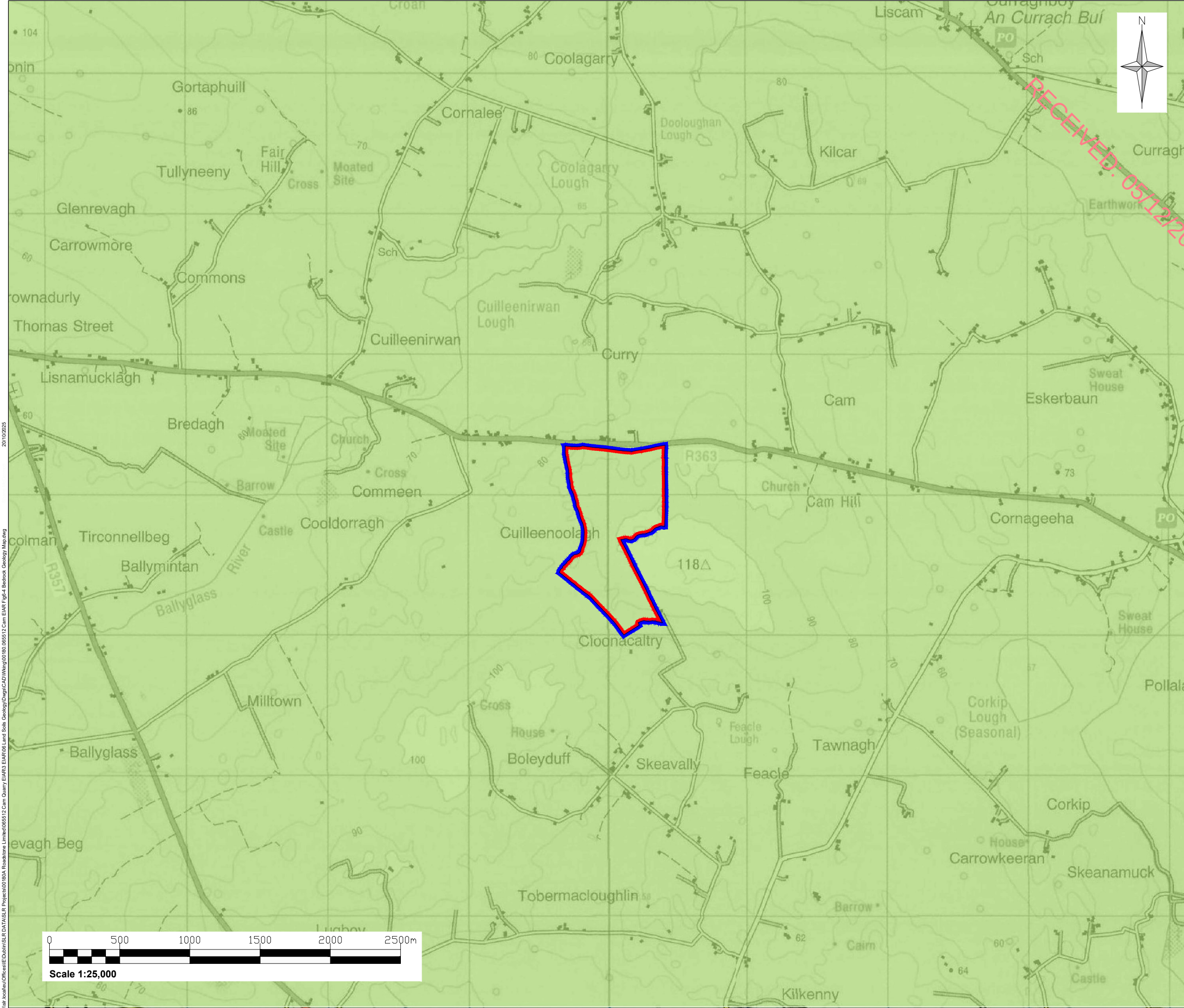
Subsoils

- Bedrock at surface.
- Till
- Subsoil rich in carbonate minerals, clays, and silt.
- Alluvium
- Peat
- Sands & Gravels
- Sediments deposited into lakes that have come from glaciers
- Water

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Project Continued Use of Existing Cam Quarry at Curry & Cloonacaltry townlands, Co. Roscommon					
Figure Title National Subsoils Map					
Scale 1:25,000 @ A3		SLR Project No. 501.065512.00001			
Designed mcob	Drawn mcob	Checked pg	Authorised pg		
Date 03/25	Date 03/25	Date 10/25	Date 10/25		
Figure Number Figure 6-3					Rev. 0

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20/10/2025



Notes:

1. Based on 6 inch scale Tailte Eireann Discovery raster maping RN047, RN048, RN050, RN051

Legend:

Landholding (c. 66.3 hectares)

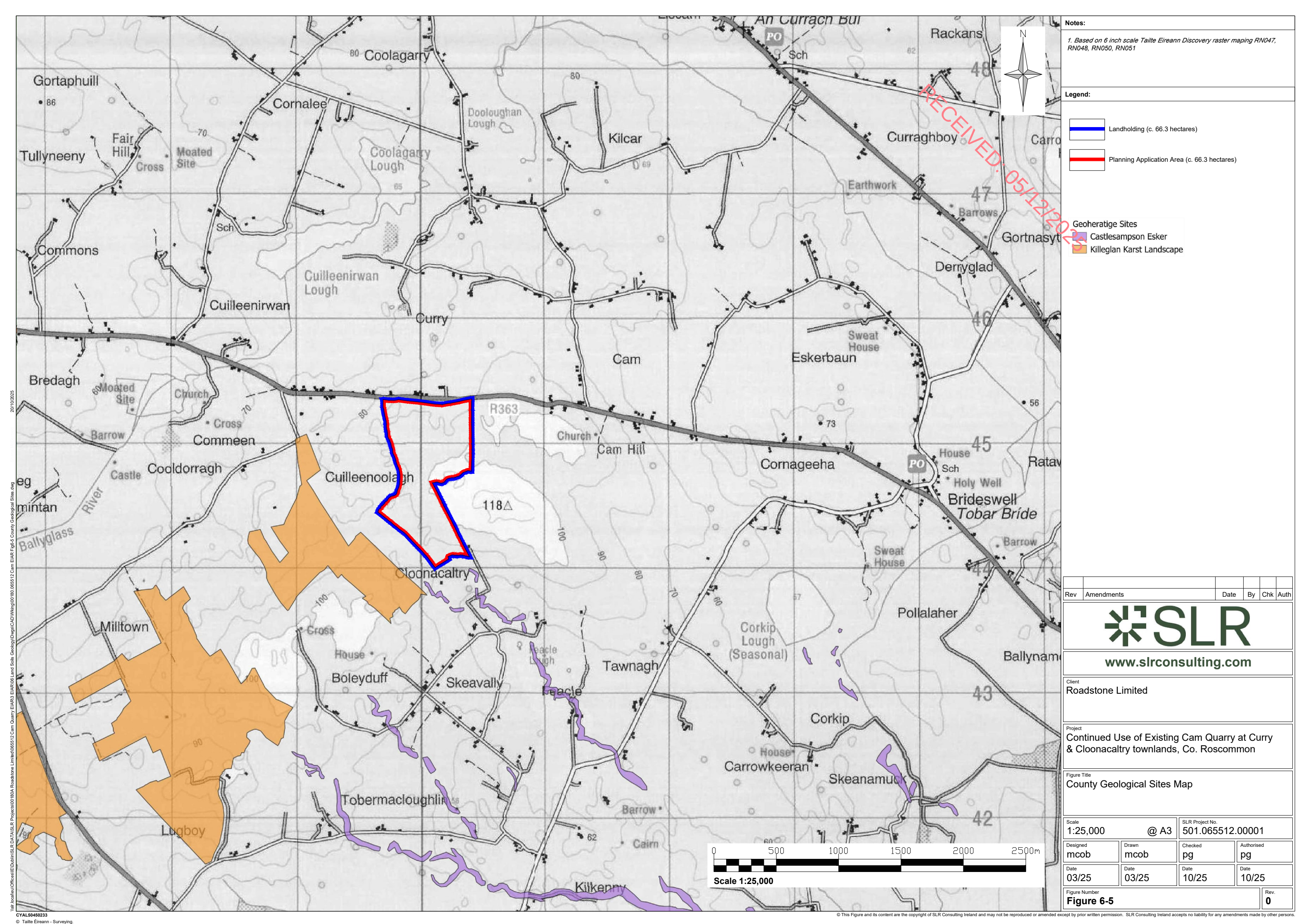
Planning Application Area (c. 66.3 hectares)

Visean Limestone & Calcareous Shale

Rev	Amendments	Date	By	Chk	Auth
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Client Roadstone Limited					
Project Continued Use of Existing Cam Quarry at Curry & Cloonacaltry townlands, Co. Roscommon					
Figure Title Bedrock Geology Map					
Scale 1:25,000 @ A3		SLR Project No. 501.065512.00001			
Designed mcob	Drawn mcob	Checked pg	Authorised pg		
Date 03/25	Date 03/25	Date 10/25	Date 10/25		
Figure Number Figure 6-4					Rev. 0

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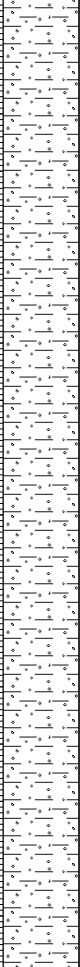
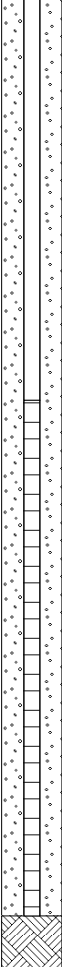
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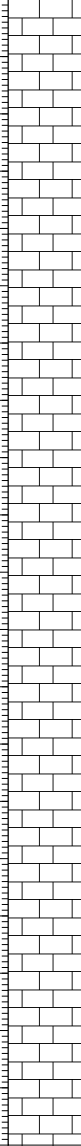
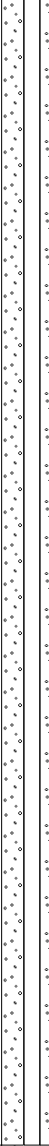
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Appendix 6-A Borehole Logs (2023)

BOREHOLE LOG										BOREHOLE No MW 3	
Client: Roadstone										RECEIVED: 05/12/2023 SLR	
Project No: 501.065091.00001		Date: 06/06/2023		Ground Level: 84.26m		Co-ordinates: E589943 N744233					
Project: Cam Quarry GW Monitoring 2023											
										Sheet 1 of 2	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
1						(4.20)	[Drillers Description] Medium dense brown very silty gravelly SAND with frequent limestone cobbles and boulders				
2											
3											
4					80.06	4.20	[Drillers Description] Weak to Medium strong weathered grey LIMESTONE with occasional highly fractured joints				
5											
6						(3.30)					
7					76.76	7.50	[Drillers Description] Strong grey LIMESTONE occasional fractures				
8											
9											
10											
11											
12											
13						(11.00)					
14											
15											
16											
17											
18					65.76	18.50	[Drillers Description] Soft to firm orangish brown gravelly CLAY with occasional limestone karst limestone 18.50 - 37.00 Karst limestone with some voids and clay infill				
19											
Borehole Continued on Next Page											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks General; Borehole collapse at 21.5m due to highly unstable clay formation, managed to push 50mm standpipe to 36m	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
06/06/2023	0.00	0.00	Start of shift								
06/06/2023	37.00	5.00	End of shift								
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79		Method: Rotary open hole Hole Size: 120mm			Logged By: SPD		Approved By: DB		
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

BOREHOLE LOG										BOREHOLE No MW 3	
Client: Roadstone											
Project No: 501.065091.00001		Date: 06/06/2023		Ground Level: 84.26m		Co-ordinates: E589943 N744233					
Project: Cam Quarry GW Monitoring 2023										Sheet 2 of 2	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
21						(18.50)	[Drillers Description] Soft to firm orangish brown gravelly CLAY with occasional limestone karst limestone				
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37				47.26				37.00		Borehole Complete at 37.00m	
38											
39											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks General; Borehole collapse at 21.5m due to highly unstable clay formation, managed to push 50mm standpipe to 36m	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79			Method: Rotary open hole Hole Size: 120mm			Logged By: SPD		Approved By: DB	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

BOREHOLE LOG										BOREHOLE No MW 4	
Client: Roadstone										RECEIVED: 05/12/2023 SLR	
Project No: 501.065091.00001		Date: 08/06/2023		Ground Level: 90.05m		Co-ordinates: E590374 N745365					
Project: Cam Quarry GW Monitoring 2023										Sheet 1 of 3	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
1					89.85		0.20	[Drillers Description] Firm brown TOPSOIL			
2							(5.90)	[Drillers Description] Medium dense fine brown silty gravelly SAND with frequent cobbles and boulders			
3											
4											
5											
6					83.95		6.10	[Drillers Description] Medium strong weathered grey LIMESTONE			
7							(1.90)				
8					82.05		8.00	[Drillers Description] Strong grey LIMESTONE rare fractures			
9								10.50 - 10.80 Fractured rock zone, with some clay infill			
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
Borehole Continued on Next Page											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
08/06/2023	0.00	0.00	Start of shift								
08/06/2023	60.00	6.60	End of shift								
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79		Method: Rotary open hole Hole Size: 120mm			Logged By: SPD		Approved By: DB		
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

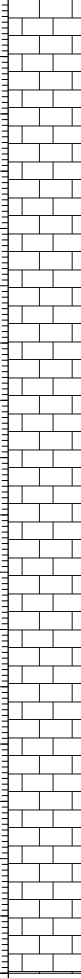
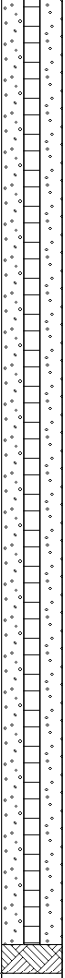
BOREHOLE LOG										BOREHOLE No MW 4	
Client: Roadstone											
Project No: 501.065091.00001		Date: 08/06/2023		Ground Level: 90.05m		Co-ordinates: E590374 N745365					
Project: Cam Quarry GW Monitoring 2023										Sheet 2 of 3	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
21							[Drillers Description] Strong grey LIMESTONE rare fractures				
22							22.00 - 22.30 Minor fracture, change in flush to brown				
23											
24											
25											
26											
27											
28											
29											
30						(39.00)					
31							31.00 - 31.40 Fractured rock zone, with some clay infill				
32											
33											
34											
35											
36											
37											
38											
39											
Borehole Continued on Next Page											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
All dimensions in metres Scale 1:132					Contractor: Stephan Petersen Plant: Knebel HY79			Method: Rotary open hole Hole Size: 120mm		Logged By: SPD	Approved By: DB
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

BOREHOLE LOG										BOREHOLE No MW 4	
Client: Roadstone											
Project No: 501.065091.00001		Date: 08/06/2023		Ground Level: 90.05m		Co-ordinates: E590374 N745365					
Project: Cam Quarry GW Monitoring 2023										Sheet 3 of 3	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
41						43.05	47.00	[Drillers Description] Strong grey LIMESTONE rare fractures			
42								[Drillers Description] Medium strong occasional Weak brownish grey karst LIMESTONE frequent fractures			
43						(13.00)	60.00	51.50 - 53.00 Highly fractured rock			
44								58.00 - 58.50 Highly fractured rock with clay infill			
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
Borehole Complete at 60.00m											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79			Method: Rotary open hole Hole Size: 120mm			Logged By: SPD	Approved By: DB		
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

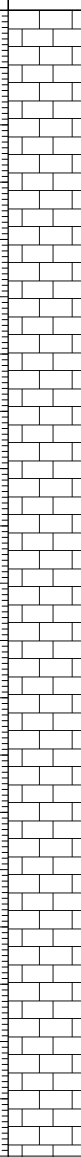
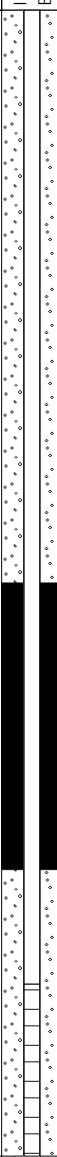
BOREHOLE LOG										BOREHOLE No MW 5	
Client: Roadstone										RECEIVED: 05/12/2025 SLR	
Project No: 501.065091.00001		Date: 02/06/2023		Ground Level: 87.89m		Co-ordinates: E590238 N745008					
Project: Cam Quarry GW Monitoring 2023											
										Sheet 1 of 3	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19				87.59		0.30	[Drillers Description] Rock Fill MADE GROUND				
						(1.10)	[Drillers Description] Medium dense fine brown silty slightly gravelly SAND				
				86.49	1.40	[Drillers Description] Weak occasional highly weathered karst light grey LIMESTONE some clayey karst joints					
					(13.60)	5.50 - 7.50 Fractured rock zone, with some clay infill					
						9.00 - 12.00 Highly fractured rock with clay infill					
				72.89		15.00	[Drillers Description] Strong grey LIMESTONE rare fractures				
Borehole Continued on Next Page											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
02/06/2023	0.00	0.00	Start of shift								
02/06/2023	57.00	2.00	End of shift								
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79		Method: Rotary open hole Hole Size: 120mm			Logged By: SPD		Approved By: DB		
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

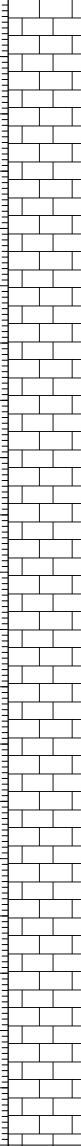
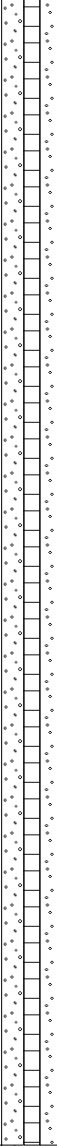
BOREHOLE LOG										BOREHOLE No MW 5	
Client: Roadstone											
Project No: 501.065091.00001		Date: 02/06/2023		Ground Level: 87.89m		Co-ordinates: E590238 N745008		Sheet 2 of 3			
Project: Cam Quarry GW Monitoring 2023											
SAMPLES & TESTS				Water	STRATA				Instrument Backfill		
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
21							(12.00)	[Drillers Description] Strong grey LIMESTONE rare fractures			
22											
23											
24											
25											
26											
27					60.89		27.00	[Drillers Description] Very weak highly weathered karst light grey LIMESTONE frequent calcite veins 27.00 - 31.00 Highly fractured rock with clay infill			
28											
29											
30											
31							(8.00)				
32											
33											
34											
35					52.89		35.00	[Drillers Description] Medium strong light grey LIMESTONE occasional karst layers frequent calcite veins			
36											
37											
38											
39											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79		Method: Rotary open hole Hole Size: 120mm		Logged By: SPD		Approved By: DB			

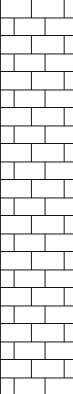
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020

BOREHOLE LOG										BOREHOLE No MW 5	
Client: Roadstone											
Project No: 501.065091.00001		Date: 02/06/2023		Ground Level: 87.89m		Co-ordinates: E590238 N745008					
Project: Cam Quarry GW Monitoring 2023										Sheet 3 of 3	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
41						(22.00)	[Drillers Description] Medium strong light grey LIMESTONE occasional karst layers frequent calcite veins				
42							42.50 - 44.00 Highly fractured rock with clay infill				
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57				30.89		57.00	Borehole Complete at 57.00m				
58											
59											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79			Method: Rotary open hole Hole Size: 120mm			Logged By: SPD		Approved By: DB	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

BOREHOLE LOG										BOREHOLE No MW 6	
Client: Roadstone										RECEIVED: 05/12/2023 SLR	
Project No: 501.065091.00001		Date: 07/06/2023		Ground Level: 86.38m		Co-ordinates: E589959 N745326					
Project: Cam Quarry GW Monitoring 2023											
										Sheet 1 of 4	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19					86.18		0.20	[Drillers Description] Firm brown TOPSOIL			
							(4.60)	[Drillers Description] Medium dense fine brown very silty gravelly SAND with frequent cobbles and boulders			
						81.58		4.80	[Drillers Description] Very weak highly weathered grey LIMESTONE		
						80.48		(1.10) 5.90	[Drillers Description] Strong grey LIMESTONE with occasional light brown fractured layers		
								(14.10)			
					66.38		20.00				
Borehole Continued on Next Page											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
07/06/2023	0.00	0.00	Start of shift								
07/06/2023	67.00	6.40	End of shift								
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79			Method: Rotary open hole Hole Size: 120mm			Logged By: SPD		Approved By: DB	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

BOREHOLE LOG										BOREHOLE No MW 6	
Client: Roadstone											
Project No: 501.065091.00001		Date: 07/06/2023		Ground Level: 86.38m		Co-ordinates: E589959 N745326					
Project: Cam Quarry GW Monitoring 2023										Sheet 2 of 4	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
21							[Drillers Description] Strong grey LIMESTONE rare fractures				
22							21.50 - 21.80 Fractured rock zone, with some clay infill				
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
Borehole Continued on Next Page											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79			Method: Rotary open hole Hole Size: 120mm			Logged By: SPD		Approved By: DB	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

BOREHOLE LOG										BOREHOLE No MW 6	
Client: Roadstone											
Project No: 501.065091.00001		Date: 07/06/2023		Ground Level: 86.38m		Co-ordinates: E589959 N745326					
Project: Cam Quarry GW Monitoring 2023										Sheet 3 of 4	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
41						(47.00)	[Drillers Description] Strong grey LIMESTONE rare fractures				
42							41.50 - 42.00 Minor fracture, change in flush to brown				
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
Borehole Continued on Next Page											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79			Method: Rotary open hole Hole Size: 120mm			Logged By: SPD		Approved By: DB	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

BOREHOLE LOG										BOREHOLE No MW 6	
Client: Roadstone											
Project No: 501.065091.00001		Date: 07/06/2023		Ground Level: 86.38m		Co-ordinates: E589959 N745326					
Project: Cam Quarry GW Monitoring 2023										Sheet 4 of 4	
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Type No	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION			
61						67.00	[Drillers Description] Strong grey LIMESTONE rare fractures				
62											
63											
64											
65											
66											
67				19.38							
68							Borehole Complete at 67.00m				
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
Boring Progress and Water Observations					Chiselling			Water Added		General Remarks	
Date	Depth	Casing Dpt	Casing Dia	Water Dpt	From	To	Hours	From	To		
All dimensions in metres Scale 1:132		Contractor: Stephan Petersen Plant: Knebel HY79			Method: Rotary open hole Hole Size: 120mm			Logged By: SPD		Approved By: DB	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

RECEIVED: 05/12/2025

Appendix 6-B Borehole Logs (2004)

RECEIVED: 05/12/2025

APPENDIX I SEISMIC REFRACTION PROFILES

DEPTH MODEL TABLES for CAMSEIS6.SIP

Table A Depth and Elev of layers directly beneath SPs and Geos

P	Surface		Layer 2	
	X-Loc	Elev	Depth	Elev
B	0.0	96.7	3.4	93.3
C	30.0	96.7	3.8	92.9
D	54.9	96.0	2.9	93.1

eo	Surface		Layer 2	
	X-Loc	Elev	Depth	Elev
1	0.0	96.7	3.4	93.3
2	5.0	96.5	3.1	93.4
3	10.0	96.4	3.0	93.4
4	15.0	96.2	3.1	93.1
5	20.0	96.0	3.5	92.5
6	25.0	96.3	3.9	92.4
7	30.0	96.7	3.8	92.9
8	35.0	97.0	3.9	93.1
9	39.9	97.4	4.1	93.3
0	44.9	96.9	3.7	93.2
1	49.9	96.4	3.5	92.9
2	54.9	96.0	2.9	93.1

Velocities used to formulate the Depth Model

Lead A	Layer 1		Layer 2	
Vertical	667			
Horizontal			3816	

DEPTH MODEL TABLES for CAMSEIS8.SIP

ba A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface		Layer 2		Layer 3	
	X-Loc	Elev	Depth	Elev	Depth	Elev
B	0.0	93.1	2.2	90.9	5.6	87.5
C	30.0	90.9	1.6	89.3	5.4	85.5
D	54.9	89.3	1.3	88.0	3.6	85.7

Geo	Surface		Layer 2		Layer 3	
	X-Loc	Elev	Depth	Elev	Depth	Elev
1	0.0	93.1	2.2	90.9	5.6	87.5
2	5.0	92.7	2.1	90.6	3.7	89.0
3	10.0	92.3	1.9	90.4	4.1	88.2
4	15.0	92.0	1.9	90.1	4.4	87.6
5	19.9	91.6	1.7	89.9	4.7	86.9
6	24.9	91.3	1.7	89.6	5.1	86.2
7	29.9	90.9	1.6	89.3	5.4	85.5
8	34.9	90.6	1.6	89.0	5.5	85.1
9	39.9	90.3	1.5	88.8	5.3	85.0
0	44.9	90.0	1.5	88.5	5.1	84.9
1	49.9	89.6	1.4	88.2	4.8	84.8
2	54.9	89.3	1.3	88.0	3.6	85.7

ocities used to formulate the Depth Model

Lead A	Layer 1		Layer 2		Layer 3	
Vertical	630		1950			
Horizontal			1950		4745	

DEPTH MODEL TABLES for CAMSEB10.SIP

Lead A Depth and Elev of layers directly beneath SPs and Geos

P	Surface		Layer 2		Layer 3	
	X-Loc	Elev	Depth	Elev	Depth	Elev
B	0.0	99.1	0.2	98.9	3.2	95.9
C	54.7	97.3	0.6	96.7	3.3	94.0

Geo	Surface		Layer 2		Layer 3	
	X-Loc	Elev	Depth	Elev	Depth	Elev
1	0.0	99.1	0.2	98.9	3.2	95.9
2	5.0	98.6	0.0	98.6	2.8	95.8
3	9.9	98.1	0.0	98.1	3.0	95.1
4	14.9	97.7	0.0	97.7	3.3	94.4
5	19.9	97.2	0.0	97.2	3.5	93.7
6	24.9	96.7	0.0	96.7	3.5	93.2
7	29.9	96.2	0.0	96.2	3.4	92.8
8	34.8	95.8	0.0	95.8	3.2	92.6
9	39.8	95.4	0.0	95.4	2.7	92.7
0	44.8	95.9	0.0	95.9	2.9	93.0
1	49.8	96.5	0.0	96.5	2.9	93.6
2	54.7	97.3	0.6	96.7	3.3	94.0

Locations used to formulate the Depth Model

Lead A	Layer 1		Layer 2		Layer 3	
	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
	305		866		5874	

DEPTH MODEL TABLES for CAMSEI12.SIP

ad A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface		Layer 2		Layer 3	
	X-Loc	Elev	Depth	Elev	Depth	Elev
B	0.0	92.3	3.5	88.8	3.6	88.7
C	25.0	94.7	2.1	92.6	3.0	91.7
D	54.6	98.4	2.2	96.2	8.8	89.6

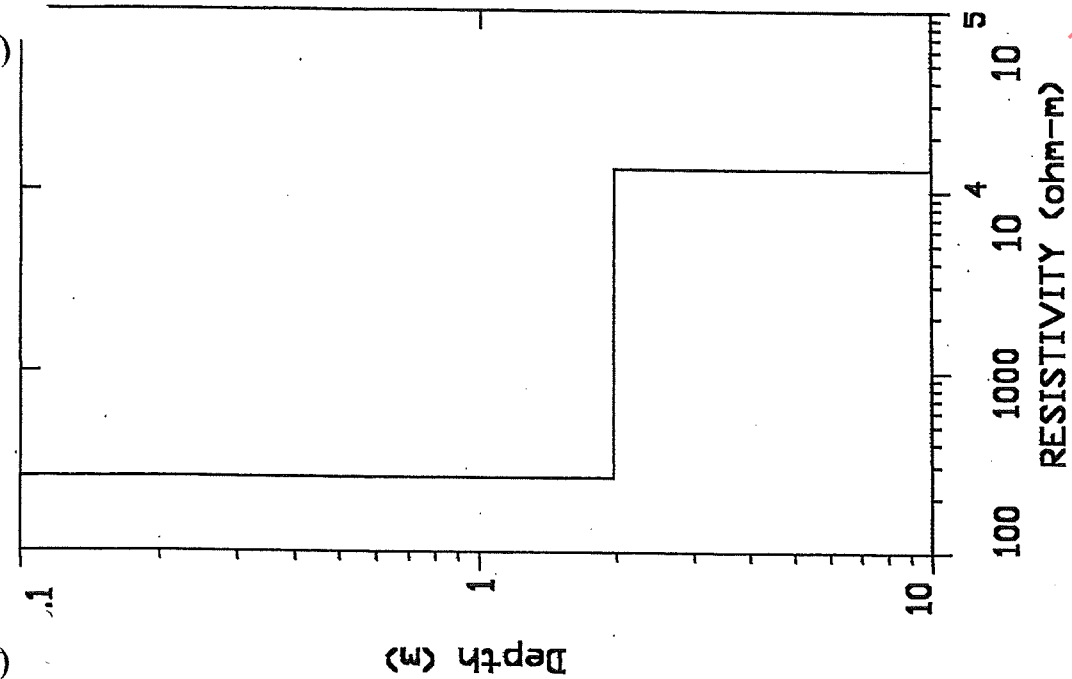
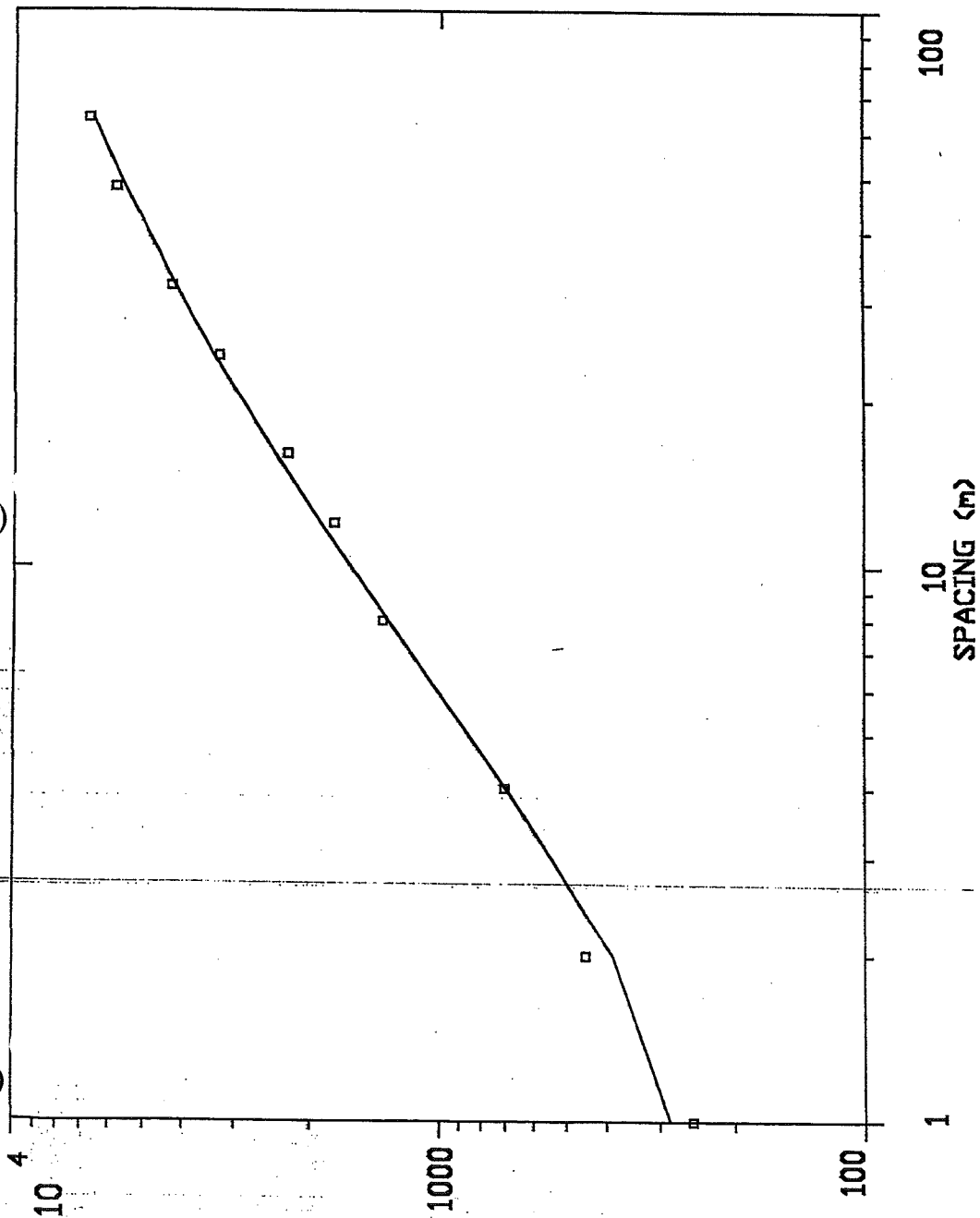
Geo	Surface		Layer 2		Layer 3	
	X-Loc	Elev	Depth	Elev	Depth	Elev
1	0.0	92.3	3.5	88.8	3.6	88.7
2	5.0	92.8	3.3	89.5	3.5	89.3
3	9.9	93.3	3.0	90.3	3.3	90.0
4	14.9	93.8	2.7	91.1	3.1	90.7
5	19.9	94.2	2.4	91.8	2.8	91.4
6	24.9	94.7	2.1	92.6	3.0	91.7
7	29.9	95.2	2.0	93.2	3.1	92.1
8	34.8	95.5	1.6	93.9	3.6	91.9
9	39.8	95.9	1.0	94.9	4.5	91.4
10	44.6	97.3	1.4	95.9	6.0	91.3
11	49.6	97.6	1.5	96.1	6.0	91.6
12	54.6	98.4	2.2	96.2	8.8	89.6

ocities used to formulate the Depth Model

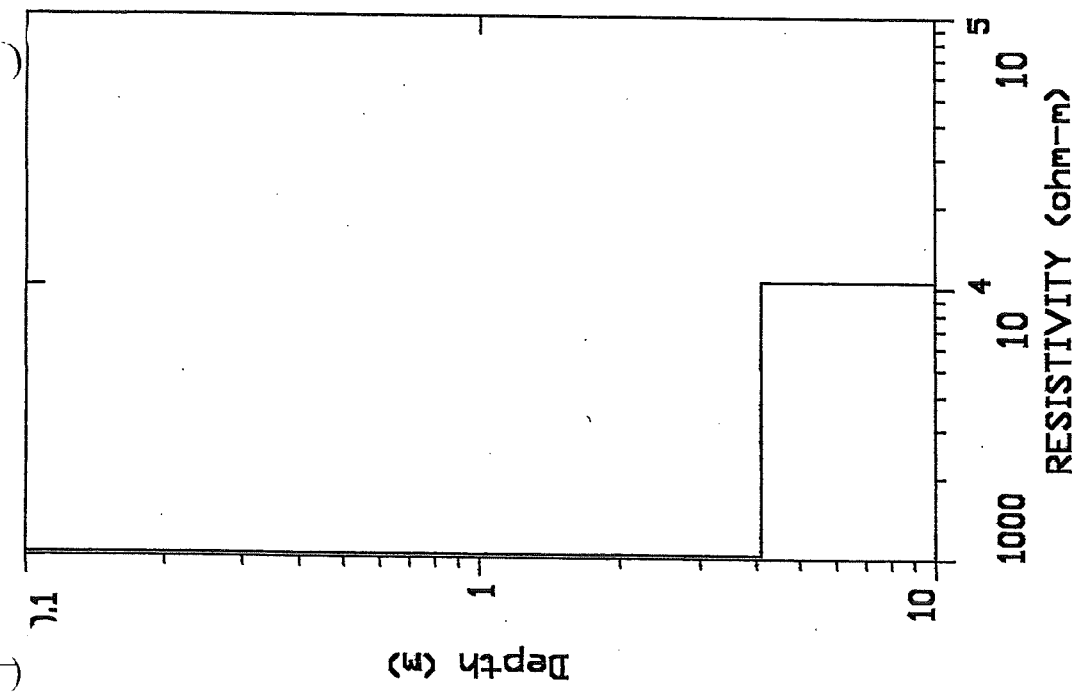
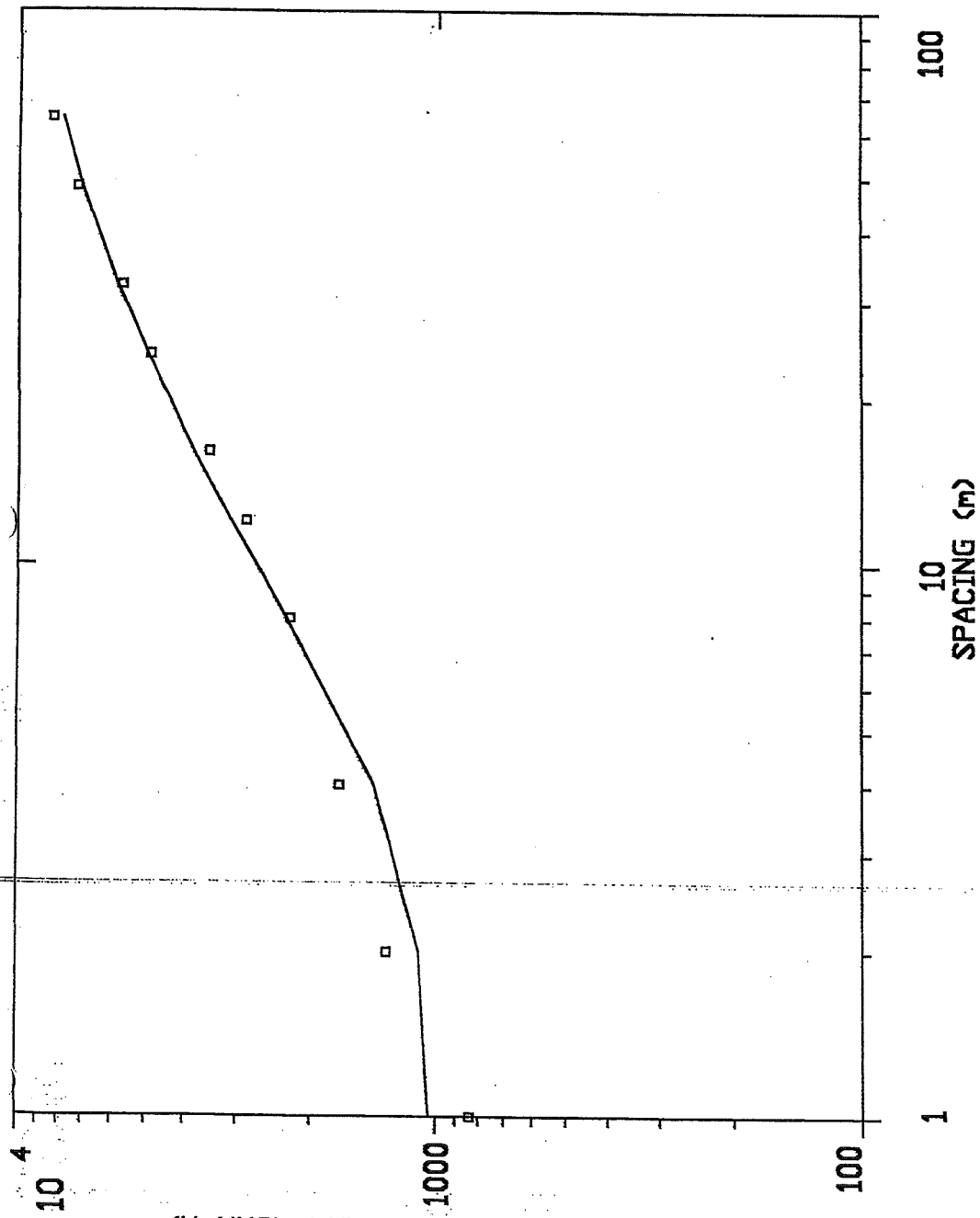
Lead A	Layer 1		Layer 2		Layer 3	
Vertical	470		2500			
Horizontal			2500		4699	

APPENDIX II WENNER SOUNDINGS (2001)

RECEIVED: 05/12/2025



Roadstone Provinces Ltd	Site Evaluation		
University College Dublin	Clooneenacaltry Roscommon		
Data Set: WS1	Date: July 2001	Azimuth: 0	
Equipment: Megger	Sounding: 1		



Roadstone Provinces Ltd	Site Evaluation
University College Dublin	Clooneenacally
Data Set: WS3	Roscommon
Equipment: Megger	Azimuth: 0
Date: July 2001	
Sounding: 3	

RECEIVED 05/08/01

APPENDIX III BOREHOLE DATA

RECEIVED: 05/12/2025

RECEIVED: 05/12/2025

ROTARY CORE LOG
CURRY / CLOONACALTRY
BOREHOLE BH1

CORE 1

DEPTH	THICK- NESS	GRAPHIC	DESCRIPTION	DISCONTINUITIES	DISC' FREQ.	CORE REC.	R.Q.D.
02.0			Core box comments 'overburden to 3m'. None recovered.		1	1	1
03.0							
04.0			Light grey C bioclastic crystalline limestone with brachiopod float 1cm from base.	Badly broken and drill rounded pebbles. Occ. core string with drill breaks. [prob. till]	38	41	15
04.5							
06.0			Light grey M bioclastic crystalline limestone with thin shale partings. Minor calcitic joints.	Top 0.3m section very broken and pebbly. Some drill rounding. Lower 1.5m is good core with stylolites, drill breaks and v. thin shale partings. [upper part till]	24	57	40
07.5							
08.0			Light grey bioclastic crystalline limestone with some stylolites and crinoid float. Minor calcitic joints.	Good core with breaks on stylolites and drill breaks. Occ. broken on calcitic joint fractures.	5	105	97
10.0							
10.5			Light grey M bioclastic crystalline limestone with occ. brachiopod bands. Hairline stylolites and crinoid float present.	Gen. good core with stylolites, drill breaks and occ. pre-drill weathered fracture.	6	100	85
12.0							
13.5			Dark M-C bioclastic crystalline limestone. Upper 0.5m is laminated and burrowed. stylolites are well spaced. Many solitary corals at 0.45 and 2.5m down.	V. good core with mainly stylolite and drill breaks.	3	100	97
14.0							
16.0			Massive dark C-M bioclastic crystalline limestone with well developed stylolites and minor float incl. crinoids at 1.3-1.5m down.	V. good core with stylolite associated breaks and some drill breaks.	3	98	95
16.5							
18.0							
19.5			F-M bioclastic crystalline limestone with occ. floating brachiopods. Some subvertical calcitic jointing. Stylolites developed and well spaced.	V. good core with breaks on stylolites and horizontal and oblique drill breaks.	4	100	98
20.0							
22.0							
22.5			M bioclastic crystalline limestone with coarse band 1.2-1.5m down. Stylolites developed and well spaced. Minor calcitic joints.	V. good core with breaks on drill breaks and rare stylolite.	3	99	98
24.0							

RECEIVED: 05/12/2025

RECEIVED: 05/12/2025

ROTARY CORE LOG
CURRY / CLOONACALTRY
BOREHOLE BH3

CORE 3

DEPTH	THICK- NESS	GRAPHIC	DESCRIPTION	DISCONTINUITIES	DISC' FREQ.	CORE REC	R.Q.D.
02.0			No core box comments. Assume overburden of glacial till.		/	/	/
03.0							
04.0			Top pebbles of F black limestone. Below, core is M-F bioclastic crystalline limestone with stylolites developed.	V. good core excl. top and base 0.05m. Top pebbles [prob till derived] drill worn and broken. Remainder is stylolite breaks and fractures on calcitic joints.	10	95	84
04.5							
06.0			M-F bioclastic crystalline limestone with crinoid and brachiopods large floating fossils. Fine stylolites are concentrated towards base of core string.	Good core but shattered to top along fine calcitic joints. Further breaks are on oblique joints and stylolites.	13	90	76
07.5							
08.0			Light grey F-M bioclastic crystalline limestone with occ. coarse bands. Fine stylolites and float incl. solitary corals and crinoid ossicles.	V. good core with few breaks on stylolites and occ. drill break.	4	100	100
10.0							
10.5			Dark M-F bioclastic crystalline limestone with some float incl. corals and crinoids. Freq. fine stylolites. Single 1cm thick calcite band 2.7m down. Single well developed stylolite at base with high amplitude.	V. good core broken rarely on stylolites and drill breaks.	3	100	100
12.0							
13.5			Dark M-F bioclastic crystalline limestone with some float incl. corals, crinoids and brachiopods. Freq. and fine stylolites.	V. good core broken rarely on stylolites and drill breaks.	3	99	96
14.0							
16.0			Dark M-F bioclastic crystalline limestone with solitary corals and crinoidal float. Stylolites are freq. and fine.	V. good core broken on stylolites and occ. drill breaks.	4	100	95
16.5							
18.0							
19.5			Dark F-M bioclastic crystalline limestone with minor float. Shell band at 1.0m down containing gastropods and brachiopods. Group of stylolites with severe dissolution 1.6m down makes rock friable. V fine calcitic joints some void infilling.	Upper 0.6m broken along calcitic joints, remainder is good core. Main breaks on stylolites and drill breaks.	12	99	86
20.0							
22.0							

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48.0		F-M grey bioclastic crystalline limestone with well developed stylolites. Calcitic veins up to 4mm and minor vugs with pink calcitic infill. Base slightly friable.	Broken up core with majority of breaks on stylolites some on joint fractures and smaller drill breaks.	8	100	85
49.5		M-F bioclastic crystalline limestone with well developed stylolites. Pink calcitic subvertical joints and some veins. Clast replacement in calcite. Minor dissolution in upper 0.1m.	Good core excl. jointed zone. Many drill breaks and stylolites various joint fractures esp. near calcitic veins.	10	103	86
52.0		Gen. M-F dark bioclastic crystalline limestone with float but coarse zone 1.5-1.8m down. 1cm calcitic band and various minor calcitic joints.	Good core with breaks on drill breaks and some on stylolites.	6	98	90
52.5						
54.0		M-F bioclastic crystalline limestone with some float. Stylolites developed. Some subvertical calcitic joints. Some oblique joints show slickensides.	Fair core with many stylolites and oblique joints, some drill breaks.	7	95	73
55.5						
56.0		M bioclastic crystalline limestone with some stylolites and calcitic joints.	Fair core with number of drill breaks often closely related to stylolites and minor joints.	14?	100?	66?
58.0						
58.5						
60.0						
??		Final core string 1.74m long. No wood chip depth marker. END OF CORE				
2.0						

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ROTARY CORE LOG
CURRY / CLOONACALTRY
BOREHOLE BH5

CORE 5

DEPTH	THICK- NESS	GRAPHIC	DESCRIPTION	DISCONTINUITIES	DISC FREQ.	CORE REC.	R.Q.D.
02.0			Core box comment 'Overburden to 6m. B. Row at 5m approx' No core recovered assume glacial till.				
04.0							
06.0	06.0			Upper 0.4m badly broken and rubbly. Breaks along stylolites and calcitic joints. Soil filled cavity c0.3m down. Remainder of core is good. Main breaks along stylolites, some show severe dissolution.	9	89	79
07.5							
08.0			C bioclastic crystalline limestone below 1.4m M-F. Stylolites with severe dissolution where crossing calcitic joints.	Fair core broken along subvertical joints with thick calcitic infills. Also on major stylolites. Pebbly drill chippings c 1.4m down.	8	100	97
10.0							
10.5			Light grey, C, v. bioclastic crystalline limestone. Gen massive with few large bioclasts.	Gen. good core with majority drill breaks and some severely dissolved stylolites.	5	100	96
12.0							
13.5							
14.0			C-M bioclastic crystalline limestone grey and massive with rare large bioclasts. Well spaced minor stylolites and occ. with bad dissolution.	Good core excl. 1.5 to 2.3m down. Breaks occur on stylolites and many drill breaks some associated to minor subvertical jointing. Thin shale parting at 0.35m down.	8	97	83
16.0							
16.5			C grey bioclastic crystalline limestone. Gen. massive with rare large bioclasts. Some stylolites occur.	Top 0.4m is jointed and broken remainder is v. good core. Breaks along stylolites and few drill breaks.	4	97	94
18.0							
19.5							
20.0			C bioclastic crystalline limestone light grey. Fine burrows at 0.45m down and shell band at 2.8m down. Subvertical joint has brown calcitic infill up to 3mm thick.	Good core, none missing. Major stylolite at 0.8m down with severe dissolution where crossing vertical joint with brown calcitic infill. Breaks on drill breaks and few stylolites.	4	100	100
22.0							

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48.0		M-F dark bioclastic crystalline limestone. Occ. stylolites and some thin impersistent calcitic joints. Rare large bioclasts incl. crinoids. Occasional vugs.	Good core broken on drill breaks and some at stylolites.	5	100	92
49.5						
50.0		F bioclastic crystalline limestone with coarse bands to base. Occ. stylolites up to 2mm residuum, some broken.	Fair core improves to base with drill and stylolite fractures common. Rare weathered pre-drill fractures are subvertical and oblique.	7	98	87
52.0						
52.5		F dark hard bioclastic crystalline limestone with rare floating large bioclasts. Minor brown calcitic joints and v. thin stylolites. At base dolomitised v. coarse.	Good core to 1.13m down then 0.2m drill broken gravel zone pink friable dolomitic then 0.27m pink good core. Breaks are horizontal and oblique drill breaks and occ. stylolite.	10	107	83
54.0		Recrystallised dolomite pink and gen. friable or highly crystalline. Thick calcitic veining. Base good pink dolomitised.	Core poor uppermost as drill broken rubble of calcite vein crystals but towards base core is good though friable.	15	77	35
55.5						
56.0		Pink friable dolomite with large calcite lined vugs (<5cm). Chicken wire veining means easily broken.	Gen good core though many horizontal and oblique drill breaks.	10	100	68
58.0						
58.5		Pink very coarsely recrystallised dolomite with calcite lined vugs. Sugary and friable.	Very broken up core. Vugs split and many drill breaks incl. drillers rubble.	20	100	89
60.0		Pink recrystallised dolomite with large calcite lined vugs. Sugary and friable.	Good core though missing section poss. rubble. Mainly horizontal and oblique drill breaks.	5	66	50
61.5		Pink sugary dolomitised with calcitic vugs and rare stylolites.	Fair core with fractures gen. drill breaks influenced by subvertical calcitic joints and veining. Vugs also broken.	8	100	88
64.0						
64.5		Pink recrystallised friable sugary dolomitic limestone with calcite lined vugs some yellowed.	Good core gen. oblique and pointed drill breaks. Vugs also fractured.	5	100	97
66.0						
67.5		Pink recrystallised sugary dolomitic limestone with calcitic vugs. Occ. stylolite and some veining.	Good core with oblique and pointed drill breaks. Vugs also fractured.	6	98	85
68.0						
70.0						

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ROTARY CORE LOG
CURRY / CLOONACALTRY
BOREHOLE BH6

DEPTH	THICK- NESS	GRAPHIC	DESCRIPTION	DISCONTINUITIES	DISC' FREQ.	CORE REC	R.Q.D.
02.0			No core box comments. Assume overburden to 5.5m. Some core recovered. Pebbles and short unrelated drill strings of C bioclastic crystalline limestone with various weathering artifacts. Rusty coloured weathering, poss. calcitic jointing and minor stylolites.	V. poor core with numerous unrelated drill rounded pebbles.	10	07	2
04.0							
05.5							
06.0			Light grey bioclastic crystalline limestone with brachiopod float 0.7m down. Minor calcitic joints. Some developed stylolites. Coarse calcitic joint infill 1.1m down.	Good core with horizontal drill breaks and stylolites dominant	6	101	82
07.5							
08.0			M-C banded bioclastic crystalline limestone with floating large bioclasts incl. brachiopod and solitary corals 0.3m down and colonial coral 2.3m down. Network of fine calcitic joints in upper portion and some developed stylolites throughout.	Good core with various drill breaks and some stylolites. Subvertical joints not broken.	7	96	84
10.0							
10.5			M-C dark bioclastic crystalline limestone with moderate float incl. solitary corals and crinoid ossicles. Many fine stylolites and fine calcitic joints. Calcite lined vug 1.7m down.	Good core with breaks mainly stylolite related. Also some drill breaks.	7	100	88
12.0							
13.5			M-C bioclastic crystalline limestone with thick bioclastic bands at 1.3, 1.5 and 2.6m down. Some developed stylolites single example with late void infilling calcite. Occ. red weathered fractures.	Good core with stylolite and drill breaks dominant. Pre-drill weathered fracture occurs 0.6m down.	5	100	97
14.0							
16.0			M-C bioclastic crystalline limestone with float incl. crinoids. Minor calcitic jointing. Some severely developed stylolites showing late dissolution.	Good core broken on stylolites and some drill breaks.	7	100	88
18.0							
19.5			Light grey M-C bioclastic crystalline limestone with well spaced stylolites and floating brachiopods. Freq. but thin calcitic joint network.	Good core broken on drill breaks and occ. stylolite.	5	98	93
20.0							
22.0			F-M bioclastic crystalline limestone with well spaced stylolites. 5 calcitic bands 3-10cm thick occur at 0.2, 0.5, 2.1, 2.3 and 2.6m down.	Fair core but drill broken on calcite bands. Remaining breaks on stylolites and further drill breaks.	7	99	89
24.0							

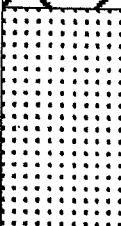
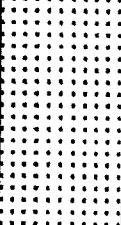
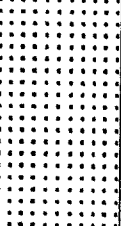
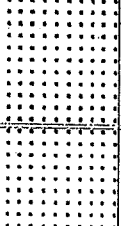
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50.0	50.0	Upper 0.9m are pink crystalline dolomitised limestone with large joint vein and severe dissolution. core smashed from 0.9-1.05m down. Below this large joint continues into grey bioclastic crystalline limestone with severe dissolution adjacent to joint. Single severely dissolute stylolite.	Poor core broken on many drill breaks, most stylolites, freq. subvertical joint fractures. Drill smashed gravel from 0.9-1.05m down.	10	100	73
52.0	52.5	M-C bioclastic crystalline limestone with calcitic joints. Some developed stylolites. Lowest 1.0m M-F bioclastic crystalline limestone without joints.	Fair core with breaks on subvertical joints some on stylolites and a number of drill breaks often associated with joints.	8	100	82
54.0	55.5	F bioclastic crystalline limestone with some well separated coarse bioclastic bands. Freq., fine stylolites. 0.1m thick calcitic band occurs 1.8-1.9m down.	V. good core with rare stylolite and oblique drill breaks. Calcitic band badly broken.	3	100	95
56.0	58.5	F dark grey bioclastic crystalline limestone with rare float and few calcitic joints.	Good core with breaks on oblique drill shears, stylolites and horizontal drill breaks.	7	107	100
58.0	60.0	END OF CORE				
60.0	60.0					

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ROTARY CORE LOG
CURRY / CLOONACALTRY
BOREHOLE BH7

DEPTH	THICK- NESS	GRAPHIC	DESCRIPTION	DISCONTINUITIES	DISC' FREQ.	CORE REC.	R.Q.D.
02.0			Core box marked 'Overburden to 9m. Rock and boulder. ?Rock Large bands of clay'. Probably glacial till.				
04.0					1	1	1
06.0							
08.0							
09.0							
10.0			Pebbles and short string of core of F bioclastic crystalline limestone.	Unrelated pebbles with some drill rounded margins.	8	7	7
10.5			Orangey red clay with shards of grey and pale yellow limestone. gen., soft and unlithified. [probably recent clay]	Good core string present but lots missing. Drill breaks.	2	19	10
12.0							
13.5							
14.0			Rusty brown clay with organically mediated Fe staining perhaps iron pan. Tubular pitting possibly root holes. [Part of regolith]	Poor core with drill breaks and crumbling.	3	4	0
16.0							
16.5			Grey clay weathering orange with single limestone pebble. [Regolith]	Poor core broken on drill breaks. Lots missing.	1	6	0
18.0							
19.5							
20.0			Pale grey shale, orange chickenwire weathering and slickensided internally [soil development].	Poor core lots missing. Drill breaks and crumbling.	5	17	4
22.0							
22.5							

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ROTARY CORE LOG
CURRY / CLOONACALTRY
BOREHOLE BH8

DEPTH	THICK- NESS	GRAPHIC	DESCRIPTION	DISCONTINUITIES	DISC' FREQ.	CORE REC.	R.Q.D.
02.0			Core box marked 'Overburden to 3m Boulders and clay'. No core recovered. Probably glacial till.	/	/	/	/
03.0							
04.0			Core box marked boulders. C light grey bioclastic crystalline limestone. Some dissolution of clasts. Rare floating bioclasts incl. brachiopods.	Unacquainted core strings. Dominated by pebbles to top and larger boulders to base. Poss. still coring glacial till.	10	31	16
04.5							
06.0			Core box marked boulders. Pebbles of M light grey bioclastic crystalline limestone.	Pebbles some with joint fractures. Badly dissociated strings. Much missing core.	20	17	4
07.5							
08.0			M-C bioclastic crystalline limestone with minor float. 0.2m of contorted pale buff yellow clay to base, prob. recent void infill.	Very broken up core incl. many dissociated pebbles but majority of strings refit. Breaks incl. stylolites and joints but majority are drill breaks.	35	73	28
10.0							
10.5			M-C bioclastic crystalline limestone with minor calcitic joints and numerous stylolites. Some stylolites are well developed and dissolution makes core friable.	Core gen. good but poorly fitting. Stylolites dominate breaks with minor drill breaks.	10	87	59
12.0							
13.5							
14.0			M-C bioclastic crystalline limestone with patchy bands of float incl. brachiopods. Dissolution of stylolites makes adjacent core friable. Pitted as minor dissolution of clasts esp. near stylolites.	Top 0.3m of core broken pebbles. Remainder good core with breaks on stylolites and few drill breaks. Mud filled joint in upper portion of core string.	10	73	58
16.0							
16.5							
18.0			Upper and lowermost 1.0m light grey M-C bioclastic crystalline limestone. Middle 1.0m is M-F bioclastic crystalline limestone with floating large bioclasts in mud enriched bands. Major dissolution of stylolites.	Gen. good core, refits well. Majority of breaks on stylolites with major dissolution. Others incl. horizontal and oblique drill breaks.	7	93	81
19.5							
20.0			M-C light grey bioclastic crystalline limestone with rare floating large bioclasts incl. brachiopods. Lowest 0.5m is M-F crystalline limestone. Friable in shattered zone and at 2.4m down adjacent to stylolite dissolution.	Gen good core but vertical joints at 1.4-1.6m down produce shattered zone of joint and associated drill breaks. Further breaks elsewhere dominated by stylolites.	10	97	77
22.0							
22.5							
24.0			Upper and lowermost 0.3m are M-F bioclastic crystalline limestone remainder is M-C. Large colonial coral at 2m down, appears recrystallised. Minor calcitic joints and some stylolites showing moderate dissolution.	V. good core excl. shattering at 2.3m down associated to minor calcitic jointing. Further breaks dominated by stylolites.	7	102	88

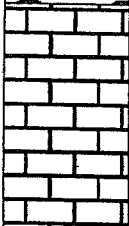
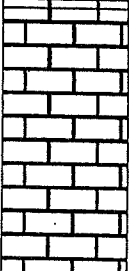
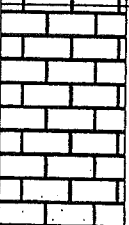
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50.0		C-M banded bioclastic crystalline limestone with rare float incl. corals and crinoids. Pre-drill weathered joints esp. c1.5- 2.0m down. Some dissolution of bioclasts and veins.	Upper 1.5m good core lower 1.5m broken on clay filled joint. Lowest part breaks along pre-drill weathered fractures. Stylolites dominate breaks in longer core strings.	18	100	72
52.0	52.5	M-C bioclastic crystalline limestone with v. coarse bands. Narrow stylolites gen. broken, minor calcitic jointing.	Fair core but some missing. Badly broken in places esp. associated to pre-drill weathered fractures. Breaks thus dominated by weathered fractures and by stylolites with only minor drill breaks.	15	84	58
54.0	55.5	M-C bioclastic crystalline limestone mud enriched at 2.3- 2.6m down. Freq. stylolites are broken. Colonial coral at 2.6m down.	Broken up core. Dominated by stylolites but also with oblique joints and shattering. Pebbles rounded by drill bit.	13	93	68
56.0	58.5	M-C bioclastic crystalline limestone with few stylolites. Some red staining on veinlets.	Badly shattered to pebbles in places esp. along weathered fractures and oblique joints. Occ. drill breaks. Crystalline calcite to base.	28?	77?	27?
58.0						
60.0						
62.0	c60?	Unknown final depth. (Wood chip remarks 37.5m) END OF CORE				

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ROTARY CORE LOG
CURRY / CLOONACALTRY
BOREHOLE BH9

DEPTH	THICK- NESS	GRAPHIC	DESCRIPTION	DISCONTINUITIES	DISC' FREQ.	CORE REC.	R.Q.D.
02.0			No core box comments. Assume overburden. No core recovered.		/	/	/
03.0							
04.0	04.0		Limestone rubble. F-M, bioclastic, crystalline, minor float and stylolites.	Mostly pebbles and rubble with few refittable strings. Poss. further regolith.	82	40	11
05.0	05.0		Limestone rubble. F-M, bioclastic, crystalline, minor float and stylolites.	Gen. pebbly rubble. Poss. further regolith.	72	26	19
06.0	06.0		Rubble of dark M bioclastic crystalline limestone with occ. float.	Gen. rubble. Some pebbles show weathered joint evidence. Poss. further regolith.	26	8	8
07.0	07.0		Rubble of dark F bioclastic crystalline limestone with some floating large bioclasts.	Gen. rubble long strings show subvertical weathered joints and stylolites.	48	70	24
08.0	08.0		Rubble of M-F bioclastic crystalline limestone with occ. float.	Gen. pebbles but single long string 24cm long. Poss regolith.	15	12	10
10.0	10.5		F-M bioclastic crystalline limestone with rare float. Few but well developed stylolites. occ. subvertical joint breaks.	Good core prob. true bedrock. Breaks gen. on stylolites and drill breaks rare joint fractures.	6	99	91
12.0	13.5		M-F bioclastic crystalline limestone with rare float. In upper 1.5m well developed stylolites are rotten in lower half less developed. Calcitic band occurs 0.5m down associated with most rotten stylolites and minor dissolution of bioclasts.	Good core dominated by stylolites and some drill breaks with minor oblique joint fracturing.	8	103	62
14.0	17.0		M-F bioclastic crystalline limestone with float incl. solitary corals. Minor calcitic veins and vertical joints. 7 well spaced 1-3cm calcitic bands occur at all levels. Calcitic infill of some voids and stylolite zones.	Good core with breaks dominated by stylolites and few drill breaks.	8	99	80
16.0	20.0		M-F bioclastic crystalline limestone with some float contains minor subvertical calcitic joints.	Good core with some stylolites and fractured zone associated with red, friable pre-drill weathered fractures.	12	100	78
18.0							
20.0							
22.0							

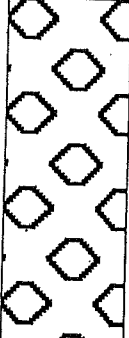
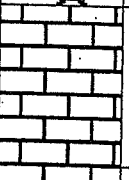
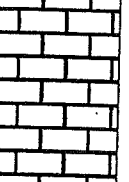
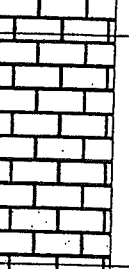
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47.0		M-F bioclastic crystalline limestone with some float. Minor vertical calcitic veining and infilling of voids. Stylolites are few and fine.	V. good core. Majority of breaks on drill breaks and a few on stylolites and joints.	5	100	90
48.0						
50.0	50.0	Top 0.3m mud enriched bioclastic crystalline limestone with well developed stylolites and obvious bioclastic clasts. Remainder is M-F bioclastic crystalline limestone with occ. coarse bands incl. shell bed at 1.2m down.	Good core gen. broken on horizontal drill breaks but some on stylolites and oblique joints.	5	98	96
52.0						
53.0		M-F bioclastic crystalline limestone with some float. Minor calcitic joints. Stylolites are few and fine. A single 1cm thick calcitic band occurs 1.0m down.	Good core. broken evenly on horizontal drill breaks and oblique calcitic jointing.	9	100	94
54.0						
56.0	56.0	M-F bioclastic crystalline limestone with increasing float downwards incl. large brachiopods incl. large down. Stylolites are few and fine. Minor subvertical calcitic joints present.	V. good core broken on stylolites and horizontal drill breaks and occ. oblique joints.	6	100	90
58.0						
59.0		M-F bioclastic crystalline limestone with some crinoidal float. Stylolites are few and fine.	V. good core. Majority of breaks on horizontal drill breaks. A few on stylolites and calcitic joints.	6	100	95
60.0						
62.0	62.0	END OF CORE				

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ROTARY CORE LOG
CURRY / CLOONACALTRY
BOREHOLE BH10

DEPTH	THICK- NESS	GRAPHIC	DESCRIPTION	DISCONTINUITIES	DISC' FREQ.	CORE REC.	R.Q.D.
02.0			Core box marked 'Overburden to 9m Boulder clay and boulders to 7.4m approx'. First wood chip marked 7.4m.				
04.0					/	/	/
06.0							
08.0	7.4		Gen. pebbles of weathered light grey M-C bioclastic crystalline limestone showing some joints and large bioclast float.	Poor core, great deal missing. Few large sections, mainly pebbles. Pointed and polished drill breaks suggests drilling further glacial fill containing large boulders.	10	24	12
10.0							
12.0	11.9		Top 1.4m is clean bioclastic crystalline limestone with solitary corals, crinoids and brachiopod floating bioclasts. Fine calcitic jointing is present. Lower 0.5m contains calcitic joints, steep angle veins and bands of coarsely crystalline calcite.	Very broken core with many oblique joints and fractures, some pre-drill weathered. Drill breaks very common in crystalline calcite bands. These ground into gravel.	20	90	45
14.0	14.0		Light grey bioclastic crystalline limestone with occ. calcitic bands to top. 1.0m down rock is friable bioclasts weather proud. 1.7m down recent sand is mixed with limestone pebbles and calcite crystal debris.	Badly broken core. Freq. drill breaks esp. in crystalline calcite. Some fracturing of calcitic joints and oblique pre-drill fractures.	14	55	28
16.0							
18.0	17.0		Gen. M-C light grey bioclastic crystalline limestone. Calcitic bands are brecciated and adjacent areas are friable with bioclasts weathering proud.	Badly broken core. Fracturing on veins and calcitic joints, some pre-drill weathered fractures. Drill breaks common throughout. Poss. void present with recent sandy infill.	24	55	30
20.0	20.0		Light grey bioclastic crystalline limestone rich in crinoid debris. Some calcite bands (c3cm) and adjacent friable zones. Base of core is F-M bioclastic crystalline limestone with rare float.	Badly broken core with a great deal missing. Majority of drill breaks in recovered core. Lower portion of core comprises drill rounded pebbles.	13	30	23
22.0							

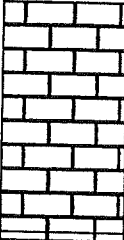
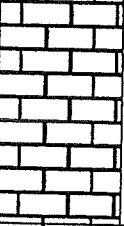
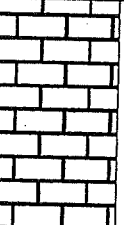
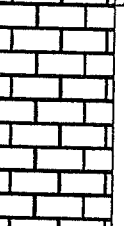
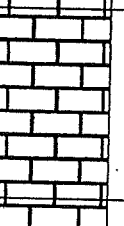
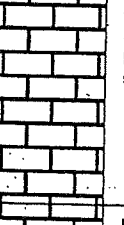
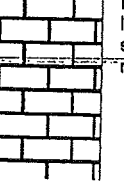
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47.0		F-M bioclastic crystalline limestone with minor stylolites and some float. Minor subvertical joints are present.	Upper 0.4m drill broken. Remainder fair core with majority of drill breaks plus some along stylolites and joints.	9	97	77
48.0						
50.0	50.0	M-C bioclastic crystalline limestone with rare float. Few well developed stylolites many fine.	Good core to 1.5m down then 0.4m shattered remainder broken up core. Main breaks on stylolites and drill breaks. Shattered zone is fractured on subvertical calcite joints.	12	99	77
52.0						
53.0		F-M bioclastic crystalline limestone with fine stylolites oblique to the core. Colonial coral 1.0m down and brachiopod float in upper 0.5m. Calcite veins occur at 1.5m down.	Broken core incl. brecciate at 1.3m down. Breaks mainly drill breaks often related to joints and stylolites. Breccia zone is broken on calcite veins and along pre-drill weathered fractures.	14	90	77
54.0						
56.0	56.0	F-M bioclastic crystalline limestone with occ. float incl. colonial coral 0.7m down. Some calcitic jointing. Stylolites well developed and oblique to core.	Exceptional core with no vertical joint fracturing. Mixture of drill and stylolite breaks.	3	100	96
58.0						
59.0		F bioclastic crystalline limestone with rare float incl. crinoids. No wood chip at base. 1.0m of core minimum.	Good core with oblique stylolite breaks and oblique drill breaks. Single wide subvertical calcitic joint fractured.	8	100	76
60.0	60.0+	Light gray bioclastic crystalline limestone with 1cm thick calcitic banding. Lowest piece of core is calcite band >6cm.	Horizontal drill breaks on calcite bands.	11?	100?	66?
+0.3m						
62.0		Final string is 0.3m long with no final depth wood chip. END OF CORE				

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ROTARY CORE LOG
CURRY / CLOONACALTRY
BOREHOLE BH11

DEPTH	THICK- NESS	GRAPHIC	DESCRIPTION	DISCONTINUITIES	DISC' FREQ.	CORE REC.	R.Q.D.
02.0	02.5		No core box comments. Assume overburden.		/	/	/
04.0			M-F bioclastic crystalline limestone with floating large bioclasts of crinoids and brachiopods. Stylolites are well developed but well spaced.	Top 0.4m rubbly then 1m good core and remainder badly broken. Large subvertical joint from 1.0m down is broken further breaks are on stylolites and many drill breaks.	15	97	77
06.0	05.5		Grey M-F bioclastic crystalline limestone with dissolution esp. along stylolites. Some bioclast float. 2cm thick calcite band at 1.3m down cut by 2mm major calcite filled joints.	Top 1.65m v. good core remainder broken core. Breaks are on stylolites and some drill breaks. Joint fractures at base only.	6	98	93
08.0	08.5		Grey F-M bioclastic crystalline limestone with some float incl. band corals, crinoids and brachiopods at 1.8m down. Major calcitic joints towards base.	Fair core with many stylolite and drill breaks. Joint fracturing at 0.1-0.4m down and 1.3m down.	8	94	82
10.0	11.5		M-C bioclastic crystalline limestone with float. Calcitic veining and 3cm thick steeply angled calcite band 1.0-1.2m down.	Badly broken core esp. upper 1.5m. Stylolites dominate breaks with some drill breaks. Calcite band is drill broken to rubble.	12	95	70
12.0	14.5		F bioclastic crystalline limestone with rare float incl. crinoid ossicles and solitary corals. Occ. coarse bands.	V. good core, none missing. stylolite breaks dominate with occ. drill break.	4	98	78
14.0	17.0		F bioclastic crystalline limestone with some floating solitary corals, crinoids and brachiopods. Well developed stylolites.	V. good core. Breaks dominated by stylolites with occ. drill breaks.	5	100	95
16.0	20.0		F-M bioclastic crystalline limestone with some float. Well spaced developed stylolites and minor calcitic joints throughout.	Good core with stylolite breaks dominant. Occ. drill break.	6	100	90
18.0							
20.0							
22.0							

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47.0						
48.0		F bioclastic crystalline limestone with minor crinoidal float. Some subvertical jointing with calcitic infill.	Gen. good core but subvertical joint fractured centrally. Stylolites dominate with some drill breaks.	7	100	90
50.0	50.0					
52.0		F-M bioclastic crystalline limestone with developed stylolites. Oblique jointing and crystalline calcite bands. Some void infilling with calcite.	V. good core excl. fractured joints in zone 2.0-2.2m down. Other breaks on stylolites horizontal drill breaks and oblique joints.	5	100	92
53.0						
54.0		F-M bioclastic crystalline limestone with calcitic joints throughout esp. 0.9 - 1.6m down. Some stylolites developed.	Good core excl. 0.9 - 1.6m down where badly broken along severe calcitic joints. Further breaks on stylolites and drill breaks.	11	100	73
56.0	56.0					
END OF CORE						

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APPENDIX 3.3.2
RESPONSE FROM GSI IN RELATION TO
GEOLOGICAL HERITAGE ISSUES

Suirbhéireacht Gheolaíochta Éireann
Tor an Bhacaigh
Bóthar Haddington
Baile Átha Cliath 4



Geological Survey of Ireland
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Dublin 4
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Direct +353 1 6782858
Fax. +353 1 6681782
<http://www.gsi.ie>
Email: matthewparkes@gsi.ie

19/08/2004

Dr John Kelly
John Barnett & Associates Ltd.,
CSA House, Unit 7,
Dundrum Business Park,
Windy Arbour,
Dublin 14

Re: Lands at Curry/Cloonacaltry, Co Roscommon

Dear John,

I am writing to inform you that at present, there are no identified sites of geological heritage importance in the area you have outlined on the map extract.

Yours sincerely,

Dr Matthew A Parkes
Pgeo., EurGeol.

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Appendix 6-C County Geological Site Report - Killeglan Karst Landscape

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Killeglan Karst Landscape
Other names used for site	
IGH THEME	IGH7 Quaternary
TOWNLAND(S)	Milltown, Cuilleenoolagh, Cloonacaltry, Skeavally, Boleyduff, Tobermacloughlin, Lugboy, Breeole, Porteen, Ballyglass
NEAREST TOWN	Ballyforan, Taghmaconnell
SIX INCH MAP NUMBER	47, 48, 50
NATIONAL GRID REFERENCE	188250 243150 (centre of area)
1:50,000 O.S. SHEET NUMBER	47 1/2 inch Sheet No. 12

Outline Site Description

This site comprises an extensive area of bouldery terrain in southern Roscommon, covering an area of 5 by 2 kilometres, and includes a number of low amplitude, hummocky ridges. Three discrete areas of this topography are defined in close proximity to each other.

Geological System/Age and Primary Rock Type

The landscape is formed on bedrock which is Lower Carboniferous limestone. The majority of the ridge features, as well as the boulders, are Quaternary in age, having been deposited at the base or edge of the ice sheet moving northwest to southeast during the maximum period of the last Ice Age.

Main Geological or Geomorphological Interest

This area is unique in lowland Ireland as it expresses what the entire lowland limestone landscape would have looked like before man modified the countryside, by reclaiming land and building field boundaries.

The area comprises a number of low, quasi-linear and hummocky ridges, which are 2m-10m in amplitude and often long and sinuous. These seem to be minor ribbed moraines. All of these features have been covered by karstified limestone boulders strewn across the ground. The area looks just like an area of karstified bedrock outcrop in many respects, but little outcrop is seen. The abundance of limestone boulders gives the landscape an unusual and rustic feel. The entire area is dry, with no surface drainage features visible. The majority of the area comprises dry grassland or scrub.

Site Importance – County Geological Site; recommended for Geological NHA

This is the only such area of lowland, boulder-strewn, limestone glacial karst in the country. It is of national importance.

Management/promotion issues

This is an excellent site in terms of macro-scale Quaternary geomorphology. The landscape is noteworthy and should be promoted as unique amongst landscape elements within the Roscommon County Development Plan and in Landscape Characterisation. The site should also be designated as an NHA owing to the uniqueness of the natural landscape character.

The site boundary illustrated here delineates the area displaying this geology in 2004 when the aerial photographs of the locality were taken. As land management practices are constantly changing and may have impacted heavily on this vulnerable landscape, in order to delineate the exact remaining area of interest a detailed field survey is required.

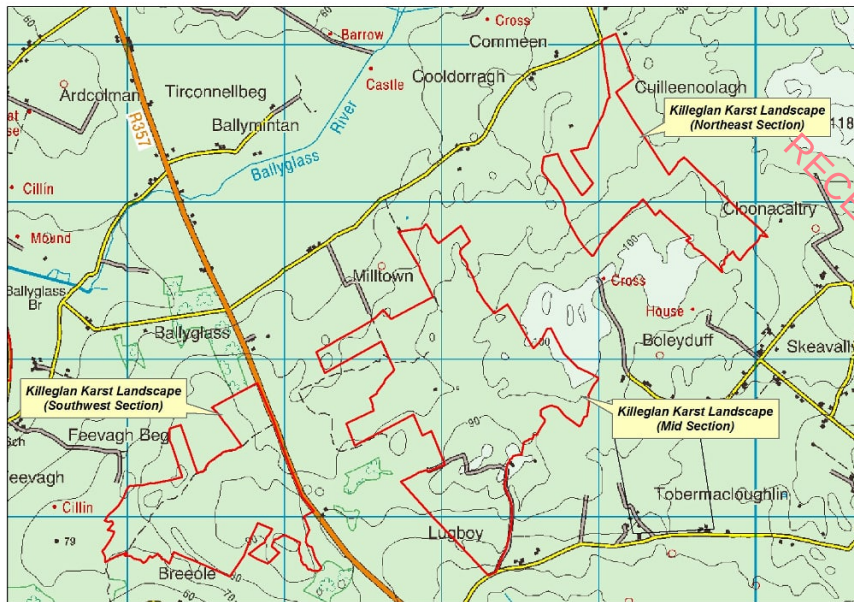
Further research and investigation is required to document and understand the full scientific story. Since a windfarm has been granted planning permission in 2012, it is hoped that scientific opportunity created by ground excavations for this will be used and not wasted.



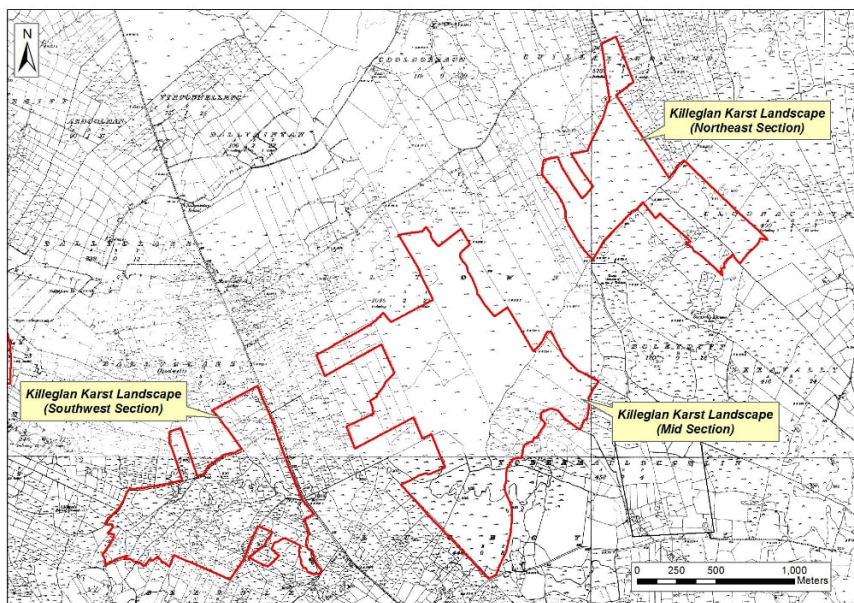
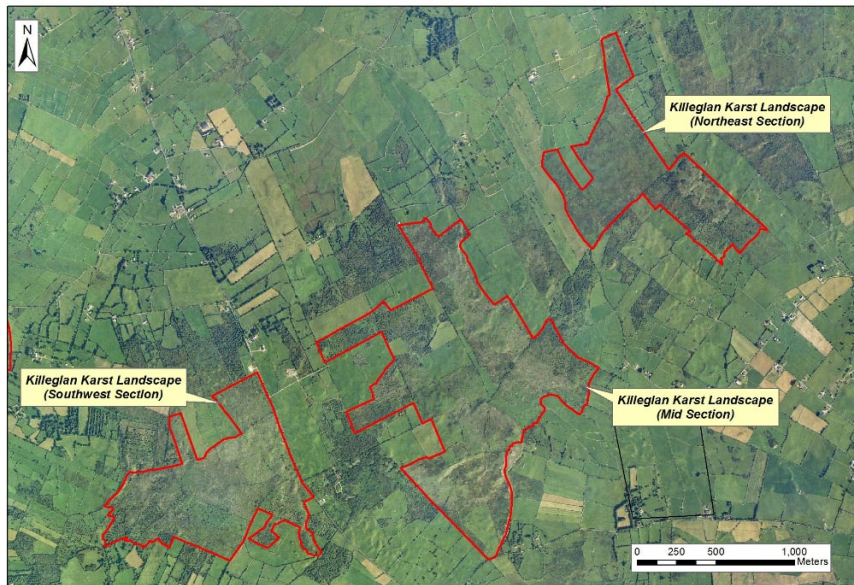
The pristine landscape of limestone boulders on glacial moraine at Killeglan.



The pristine landscape of limestone boulders on glacial moraine at Killeglan, with karstic weathering imitating limestone bedrock.



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**Appendix 6-D County Geological
Site Report -
Castlesampson
Esker**

ROSCOMMON - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	Castlesampson Esker
Other names used for site	Onagh Esker
IGH THEME	IGH7 Quaternary
TOWNLAND(S)	Tobermacloughlin, Onagh, Kilkenny, Castlesampson, Carrowkeeran, Eskerbeg
NEAREST TOWN	Athlone, Ballyforan
SIX INCH MAP NUMBER	48, 51
NATIONAL GRID REFERENCE	192000 241240 (centre of features)
1:50,000 O.S. SHEET NUMBER	47 1/2 inch Sheet No. 15

Outline Site Description

This esker trends west-northwest to east-southeast in south Roscommon, occurring south of the R363 road between Ballyforan and Athlone.

Geological System/Age and Primary Rock Type

The esker is formed on bedrock which is Lower Carboniferous limestone. The feature itself is Quaternary in age, having been deposited at the base of the ice sheet moving northwest to southeast during early deglaciation after the last Ice Age.

Main Geological or Geomorphological Interest

The Castlesampson esker is an excellent example of a complex, multi-crested esker which is comprised of numerous beads. The esker system comprises ten individual segments, which stretch for a distance of just over six kilometres. The most complex portion of the longest bead (3.5km) has at least four crests. The esker has a very complex, generally sinuous morphology. The feature interfingers with many flanking fans and deltas, with a pronounced kame-kettle topography in places. Many of the kettle holes host lakes.

The esker was probably deposited as a series of fans, which formed at the mouth of a subglacial tunnel as the ice progressively retreated towards the northwest in this area of Roscommon. Several fans, deltas and kames flank the feature.

Site Importance – County Geological Site

The esker is one of Ireland's best examples of the 'long beaded' esker type.

Management/promotion issues

This report gives proper recognition to the geomorphological component of a site that is already conserved for its grassland natural heritage as SAC and proposed NHA (Site Number 001625).

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Scrub vegetation on a bead of the Castlesampson esker system.



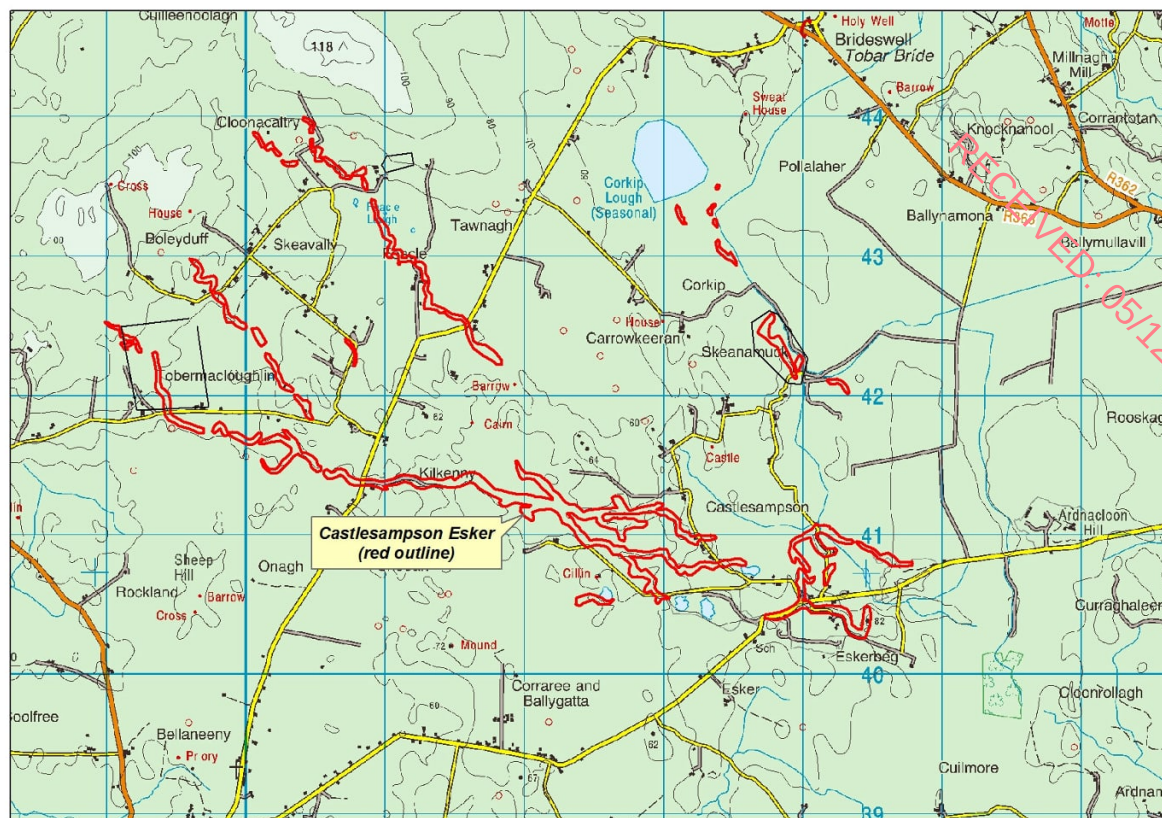
Reclaimed gravel pit within the Castlesampson esker system.



Bare gravels outcropping on the summit of the Castlesampson esker. See the sinuous nature of the feature as it winds away into the distance.



Two distinct beads of the Castlesampson esker system.



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Appendix 6-E Geological Survey of Ireland Consultation Response



RECEIVED: 05/12/2025

Lynn Hassett
SLR Consulting Ireland
7 Dundrum Business Park
Windy Arbour
Dublin, D14 N2Y7

07 April 2025

Re: Continued use of existing Cam Quarry, Curry & Cloonacaltry townlands, Brideswell, Co Roscommon
Your Ref: 501.065512.00001
Our Ref: 25/40

Dear Lynn,

Geological Survey Ireland is the national earth science agency and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and interpretation and gather various data for that purpose. Please see our [website](#) for data availability.

With reference to your email received on the 10 March 2025, concerning the Continued use of existing Cam Quarry, Curry & Cloonacaltry townlands, Brideswell, Co Roscommon, we recommend using our various data sets when conducting the EIAR, SEA, planning and scoping processes for developments, plans and policies. For more detailed information on how to access this data please access 'Data and Maps' [Data & Maps \(gsi.ie\)](#) on our 'Geoscience for planning' webpage. Use of our data or maps should be attributed correctly (please refer to each individual dataset's metadata for correct attribution).

For specific data available for Environmental Assessment and Planning topics please follow this link [[Data by Environmental Assessment and Planning Topic \(gsi.ie\)](#)], where you will find our data arranged by environmental assessment topic as illustrated below:

Land and soils <i>Soil</i> • Subsoils (Quaternary Geology) • Tellus Geochemistry • Geotechnical <i>Geology</i> • Bedrock • Geophysics • Bedrock & Quaternary 3D	Water <i>Groundwater</i> • Aquifers GW vulnerability, GWPSs (GWPPs) <i>Surface water</i> • Tellus Geochemistry <i>Estuarine & marine waters</i> • Marine and coastal <i>Flooding</i> • GWClimate • Karst	Climate Change <i>Carbon accounting / Carbon balance</i> • Geothermal • Carbon capture and storage <i>Climate change trends</i> • National coastal change assessment
Cultural Heritage <i>Archaeology</i> • Cherish <i>Underwater Archaeology</i> • Shipwrecks	Material Assets <i>Built Services</i> • Natural resources (Minerals & Aggregates) • Active quarries	The Landscape <i>Landscape Appearance & Character</i> • Physiographic units <i>Historical landscapes</i> • Historic mines
Other Relevant Data		
<i>Natural (Geo) hazards</i> • Landslide Susceptibility Mapping • Groundwater flooding • Coastal vulnerability • Subsidence • Radon	<i>Natural heritage</i> • Geoheritage (County Geological Sites) • Dimension Stone/Stone Built Ireland	



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Geoheritage

Geological Survey Ireland is in partnership with the National Parks and Wildlife Service (NPWS, Department of Housing, Local Government and Heritage), to identify and select important geological and geomorphological sites throughout the country for designation as geological NHAs (Natural Heritage Areas). This is addressed by the Geoheritage Programme of Geological Survey Ireland, under 16 different geological themes, in which the minimum number of scientifically significant sites that best represent the theme are rigorously selected by a panel of theme experts.

County Geological Sites (CGSs), as adopted under the National Heritage Plan, include additional sites that may also be of national importance, but which were not selected as the very best examples for NHA designation. All geological heritage sites identified by Geological Survey Ireland are categorised as CGS pending any further NHA designation by NPWS. CGSs are now routinely included in County Development Plans and in the GIS of planning departments, to ensure the recognition and appropriate protection of geological heritage within the planning system. CGSs can be viewed online under the Geological Heritage tab on the online [Map Viewer](#).

The audit for Co. Roscommon was completed in 2012. The full report details can be found [here](#). **Our records show that there are CGSs adjacent to the quarry development.**

Killeglan Karst Landscape, Co. Roscommon. (GR 187960, 242893), under IGH themes: IGH1 Karst, IGH7 Quaternary. Site Code: RO015. This site comprises an extensive area of bouldery terrain in southern Roscommon covering an area of 5 by 2 kilometers, and includes a number of low amplitude, hummocky ridges. This is the only such area of lowland, boulder-strewn, limestone glacial karst in the country. It is of national importance. Link to site report: [RO015](#).

Castlesampson Esker, Co. Roscommon (GR 192104, 241567), under IGH theme: IGH7 Quaternary. This esker is an excellent example of a complex, multi-crested esker which is comprised of numerous beads. The esker system comprises ten individual segments, which stretch for a distance of just over six kilometers. The esker is one of Ireland's best examples of the 'long beaded' esker type. Link to site report: [RO010](#).

With the current plan, there are no envisaged impacts on the integrity of current CGSs by the proposed development. However, if the proposed development plan is altered, please contact Clare Glanville (Clare.Glanville@gsi.ie) for further information and possible mitigation measures if applicable.

Groundwater

Geological Survey Ireland's [Groundwater and Geothermal Unit](#), provides advice, data and maps relating to groundwater distribution, quality and use, which is especially relevant for safe and secure drinking water supplies and healthy ecosystems. Proposed developments need to consider any potential impact on specific groundwater abstractions and on groundwater resources in general. We recommend using the groundwater maps on our [Map viewer](#) which should include: wells; drinking water source protection areas; the national map suite - aquifer, groundwater vulnerability, groundwater recharge and subsoil permeability maps.

For areas underlain by limestone, please refer to the karst specific data layers (karst features, tracer test database; turlough water levels ([gwlevel.ie](#))). Background information is also provided in the Groundwater Body Descriptions. Please read all disclaimers carefully when using Geological Survey Ireland data.

The proposed wind farm development is underlain by a 'Regionally Important Aquifer - Karstified (conduit)'. The Groundwater Vulnerability map indicates the range of groundwater vulnerabilities within the area covered is variable. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' in your assessments, as any groundwater-surface water interactions that might occur would be greatest in these areas.

[GWClimate](#) is a groundwater monitoring and modelling project that aims to investigate the impact of climate change on groundwater in Ireland. This is a follow on from a previous project (GWFlood) and the data may be useful in relation to Flood Risk Assessment (FRA) and management plans. Maps and data are available on the [Map viewer](#).

Within the quarry application area there is a groundwater drinking water abstraction for which there is a zone of contribution/source protection area: **Killeglan Public Water Supply - Tobermore Spring**. Link to report [here](#).



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Key to groundwater protection in general, and protection of specific drinking water supplies, is preventing ingress of runoff to the aquifer. Design of the quarry drainage will need to be cognizant of the public water scheme and the interactions between surface water and groundwater as well as run-off. Appropriate design should be undertaken by qualified and competent persons to include mitigation measures as necessary, such as SUDs or other drainage mitigation measures.

Also, any excavation/cuttings required should ensure that groundwater flow within the zones of contribution to the groundwater abstraction points is not disrupted, resulting in diminished yields. Note that there could be other groundwater abstractions in the locality for which Geological Survey Ireland has not undertaken studies, and a robust assessment should be undertaken by qualified and competent persons.

Given the Public Water Supply Scheme and numerous domestic wells, the effects of any potential contamination / dewatering as a result of the quarry development would need to be assessed.

Geological Survey Ireland has completed Groundwater Protection Schemes (GWPSs) in partnership with Local Authorities, and there is now national coverage of GWPS mapping. A Groundwater Protection Scheme provides guidelines for the planning and licensing authorities in carrying out their functions, and a framework to assist in decision-making on the location, nature and control of developments and activities in order to protect groundwater.

The Roscommon Groundwater Protection Response overview and link to the main reports is here: <https://www.gsi.ie/en-ie/publications/Pages/Roscommon-Groundwater-Protection-Scheme-Reports.aspx>.

Other Comments

Should development go ahead, all other factors considered, Geological Survey Ireland would much appreciate a copy of reports detailing any site investigations carried out. The data would be redacted for confidentiality and added to Geological Survey Ireland's national database of site investigation boreholes, implemented to provide a better service to the civil engineering sector. Data can be sent to the Geological Mapping Unit, at <mailto:GeologicalMappingInfo@gsi.ie>.

The Geological Survey would request that the operator might assist our geological heritage goals with the following (and ideally this would be written into the restoration / closure plan) and be included as a condition of planning as deemed appropriate by the planning authority:

1. Allowing access to quarry faces by appropriate scientists (upon request and with due regards to Health and Safety requirements) during quarrying to check for scientifically significant new stratigraphies / relationships as they might become exposed and to establish if the quarry site is worthy of recognition post extraction and through aftercare/restoration planning.
2. If deemed appropriate in (1) above, leaving a representative section of the quarry face at the end of the quarry life or inclusion of information panels to promote the geology to the public or develop tourism or educational resources if appropriate depending on the future use of the site. Natural exposures are few, or deeply weathered, this measure would permit on-going improvement of geological knowledge of the subsurface.

We also encourage discussion on end-of-life plans for the quarry and would be happy to recommend ways to promote the geology to the public or develop tourism or educational resources if appropriate. Geological Survey Ireland would like to offer help with interpretative signs where interesting geological features have been exposed, if appropriate.

The Geoheritage Programme tries to promote a partnership between geological heritage and active quarrying, with such measures as those outlined in the 'Geological Heritage Guidelines for the Extractive Industry', which can be downloaded [here](#). This document, written in association with Irish Concrete Federation, acts as a comprehensive guide in the sustainable extraction of natural resources while preserving the geological heritage of Ireland.



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If we can be of any further help, please do not hesitate to contact me Clare Glanville, or my colleague Trish Smullen at GSIPlanning@gsi.ie.

Yours sincerely,

Dr. Clare Glanville
Senior Geologist
Geoheritage and Planning Programme
Geological Survey Ireland

Trish Smullen
Geologist
Geoheritage and Planning Programme
Geological Survey Ireland

The publicly available data referenced/presented here, should in no way be construed as Geological Survey Ireland support for or objection to the proposed development or plan. The data are made freely available to all and can be used as independent scientific data in assessments, plans or policies. It should be noted that in many cases these data are a baseline or starting point for further site specific assessments.