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Acronyms and Abbreviations

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

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Introduction

Background

- 6.1. This chapter of the Environmental Impact Assessment Report (EIAR) provides a description of the existing land, soils and geological setting at the regional and local scale, and an assessment of the impact of the proposed development on the land, soils and geological features of the area around the site at Mounthall and Cummer townlands, Camross, Co. Laois.
- 6.2. The planning application area covers c. 12.2 ha and includes the existing permitted sand & gravel extraction area located at the northern end of it. To the south, the extension area expands and comprises a number of agricultural fields. The proposed sand & gravel extraction area covers approximately 8 ha. Access to the proposed development is via an existing entrance at the existing permitted sand & gravel pit on the L10317 local road.
- 6.3. The existing sand and gravel pit features a c.8m high face, with ground levels ranging from c. 194m AOD at the entrance to 200-203m AOD along the western boundary.
- 6.4. The proposed development will consist of:
- Continued use and extension to existing permitted sand and gravel pit registered under Section 261 of the Planning & Development Act 2000, as amended (site ref. QY05/10) within an overall application area of c. 12.2 hectares;
 - Extraction of sand and gravel (dry working) over an area of c. 8 hectares with processing and washing of material on site (closed loop water recycling system with associated silt storage lagoons 1,952.25m²), and all ancillary works and structures;
 - Site facilities consisting of mobile processing plant, portacabin site office (6.25m²), portacabin welfare facility (18.9m²), serviced portaloo toilet, bunded fuel storage and refuelling pad with hydrocarbon interceptor, weighbridge, wheelwash, water supply borehole, perimeter berms, vegetation planting and fencing;
 - Access to the site will be via the existing sand & gravel pit entrance;
 - Restoration of the site to agricultural lands; and
 - The proposed extraction operational period is for 10 years plus 1 year to complete restoration (total duration sought 11 years).

Scope of Work / EIA Scoping

- 6.5. This EIAR section is based on a desk study of the proposed development site / surrounding lands using published geological data, site photographs, a geotechnical assessment and site visits previously carried out by SLR.

Consultations / Consultees

- 6.6. Pre-application consultation was held with Laois County Council on 1st May 2024 as part of the preparation of the planning application.
- 6.7. The Geological Survey of Ireland (GSI) was consulted during the preparation of this EIAR Chapter and publicly available information from the GSI was reviewed also. The GSI consultation response is available in **Appendix 6-A**.

Authors

- 6.8. This EIAR Chapter relating to Land, Soils and Geology was prepared by:
- Nikolina Bozinovic - BSc, MSc (Engineering Geology and Hydrogeology) and Project Hydrogeologist with SLR Consulting Ireland; and
 - Peter Glanville - Professional Geologist (EurGeol. PGeo.) and Technical Director with SLR Consulting Ireland.

Regulatory Background

EU Directives

- 6.9. The following European Union (EU) Directives relate to Land, Soils and Geology at the proposed development site in this EIAR:
- Environmental Impact Assessment Directive (2014/52/EU); and
 - European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. 296 of 2018).
- 6.10. This chapter of the EIAR has been undertaken in accordance with the EU EIA Directive which regulates the environmental impact assessment process and information to be contained in EIARs.

Guidelines

- 6.11. This Land, Soils and Geology EIAR chapter has been prepared in compliance with the following guidelines:
- 6.12. Environmental Protection Agency Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. May 2022;
- European Commission, Environmental Impact Assessment of Projects - Guidance on the preparation of the environmental impact assessment report (Directive 2011/92/EU as amended by 2014/52/EU), Publications Office, 2017;
 - Department of Environment, Heritage and Local Government, 2004. Quarries and Ancillary Activities, Guidelines for Planning Authorities;
 - Environmental Protection Agency, 2006. Environmental Management in the Extractive Industry: Non-Scheduled Minerals;
 - 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;
 - Geological Survey of Ireland, Irish Concrete Federation (2008) Geological Heritage Guidelines for the Extractive Industry;
 - 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;

- Good Practice Guide for Handling of Soils (UK Ministry of Agriculture, Fisheries and Food, 2000); and
- Transport Infrastructure Ireland (March 2013). Specification for Road Works Series 600 – Earthworks.

Planning Policy and Development Control

- 6.13. This section sets out the Planning Policy and Development Control relating to Land, Soils and Geology of relevance to the proposed development in the Laois County Development Plan 2021-2027.
- 6.14. The County Development Plan sets out conservation objectives in relation to natural heritage and landscape, including geology, in the county. The GSI have recommended 33 designated County Geological Sites (CGS) in Laois, which are listed in the development plan.
- 6.15. The Natural Heritage Objectives in the Development Plan are designed to protect and enhance the natural heritage in a manner that is appropriate to its significance (**Objective GEO2**).
- 6.16. Section 9.6 of the Laois County Development Plan, in relation to the rural economy states that:
- 'Rural businesses and enterprises are an important source of local employment in the County. Many examples of fine rural businesses exist throughout the county. This includes agricultural, equine, engineering/manufacturing, recreational, tourism, energy/renewable energy, and rural resource-based enterprises.'*
- 6.17. Section 9.5 of the Laois County Development Plan covers mining and aggregate resources and the extractive industry. The plan recognises that mineral extraction is a valuable resource to the county in terms of construction, employment and revenue. However, these considerations must be balanced against the significant impacts quarrying can have in terms of environment, heritage and the landscape.
- 6.18. The current development plan contains objectives in relation to the extractive industry, and those relevant to this EIA topic are set out below:
- **RL 14** 'Support in principle the expansion of the aggregates and concrete products industry which offers opportunity for employment and economic development generally subject to environmental, traffic and planning considerations and ensure that any plan or project associated with extractive industry is subject to appropriate assessment screening in compliance with the Habitats Directive and subsequent assessment as required, applicants for planning permission shall have regard to the GSI-ICF Quarrying Guidelines';
 - **RL 15** 'To secure the long-term supply of value-added products (such as concrete products and asphalt, which are often, but not always, produced in conjunction with aggregate extraction';
 - **RL 16** 'To support the necessary role of the extractive industries in the delivery of building materials for infrastructural and other development and to recognize the need to develop extractive industries for the benefit of society and the economy';
 - **RL 17** 'Support in principle the processing of minerals to produce cement, bitumen or other products in the vicinity of the source of the aggregate, where the transport network is suitable to reduce trip generation';

Receiving Environment

Study Area

- 6.19. For the purposes of this assessment, the study area comprises the application site and predominantly focuses on the surrounding area up to 2 km; this is in line with the Institute of Geologists of Ireland's (IGI) guidelines (2013).
- 6.20. The IGI guidelines state that the minimum distance of 2 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. The IGI guidelines also state that maps should be sourced to allow for the review of any sensitive geological and hydrogeological conditions that exist beyond 2 km of the site boundary (from the outer limit of the planning and/or licence area) and presented at a scale of 1:25,000.
- 6.21. The baseline maps produced in this EIAR are at a scale of 1:25,000 and include an area up to c. 3.5 km from the lands under the control of the applicant, although the main focus of the study area extends up to 2 km as stated above.

Baseline Study Methodology

- 6.22. This section of the EIAR provides a description of the existing geological setting on both a local and regional scale, an assessment of the impact of the development on the geological features of the area and other geological aspects of the development.
- 6.23. The baseline study undertaken here for Land, Soils and Geology, involves a review of published literature and information, geotechnical assessment, borehole information, GSI consultation response and the findings from a walkover survey of the proposed development site. This baseline information was considered in the context of the existing site, proposals for it and the geological conditions of the surrounding study area.
- 6.24. This chapter describes the receiving environment at and in the immediate vicinity of the site using the available baseline information gathered, specifically the:
- Context of the receiving environment - location/ magnitude/ spatial extent and trends of the environmental factors;
 - Character of the receiving environment - distinguishing aspects of the environment being considered here;
 - Significance of the receiving environment - the quality, value or designation is assigned to the existing environment; and
 - Sensitivity of the receiving environment - how sensitive is the aspect of the environment to change.
- 6.25. This chapter was prepared by SLR Consulting Ireland with regard to the Guidelines on Geology in Environmental Impact Assessments issued by the Institute of Geologists of Ireland¹ and also the EPA guidelines².

¹ Guidelines for the Preparation of Soils, geology and Hydrogeology Chapters of Environmental Impact Statements

² Guidelines on the Information to be Contained in Environmental Impact Statements (2022).

- 6.26. The baseline study is a qualitative assessment of the available information based on professional experience and interpretation of the available quantitative data obtained through comprehensive fieldwork (see below).

Sources of Information

- 6.27. 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 soil and subsoil mapping for Irish Forestry Soils Project (www.epa.ie);
- Irish Soils Information System (www.teagasc.ie/soils);
- Environmental Protection Agency (<https://gis.epa.ie/EPAMaps/>);
- Irish Geological Heritage Programme (www.gsi.ie); and
- Tailte Éireann - Surveying (www.osi.ie).

Detailed Site Investigations

- 6.28. A number of investigations have been undertaken at the site to establish the geological conditions at the site and to prove the sand & gravel resource. The site investigations included:
- Geophysical site survey (Apex Geophysics Ltd., 2022);
 - A detailed geological investigation to establish the resource at the site (2023);
 - Borehole survey for the hydrogeological assessment (2023 and 2024); and
 - Inspection of the existing pit faces at the site.
- 6.29. A geological assessment of the site was undertaken in 2023 and this is described in this EIAR chapter, and a copy is included in **Appendix 6-B**.
- 6.30. Ten groundwater monitoring wells have been drilled at the site to provide information on the groundwater levels, refer to EIAR Chapter 7 - Water (Hydrology & Hydrogeology).
- 6.31. The exposures at the existing sand & gravel pit also provide information on the local soils and subsoils at the proposed development site (see **Appendix 6-C**).

Land Baseline

- 6.32. 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.
- 6.33. 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'.

- 6.34. 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. The current land use across the extension area is agricultural which has a beneficial aspect for society through grassland animal grazing.
- 6.35. Agricultural land use activities may be considered to be tied activities; tied to the resource present at the site while the type/nature of agricultural activity is also related to the suitability of the soils present.
- 6.36. The extraction of sand and gravel material at the proposed development site is a resource-tied land use activity, as it is dependent on the location and suitability of the sand and gravel material for its intended use, which are considered to be a natural resource.
- 6.37. The sand & gravel material is a mineral resource (non-scheduled mineral). The sand and gravel material resource at the site has been proven through the operation of the existing pit and the inspection and ground investigation surveys within the extension lands. This has included sampling and testing of the in-situ sand and gravel material.
- 6.38. The proposed development will result in a temporary loss of c. 8 ha of agricultural land across the proposed extension area. In terms of land take, the proposed development will result in a temporary use of the land for sand and gravel material extraction and a temporary loss of agricultural lands over the extension area. The soils at the site will be stripped and stored on site during the extraction of the sand and gravel material and will be used for the restoration of the site to return it to a beneficial agricultural after-use.

Land Cover

- 6.39. 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.
- 6.40. The Corine land cover mapping (www.epa.ie) reflects land use at the time of survey, in this case the latest available land cover data for Ireland is 2018. There is a mix of land cover types in the vicinity of the site as shown in **Figure 6-1** and includes the following land cover types:
- Agricultural pasture;
 - Transitional woodland-shrub;
 - Forested land (Coniferous forest);
 - Peat bogs; and
 - Broad leaved forests.

Soils Baseline

- 6.41. 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.
- 6.42. 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.

- 6.43. 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

- 6.44. The Irish Soil Information System (ISIS) project was undertaken by the EPA and Teagasc, and has gathered together existing information and data from soil survey work in Ireland, which has been augmented with new field data, leading to the production of a new national soil map at a scale of 1:250,000 (www.teagasc.ie/soils).
- 6.45. The ISIS 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, with different environmental and agronomic responses. For each soil type, the properties have been recorded in a database maintained by Teagasc.
- 6.46. The soil association at the proposed development site is classified as the Clonegall Series (ISIS Code 0920CG); it is described as Coarse loamy drift with siliceous stones, see **Figure 6-2**. The soil combination is considered to be well draining.
- 6.47. The Clonegall association belongs to the Gleyic Brown Podzolic subgroup. It is shallow, well-draining and widespread within the study zone, covering c. 50% of study zone.

Site Soils

- 6.48. The soils at the site are mapped and described under the Teagasc Irish Forestry Soils (IFS) study as being predominantly shallow well drained mineral soils, which are derived from non-calcareous parent material (IFS code AminSW). The soils at the site have formed on sand and gravel materials and are referred to as Lithosols.
- 6.49. There is a small area of till derived chiefly from Devonian soils along the south and western edge of the site and within the red line application area. The till soils are derived from mainly non-calcareous parent materials (IFS code AminDW). Till soils are classified as deep and well drained mineral (Mainly acidic).
- 6.50. Soil thickness varies across the proposed development site, from 0.1m - 0.6m of topsoil overlying a variable thickness of subsoil.
- 6.51. Borehole drilling for groundwater monitoring has confirmed the presence of sand and gravel material to depths of up to c. 24m below ground level.
- 6.52. The use of the soils is limited due to their free draining nature as they quickly dry out and the grass or crop production is poor, particularly during summer months (Gardiner and Ryan, 1964³). The agricultural land use in the proposed extension area and in the vicinity of the site is primarily agriculturally improved grassland, used for grazing.

Subsoils Baseline

National Subsoils

- 6.53. The subsoils (Quaternary deposits) were deposited during the last 2 million years. The two principal types of quaternary subsoils in Ireland are glacial till, deposited at the base of ice sheets, and sand and gravel deposits associated with the melting of the ice sheets, and are generally termed glaciofluvial outwash sands and gravels. Other extensive quaternary

³ Gardiner, M.J., & Ryan, P. (1964) Soils of County Wexford; National Soil Survey of Ireland. An Foras Taluntais, Dublin)

subsoils in Ireland include peat and river alluvium. Most Quaternary deposits in Ireland were deposited since the maximum of the last glaciation, the Midlandian, which occurred approximately 17,000 years ago.

- 6.54. 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 at a national basis using existing Quaternary Geology maps, publications, remote sensing and field mapping and sampling.
- 6.55. Distribution of subsoils in the study area is uniformed and presented as principally Devonian Sandstones occurring in form of till or gravels.

Site Subsoils

- 6.56. Subsoils in the proposed development site have been mapped under the IFS project as glacial till material and gravels derived from lower Devonian sandstones see **Figure 6-3**.
- 6.57. Three cable percussive boreholes encountered silt/clay at depths ranging from 10.5 to 21.5 m below ground level (bgl). The silt continued to the bottom of each borehole, reaching depths of 11.5 m bgl in BH01, 12 m bgl in BH03, and 23 m bgl in BH02 (refer to EIAR Chapter 7 – **Figure 7-1** for locations).

Bedrock Geology Baseline

Regional Setting

- 6.58. The Geological Heritage of County Laois Report (GSI, 2016), states that the landscape of Co. Laois is mainly low-lying with ancient Silurian rocks in the Slieve Bloom Mountains to the northwest and younger Carboniferous rocks in the Castlecomer Plateau to the southeast. The central lowlands consist of fossil-rich grey limestones, while the southeastern low hills feature Carboniferous sandstones, mudstones, and thin coal seams, with glacial till spread across the lowlands from the last Ice Age.
- 6.59. Regionally, the proposed site lies in the Upper Devonian sandstones of middle Ireland.
- 6.60. The lands at Mounthall are underlain by Upper Palaeozoic Devonian pale and red sandstone, grit and claystone from the Cadamstown Formation, see **Figure 6-4**.
- 6.61. There are no bedrock exposures at the site, the closest bedrock outcrop of Cadamstown Formation in study area is encountered approximately 500m in a northeast direction from the northern application boundary. It is not proposed to extract or blast any bedrock at the site as part of this planning application.

Local Geology

- 6.62. An assessment of the local geology at the site has been undertaken here based on review of GSI mapping, existing exposures at the site, walkover surveys of the site, and geological assessment also undertaken at the site.
- 6.63. Geological Survey of Ireland (GSI) 1:100,000 mapping shows the proposed development site is primarily underlain by the Cadamstown Formation, comprising pale and red sandstone, grit and claystone, see **Figure 6-4**.
- 6.64. Bedrock lies beneath substantial layers of soil, sand and gravel, with minimal exposure in close proximity to the site. Although no outcrops are documented within the proposed development site, there are sporadic occurrences of small outcrops, principally within the Capard Formation, to the north in the study area.

- 6.65. Geophysical site investigations from 2022 have identified the bedrock by the seismic data, within the application site, at depths ranging from 3m to 25m bgl, depending on location and topography and generally corresponding to between 170m and 225m AOD.
- 6.66. Two groundwater monitoring wells drilled in 2024 encountered bedrock; BH10 at 7.5m bgl and BH07 at 5.7m bgl at the site.
- 6.67. BH04 and BH05 drilled in 2023 reached the bedrock at 7.5 m bgl and 9.3 m bgl respectively.
- 6.68. Boreholes drilled in 2023 (BH01, BH02 and BH03) and 2024 (BH6, BH8 and BH9) were terminated before reaching bedrock, at various depths ranging from 11.5m to 25.3m bgl.

Geological Structure

- 6.69. The Cadamstown Formation sequence sits above the Silurian sediments, and their interface, extending from southwest to northeast, is found roughly 400m north of the northern application boundary. This contact, referred to as an 'unconformity,' results from a period of erosion or a pause in sedimentation, succeeded by the deposition of fresh sediments, see **Figure 6-4**.

Karstification

- 6.70. Karst does not occur in the Devonian sandstone rock types at the site or in the study area.

Site Investigations

Geophysical Investigations (2022)

- 6.71. APEX Geophysics Limited were commissioned by Breedon Ireland to conduct a geophysical survey at the site, with the aim of assessing the potential sand and gravel material on the site. The geophysical investigation sought to gather data on the sand and gravel thickness, overburden thickness and the depth to bedrock.
- 6.72. The survey took place on the 7th, 8th and 14th of July 2022, involving the collection of EM conductivity readings, ten Electrical Resistivity Tomography (ERT) profiles, and three seismic refraction profiles. For interpretation purposes, the site was divided into three zones. A copy of the geophysical survey report is included in **Appendix 6-D**.
- 6.73. The three zones at the site are:
- Zone A, covering over 5.4 ha in the east of the site;
 - Zone B, covering over 8.1 ha in the west of the site; and
 - Zone C, covering over 5.3 ha in the north of the site.
- 6.74. The geophysical data has outlined a potential resource of 'clean' SAND/GRAVEL underlined by silty SAND/GRAVEL in Zone A, with an average interpreted thickness of 11m. In Zone B, the main interpretation suggests an average thickness of 5m of silty SAND/GRAVEL, while Zone C exhibits an average interpreted thickness of 6m, primarily consisting of 'clean' SAND/GRAVEL. Summary details of the survey findings are presented in **Table 6-1** below.

Table 6-1: Summary of geophysical site investigation findings (Apex Geophysics, 2022)

No.	Item	Zone A	Zone B	Zone C
1	Material	SAND/GRAVEL and silty SAND GRAVEL	Silty SAND /GRAVEL	SAND/GRAVEL and silty SAND GRAVEL
2	Area (ha)	c. 5.4	c. 8.1	c. 5.3

No.	Item	Zone A	Zone B	Zone C
3	Topsoil thickness (m)	c. 1	c.1	c. 1
4	Depth to bedrock (m bgl)	Bedrock encountered ranged from 3-25	In range of depth from 3-25	The shallowest area encountered in range from 3-25
5	Average thickness of SAND/GRAVEL in meters (0.7 correction applied) *	c. 11	c. 5	c. 6

*The estimated thickness shown on the ERT profiles have been multiplied by a calibration factor of 0.7 (this is due to the over estimation of the thickness of the high resistivity materials, which is an artifact of resistivity data processing software), see **Appendix 6-D**.

- 6.75. The estimates are based on interpreted geophysical data and average heights from the topographic data acquired as part of geophysical investigation.
- 6.76. In summary, the main potential resource is located in Zone A with 'clean' SAND/GRAVEL and silty SAND/GRAVEL; Zones B & C are characterised by mainly 'silty' SAND/GRAVEL.
- 6.77. The Apex report stated that based on investigation findings, it recommended to conduct further confirmatory investigations by trial pitting with samples taken for Particle Size Distribution (PSD) analysis and chemical, physical and mechanical test together with a topographic survey.

Geological Assessment (2023)

- 6.78. SLR were requested by Breedon Ireland to conduct an evaluation of the underlying geology of the Mounthall and Cummer lands in Camross, Co. Laois. The purpose of the evaluation was to explore the potential sand and gravel resources on the site. The evaluation included a desk-based study, on-site inspection, trial pit excavations, borehole drilling and the physical testing of samples.
- 6.79. In February 2023, SLR conducted a comprehensive ground investigation at the site to assess the underlying superficial geology and identify potential sand and gravel deposits suitable for extraction.
- 6.80. A total of 13 trial pits were excavated, logged and photographed, with representative bulk samples taken from nine pits for testing.
- 6.81. Three cable percussive boreholes were drilled to obtain samples and ascertain the base of the deposit. Details of the trial pits and boreholes are included in **Appendix 6-B**.
- 6.82. Subsequently, a total of 20 no. bulk samples were selected to be representative of the main lithologies and sent to Irish Drilling, Loughrea, Co. Galway for particle size distribution analysis (PSD).
- 6.83. Sand and gravel deposits were encountered in both, the boreholes and trial pits across the area. The thickness of these deposits varied, ranging from 2.3m in trial pit TP01, situated in the existing worked pit, to 21m in borehole BH02, located in the centre of the proposed extraction area.
- 6.84. These deposits are characterized by two main types of strata. Firstly, there is predominantly a yellow/brown slightly silty gravelly SAND, with fines content varying between 5.3% and 29.6%, averaging at 14.3%. Excluding outlier results, the average fines content for this sand is 11%. The second main strata consists of yellow/brown silty very sandy GRAVEL, with fines content ranging from 3.7% to 13.3%, averaging at 7%.

- 6.85. Neither the trial pits nor boreholes reached the bedrock. A firm to stiff red / brown slightly sandy slightly gravelly SILT/CLAY is encountered at the base of the deposit. This was recorded in each of the boreholes and in the trial pit in the existing sand and gravel pit (TP01).
- 6.86. The summary details of trial pits and boreholes are presented in **Appendix 6-B** together with Geological Assessment report.

Borehole Information

- 6.87. Ten groundwater monitoring wells were installed at the site during February and December 2023, and February 2024. The locations of the boreholes are shown in **Figure 7-1** from Chapter 7 Water (Hydrology & Hydrogeology).
- 6.88. The depth of boreholes ranges from 4m to 25.3m bgl. The bedrock was encountered at four boreholes in total; in two boreholes drilled in 2023 (BH04 and BH05), as well as in two boreholes drilled in 2024 (BH07 and BH10). The depth to bedrock ranges from 5.7m bgl at BH07 (2024) to 9.3m bgl at BH04 (2023).
- 6.89. All boreholes have intersected sand and gravel material in various thickness ranging from 2.4m to 23.3m. Details of drilled boreholes are presented in **Table 6-2** below.

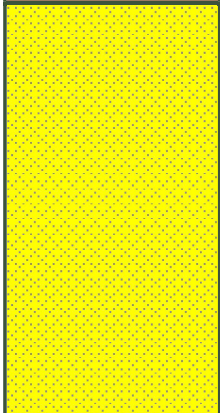
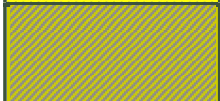
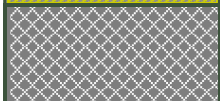
Table 6-2: Summary of site groundwater monitoring boreholes (2023 and 2024)

BH ID	BH Date	ITM Coordinates	BH Depth (m bgl)	GW Depth (m bgl)	Depth to bedrock (m bgl)	Sand/Gravel Interval (m)	Sand/Gravel Interval (m bgl)
BH01	02/2023	E:626572 N:698132	11.5	-	-	10.1	0.4 - 10.5
BH02	02/2023	E:626760 N:698136	23	-	-	21	0.5 - 21.5
BH03	02/2023	E:626760 N:698136	12	-	-	10.5	0 - 10.5
BH04	12/2023	E:626601 N:698335	25	6 and 20	9.3	7.2	0.2 - 7.4
BH05	12/2023	E:626461 N:698022	15	9.5	7.5	7.3	0.2 - 7.5
BH06	02/2024	E:626537 N:698138	4	2.2	-	2.4	0.6 - 3
BH07	02/2024	E:626537 N:698138	6.2	3	5.7	4.2	1.2 - 5.4
BH08	02/2024	E:626719 N:698125	24.2	20.9	-	18.6	5.0 - 23.6
BH09	02/2024	E:626719 N:698125	25.3	23	-	23.3	0.7 - 24
BH10	02/2024	E:626537 N:698138	7.8	-	7.8	6.1	0.8 - 6.9

Geological Profile

6.90. Based on the information from the review of published geological information, site inspections, and the installation of the groundwater wells, the summarised geological profile at the site is presented on the **Diagram 6-1** below.

Diagram 6-1: Schematic Geological profile at the site

	TOPSOIL (up to 1 m thickness)
	SAND/GRAVEL (varying in thickness, up to 23 m)
	SILT/CLAY (confirmed at base of SAND/GRAVEL deposits)
	BEDROCK (varying in depth, from 3 – 25 m bgl)

Geological Heritage

- 6.91. The Geological Survey of Ireland (GSI) Irish Geological Heritage (IGH) Programme has identified geological heritage sites in Ireland. The IGH programme has not identified any geological heritage sites at or within the study area of the proposed development at Mounthall (www.gsi.ie).
- 6.92. There are no County Geological Heritage sites in the immediate vicinity of the site at Mounthall in the Laois County Development Plan (2021-2027).
- 6.93. The closest designated IGH site is the Baunreagh Quarry, located approximately 5 km to the northeast of the site and is designated under IGH4 Cambrian-Silurian.
- 6.94. The proposed development will provide additional exposures of the outwash sand and gravel material deposits in the Mounthall area, for the geological record.

GSI Consultation Response

- 6.95. In response to SLR letter dated 4th April 2024 regarding the proposed sand and gravel pit extension development, the GSI recommended utilising and referencing their publicly available datasets for the environmental assessment and planning process, see **Appendix 6-A**.
- 6.96. This chapter addresses the relevant datasets recommended by the GSI pertaining to land, soils, and geology.

6.97. Regarding this chapter, the GSI response stated that the audit for Co. Laois, conducted in 2016, found no CGSs near the proposed sand and gravel pit extension. Geological Survey Ireland requests that the operator assist with geological heritage goals by:

- Allowing scientists access to quarry faces during operations to study new stratigraphies and assess the site's post-extraction significance; and
- Leaving a representative section of the pit face or including information panels for public education and tourism if appropriate, to enhance geological knowledge.

6.98. These actions can be included in the restoration plan as planning conditions if deemed appropriate.

6.99. The GSI has also advised regarding review of GSI database for geohazards, geological mapping, groundwater, geophysical data, geochemistry of soils, surface waters and sediments and relevant guidelines, details in **Appendix 6-A**.

Sensitive Receptors

6.100. In terms of the land, soils and geology baseline considered here, the sensitive receptors identified from this baseline are:

- land for agricultural use; and
- agricultural soils.

Impact Assessment

Evaluation Methodology

6.101. The evaluation of impacts of the proposed development is based on a methodology similar to that outlined in the 'Guidelines for the Assessment of Geology, Hydrology and Hydrogeology for National Road Schemes' published by the National Roads Authority (2009) and the Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements published by the IGI (2013).

Evaluation of Impacts

6.102. This assessment therefore will focus on the potential impact of the proposed sand and gravel pit development at the site.

6.103. The proposed development comprising sand and gravel material extraction will result in the direct loss of agricultural land within the extraction area. On cessation of the extraction activities the site will be restored to agricultural use, refer to EIAR Chapter 2 **Figure 2-6** for details of the proposed restoration plan.

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

Table 6-3: Status & Importance: Land, Soil & Geology attributes

Attribute	Status / Occurrence	Importance
Land	The land at the existing development has been used for sand & gravel extraction.	The sand & gravel material is of high importance at a regional level for its aggregates.

Attribute	Status / Occurrence	Importance
	The land at the proposed extension is currently used for agriculture. The land is well drained.	Agricultural land has a value in terms of its ability to support agriculture and it is considered to be of high importance at a local scale.
Soils	The soils at the site are well drained. The Clonegall Series Association has a relatively wide distribution across the county and therefore is not unique or specific to this site.	The soils are considered to be of moderate importance at a local scale as they are well drained but limited by their shallow nature.
Subsoils	The subsoils are till and sand & gravels derived from lower Devonian sandstones. The subsoils do not have any particular status.	The subsoils at the site are considered to be of moderate importance at a local scale as they facilitate the development of well-draining soils and can provide for sand & gravel extraction.
Geology	The bedrock at the site does not have any particular status.	In terms of the proposed development, the bedrock geology is of low economic importance at the local scale. Bedrock material will not be extracted as part of the proposed development.
Geological Heritage	There is no County Geological Site or Geological Heritage site identified in development or within the wider surroundings.	The closest designated IGH site is c. 5 km from the development site, therefore of low importance in relation to the proposed development.

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

Table 6-4: Magnitude of potential impacts on Land, Soil and Geology (with no mitigation)

Attribute	Impact of Proposal on Land, Soil and Geology	Magnitude of Potential Impact (with No Mitigation)
Land	Development of land for the purposes of sand & gravel extraction.	Moderate and site-specific impact due to permanent loss of the sand & gravel resource within the extraction area.
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.
Subsoils	Permanent loss of sand & gravel subsoil material from extraction.	Negative and permanent at the site as the material will be removed during the operation of the proposed development.
Geology	No impact as bedrock will not be extracted at the site.	No impact.
Geological Heritage	No impact as quarrying activities will have no effect on the geomorphological features at the closest IGH designated site.	No impact.

Direct Impacts

- 6.106. The nature of the development will entail the stripping and storage of soil material and the excavation of the underlying sand and gravel material within the proposed extraction area.
- 6.107. There will be a direct impact on the overlying soil which will occur during the stripping and placement of soils to expose the underlying sand and gravel material.
- 6.108. The direct impact on the soils will be medium term during the lifetime of the project as the soils will be reused in restoration. The effect on the soils, without mitigation, will be significant as the structure and nature of the soils could be degraded.
- 6.109. A direct impact will occur from the removal of the existing in situ sand and gravel material deposits within the extraction area. This impact will be negative and permanent at the site as the material will be removed during the operation of the sand & gravel pit. However, this localised site specific impact has to be balanced against the strategic national importance of the pit as a long-term secure supply of high quality sand and gravel material products are required in supporting construction and economic development.
- 6.110. The proposed development will not impact on bedrock geology.

Indirect Impacts

- 6.111. The development will not have an indirect impact on the geological aspects of the environment outside the footprint of the proposed sand and gravel pit.
- 6.112. Soils in adjoining lands will not be contaminated as a result of this proposal. The working (extraction and processing) of sand and gravel material at the site will not release any contaminants onto the lands and any dust resulting from the development can be controlled (refer to EIAR Chapter 8 - Air Quality).
- 6.113. The proposed development will not lead to any indirect impacts on bedrock geology.

Cumulative Impacts

- 6.114. A planning search and review of available aerial photograph imagery has been undertaken within a 5 km radius of the site.
- 6.115. The search and review indicates a small sand & gravel pit approximately 1.2 km southwest of the site at Srahanboy townland.
- 6.116. There is an existing sand & gravel pit at Coolrain, located approximately 4 km south of the site.
- 6.117. Given that there are no pits adjacent to the site and the small nature of the sand and gravel pit located to the southwest at Srahanboy, it is not considered that there is the potential for cumulative impacts on the soils and geology of the receiving environment as a result of the proposed development.

Unplanned Events

- 6.118. Unplanned events within the application site, such as accidents, have the potential to impact on the land, soils and geology adjoining the site.
- 6.119. Ground instability, particularly the long-term stability of the pit faces, has the potential to impact on adjoining lands. The proposed development 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 eliminate the potential for unplanned events such as instability of pit faces or instability in adjacent lands.

- 6.120. With the implementation of the SHWW Quarry Regulations 2008, it is considered extremely unlikely that instability of pit faces would result in an impact on the land, soils and geology at the proposed development site or on adjacent lands outside the application area.

Human Health

- 6.121. From a land, soils and geology perspective, any potential impacts on human health from the proposed development 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.

Interaction with Other Impacts

- 6.122. The interaction between soils / geology and water is addressed in EIAR Chapter 7 Water (Hydrology & Hydrogeology).

'Do-nothing Scenario'

- 6.123. In a "do nothing scenario", the proposed extraction and land restoration activities would not proceed at the application site. The existing permitted sand and gravel pit would remain in its current state and the proposed extension area would not progress leaving the mineral resource unused and remaining in-situ at the site. The local supply of quality aggregates would not be augmented and would become increasingly restricted. The agricultural pastoral use would continue in the rest of the application site. This would result in no significant adverse impact in relation to land, soil and geology.
- 6.124. The site would not be used to maximum advantage and the opportunity would be missed to obtain high quality and desirable sand and gravel from a proven resource.

Mitigation Measures

- 6.125. Mitigation measures are outlined below for the proposed development.

Construction Stage

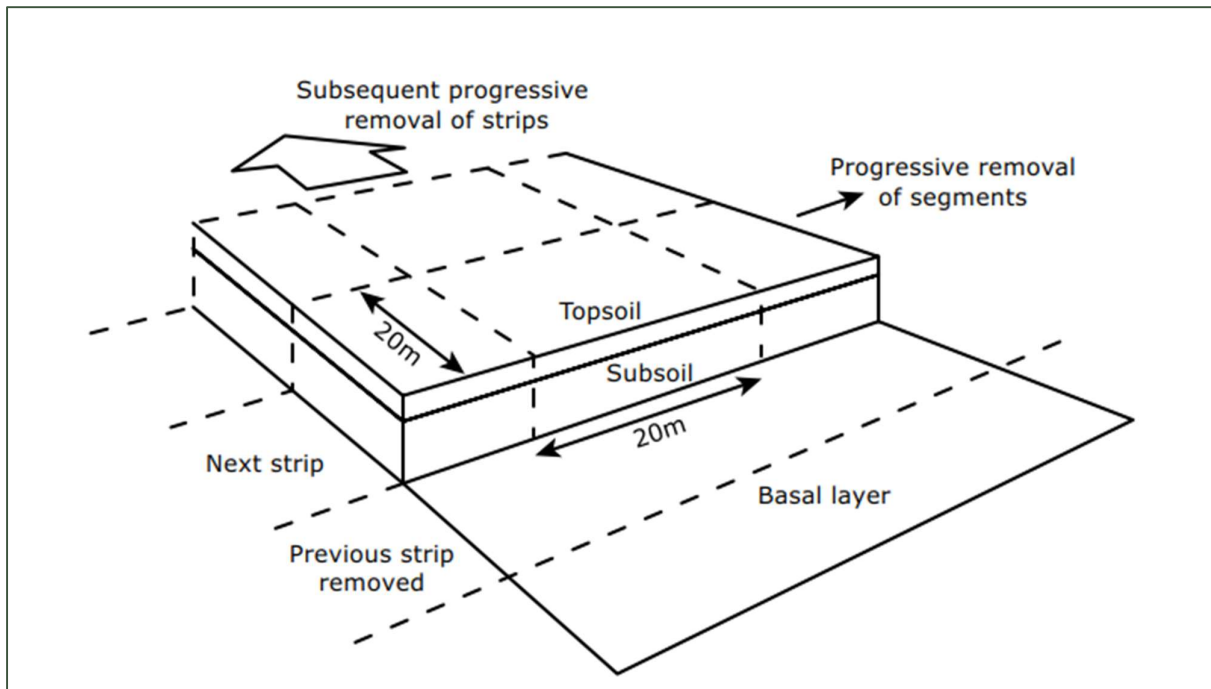
Soils

- 6.126. Soils will be managed on site in line with best practice. A specific Soil Management Plan will be developed for the site for the stripping, storage and reuse of the soils in restoration at the site.
- 6.127. 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 guidelines⁴.
- 6.128. 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.

⁴ The Institute of Quarrying Good Practice Guide for Handling Soils in Mineral Workings, 2021.

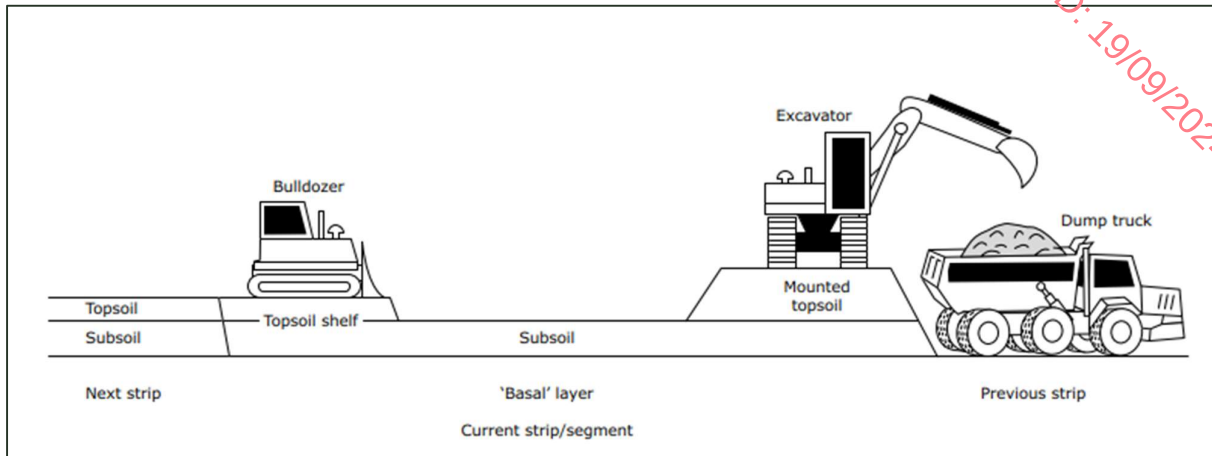
- 6.129. The scheme will involve soil stripping across the proposed extension area. The soil stripping and storage operations will be undertaken in such a manner so as to minimise soil compaction.
- 6.130. In order to limit the effects of erosion and deterioration on the soil, material will not be removed 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.
- 6.131. Initial soils stripped will be stored in screening berms along the northern and eastern boundaries of the proposed extraction area 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.
- 6.132. 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.
- 6.133. 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 6-2** and **Diagram 6-3** below).

Diagram 6-2: Soil stripping using modified layer by layer practice (The Institute of Quarrying, 2021)⁵



⁵ <https://f.hubspotusercontent30.net/hubfs/885685/Soils%20Guidance/IQ%20Soil%20Guidance%20Sheet%20I.pdf>

Diagram 6-3: Topsoil stripping using modified layer by layer practice (The Institute of Quarrying, 2021)⁶



- 6.134. 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.
- 6.135. 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.

Subsoils

- 6.136. Sand and gravel material will be extracted, processed and used for aggregates locally and regionally.

Geology

- 6.137. It is not proposed to extract bedrock as part of this development at Mounthall and, therefore, no mitigation measures are required. There will be no effect on the geology during construction.

Geological Heritage

- 6.138. There will be no effect on geological heritage arising from the proposed development.

Operational Stage

- 6.139. The design of the extraction area has provided suitable set-back distances to adjoining land boundaries and the final pit slopes during the operational and post-operational stages are designed to ensure long term stability.
- 6.140. Operations at the proposed development site will comply with the Health and Safety Authority Safe Quarry Guidelines in relation to the Safety Health and Welfare at Work (Quarries) Regulations 2008 to ensure stability of the adjoining lands.

⁶ <https://f.hubspotusercontent30.net/hubfs/885685/Soils%20Guidance/IQ%20Soil%20Guidance%20Sheet%20I.pdf>

- 6.141. No mitigation measures are required for geology or geological heritage during the operational stage.

Post-Operational Stage (Final Restoration)

- 6.142. On cessation of extraction the land within the extraction area will be restored to agricultural use. The final restored pit slopes are designed to ensure long-term stability.
- 6.143. No mitigation measures are required for geology or geological heritage during the post-operational stage.

Residual Impacts

- 6.144. The residual impacts on land, soil and geology are those impacts which remain following the implementation of the mitigation measures outlined above.
- 6.145. 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.
- 6.146. The stripped soils at the proposed development will be used in the restoration of the site to agricultural use. With this mitigation measure in place, it is considered that the residual impact on soils will be low to imperceptible.
- 6.147. The design of the extraction scheme (boundary set-back distance and final pit slopes) together with the operation of the pit will be in line with the Health and Safety Authority Safe Quarry Guidelines in relation to the Safety Health and Welfare at Work (Quarries) Regulations 2008 and will eliminate the potential for unplanned events such as instability of pit face or instability in adjacent lands. Therefore, it is considered that the residual impact of the proposed development on land stability will be negligible.

Monitoring

- 6.148. The restoration works will be managed and monitored during the one-year proposed final restoration period to ensure that the restored soils and land use is successful and to confirm that the restored final pit faces are stable, refer to EIAR Chapter 2 - Project Description.

References

Geological Survey of Ireland (2007), 1:100,000 *Bedrock Geology of Ireland* (Digital-Map).

Institute of Geologists of Ireland (2013), *Geology in Environmental Impact Statements*.

Teagasc (2004), Ireland Subsoil Parent Materials Map (digital version).

Teagasc (2007), Ireland Soils Map (digital version).

Creamer, R. & O'Sullivan, L., (2018) The Soils of Ireland

EPA Report No. 130 (2014), Irish Soil Information System Synthesis Report.

EPA (2008), Irish Soil Information System Final Technical Report 10.

Geological Survey of Ireland Bedrock Geology Sheet 15 (1:100,000).

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

National Roads Authority (2006) A Guide to Landscape Treatments for National Road Schemes in Ireland.

Transport Infrastructure Ireland (March 2013). Specification for Road Works Series 600 - Earthworks.

Laois County Development Plan 2021 - 2027.

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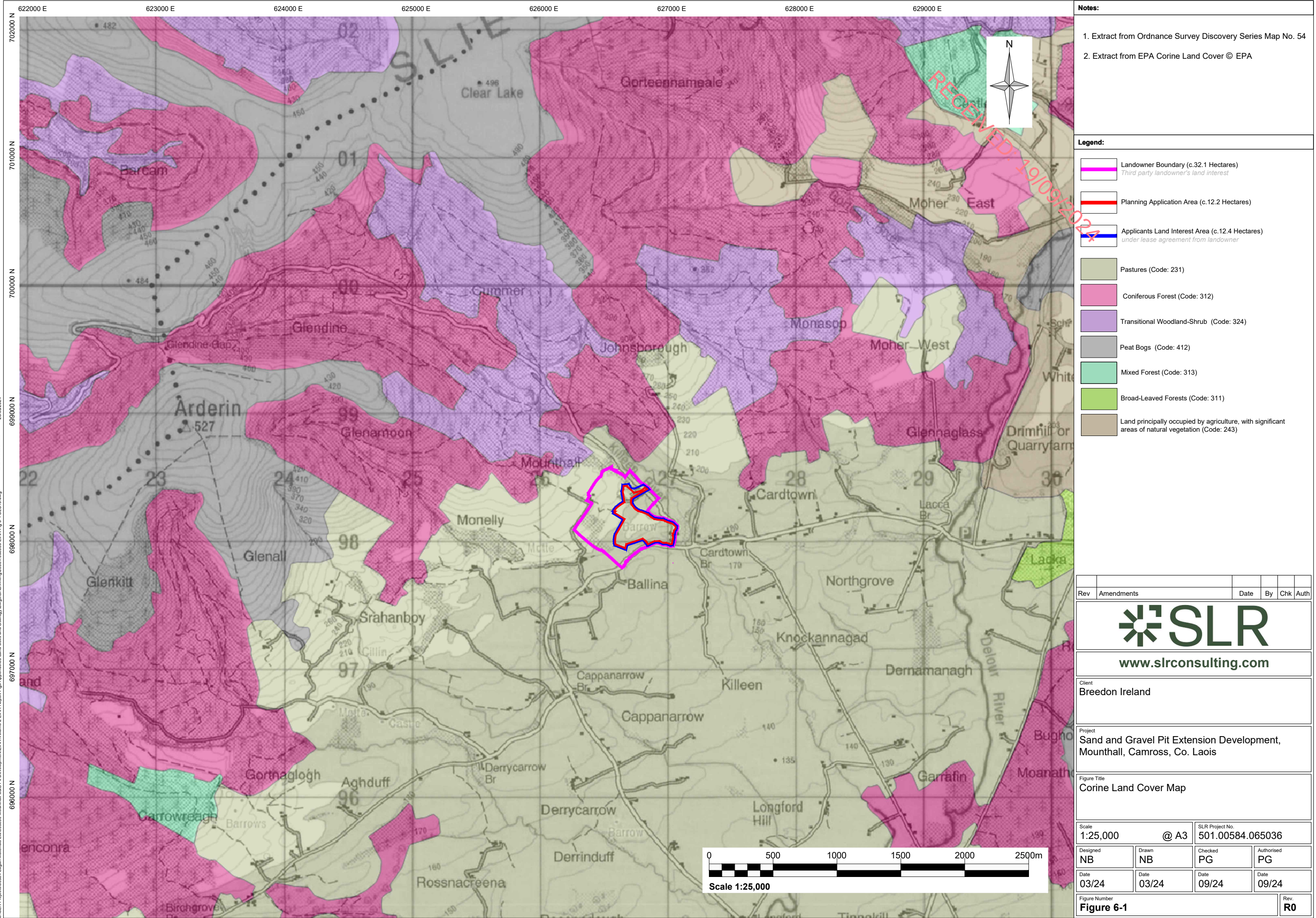
Figures

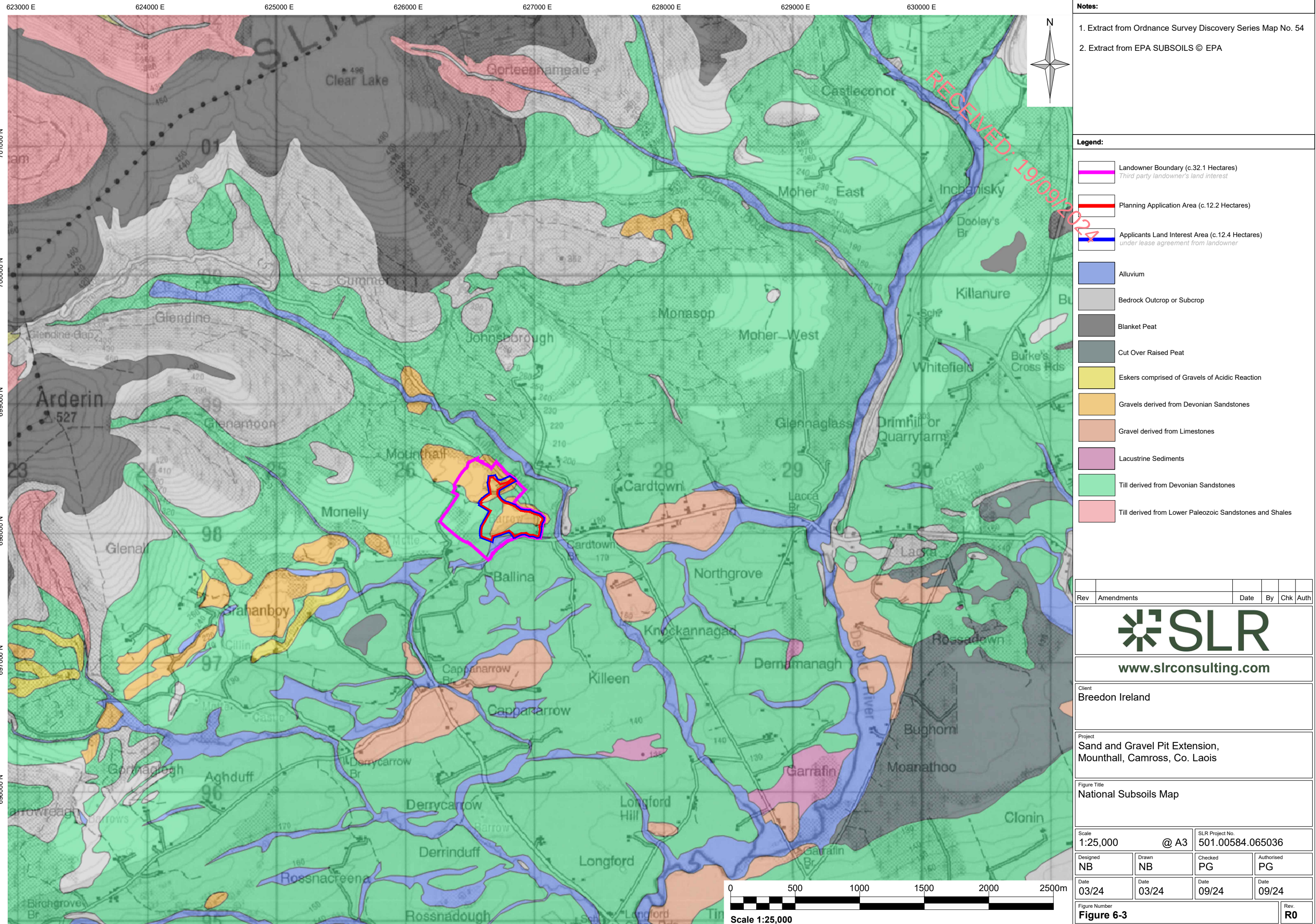
Figure 6-1: Land Cover Map (1:25,000)

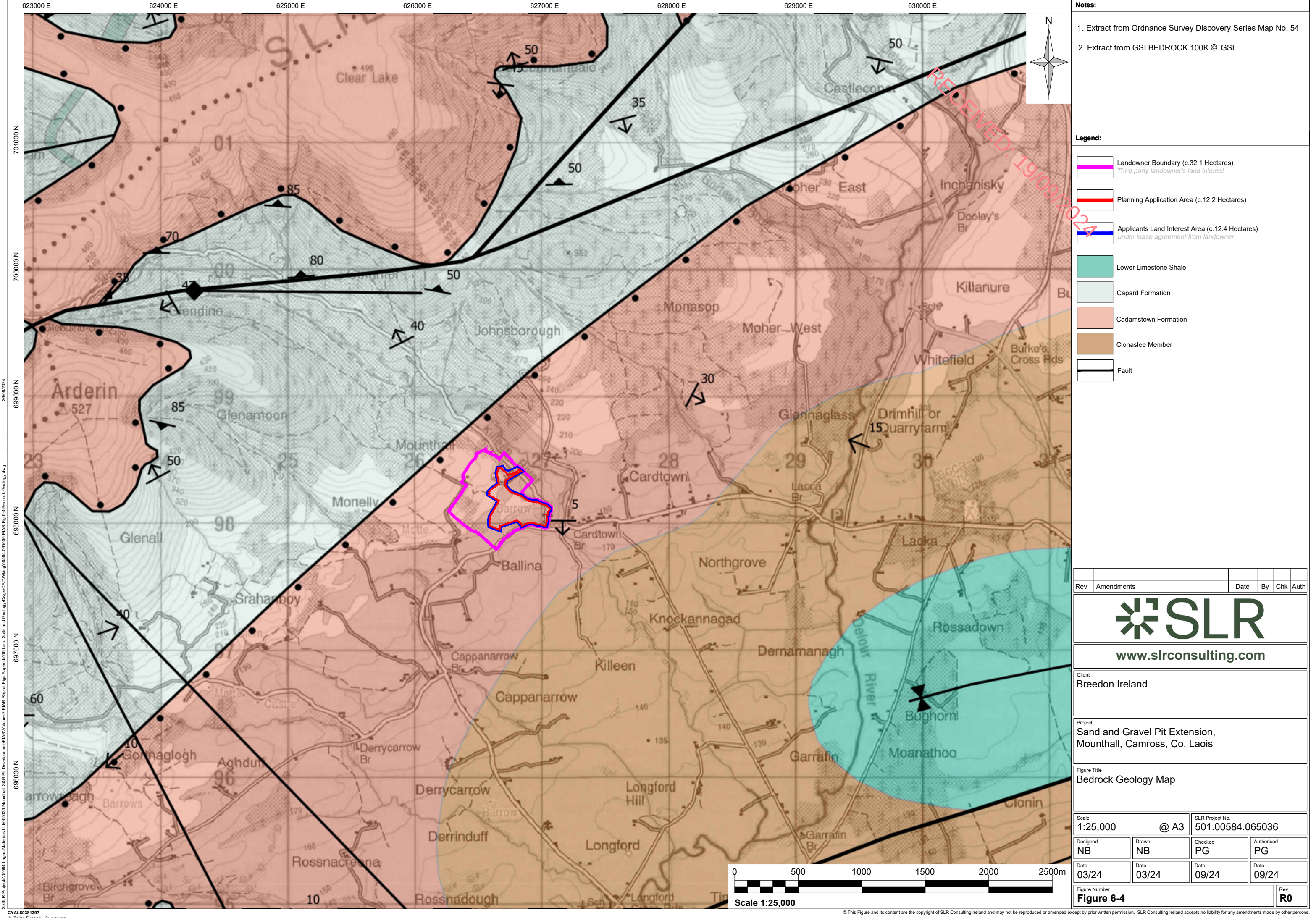
Figure 6-2: National Soils Map (1:25,000)

Figure 6-3: National Subsoils Map (1:25,000)

Figure 6-4: Bedrock Geology Map (1:25,000)







RECEIVED: 19/09/2024

Appendices

Appendix 6-A: GSI Consultation Response



RECEIVED: 19/05/2024
07 May 2024

Shane McDermott
SLR Consulting Ireland
7 Dundrum Business Park
Windy Arbour
Dublin, D14 N2Y7

Re: Proposed Sand & Gravel Extension Development at Mounthall, Camross, Co. Laois
Your Ref: 501.065036.00001
Our Ref: 24/119

Dear Shane,

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 gather various data for that purpose. Please see our [website](#) for data availability. We recommend using these various data sets, when conducting the EIAR, SEA, planning and scoping processes. Use of our data or maps should be attributed correctly to '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 is 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 this data is a baseline or starting point for further site-specific assessments.

With reference to your letter received on the 04 April 2024, concerning the proposed Sand & Gravel Extension Development at Mounthall, Camross, Co. Laois, Geological Survey Ireland would encourage use of and reference to our datasets. Please find attached a list of our publicly available datasets that may be useful to the environmental assessment and planning process. We recommend that you review this list and refer to any datasets you consider relevant to your assessment. The remainder of this letter and following sections provide more detail on some of these datasets.

Geoheritage

A national inventory of geoheritage sites known as County Geological Sites (CGSs) is managed by the Geoheritage Programme of Geological Survey Ireland. CGSs, as adopted under the National Heritage Plan, include sites that are of national importance which have been selected as the very best examples for NHA (Natural Heritage Areas) designation. NHA designation will be completed in partnership with the National Parks and Wildlife Service (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. Laois was carried out in 2016. The full report details can be found [here](#). **Our records show that there are no CGSs in the vicinity of the proposed sand & gravel pit extension.**

Geological Survey Ireland 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 interesting new stratigraphies / relationships as they might become exposed and to establish if the sand and gravel pit is worthy of recognition post extraction and through aftercare/restoration planning.
2. If deemed appropriate in (1) above, leaving a representative section of the sand & gravel pit 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.



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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.

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 Groundwater Data Viewer indicates an aquifer classed as a 'Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones' underlies the proposed development. The Groundwater Vulnerability map indicates the area covered is classed as 'Moderate' to 'High' Vulnerability.

[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](#).

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 Groundwater Protection Response overview and link to the main reports is here:** <https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/default.aspx>

Geological Mapping

Geological Survey Ireland maintains online datasets of bedrock and subsoils geological mapping that are reliable and accessible. We would encourage you to use these data which can be found [here](#), in your future assessments.

Please note we have recently launched QGIS compatible bedrock (100K) and Quaternary geology map data, with instructional manuals and videos. This makes our data more accessible to general public and external stakeholders. QGIS compatible data can be found in our downloadable bedrock 100k .zip file on the [Data & Maps](#) section of our website.

Geohazards

Geohazards can cause widespread damage to landscapes, wildlife, human property and human life. In Ireland, landslides, flooding and coastal erosion are the most prevalent of these hazards. We recommend that geohazards be taken into consideration, especially when developing areas where these risks are prevalent, and we encourage the use of our data when doing so.

Landslides are common in areas of peat, rock near surface and in fine to coarse range materials (such as glacial tills), areas which are found close to the proposed sand & gravel pit extension. Geological Survey Ireland has information available on landslides in Ireland via the National Landslide Database and Landslide Susceptibility Map both of which are available for viewing on our dedicated [Map Viewer](#). Associated guidance documentation relating to the National Landslide Susceptibility Map is also available.

Geological Survey Ireland also engaged in a national project on Groundwater Flooding. The data from this project may be useful in relation to Flood Risk Assessment (FRA) and management plans, and is described in more detail under 'Groundwater' above.



RECEIVED 10/01/24

Geochemistry of soils, surface waters and sediments

Geological Survey Ireland provides baseline geochemistry data for Ireland as part of the Tellus programme. Baseline geochemistry data can be used to assess the chemical status of soil and water at a regional scale and to support the assessment of existing or potential impacts of human activity on environmental chemical quality. Tellus is a national-scale mapping programme which provides multi-element data for shallow soil, stream sediment and stream water in Ireland. At present, mapping consists of the border, western and midland regions. Data is available at <https://www.gsi.ie/en-ie/data-and-maps/Pages/Geochemistry.aspx>.

Geophysical data

Geological Survey Ireland produces high-resolution geophysical data (Magnetic field, electrical conductivity, natural gamma-ray radiation) of soils & rocks as part of the [Tellus programme](#). These data currently cover approximately 75% of the country and provide supporting geological information on a regional scale useful for assessing environmental impact and risk. [Tellus programme](#) provides expertise to the Environmental Protection Agency (EPA) for the determination of radon risk. The data is used in mineral exploration or is useful in aiding site investigation works for large scale projects.

Guidelines

The following guidelines may also be of assistance:

- Institute of Geologists of Ireland, 2013. Guidelines for the Preparation of the Soils, Geology and Hydrogeology Chapters of Geology in Environmental Impact Statements.
- [EPA, 2022](#). Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)
- Department of Environment, Heritage and Local Government, 2004. Quarries and Ancillary Activities, Guidelines for Planning Authorities.
- Environmental Protection Agency, 2006. Environmental Management in the Extractive Industry: Non-Scheduled Minerals.
- Geological Survey of Ireland - Irish Concrete Federation, 2008. Geological Heritage Guidelines for the Extractive Industry.

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 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>, 01-678 2795.

I hope that these comments are of assistance, and if we can be of any further help, please do not hesitate to the Geological Survey Ireland Planning Team at GSIPlanning@gsi.ie.

Yours sincerely,

Geoheritage and Planning Programme

Enc: Table - Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes.

Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes
following European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018
(S.I. No. 296 of 2018)

Geological Survey Ireland Programme	Dataset	Relevant EIA Topic	Coverage	Description / Notes / Limitations	Link to Geological Survey Ireland map viewer
Geohazards	Landslide: National landslide database and landslide susceptibility map	Land & Soil/Climate/Landscape	National	Associated guidance documentation relating to the National Landslide Susceptibility Map is also available.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b68c1e4a9044a5981f950e9b9c5625c
Geohazards	Groundwater Flooding (Historic)	Water	Regional	Provide information of historic flooding, both surface water and groundwater. [A lack of flooding presented in any specific location of the map only indicates that a flood has not been detected. It does not indicate that a flood cannot occur in that location at present or in the future]	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc
Geohazards	Groundwater Flooding (Predictive)	Water	Regional	Provides information on the probability of future karst groundwater flooding (where available). [The maps do not, and are not intended to, constitute advice. Professional or specialist advice should be sought before taking, or refraining from, any action on the basis of the flood maps]	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc
Geohazards	Radon Map	Land & Soils/Air	National		http://www.epa.ie/radiation/radonmap/
Geohazards	County Geological Sites as adopted by National Heritage Plan and listed in County Development Plans	Land & Soils/Landscape	Regional	All geological heritage sites identified by Geological Survey Ireland are categorised as CGS pending any further NHA designation by NPWS.	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0b2fde2aaac3c228
Geological Mapping	Bedrock geology:	Land & Soils	National	1:100,000 scale and associated memoirs.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Bedrock geology:	Land & Soils	Regional	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Quaternary geology: Sediments	Land & Soils	National	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Quaternary geology: Geomorphology	Land & Soils	National	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Physiographic units:	Land & Soils	National	Broad-scale physical landscape units mapped at 1:100,000 scale in order to be represented as a cartographic digital map at 1:250,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=afa76a20fc54877843aca107c5c2b
Geological Mapping	GeoUrban: Spatial geological data for the greater Dublin and Cork areas	Land & Soils	Regional	includes 3D models	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9768f4818b79416093beb2212a850ce6&scale=0
Geological Mapping	Geotechnical database	Land & Soils	National	Digitised geotechnical and Site Investigation Reports and boreholes which can be accessed through online downloads	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=a2718be1873d47a585a3f0415b4a724c
Goldmine	Historical data sets including geological memoirs and 6" to 1 mile geological mapping records	Land & Soils/Water	National	available online	https://secure.dcaa.gov.ie/goldmine/index.html
Groundwater & Geothermal	Groundwater resources (aquifers)	Water	National	Data limited to 1:100,000 scale; sites should be investigated at local scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater recharge.	Water	National	Data limited to 1:40,000 scale; sites should be investigated at local scale; long term annual average recharge	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater vulnerability.	Water	National	Data limited to 1:40,000 scale; sites should be investigated at local scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Group scheme and public supply source protection areas.	Water	National	Not all PWS / GWS have SPZ / ZOC. Check with IW / coco / NFGWS for private supplies.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater Protection Schemes	Water	National	Data is limited to scale of 1:40,000. Data does not include all of the source protection areas	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Catchment and WFD management units.	Water	National		https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	karst specific data layers	water	National	For areas underlain by limestone, includes karst features, tracer test database; turf/rough water levels (gwlevel.ie)	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Wells and Springs	Water	National	Not comprehensive, there may be unrecorded wells and springs	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater body Descriptions	Water	National	Not exhaustive; only those in designated SACs; could be other GWDTEs; for more information contact NPWS / EPA / site investigations Also, Roadmap for a Policy and Regulatory Framework for Geothermal Energy, November 2020	https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx
Groundwater & Geothermal	Geothermal Suitability maps	Land & Soils/Water	National		https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9eae46bee08de41278b90a9916d00b9e
Marine & Coastal Unit	INFOMAR - Ireland's national marine mapping programme; providing key baseline data for Ireland's	Water	National		https://secure.dcaa.gov.ie/GSI/INFOMAR_VIEWER/
Marine & Coastal Unit	CHERISH - Coastal change project (Climate, Heritage and Environments of Reefs, Islands, and Headlands)	Water	Regional		http://www.cherishproject.eu/en/
Marine & Coastal Unit	Coastal Vulnerability Index (CVI).	water / Land & Soils	Regional	Currently the project is being carried out on the east coast and will be rolled out nationally	https://www.gsi.ie/en-ie/programmes-and-projects/marine-and-coastal-unit/projects/Pages/Coastal-Vulnerability-Index.aspx
Minerals	Aggregate potential	Land & Soils/Material Assets	National	Consideration of mineral resources and potential resources as a material asset which should be explicitly recognised within the environmental assessment process	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956
Minerals	Active quarries	Land & Soils	National		https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956
Minerals	Historic mines	Land & Soils/Cultural Heritage	National	Inventory and Risk Classification 2009. Environmental Protection Agency, Economic Minerals Division and Geological Survey Ireland (DECC).	https://gis.epa.ie/EPAMaps/default?zesting=7&nothing=7&lid=EPA:LEMA_Facilities_Extractive_Facilities https://www.epa.ie/enforcement/mines/
Tellus	Geochemical data: multi-element data for shallow soil, stream sediment and stream water	Land & Soils	Regional	A national mapping programme	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707f72754
Tellus	Airborne geophysical data including radiometrics, electromagnetics and magnetics	Land & Soils	Regional	A national mapping programme	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707f72754
Tellus	urban geochemistry mapping (Dublin SURGE project).	Land & Soils	Regional		https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707f72754

Notes:

- The maps and data listed above are available on the Geological Survey Ireland map viewer <https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx>
- Please read all disclaimers carefully when using Geological Survey Ireland data
- Geological Survey Ireland and Irish Concrete Federation published guidelines for the treatment of geological heritage in the extractive industry in 2008.

Appendix 6-B: Summary Table of Geological Assessment and Geological Assessment Report

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**Appendix 6-2 Table 1:
Summary of geological investigation details (2023)**

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Trial Pit ID	GR ITM	Ground Elevation (m AOD)	Depth (m bgl)	Topsoil Thickness (m)	S&G Thickness (m)	Bedrock Depth (m bgl)	Groundwater Level (m bgl)	Sample Depth (m bgl)	PHOTO
23-MTL-TP01	E:626609 N:698396	201	3.2	-	2.3	-	1.00 - 3.20 High water inflow with water pond from 1m onwards	-	
23-MTL-TP02	E:626573 N:698308	207	3.8	0.2	3.6	-	-	-	
23-MTL-TP03	E: 626692 N:698195	209	4.0	0.3	3.7	-	-	0.3 – 3.0	

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Trial Pit ID	GR ITM	Ground Elevation (m AOD)	Depth (m bgl)	Topsoil Thickness (m)	S&G Thickness (m)	Bedrock Depth (m bgl)	Groundwater Level (m bgl)	Sample Depth (m bgl)	PHOTO
23-MTL-TP04	E: 626584 N: 698167	204	3.8	0.2	3.6	-	-	-	
23-MTL-TP05	E: 626527 N: 698072	197	2.8	0.2	2.6	-	-	2.3 - 2.8	
23-MTL-TP06	E: 626564 N: 698016	188	4.5	0.2	4.3	-	-	0.2 - 2.8	
23-MTL-TP07	E: 626741 N: 698136	205	4.2	0.4	3.8	-	-	0.4 – 3.0	

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Trial Pit ID	GR ITM	Ground Elevation (m AOD)	Depth (m bgl)	Topsoil Thickness (m)	S&G Thickness (m)	Bedrock Depth (m bgl)	Groundwater Level (m bgl)	Sample Depth (m bgl)	PHOTO
23-MTL-TP08	E: 626793 N: 698163	203	4.2	0.2	4.0	-	-	1.2 – 4.2	
23-MTL-TP09	E: 626670 N: 698110	210	3.9	0.6	3.3	-	-	-	
23-MTL-TP10	E: 626757 N: 698042	186	3.8	0.2	3.6	-	-	1.5 – 3.8	
23-MTL-TP11	E: 626927 N: 698138	195	2.8	0.2	2.6	-	-	2.5 – 2.8	

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Trial Pit ID	GR ITM	Ground Elevation (m AOD)	Depth (m bgl)	Topsoil Thickness (m)	S&G Thickness (m)	Bedrock Depth (m bgl)	Groundwater Level (m bgl)	Sample Depth (m bgl)	PHOTO
23-MTL-TP12	E: 626922 N: 698053	186	4.7	0.1	4.6	-	-	0.1 – 2.4	
23-MTL-TP13	E: 626842 N: 698086	177	3.8	0.4	3.4	-	-	0.4 – 3.0	
23-MTL-BH01	E: 626572 N: 698132	201	11.5	0.4	10.1	-	7.7	4.5 – 9.0 9.0 – 10.5	

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Trial Pit ID	GR ITM	Ground Elevation (m AOD)	Depth (m bgl)	Topsoil Thickness (m)	S&G Thickness (m)	Bedrock Depth (m bgl)	Groundwater Level (m bgl)	Sample Depth (m bgl)	PHOTO
23-MTL-BH02	E: 626760 N: 698136	199	23	0.5	21	-	18.9	0.5 – 4.5 4.5 – 13.5 13.5 – 15.6 16.5 – 19.6 19.6 – 21.5	
23-MTL-BH03	E: 626899 N: 698112	185	12	0	10.5	-	6.8	0.0 – 3.4 4.0 – 8.9 8.9 – 10.5	

MOUNTHALL GEOLOGICAL ASSESSMENT

Prepared for: Lagan Materials Ltd.

SLR Ref: 501.00584.064936
Version No: Draft
March 2023



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Figure 1: Location Map
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Figure 3: Bedrock Geology Map
Figure 4: Trial Pit & Borehole Plan
Figure 5: Site Extraction Plan
Figure 6: Cross Section Details

APPENDICES

Appendix 01: Trial Pit Logs
Appendix 02: Borehole Logs
Appendix 03: Particle Size Distribution Results
Appendix 04: Geophysical Report

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1.0 Introduction

SLR Consulting Ireland (SLR) were requested by Lagan Materials Ltd. (Lagan) to undertake an assessment of the underlying geology at lands at Mounthall, Camross, Co. Laois. The aim of the assessment was to investigate the potential sand and gravel resource in the lands, as shown in Figure 1.

The assessment comprised a desk top study, site walkover, trial pitting, borehole drilling and physical testing.

This assessment has been undertaken by Professional Geologist EurGeol Tom Moore PGeo and MIT Sam Irwin.

2.0 Geological Setting

2.1 Soils and Superficial Deposits

2.1.1 Regional Setting

Teagasc sub-soil parent mapping indicates that Gravels derived from Devonian sandstones underly most of the site with Till derived from Devonian sandstones underlying the remainder of the site, see Figure 2. A thin band of alluvium is located at the southern end of the site associated with the local stream.

2.1.2 Local Detail

A previously worked sand pit exists in the northern part of the site, this pit appears to have been predominantly worked out and partially backfilled.

2.2 Geological Setting

2.2.1 Regional Setting

GSI 1:100,000 geology map sheet 15 Geology of Laois Offaly shows the entire area to be underlain by pale red sandstone, grit, and claystone of the Cadamstown Formation, see Figure 3.

No bedrock is exposed on the site.

3.0 2023 Investigation

In February 2023 SLR oversaw a ground investigation across the area to determine the underlying superficial geology and identify any potential extractable sand and gravel deposits. A total of 13 No. trial pits were excavated, logged, and photographed with representative samples taken from each. Three cable percussive boreholes were also drilled to collect samples and determine the base of the deposit. Figure 4 shows the location of the trial pits and boreholes.

Samples were sent to Irish Drilling Ltd, for physical analysis.

Table 3-1
Trial Pit Completion Details.

Hole	Easting ING	Northing ING	Elevation mOD	EOH (m)
23-MTL-TP01	626609	698396	209.00	3.20
23-MTL-TP02	626573	698308	204.00	3.80
23-MTL-TP03	626692	698195	197.00	4.00
23-MTL-TP04	626584	698167	188.00	3.80
23-MTL-TP05	626527	698072	205.00	2.80
23-MTL-TP06	626564	698016	203.00	4.50
23-MTL-TP07	626741	698136	210.00	4.20
23-MTL-TP08	626793	698163	186.00	4.20
23-MTL-TP09	626670	698110	195.00	3.90
23-MTL-TP10	626757	698042	186.00	4.40
23-MTL-TP11	626927	698138	177.00	2.80
23-MTL-TP12	626922	698053	209.00	4.70
23-MTL-TP13-	626842	698086	204.00	3.80

Table 3-2
Borehole Completion Details.

Hole	Easting ING	Northing ING
23-MTL-BH01	626572	698132
23-MTL-BH02	626760	698136
23-MTL-BH03	626899	698111

3.1 Trial Pit Results

The trial pit investigation covered the whole study area, concentrating mainly on the eastern side, the likely main extraction area.

The main strata encountered are listed as follows:

- Loose to medium dense silty gravelly medium SAND
- Loose to medium dense silty very sandy medium and coarse GRAVEL

The detailed descriptions from each of the trial pits and samples logged has been incorporated into one of the strata groups above. Table 3.3 below gives a summary.

Table 3-3
Trial Summary Details

Hole	From	To	Description
23-MTL-TP01	0.000	1.500	Loose, brown, slightly sandy clayey GRAVEL with occasional cobbles and boulders. Clasts are rounded.
	1.500	2.300	Loose to medium dense, dark brown/greyish brown, slightly clayey slightly silty SAND with rare rounded gravel. Sand grains are fine to medium.
	2.300	3.200	Stiff, dark brown to reddish brown, slightly sandy gravelly CLAY (marl). Clasts are rounded.
23-MTL-TP02	0	0.200	Topsoil
	0.200	1.100	Loose to medium dense, brown, gravelly SAND with occasional clay. Sand grains are medium to coarse. Clasts are rounded.
	1.100	2.000	Loose to medium dense, brown, very gravelly SAND with occasional clay. Sand grains are medium to coarse. Clasts are rounded.
	2.000	3.500	Loose to medium dense, brown to greyish brown SAND & GRAVEL with occasional cobbles and boulders. Sand grains are coarse to fine. Clasts are rounded.
	3.500	3.800	Medium dense, brown to dark brown, slightly clayey gravelly SAND. Sand grains are coarse to fine. Clasts are rounded.
23-MTL-TP03	0	0.300	Topsoil
	0.300	3.000	Loose, dark brown to brown, slightly clayey SAND & GRAVEL with occasional boulders. Sand grains are coarse to medium. Clasts are rounded. More gravelly towards base.
	3.000	4.000	Loose, greyish brown, gravelly SAND. Sand grains are coarse to medium. Clasts are rounded to subangular. Less gravelly towards base.
23-MTL-TP04	0	0.200	Topsoil
	0.200	2.500	Medium dense, brown, clayey gravelly SAND with very rare rounded cobbles. Sand grains are coarse to fine. Clasts are rounded. More clayey towards base.

Hole	From	To	Description
	2.500	3.800	Loose to medium dense, pale brown to reddish brown, slightly gravelly clayey SAND. Red clay/silt bands interbedded. Sand grains are coarse to fine.
23-MTL-TP05	0	0.200	Topsoil
	0.200	2.300	Loose, brown to dark brown, clayey SAND & GRAVEL with very rare rounded cobbles. Sand grains are coarse. Clasts are rounded.
	2.300	2.800	Loose to medium dense, brown, slightly gravelly SAND with occasional rounded cobbles. Sand grains are coarse to medium.
23-MTL-TP06	0	0.200	Topsoil
	0.200	2.800	Medium dense, brown to dark brown, very gravelly CLAY. Clasts are rounded.
	2.800	4.500	Medium dense, brown, reddish brown and yellowish brown, gravelly CLAY with rare white windblown fine-grained sand. Clasts are rounded.
23-MTL-TP07	0	0.400	Topsoil
	0.400	3.000	Loose to medium dense, brown, slightly gravelly SAND with rare rounded cobbles. Sand grains are coarse to fine. Less gravelly towards base.
	3.000	4.200	Loose, pale brown, slightly gravelly SAND. Sand grains are medium.
23-MTL-TP08	0	0.200	Topsoil
	0.200	1.200	Loose, brown, slightly silty SAND & GRAVEL. Sand grains are coarse to fine. Clasts are rounded.
	1.200	4.200	Loose, pale brown, slightly gravelly SAND. Sand grains are coarse to fine.
23-MTL-TP09	0	0.600	Topsoil
	0.600	2.900	Loose to medium dense, brown SAND & GRAVEL with occasional rounded cobbles and boulders. Sand grains are coarse to fine. Clasts are rounded to subangular. More sandy towards base.
	2.900	3.900	Loose to medium dense, brown to dark brown, very gravelly SAND with rare cobbles. Sand grains are coarse to fine. Clasts are rounded.
23-MTL-TP10	0	0.200	Topsoil
	0.200	1.500	Loose, brown SAND & GRAVEL with rare cobbles. Sand grains are coarse to medium. Clasts are rounded
	1.500	3.800	Loose to medium dense, pale brown SAND with occasional rounded gravel. Sand grains are fine.
23-MTL-TP11	0	0.200	Topsoil
	0.200	2.500	Loose, dark brown, slightly clayey SAND & GRAVEL with occasional cobbles. Sand grains are coarse to medium. Clasts are rounded.
	2.500	2.800	Very Loose, brown, sandy GRAVEL. Sand grains are coarse to fine. Clasts are rounded.
23-MTL-TP12	0	0.100	Topsoil

Hole	From	To	Description
	0.100	2.400	Loose, dark brown, slightly clayey SAND & GRAVEL with rare cobbles and boulders. Sand grains are coarse to medium. Clasts are subrounded to rounded.
	2.400	4.700	Loose, dark brown, very gravelly SAND with occasional to common cobbles and boulders. Sand grains are coarse to medium. Clasts are rounded.
23-MTL-TP13-West	0	0.400	Topsoil
	0.400	3.000	Loose, dark brown, very gravelly SAND / SAND & GRAVEL with occasional cobbles and boulders. Sand grains are coarse to fine. Clasts are rounded.
	3.000	3.800	Loose, brown to greyish brown, very sandy GRAVEL with occasional cobbles. Sand grains are coarse to fine. Clasts are rounded.
23-MTL-TP13-East	0	0.400	Topsoil
	0.400	2.000	Loose, greyish brown, slightly clayey very sandy GRAVEL / SAND & GRAVEL with occasional cobbles and boulders. Sand grains are coarse to fine. Clasts are rounded.
	2.000	3.800	Loose, brown to greyish brown, very sandy GRAVEL with occasional cobbles. Sand grains are coarse to fine. Clasts are rounded.
23-MTL-TP13-South	0	0.400	Topsoil
	0.400	3.500	Medium dense, brown, slightly silty very gravelly SAND with very rare cobbles. Sand grains are coarse to fine. Clasts are rounded.
	3.500	3.800	Loose, brown to greyish brown, very sandy GRAVEL with occasional cobbles. Sand grains are coarse to fine. Clasts are rounded.
23-MTL-TP13-North	0	0.400	Topsoil
	0.400	1.000	Loose, dark brown, very gravelly SAND / SAND & GRAVEL with occasional cobbles and boulders. Sand grains are coarse to fine. Clasts are rounded.
	1.000	3.800	Loose, brown to greyish brown, very sandy GRAVEL with occasional cobbles. Sand grains are coarse to fine. Clasts are rounded.

3.2 Borehole Results

The cable percussive boreholes were drilled across the central part of the extraction area along an east – west line to confirm the depth of the sand and gravel deposit. 3 No. boreholes were drilled to depths of between 11.5 and 23m, with each encountering a firm to stiff reddish brown SILT/CLAY at the base.

Water levels in standpipes installed in the boreholes are reported in Table 3.5.

Strata details for each of the boreholes is included in Table 3.4 below.

Table 3-4
Borehole Summary Details

Hole	From	To	Description
23-MTL-BH01	0	0.400	Topsoil
	0.4	4.500	Brown fine and medium SAND (dry)
	4.5	9.000	Brown slightly gravelly fine and medium SAND (damp)
	9	10.500	Brown silty very gravelly medium SAND
	10.5	11.500	Stiff red/brown slightly sandy slightly gravelly SILT/CLAY with medium cobbles
23-MTL-BH02	0	0.500	Topsoil
	0.5	4.500	Brown fine and medium SAND with medium cobble content (dry)
	4.5	13.500	Brown sandy GRAVEL with medium cobble content
	13.5	15.600	Blue / brown slightly silty very sandy GRAVEL
	15.6	16.500	Brown rounded and subrounded GRAVEL and COBBLES with low boulder content
	16.5	19.600	Brown coarse SAND
	19.6	21.500	Dense brown sandy GRAVEL
	21.5	23.000	Stiff reddish brown slightly sandy gravelly SILT/CLAY with medium cobble content
23-MTL-BH03	0	3.400	Brown fine and medium SAND with medium cobble content (dry)
	3.4	4.000	Dense brown sandy GRAVEL and COBBLES with medium boulder content
	4	8.900	Dense brown SAND and GRAVEL with medium cobble content
	8.9	10.500	Reddish brown fine and medium SAND (wet)
	10.5	12.000	Firm to stiff reddish brown slightly sandy slightly gravelly SILT/CLAY

Table 3-5
Groundwater Details

Hole	Date	Level mbgl
23-MTL-BH01	15/03/23	7.7
23-MTL-BH02	15/03/23	18.9
23-MTL-BH03	15/03/23	6.8

3.3 Geophysical Survey

A geophysical survey was carried out in July 2022 across the entire landholding. The survey consisted of EM ground conductivity mapping with 2D ERT and Seismic Refraction profiling.

The survey identified an area of sand and gravel ranging in thickness from 7m to 15m over the proposed extraction area.

3.4 Sample Testing

3.4.1 Introduction

A total of 20 No. bulk samples were selected to be representative of the main lithologies and sent to Irish Drilling, Loughrea, Co. Galway for particle size distribution analysis (PSD).

The results of the aggregate testing are shown below in Table 3-6.

No historical test results were available for review.

Table 3-6
Physical Results

Hole ID	From (m)	To (m)	Lithology	<0.063mm	<2mm
23-MTL-TP03	0.3	3	Slightly silty, very sandy medium and coarse GRAVEL	3.7	29
23-MTL-TP05	2.3	2.8	Orange / brown silty very gravelly coarse SAND	5.6	79.6
23-MTL-TP06	0.2	2.8	Orange / brown very silty very gravelly medium SAND	29.6	68.9
23-MTL-TP07	0.4	3	Yellow / brown silty gravelly medium SAND	5.3	90.2
23-MTL-TP08	1.2	4.2	Yellow / brown silty gravelly medium SAND	5.9	92.2
23-MTL-TP10	1.5	3.8	Yellow / brown silty gravelly medium SAND	8.9	
23-MTL-TP11	2.5	2.8	Brown slightly silty very sand medium GRAVEL	4.3	29.4
23-MTL-TP12	0.1	2.4	Orange / brown slightly silty very sandy medium and coarse GRAVEL	4.1	44.6
23-MTL-TP13-West	0.4	3	Dark brown silty sandy medium GRAVEL	11.1	28.5
23-MTL-BH01	0.4	4.5	Brown gravelly silty fine and medium SAND	16.9	84
23-MTL-BH01	4.5	9	Yellow / brown silty very sandy medium and coarse GRAVEL	13.3	42.4
23-MTL-BH01	9	10.5	Brown silty very gravelly medium SAND	19.2	80.2
23-MTL-BH02	0.5	4.5	Orange / brown gravelly silty medium SAND	18.3	91.8
23-MTL-BH02	4.5	13.5	Brown slightly sandy slightly gravelly SILT (assumed to be localised)	56.2	75.4
23-MTL-BH02	13.5	15.6	Blue / brown slightly silty very sandy GRAVEL	2.3	25.5
23-MTL-BH02	16.5	19.6	Grey / brown gravelly silty medium and coarse SAND	9.3	92
23-MTL-BH02	19.6	21.5	Light brown very silty GRAVEL and SAND	23.9	64.9
23-MTL-BH03	0	3.4	Orange / brown silty very sandy GRAVEL	10.6	46.8
23-MTL-BH03	4	8.9	Light brown silty very sandy medium and coarse GRAVEL	7.5	33
23-MTL-BH03	8.9	10.5	Light brown slightly gravelly sandy SILT	38.6	90.5

3.5 Main Strata Descriptions

3.5.1 SAND & GRAVEL

Sand and gravel was encountered in each of the boreholes and trial pits, varying in thickness from 2.3m in trial pit 23-MTL-TP01 in the previously worked pit to 21m in borehole 23-MTL-BH02 in the centre of the proposed extraction area.

The sand and gravel deposits are described as two main strata types. Mainly a *yellow / brown slightly silty gravelly SAND* with the fines content varying from 5.3% to 29.6% and averages at 14.3%. Removing the two high outlier results the average fines content for the sand tested is 11%. The other main strata is a *yellow / brown silty very sandy GRAVEL*. The fines content for this strata ranges from 3.7% to 13.3% with an average of 7%.

3.5.2 SILT / CLAY

Rare light brown slightly gravelly sandy silt was recorded interbedded within the sand and gravel deposits and towards the base of the deposit.

A *firm to stiff red / brown slightly sandy slightly gravelly SILT/CLAY* is encountered at the base of the deposit. This was recorded in each of the boreholes and in the trial pit in the existing sand pit (23-MTL-TP01).

4.0 Resource & Reserves

4.1.1 Reporting Terminology

The mineral reserves and resources have been reported using the Pan-European Reserves & Resources Reporting Committee (PERC) mineral reporting code. They have been sub-divided into appropriate categories, based on levels of geological knowledge and confidence that can be determined from the available geological data.

The mineral deposit has been defined as reserves or resources, based on legal, environmental, ownership, social and statutory factors (e.g., planning status). Image 1 below shows the definitions of the PERC Code and the differences between Indicated and Measured Resources and Probable and Proven Reserves.

Image 1
PERC Definitions

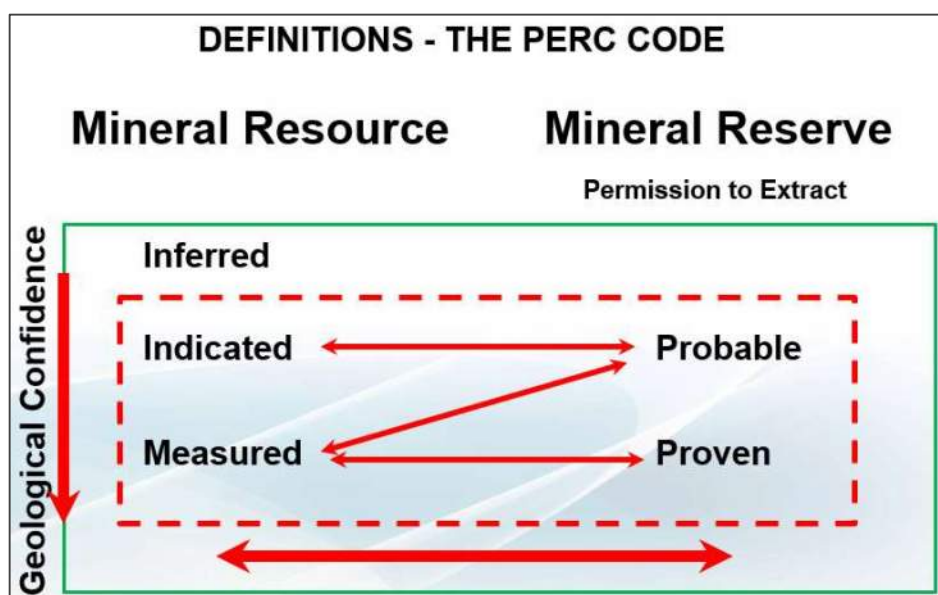


Table 4-1 outlines how the modified PERC reporting code has been applied to these assessments.

Table 4-1
Categorisation of Mineral Reserves and Resources

RESERVE/ RESOURCE CATEGORY	DEFINITION	DESCRIPTION
Proven Reserve	Economically mineable part of a measured mineral resource. Includes diluting materials and allowances for losses, which may occur as the material is mined. Takes into account modifying factors such as legal, environmental, social, and governmental status.	Well defined by intrusive ground investigation, sampling, and testing at appropriate resolution (e.g., c.100m spacing). Previous successful exploitation at this location and stratigraphic level. Has planning permission for extraction. Minerals owned by Lagan or Lagan has leasehold rights to 'win and work' the minerals.
Probable Reserve	Economically mineable part of an indicated mineral resource, and some circumstances measured mineral resource. Includes diluting materials and allowances for losses, which may occur as the material is mined. Takes into account modifying factors such as legal, environmental, social, and governmental status.	Lower level of geological confidence than a proven mineral reserve. Less well defined by intrusive ground investigation. Drilling, sampling, and testing on a limited number of locations and inferred over larger distances (e.g., >150m). Has planning permission for extraction. Minerals owned by Lagan or Lagan has leasehold rights to 'win and work' the minerals*
Measured Resource	Part of a mineral resource for which tonnage, densities, shape, physical characteristics, grade, and mineral content can be estimated with a high level of confidence. Reliable exploration sampling and testing using appropriate techniques. Spacing is close enough to confirm geological and grade continuity.	Well defined by intrusive ground investigation, sampling, and testing at appropriate resolution. Previous successful exploitation at this location and stratigraphic level, (e.g., drilled and sampled on a tight grid <100m or large exposed face sampled at high frequency). Does not have planning permission for extraction. Minerals owned by Lagan or Lagan has leasehold rights to 'win and work' the minerals
Indicated Resource	Part of a mineral resource for which tonnage, densities, shape, physical characteristics, grade, and mineral content can be estimated with a reasonable level of confidence. Cannot define grade but can assume continuity.	Defined by intrusive ground investigation and or face sampling on a widely spaced grid or inappropriately to define a measured mineral resource. Does not have planning permission for extraction. Minerals owned by Lagan or Lagan has leasehold rights to 'win and work' the minerals
Inferred Resource	Part of a mineral resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. Inferred from geological evidence but has no verification of grade or continuity or continuity	Not defined by any intrusive ground investigation or inferred from very wide drill hole spacing, which does not verify continuity, (e.g., inferred from GSI mapping and drill hole spacing >300m). Does not have planning permission for extraction.

RESERVE/ RESOURCE CATEGORY	DEFINITION	DESCRIPTION
Prospects	An area of land that is not currently owned by the mineral operator, although the mineral deposit may be well defined with potential to be 'upgraded' to reserve/resource category subject to economic factors	Land and/or minerals not owned, or leased

*Based on the assumption of the acquisition proceeding

4.2 Volume Assessment

For the purposes of the assessment the available volumes of sand and gravel have been determined of the defined extraction area based on the ground investigations. The design limit has been taken to 3mOD approximately 1m below the level of the current GAA pitch.

Design criteria consisted of:

- Standoff to Private Housing - 100m
- 10m stand-off to north, east, and west boundaries
- 30m stand-off to the southern boundary along the local road and stream
- Assumed 0.5m Topsoil across extraction area
- Pit Face Heights – 7.5m
- Final Bench Widths – 5m
- 10% Allowance for waste, etc.
- Aerial Imagery Date – 2023
- Sand & gravel density in situ of 1.8t/m³

Table 4-2 below summarises the measured resource gross volumes and tonnages available.

Table 4-2
Volume Assessment – Measured Geological Resource – Defined Extraction Area

Area	Extractable Sand & Gravel		Overburden
Overburden			20,000m ³
Defined Extraction Area – Sand & Gravel – Above Water Table	490,000m³	794,000t	
Defined Extraction Area – Sand & Gravel – Below Water Table	121,000m ³	196,000t	
Additional – Reducing Stand-off to dwellings to 50m	42,000m ³	68,000t	

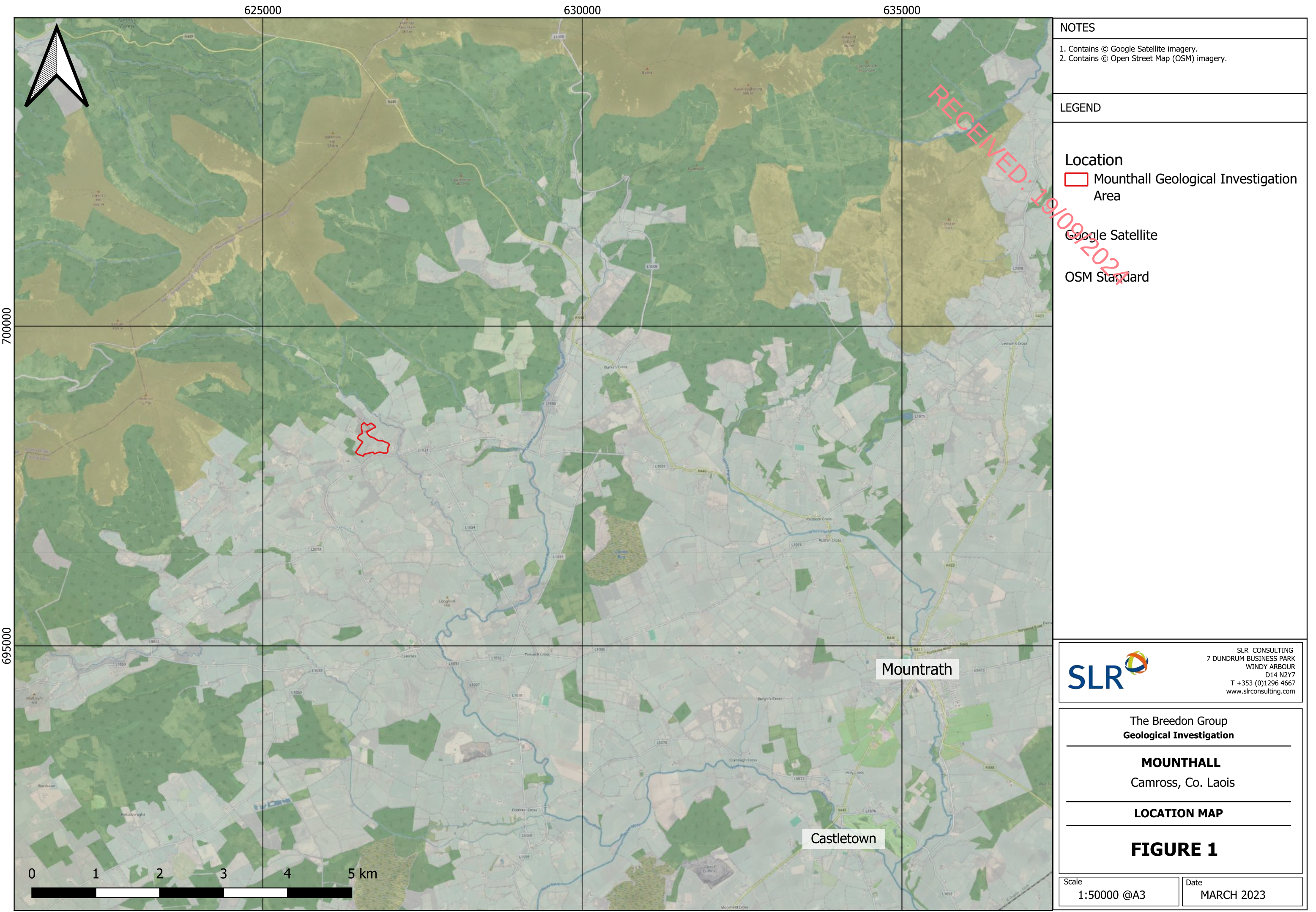
*The water table has been assumed based on an initial set of readings.

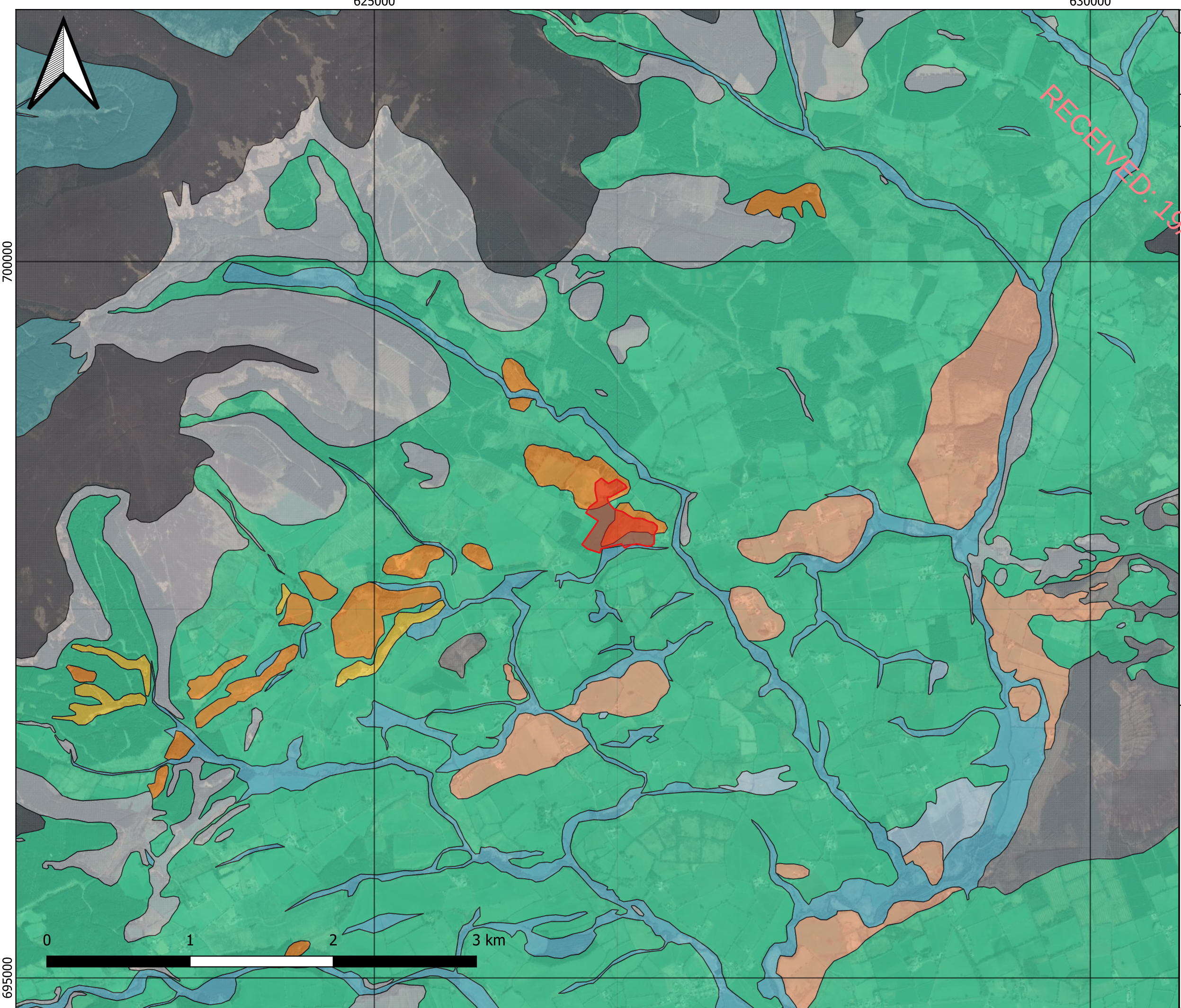
5.0 Discussion

- On-site investigations including trial pit excavations and follow up testing defined an area of potential sand and gravel resource.
- The main deposits varied from a slightly silty gravelly SAND to a silty very sandy GRAVEL, the average fines content was 14% and 7% respectively. Rare, localised silt lenses were recorded.
- The trial pits and boreholes indicated that the sand and gravel deposit was up to 21m thick in places.
- An extraction design to the top of the water table yielded an Measured Resource of **794,000t** of sand and gravel.
- An additional 196,000t may be in situ below the currently measured water table.
- A stand-off of 100m to the dwellings has been used, where this is reduced to 50m an additional 68,000t may be available.

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FIGURES





NOTES

1. Contains Irish Public Sector Data (Geological Survey Ireland) licensed under a Creative Commons Attribution 4.0 International (© BY 4.0) licence.

LEGEND

Location

- Mounthall Geological Investigation Area

Sub-Soils

Quaternary Sediments

- Alluvium
- Bedrock outcrop or subcrop
- Blanket Peat
- Cut over raised peat
- Eskers comprised of gravels of acidic reaction
- Gravels derived from Devonian sandstones
- Gravels derived from Limestones
- Lacustrine sediments
- Till derived from Devonian sandstones
- Till derived from Lower Palaeozoic sandstones and shales



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The Breedon Group
Geological Investigation

MOUNTHALL
Camross, Co. Laois

SUB-SOILS MAP

FIGURE 2

Scale
1:25000 @A3

Date
MARCH 2023

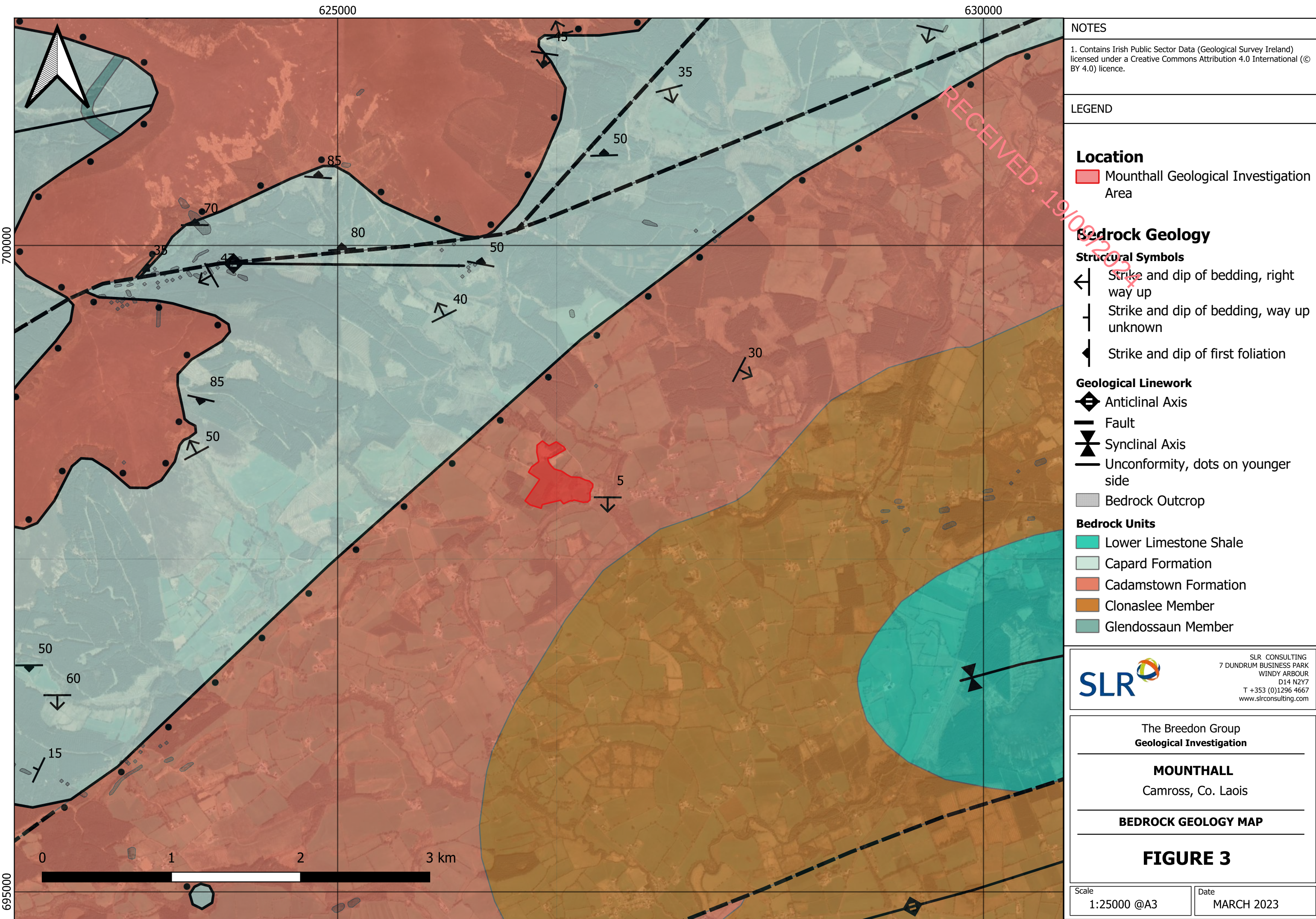


FIGURE 4 - TP & BH Plan

Mounthall, Co. Laois

Legend

-  Borehole
-  Trial Pit

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Google Earth

Image © 2023 CNES / Airbus

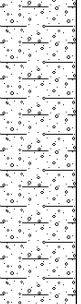
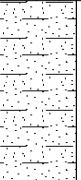
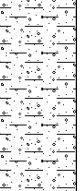
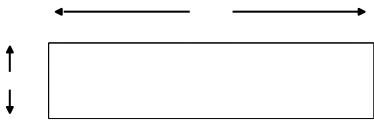
200 m



APPENDIX 01

Trial Pit Logs

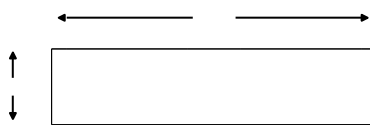
RECEIVED: 19/09/2024

TRIAL PIT LOG								TRIAL PIT No 23-MTL-TP01	
Client: Lagan Materials Ltd.									
Project: Mounthall Geological Investigation									
Project No: 501.064936.00001		Date: 14/02/2023		Ground Level: 201.00m		Co-ordinates: E626609 N698396		Sheet 1 of 1	
SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Sample	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
1					199.50		(1.50)	Loose, brown, slightly sandy clayey GRAVEL with occasional cobbles and boulders. Clasts are rounded. <i>0.00 - 2.30 Slightly unstable. Collapsed at 3.2m</i>	
								<i>1.00 - 3.20 High waterflow with water pond from 1m onwards.</i>	
2					198.70		(0.80)	Loose to medium dense, dark brown/greyish brown, slightly clayey slightly silty SAND with rare rounded gravel. Sand grains are fine to medium.	
3					197.80		(0.90)	Stiff, dark brown to reddish brown, slightly sandy gravelly CLAY (morl). Clasts are rounded.	
4								Trial Pit Complete at 3.20m	
GENERAL REMARKS: KEY V = Hand Vane Shear Strength PP = Pocket Penetrometer Shear Strength J = Jar Sample D = Disturbed Sample B = Large Bulk Sample HS = Head Space Measurement								Trial Pit Dimensions: 	
All dimensions in metres Scale 1:33		Contractor: Plant:		Method: Trial pit/trench		Logged By:		Approved By:	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020									

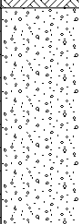
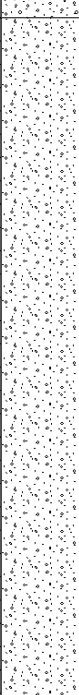
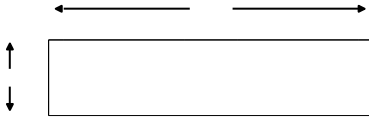
TRIAL PIT LOG										TRIAL PIT No 23-MTL-TP02		
Client: Lagan Materials Ltd.										RECEIVED: 19/09/2024 SLR		
Project: Mounthall Geological Investigation												
Project No: 501.064936.00001			Date: 14/02/2023		Ground Level: 207.00m		Co-ordinates: E626573 N698308		Sheet 1 of 1			
SAMPLES & TESTS				Water	STRATA				Instrument Backfill			
Depth	Sample	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION				
1					206.80		(0.20) 0.20	Topsoil 0.00 - 3.50 <i>Very unstable.</i>				
							(0.90)	Loose to medium dense, brown, gravelly SAND with occasional clay. Sand grains are medium to coarse. Clasts are rounded.				
					205.90		1.10					
							(0.90)	Loose to medium dense, brown, very gravelly SAND with occasional clay. Sand grains are medium to coarse. Clasts are rounded.				
					205.00		2.00					
							(1.50)	Loose to medium dense, brown to greyish brown SAND & GRAVEL with occasional cobbles and boulders. Sand grains are coarse to fine. Clasts are rounded.				
3					203.50		3.50	3.30 - 3.50 <i>Minor stiff red CLAY bands interbedded.</i>				
					203.20		(0.30) 3.80	Medium dense, brown to dark brown, slightly clayey gravelly SAND. Sand grains are coarse to fine. Clasts are rounded.				
4								Trial Pit Complete at 3.80m				
GENERAL REMARKS:						Trial Pit Dimensions:						
KEY V = Hand Vane Shear Strength PP = Pocket Penetrometer Shear Strength J = Jar Sample D = Disturbed Sample B = Large Bulk Sample HS = Head Space Measurement												
All dimensions in metres Scale 1:33			Contractor: Plant:			Method: Trial pit/trench			Logged By:		Approved By:	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020												

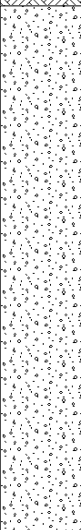
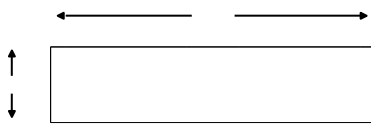
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TRIAL PIT LOG									
Client: Lagan Materials Ltd.						TRIAL PIT No 23-MTL-TP05			
Project: Mounthall Geological Investigation						SHEET NO. 1 OF 1			
Project No:		Date:	Ground Level:		Co-ordinates:				
501.064936.00001		14/02/2023	197.00m		E626527 N698072				
SAMPLES & TESTS				Water	STRATA			Instrument Backfill	
Depth	Sample	Test Type	Test Result		Reduced Level	Legend	Description		
					196.80	(0.20)	Topsoil 0.00 - 2.80 Very unstable. Collapsed at 2.8m		
						(2.10)	Loose, brown to dark brown, clayey SAND & GRAVEL with very rare rounded cobbles. Sand grains are coarse. Clasts are rounded.		
					194.70	2.30			
					194.20	(0.50) 2.80	Loose to medium dense, brown, slightly gravelly SAND with occasional rounded cobbles. Sand grains are coarse to medium.		
					Trial Pit Complete at 2.80m				
GENERAL REMARKS:					Trial Pit Dimensions: 				
KEY V = Hand Vane Shear Strength PP = Pocket Penetrometer Shear Strength J = Jar Sample D = Disturbed Sample B = Large Bulk Sample HS = Head Space Measurement									
All dimensions in metres Scale 1:33		Contractor: Plant:		Method: Trial pit/trench		Logged By:		Approved By:	

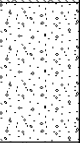
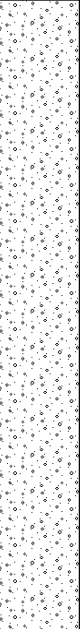
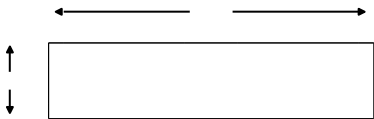
TRIAL PIT LOG										TRIAL PIT No 23-MTL-TP06		
Client: Lagan Materials Ltd.										RECEIVED: 19/09/2024 SLR		
Project: Mounthall Geological Investigation												
Project No: 501.064936.00001			Date: 14/02/2023		Ground Level: 188.00m		Co-ordinates: E626564 N698016		Sheet 1 of 1			
SAMPLES & TESTS				Water	STRATA				Instrument Backfill			
Depth	Sample	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION				
1					187.80		(0.20) 0.20	Topsoil				
							(2.60)	Firm, brown to dark brown, very gravelly CLAY. Clasts are rounded.				
							(1.70)	Firm, brown, reddish brown and yellowish brown, gravelly CLAY with rare white windblown fine-grained sand. Clasts are rounded.				
								4.00 - 4.50 Occasional rounded cobbles and boulders. 4.20 - 4.50 Minor stiff red CLAY band interbedded with white windblown sand.				
2					185.20		2.80					
3					183.50		4.50	Trial Pit Complete at 4.50m				
4												
GENERAL REMARKS:										Trial Pit Dimensions: 		
KEY V = Hand Vane Shear Strength PP = Pocket Penetrometer Shear Strength J = Jar Sample D = Disturbed Sample B = Large Bulk Sample HS = Head Space Measurement												
All dimensions in metres Scale 1:33			Contractor: Plant:			Method: Trial pit/trench			Logged By:		Approved By:	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020												

[illegible]

TRIAL PIT LOG										TRIAL PIT No 23-MTL-TP08	
Client: Lagan Materials Ltd.										RECEIVED: 19/09/2024 SLR	
Project: Mounthall Geological Investigation											
Project No: 501.064936.00001			Date: 14/02/2023		Ground Level: 203.00m		Co-ordinates: E626793 N698163		Sheet 1 of 1		
SAMPLES & TESTS				Water	STRATA					Instrument Backfill	
Depth	Sample	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
1					202.80		(0.20) 0.20	Topsoil 0.00 - 4.20 Very unstable. Collapsed at 4.2m			
							(1.00)	Loose, brown, slightly silty SAND & GRAVEL. Sand grains are coarse to fine. Clasts are rounded.			
					201.80		1.20				
							(3.00)	Loose, pale brown, slightly gravelly SAND. Sand grains are coarse to fine.			
2								2.30 - 2.50 Gravelly layer.			
3											
4											
					198.80		4.20	Trial Pit Complete at 4.20m			
GENERAL REMARKS:					Trial Pit Dimensions: 						
KEY V = Hand Vane Shear Strength PP = Pocket Penetrometer Shear Strength J = Jar Sample D = Disturbed Sample B = Large Bulk Sample HS = Head Space Measurement											
All dimensions in metres Scale 1:33		Contractor: Plant:			Method: Trial pit/trench			Logged By:		Approved By:	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

TRIAL PIT LOG										TRIAL PIT No 23-MTL-TP11	
Client: Lagan Materials Ltd.										RECEIVED: 19/09/2024 SLR	
Project: Mounthall Geological Investigation											
Project No: 501.064936.00001			Date: 15/02/2023		Ground Level: 195.00m		Co-ordinates: E626927 N698138		Sheet 1 of 1		
SAMPLES & TESTS				Water	STRATA				Instrument Backfill		
Depth	Sample	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
1					194.80		(0.20) 0.20	Topsoil 0.00 - 2.80 Very unstable. Collapsed at 2.8m			
							(2.30)	Loose, dark brown, slightly clayey SAND & GRAVEL with occasional cobbles. Sand grains are coarse to medium. Clasts are rounded. 1.50 - 2.50 Differences in layer thickness from one side of the trial pit to the other. West face = 2.5m thick SAND & GRAVEL top layer. EAST face = 1.5m thick SAND & GRAVEL top layer.			
					192.50		2.50				
					192.20		(0.30) 2.80	Very Loose, brown, sandy GRAVEL. Sand grains are coarse to fine. Clasts are rounded.			
3								Trial Pit Complete at 2.80m			
4											
GENERAL REMARKS:										Trial Pit Dimensions: 	
KEY V = Hand Vane Shear Strength PP = Pocket Penetrometer Shear Strength J = Jar Sample D = Disturbed Sample B = Large Bulk Sample HS = Head Space Measurement											
All dimensions in metres Scale 1:33			Contractor: Plant:			Method: Trial pit/trench			Logged By:		Approved By:
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020											

[illegible]

TRIAL PIT LOG								TRIAL PIT No 23-MTL-TP13-North	
Client: Lagan Materials Ltd.								SLR	
Project: Mounthall Geological Investigation								Sheet 1 of 1	
Project No: 501.064936.00001		Date: 15/02/2023		Ground Level: 177.00m		Co-ordinates: E626842 N698086			
SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Sample	Test Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
1					176.60		(0.40) 0.40	Topsoil	
					176.00		(0.60) 1.00	Loose, dark brown, very gravelly SAND / SAND & GRAVEL with occasional cobbles and boulders. Sand grains are coarse to fine. Clasts are rounded.	
							(2.80) 3.80	Loose, brown to greyish brown, very sandy GRAVEL with occasional cobbles. Sand grains are coarse to fine. Clasts are rounded. 1.00 - 3.80 Different lithology on each side of the trial pit. Sandy GRAVEL.	
								3.50 - 3.80 Very unstable. Collapsed at 3.8m	
4					173.20		3.80	Trial Pit Complete at 3.80m	
GENERAL REMARKS:					Trial Pit Dimensions: 				
KEY V = Hand Vane Shear Strength PP = Pocket Penetrometer Shear Strength J = Jar Sample D = Disturbed Sample B = Large Bulk Sample HS = Head Space Measurement									
All dimensions in metres Scale 1:33		Contractor: Plant:		Method: Trial pit/trench		Logged By:		Approved By:	
LOGGING HAS BEEN CARRIED OUT IN ACCORDANCE WITH BS5930:2015+A2:2020									

TRIAL PIT LOG							TRIAL PIT No 23-MTL-TP13-West		
Client: Lagan Materials Ltd.							RECEIVED: 19/09/2024 SLR		
Project: Mounthall Geological Investigation									
Project No: 501.064936.00001		Date: 15/02/2023		Ground Level: 177.00m		Co-ordinates: E626842 N698086		Sheet 1 of 1	
SAMPLES & TESTS				Water	STRATA				Instrument Backfill
Depth	Sample	Test Type	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
1 									

APPENDIX 02

Borehole Logs

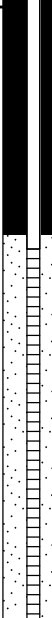
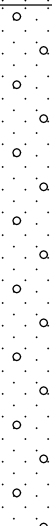
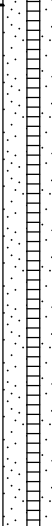
RECEIVED: 19/09/2024



Irish drilling LTD

BOREHOLE LOG

Project Camross Development			Location Camross, County Laois			BOREHOLE No BH 01	
Job No 2022LS101	Date 15-02-23 17-02-23	Ground Level (m OD)	Co-Ordinates ()				
Engineer SLR Consulting			GROUNDWATER STRIKES	Water strikes: 1st: dry 2nd: 3rd:	Rose to (@ 20 min.):	Sealed at:	Sheet 1 of 2 Status DRAFT / REV1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill	
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.00-1.50	B1					(0.40) 0.40	Grass over brown TOPSOIL.		
							(4.10)	Brown fine and medium SAND (dry).	
3.00	B2								
4.50	B3					(6.00)	Damp brown slightly gravelly fine and medium SAND. Gravel is rounded.		
6.00	B4								
7.50	B5								

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
15-02-23	09.00	4.50									50mm standpipe installed - response zone 1.90m to 11.50m bgl.
15-02-23	16.00	4.50									
All dimensions in metres Scale 1:50		Client: Breedon Group		Method/ Plant Used		Dando 2000			Driller BT	Logged By BT	

IDL AGS4 UK BH BREEDON CAMROSS CP DRAFT GPJ ID GINT AGS 4 0 4 GDT 1/3/23



Irish drilling LTD

BOREHOLE LOG

Project Camross Development			Location Camross, County Laois			BOREHOLE No BH 01	
Job No 2022LS101	Date 15-02-23 17-02-23	Ground Level (m OD)	Co-Ordinates ()				
Engineer SLR Consulting			GROUNDWATER STRIKES	Water strikes: 1st: dry 2nd: 3rd:	Rose to (@ 20 min.):	Sealed at:	Sheet 2 of 2 Status DRAFT / REV1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
9.00	B6						Damp brown slightly gravelly fine and medium SAND. Gravel is rounded. <i>(continued)</i>	
10.50	B7				10.50		Stiff reddish brown slightly sandy slightly gravelly SILT/CLAY with medium cobble content.	
11.50	B8				11.50		BH terminated at 11.50m - refusal on possible rock or boulder.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
16-02-23	16.00	11.50	11.00	203							50mm standpipe installed - response zone 1.90m to 11.50m bgl.

All dimensions in metres Scale 1:50	Client: Breedon Group	Method/ Plant Used	Dando 2000	Driller BT	Logged By BT
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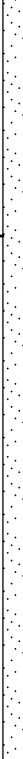
IDL AGS4 UK BH BREEDON CAMROSS CP DRAFT GPJ ID GINT AGS 4 0 4 GDT 1/3/23



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BOREHOLE LOG

Project Camross Development			Location Camross, County Laois			BOREHOLE No BH 02	
Job No 2022LS101	Date 20-02-23 23-02-23	Ground Level (m OD)	Co-Ordinates ()				
Engineer SLR Consulting			GROUNDWATER STRIKES	Water strikes: 1st: dry 2nd: 3rd:	Rose to (@ 20 min.):	Sealed at:	Sheet 1 of 3 Status DRAFT / REV1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.00-1.50	B1				(0.50) 0.50	Grass over brown TOPSOIL.		
					(4.00) 4.50	Brown fine and medium SAND with medium cobble content (dry).		
3.00	B2							
4.50	B3					Brown sandy GRAVEL with medium cobble content. Gravel is rounded.		
6.00	B4							
7.50	B5							

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
20-02-23	17.00	4.00									50mm standpipe installed - response zone 2.90m to 23.00m bgl.
21-02-23	08.00	4.00									
All dimensions in metres Scale 1:50		Client: Breedon Group		Method/ Plant Used		Dando 2000			Driller BT	Logged By BT	

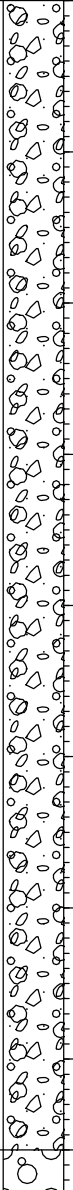
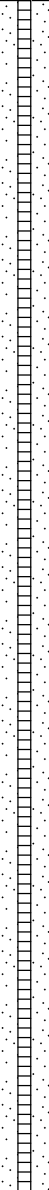
IDL AGS4 UK BH BREEDON CAMROSS CP DRAFT GPJ ID GINT AGS 4 0 4 GDT 1/3/23



Irish drilling LTD

BOREHOLE LOG

Project Camross Development			Location Camross, County Laois			BOREHOLE No BH 02	
Job No 2022LS101	Date 20-02-23 23-02-23	Ground Level (m OD)	Co-Ordinates ()				
Engineer SLR Consulting			GROUNDWATER STRIKES	Water strikes: 1st: dry 2nd: 3rd:	Rose to (@ 20 min.):	Sealed at:	Sheet 2 of 3 Status DRAFT / REV1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
9.00	B6				(11.10)	Brown sandy GRAVEL with medium cobble content. Gravel is rounded. (continued)		
10.50	B7							
12.00	B8							
13.50	B9							
15.00	B10				15.60	Brown rounded and subrounded GRAVEL and COBBLES with low boulder content.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
21-02-23	16.00	15.00				15.6	16.5	2:00			50mm standpipe installed - response zone 2.90m to 23.00m bgl.
22-02-23	08.00	15.00									
All dimensions in metres Scale 1:50		Client: Breedon Group		Method/ Plant Used		Dando 2000			Driller BT		Logged By BT

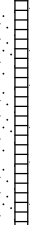
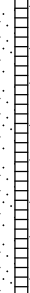
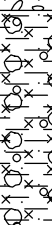
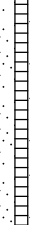
IDL AGS4 UK BH BREEDON CAMROSS CP DRAFT GPJ ID GINT AGS 4 0 4 GDT 1/3/23



Irish drilling LTD

BOREHOLE LOG

Project Camross Development			Location Camross, County Laois			BOREHOLE No BH 02	
Job No 2022LS101	Date 20-02-23 23-02-23	Ground Level (m OD)	Co-Ordinates ()				
Engineer SLR Consulting			GROUNDWATER STRIKES	Water strikes: 1st: dry 2nd: 3rd:	Rose to (@ 20 min.):	Sealed at:	Sheet 3 of 3 Status DRAFT / REV1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
16.50	B11				(0.90)	Brown rounded and subrounded GRAVEL and COBBLES with low boulder content. (continued)		
					16.50	Brown coarse SAND.		
18.00	B12				(3.10)			
19.50	B13				19.60	Dense brown sandy GRAVEL.		
21.00	B14				(1.90)			
22.50	B15				(1.50)	Stiff reddish brown slightly sandy slightly gravelly SILT/CLAY with medium cobble content.		
					23.00	BH terminated at 23.00m on RE instruction.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
22-02-23	16.00	23.00	22.00	203							50mm standpipe installed - response zone 2.90m to 23.00m bgl.
All dimensions in metres Scale 1:50		Client: Breedon Group		Method/ Plant Used		Dando 2000			Driller BT		Logged By BT

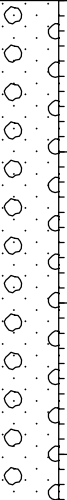
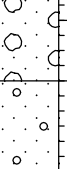
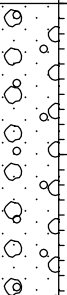
IDL AGS4 UK BH BREEDON CAMROSS CP DRAFT GPJ ID GINT AGS 4 0 4 GDT 1/3/23



Irish drilling LTD

BOREHOLE LOG

Project Camross Development			Location Camross, County Laois			BOREHOLE No BH 03	
Job No 2022LS101	Date 23-02-23 27-02-23	Ground Level (m OD)	Co-Ordinates ()				
Engineer SLR Consulting			GROUNDWATER STRIKES	Water strikes: 1st: dry 2nd: 3rd:	Rose to (@ 20 min.):	Sealed at:	Sheet 1 of 2 Status DRAFT / REV1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.00-1.50	B1					(3.40)	Brown fine and medium SAND with medium cobble content (dry).	
3.00	B2					3.40		
						(0.60)	Dense brown sandy GRAVEL and COBBLES with medium boulder content. Boulders are angular.	
						4.00		
4.50	B3						Dense brown SAND and GRAVEL with medium cobble content.	
								
6.00	B4					(4.90)		
								
7.50	B5							

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
23-02-23	16.00	4.00				3.5	4	1:00			50mm standpipe installed - response zone 2.90m to 11.00m bgl.
24-02-23	09.00	4.00				6.8	7.3	1:00			
All dimensions in metres Scale 1:50			Client: Breedon Group			Method/ Plant Used Dando 2000			Driller BT		Logged By BT

IDL AGS4 UK BH BREEDON CAMROSS CP DRAFT GPJ ID GINT AGS 4.0 4 GDT 1/3/23



Irish drilling LTD

BOREHOLE LOG

Project Camross Development			Location Camross, County Laois			BOREHOLE No BH 03	
Job No 2022LS101	Date 23-02-23 27-02-23	Ground Level (m OD)	Co-Ordinates ()				
Engineer SLR Consulting			GROUNDWATER STRIKES	Water strikes: 1st: dry 2nd: 3rd:	Rose to (@ 20 min.):	Sealed at:	Sheet 2 of 2 Status DRAFT / REV1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
9.00	B6					8.90	Dense brown SAND and GRAVEL with medium cobble content. (continued)	
						(1.60)	Wet reddish brown fine and medium SAND.	
10.50	B7					10.50	Firm reddish brown slightly sandy slightly gravelly SILT/CLAY.	
12.00	B8					(1.50)		
						12.00	BH terminated at 12.00m bgl on RE instruction.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
24-02-23	16.00	12.00	11.00	203							50mm standpipe installed - response zone 2.90m to 11.00m bgl.

All dimensions in metres Scale 1:50	Client: Breedon Group	Method/ Plant Used	Dando 2000	Driller BT	Logged By BT
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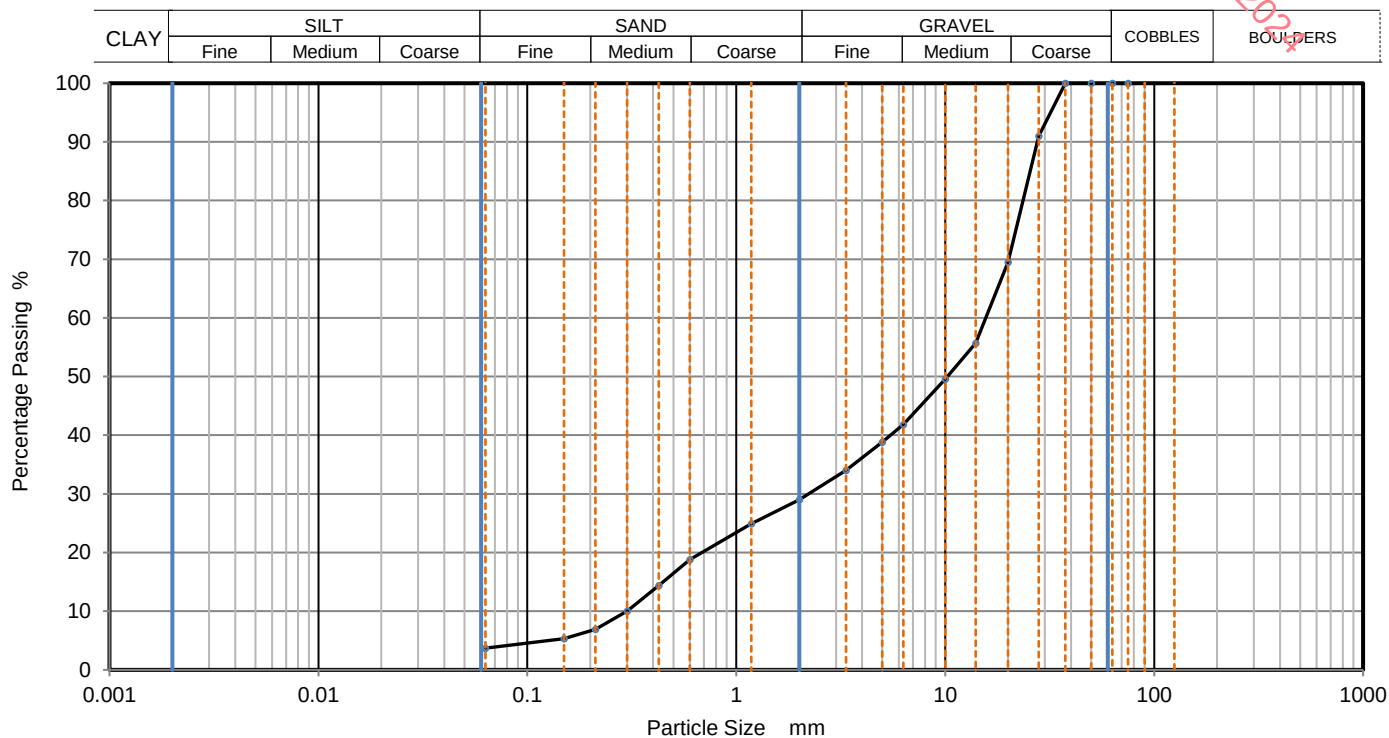
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APPENDIX 03

Particle Size Distribution Results

RECEIVED: 19/09/2024

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	23-MTL-TP03
Site Name	Camross Development			Sample No.	42007
Soil Description	Blackish-brown slightly silty very sandy medium and coarse GRAVEL.			Depth, m	0.30
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12023030131



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	91		
20	70		
14	56		
10	50		
6.3	42		
5	39		
3.35	34		
2	29		
1.18	25		
0.6	19		
0.425	14		
0.3	10		
0.212	7		
0.15	5		
0.063	4		

Dry Mass of sample, g

820

Sample Proportions	% dry mass
Very coarse	0
Gravel	71
Sand	25
Fines <0.063mm	4

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	52
Curvature Coefficient	1.1

Remarks

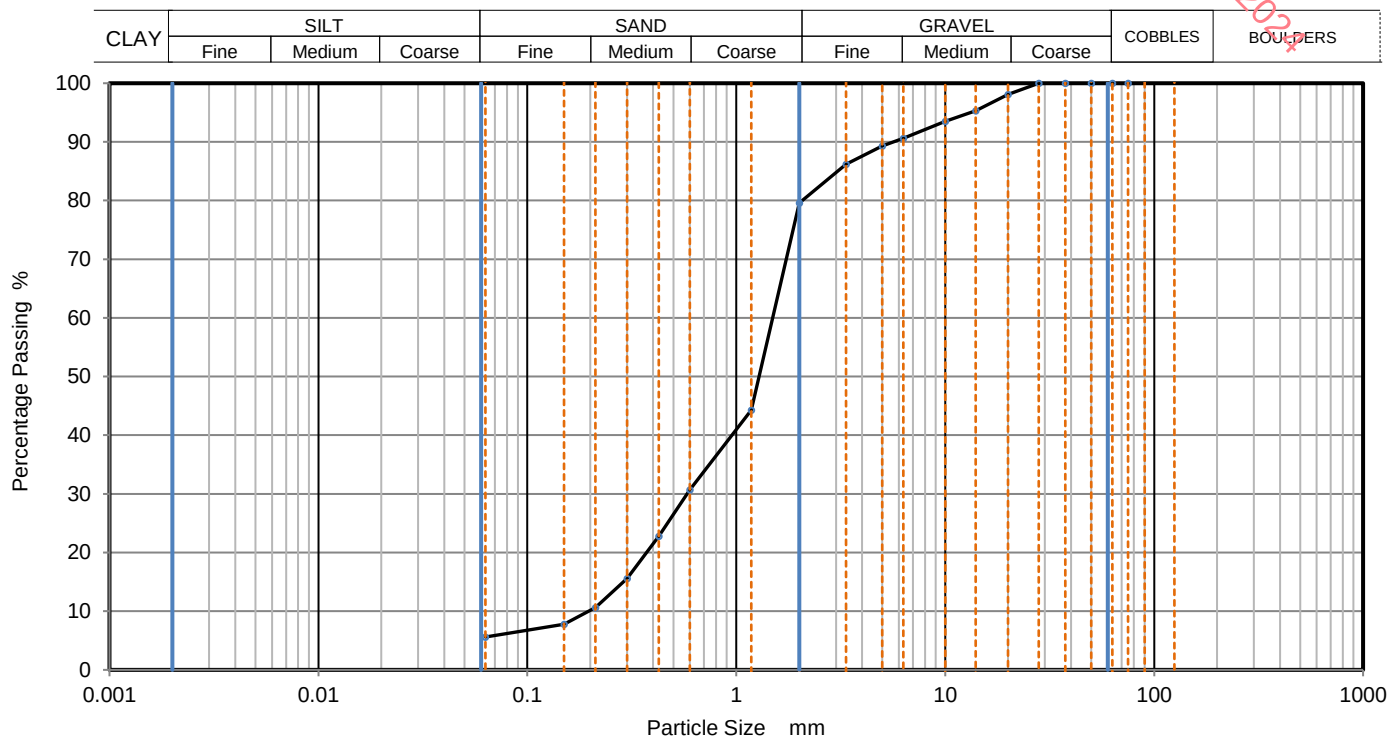
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	1
		Dympna Darcy B.Sc.	09/03/2023 11:35	
				QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	23-MTL-TP05
Site Name	Camross Development			Sample No.	42012
Soil Description	Orangish-brown silty very gravelly coarse SAND.			Depth, m	2.30
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL2023030132



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	95		
10	94		
6.3	91		
5	89		
3.35	86		
2	80		
1.18	44		
0.6	31		
0.425	23		
0.3	16		
0.212	11		
0.15	8		
0.063	6		

Dry Mass of sample, g

775

Sample Proportions	% dry mass
Very coarse	0
Gravel	20
Sand	74
Fines <0.063mm	6

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	7.6
Curvature Coefficient	1.2

Remarks

Preparation and testing in accordance with BS1377 unless noted below

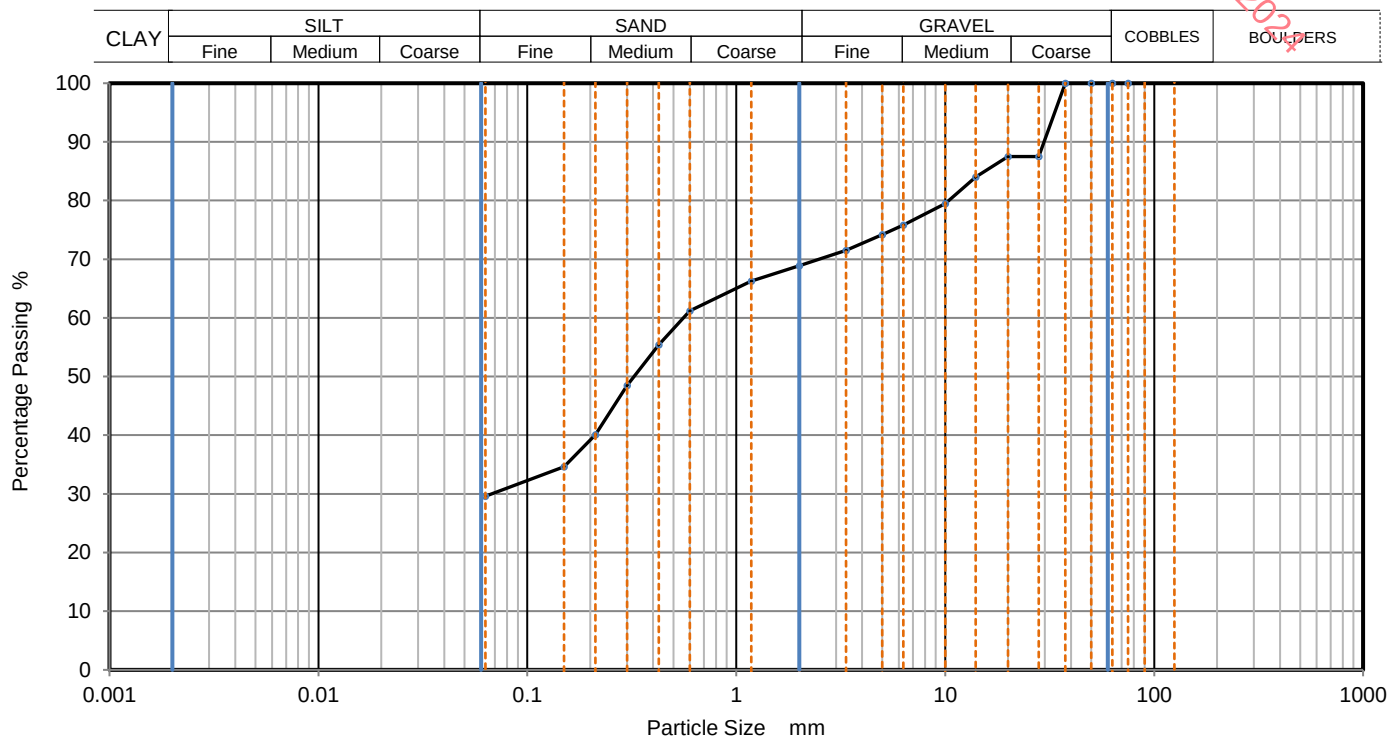
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QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	23-MTL-TP06
Site Name	Camross Development			Sample No.	42013
Soil Description	Orangish-brown very silty very gravelly medium SAND.			Depth, m	0.20
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12023030133



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	88		
20	88		
14	84		
10	80		
6.3	76		
5	74		
3.35	72		
2	69		
1.18	66		
0.6	61		
0.425	55		
0.3	49		
0.212	40		
0.15	35		
0.063	30		

Dry Mass of sample, g

849

Sample Proportions	% dry mass
Very coarse	0
Gravel	31
Sand	39
Fines <0.063mm	30

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

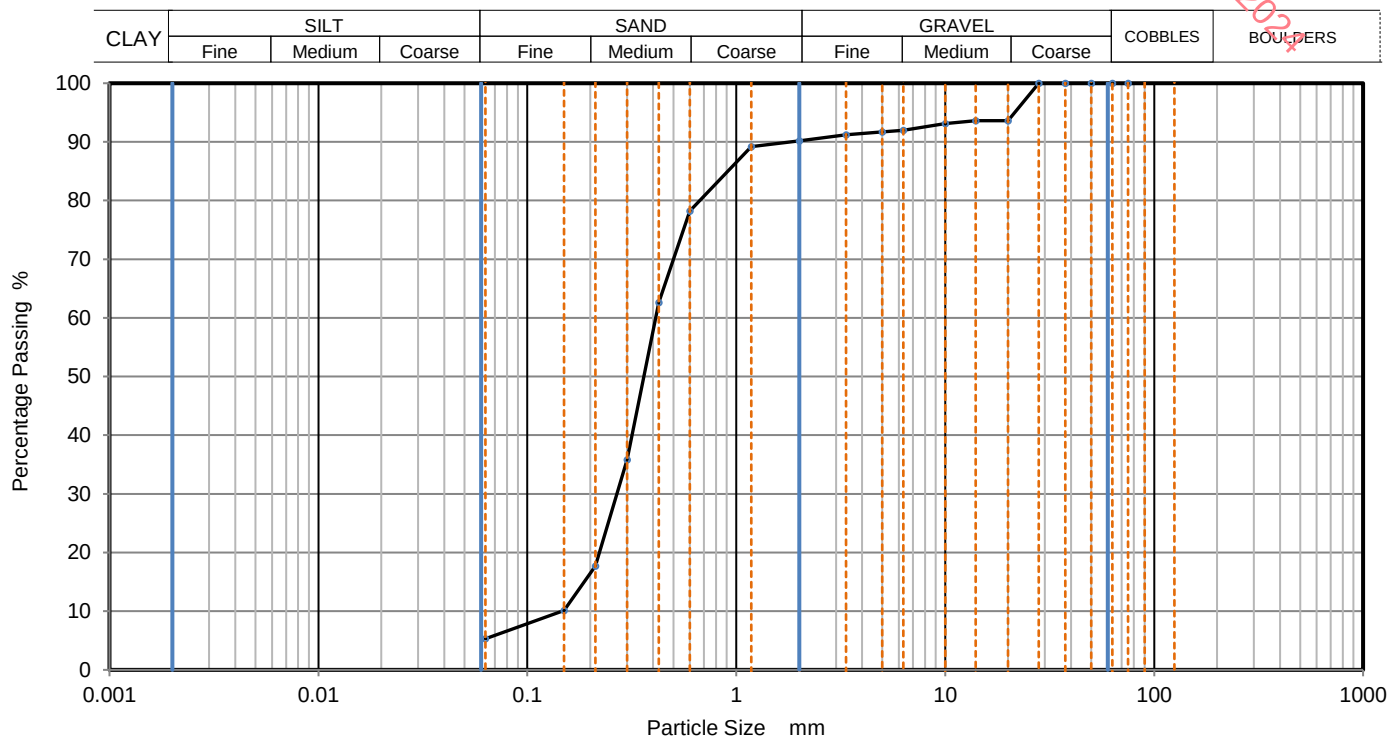
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QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	23-MTL-TP07
Site Name	Camross Development			Sample No.	42015
Soil Description	Yellowish-brown silty gravelly medium SAND.			Depth, m	0.40
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12023030134



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	94		
14	94		
10	93		
6.3	92		
5	92		
3.35	91		
2	90		
1.18	89		
0.6	78		
0.425	63		
0.3	36		
0.212	18		
0.15	10		
0.063	5		

Dry Mass of sample, g

730

Sample Proportions	% dry mass
Very coarse	0
Gravel	10
Sand	85
Fines <0.063mm	5

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	2.8
Curvature Coefficient	1.2

Remarks

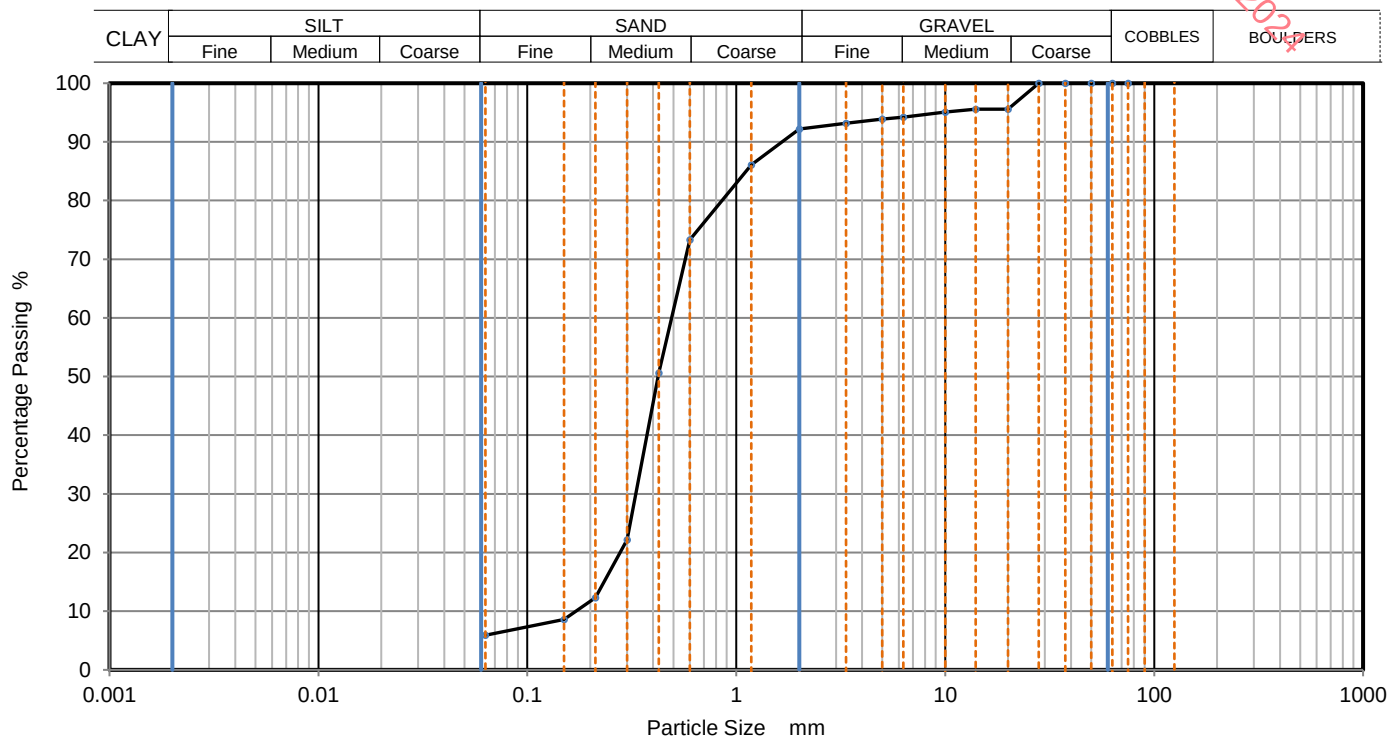
Preparation and testing in accordance with BS1377 unless noted below

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				QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION		Job Ref	2022LS101	
			Borehole/Pit No.	23-MTL-TP08	
Site Name	Camross Development		Sample No.	42018	
Soil Description	Yellowish-brown silty gravelly medium SAND.		Depth, m	1.20	
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2		KeyLAB ID	IDL12023030135	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	96		
10	95		
6.3	94		
5	94		
3.35	93		
2	92		
1.18	86		
0.6	73		
0.425	51		
0.3	22		
0.212	12		
0.15	9		
0.063	6		

Dry Mass of sample, g

765

Sample Proportions	% dry mass
Very coarse	0
Gravel	8
Sand	86
Fines <0.063mm	6

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	2.9
Curvature Coefficient	1.3

Remarks

Preparation and testing in accordance with BS1377 unless noted below

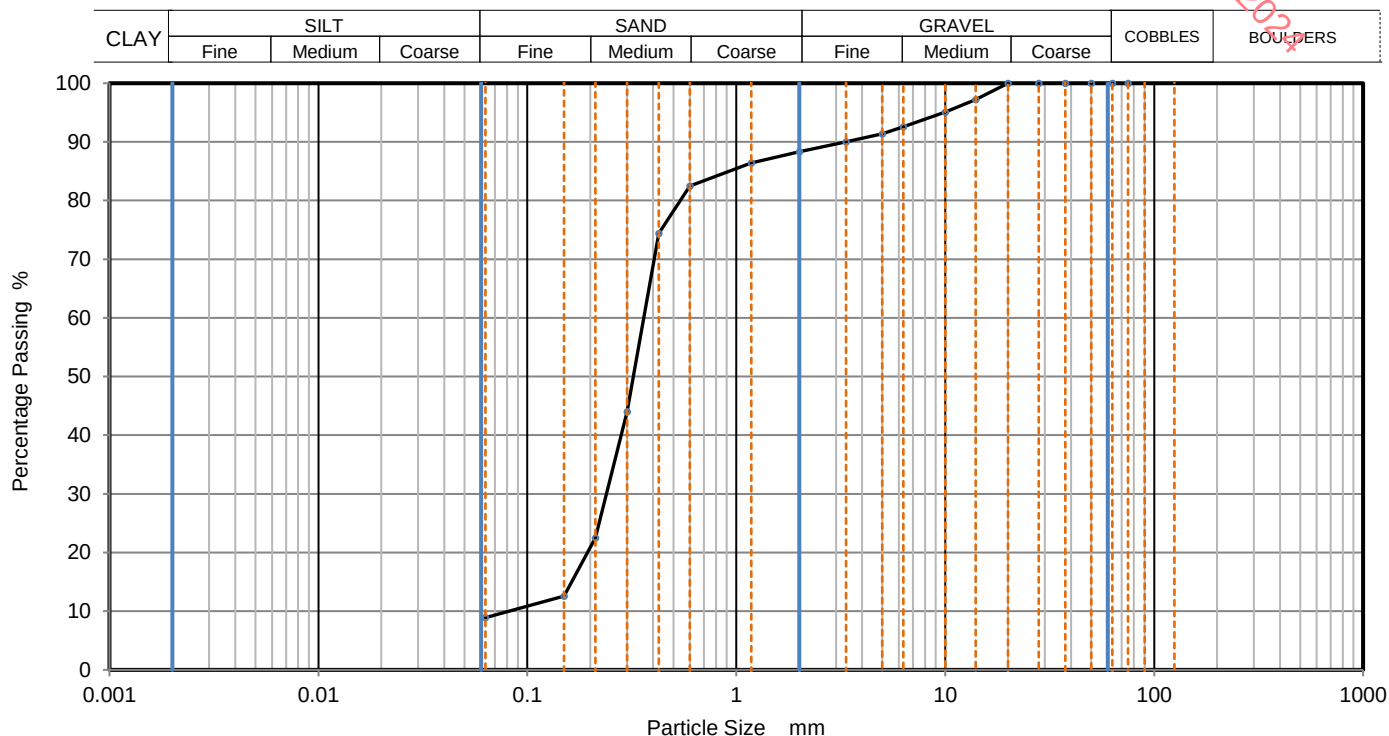
Operator	Checked	Approved	Sheet printed	1
		Dympna Darcy B.Sc.	09/03/2023 11:35	

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

QC From No:R2

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	23-MTL-TP10
Site Name	Camross Development			Sample No.	42022
Soil Description	Yellowish-brown silty gravelly medium SAND.			Depth, m	1.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL2023030136



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	95		
6.3	93		
5	91		
3.35	90		
2	88		
1.18	86		
0.6	83		
0.425	74		
0.3	44		
0.212	23		
0.15	13		
0.063	9		

Dry Mass of sample, g

780

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	79
Fines <0.063mm	9

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	4.4
Curvature Coefficient	2

Remarks

Preparation and testing in accordance with BS1377 unless noted below

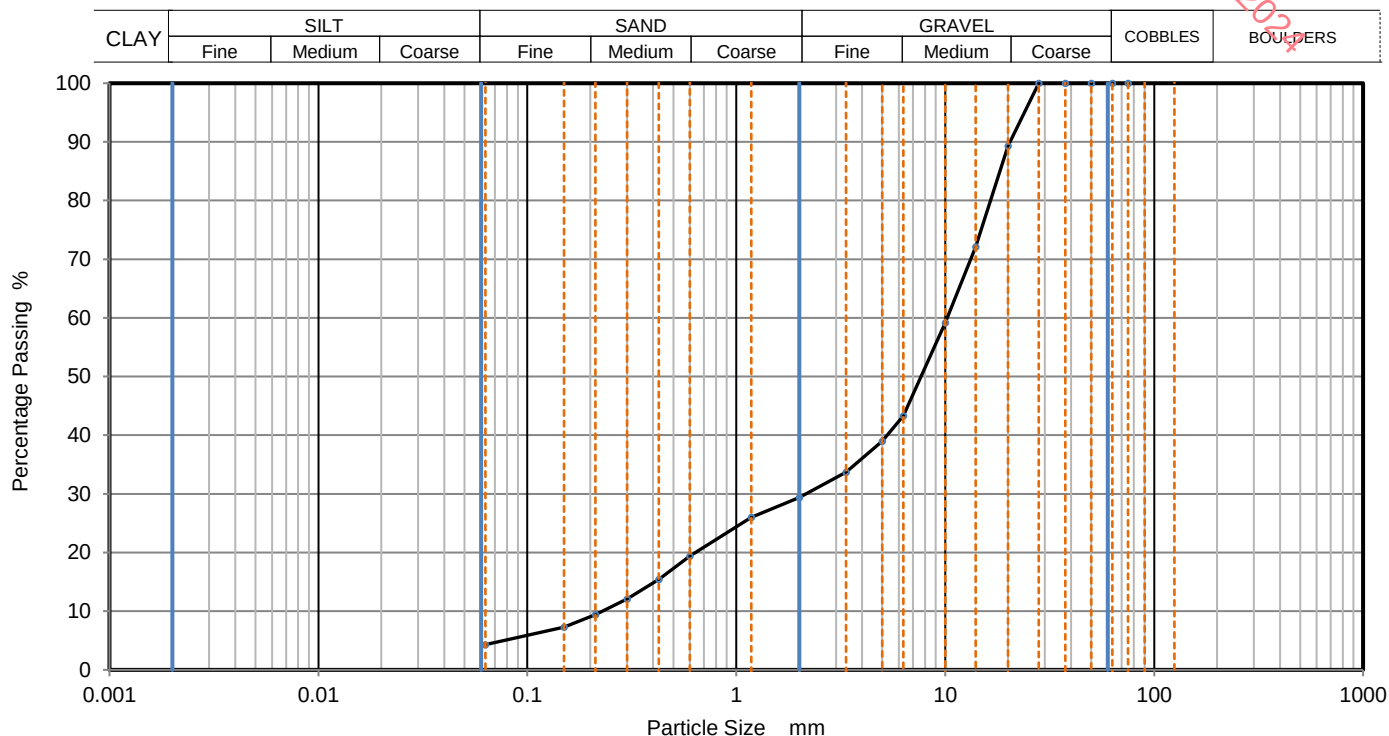
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QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	23-MTL-TP11
Site Name	Camross Development			Sample No.	42025
Soil Description	Brown slightly silty very sandy medium GRAVEL.			Depth, m	2.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL2023030137



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	89		
14	72		
10	59		
6.3	43		
5	39		
3.35	34		
2	29		
1.18	26		
0.6	19		
0.425	15		
0.3	12		
0.212	9		
0.15	7		
0.063	4		

Dry Mass of sample, g

901

Sample Proportions	% dry mass
Very coarse	0
Gravel	71
Sand	25
Fines <0.063mm	4

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

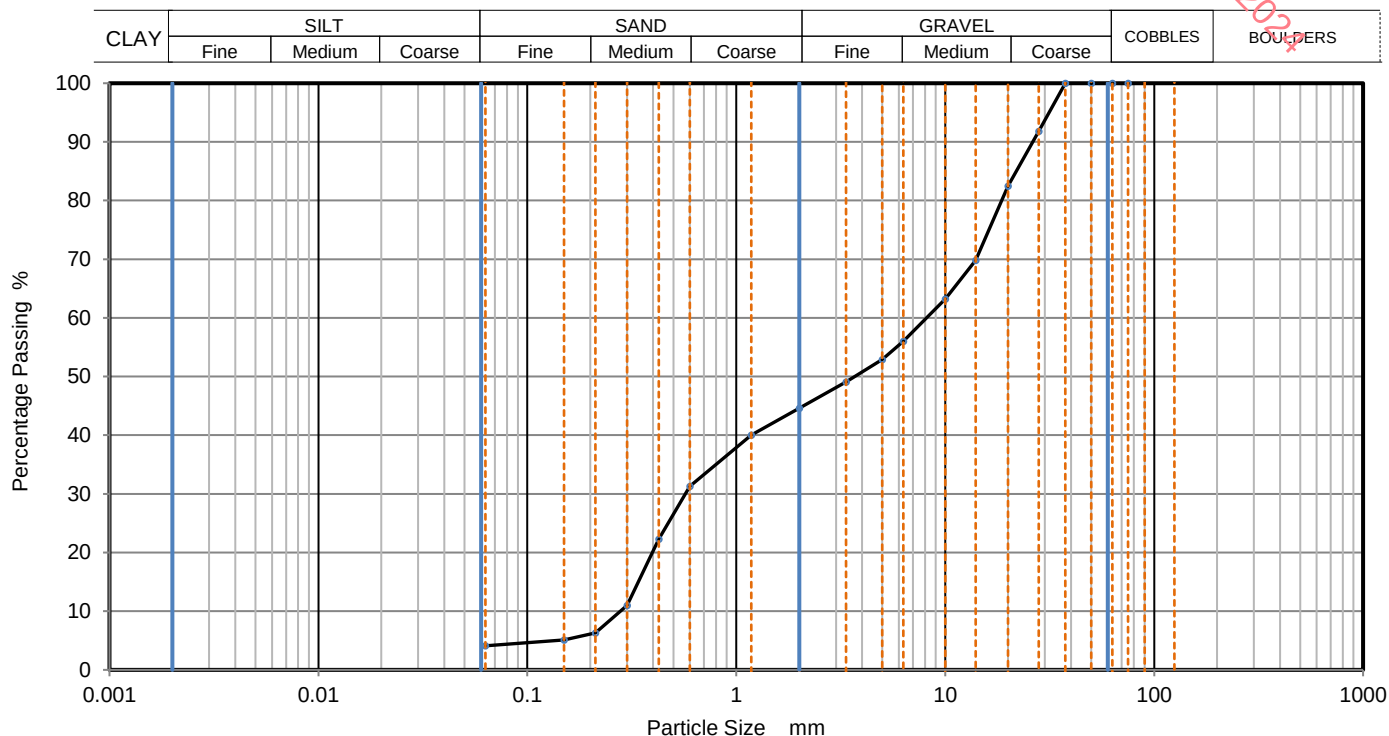
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	23-MTL-TP12
Site Name	Camross Development			Sample No.	42026
Soil Description	Orangish-brown slightly silty very sandy medium and coarse GRAVEL. Sand is medium.			Depth, m	0.10
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12023030138



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	92		
20	83		
14	70		
10	63		
6.3	56		
5	53		
3.35	49		
2	45		
1.18	40		
0.6	31		
0.425	22		
0.3	11		
0.212	6		
0.15	5		
0.063	4		

Dry Mass of sample, g

956

Sample Proportions	% dry mass
Very coarse	0
Gravel	55
Sand	41
Fines <0.063mm	4

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	29
Curvature Coefficient	0.14

Remarks

Preparation and testing in accordance with BS1377 unless noted below

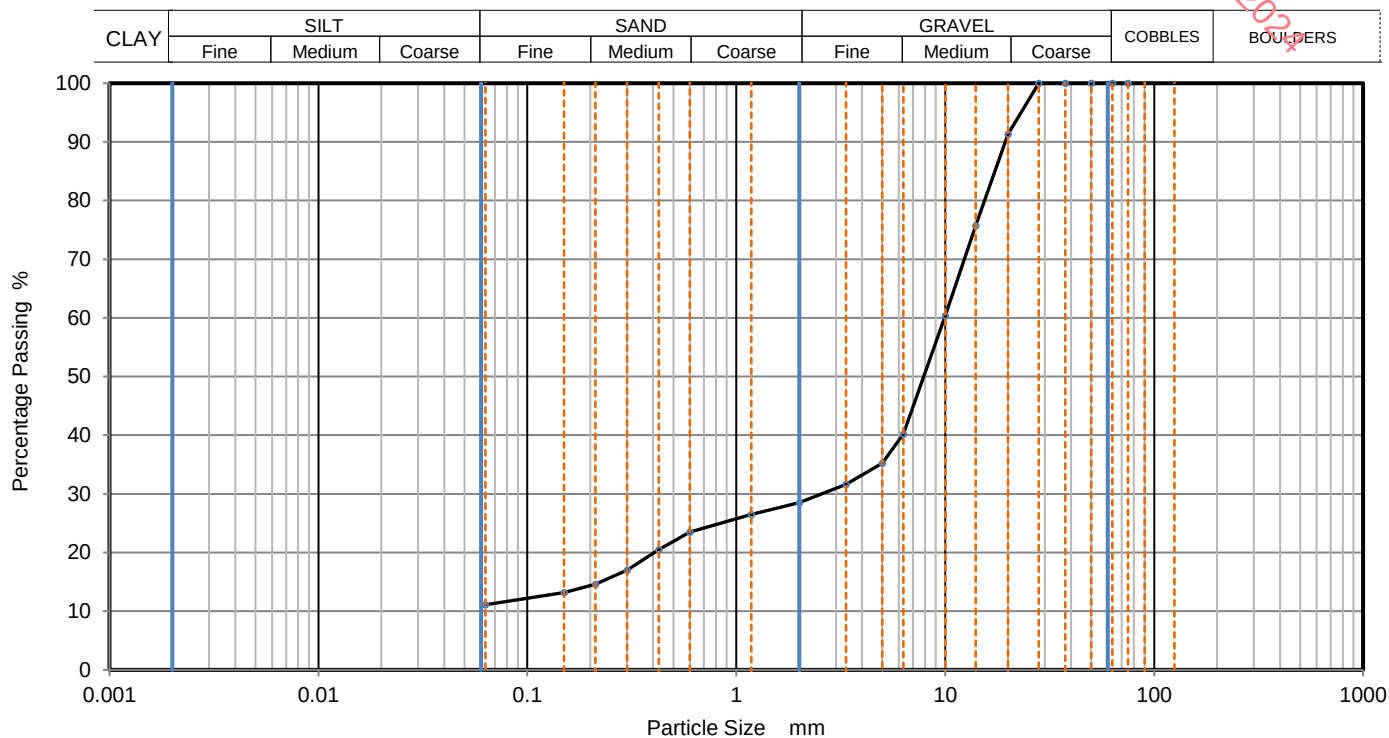
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	23-MTL-TP13
Site Name	Camross Development			Sample No.	42029
Soil Description	Dark brown silty sandy medium GRAVEL.			Depth, m	0.40
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12023030139



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	91		
14	76		
10	60		
6.3	40		
5	35		
3.35	32		
2	29		
1.18	27		
0.6	24		
0.425	21		
0.3	17		
0.212	15		
0.15	13		
0.063	11		

Dry Mass of sample, g

1006

Sample Proportions	% dry mass
Very coarse	0
Gravel	72
Sand	18
Fines <0.063mm	11

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

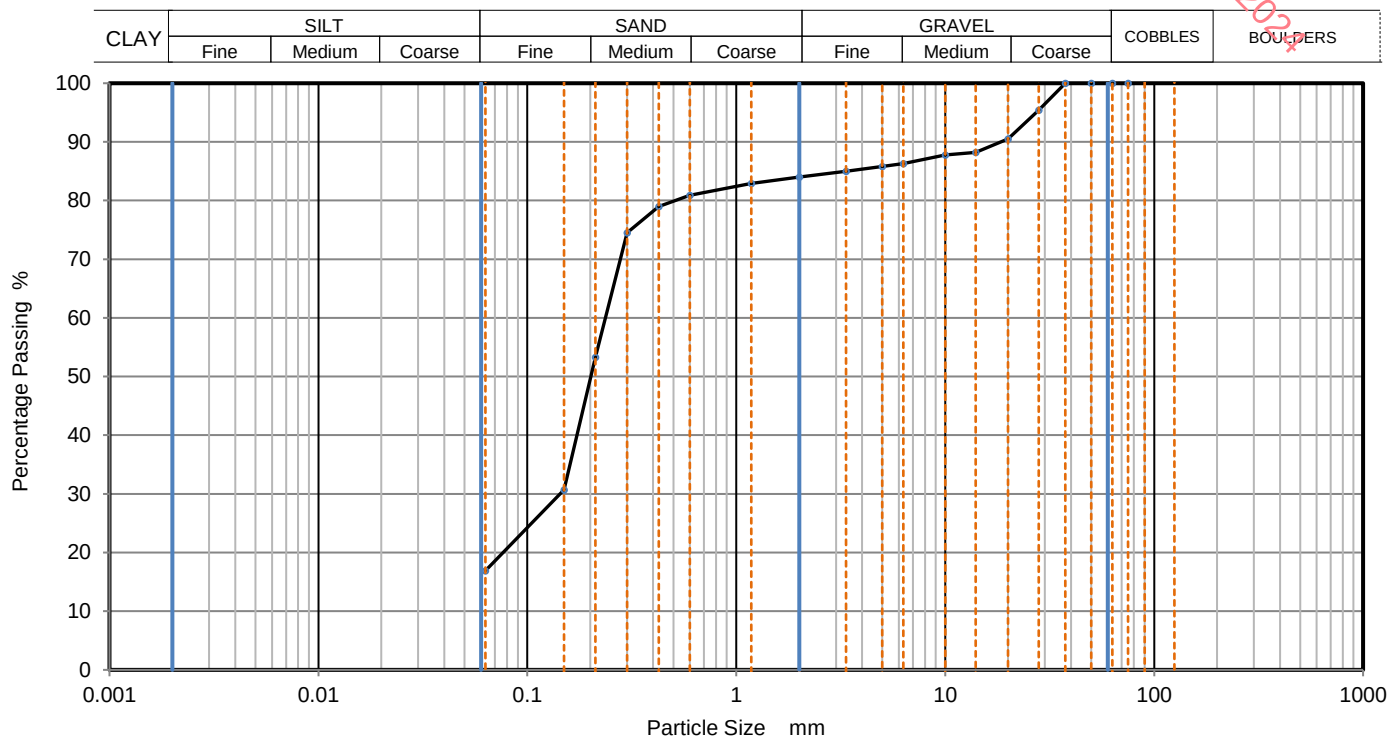
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	BH 01
Site Name	Camross Development			Sample No.	2
Soil Description	Brown gravelly silty fine and medium SAND.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202303011



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	91		
14	88		
10	88		
6.3	86		
5	86		
3.35	85		
2	84		
1.18	83		
0.6	81		
0.425	79		
0.3	75		
0.212	53		
0.15	31		
0.063	17		

Dry Mass of sample, g

914

Sample Proportions	% dry mass
Very coarse	0
Gravel	16
Sand	67
Fines <0.063mm	17

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

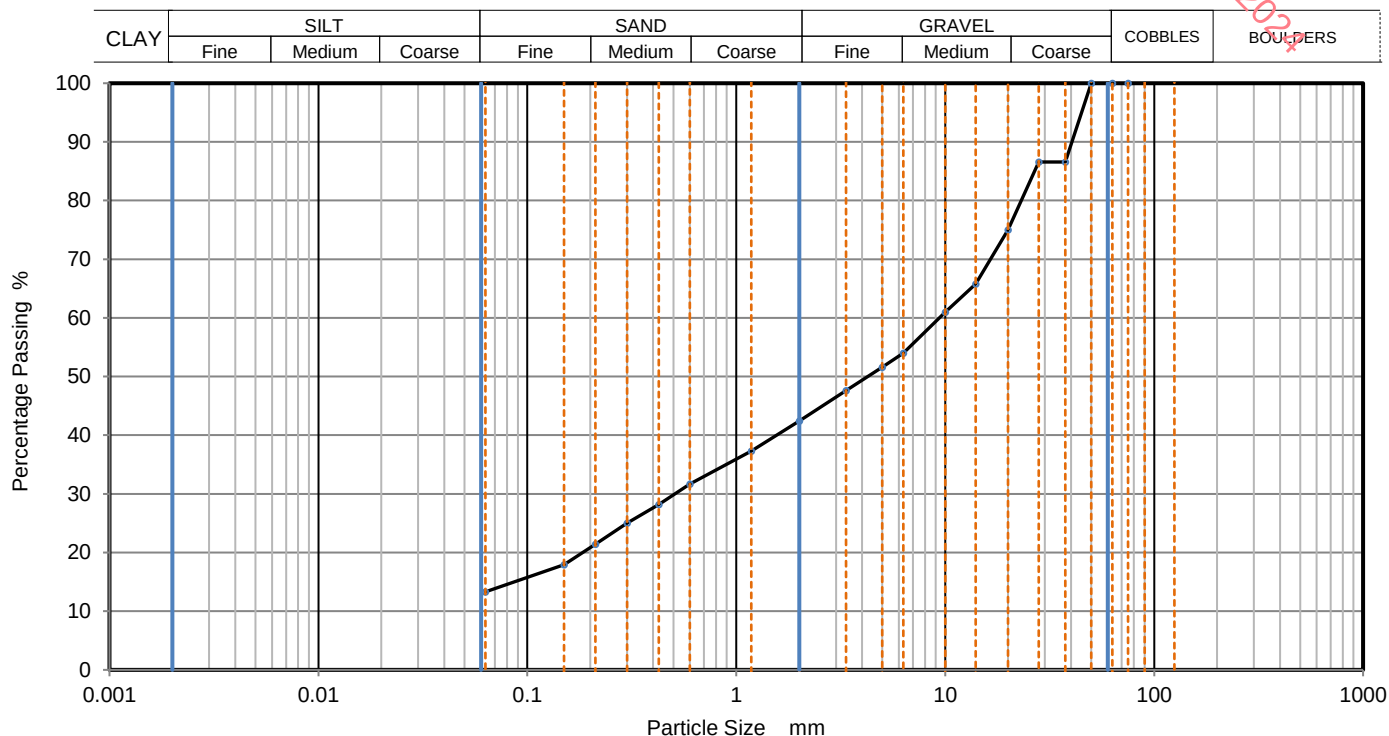
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION		Job Ref	2022LS101	
			Borehole/Pit No.	BH 01	
Site Name	Camross Development		Sample No.	4	
Soil Description	Yellowish-brown silty very sandy medium and coarse GRAVEL.		Depth, m	6.00	
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2		KeyLAB ID	IDL1202303013	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	87		
28	87		
20	75		
14	66		
10	61		
6.3	54		
5	52		
3.35	48		
2	42		
1.18	37		
0.6	32		
0.425	28		
0.3	25		
0.212	21		
0.15	18		
0.063	13		

Dry Mass of sample, g

1462

Sample Proportions	% dry mass
Very coarse	0
Gravel	58
Sand	29
Fines <0.063mm	13

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

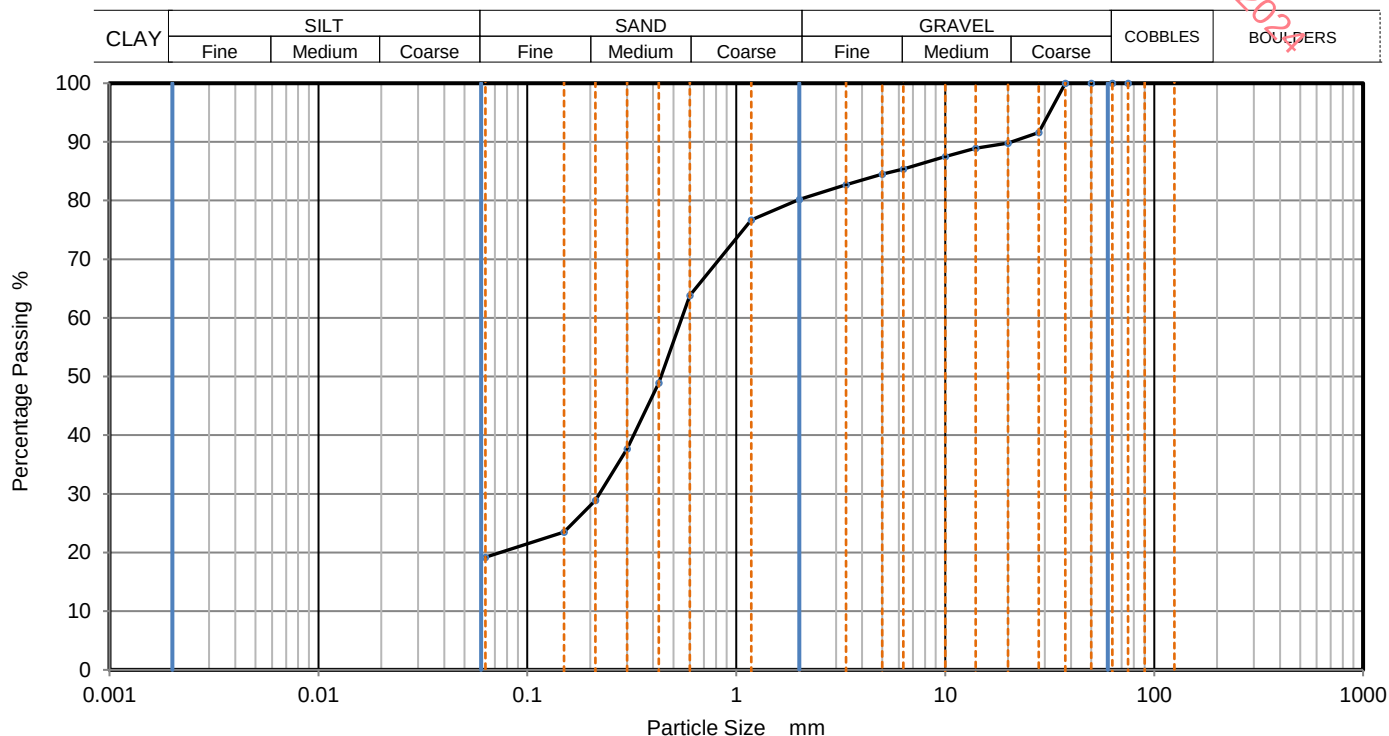
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	BH 01
Site Name	Camross Development			Sample No.	6
Soil Description	Brown silty very gravelly medium SAND.			Depth, m	9.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202303015



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	92		
20	90		
14	89		
10	88		
6.3	85		
5	85		
3.35	83		
2	80		
1.18	77		
0.6	64		
0.425	49		
0.3	38		
0.212	29		
0.15	24		
0.063	19		

Dry Mass of sample, g

925

Sample Proportions	% dry mass
Very coarse	0
Gravel	20
Sand	61
Fines <0.063mm	19

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

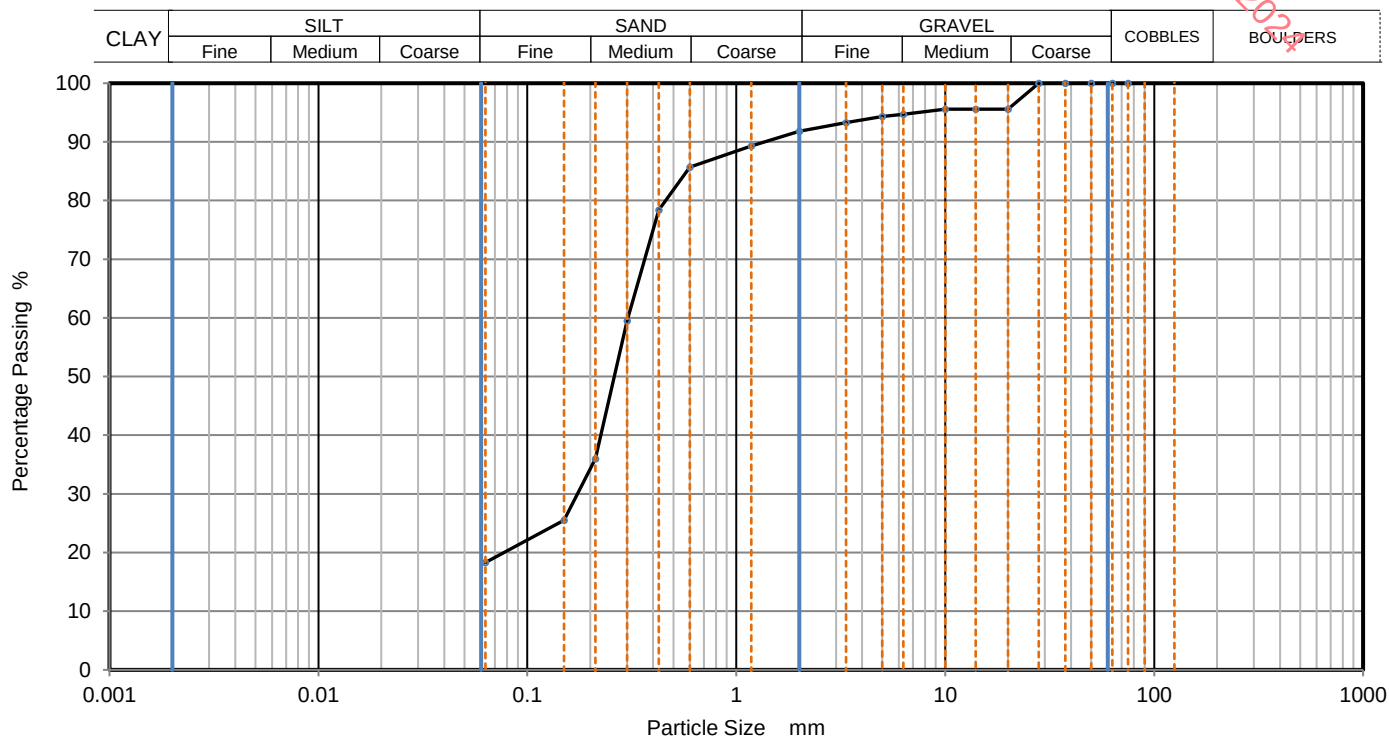
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	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	BH 02
Site Name	Camross Development			Sample No.	2
Soil Description	Orangish-brown gravelly silty medium SAND.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202303019



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	96		
10	96		
6.3	95		
5	94		
3.35	93		
2	92		
1.18	89		
0.6	86		
0.425	78		
0.3	60		
0.212	36		
0.15	26		
0.063	18		

Dry Mass of sample, g

814

Sample Proportions	% dry mass
Very coarse	0
Gravel	8
Sand	73
Fines <0.063mm	18

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

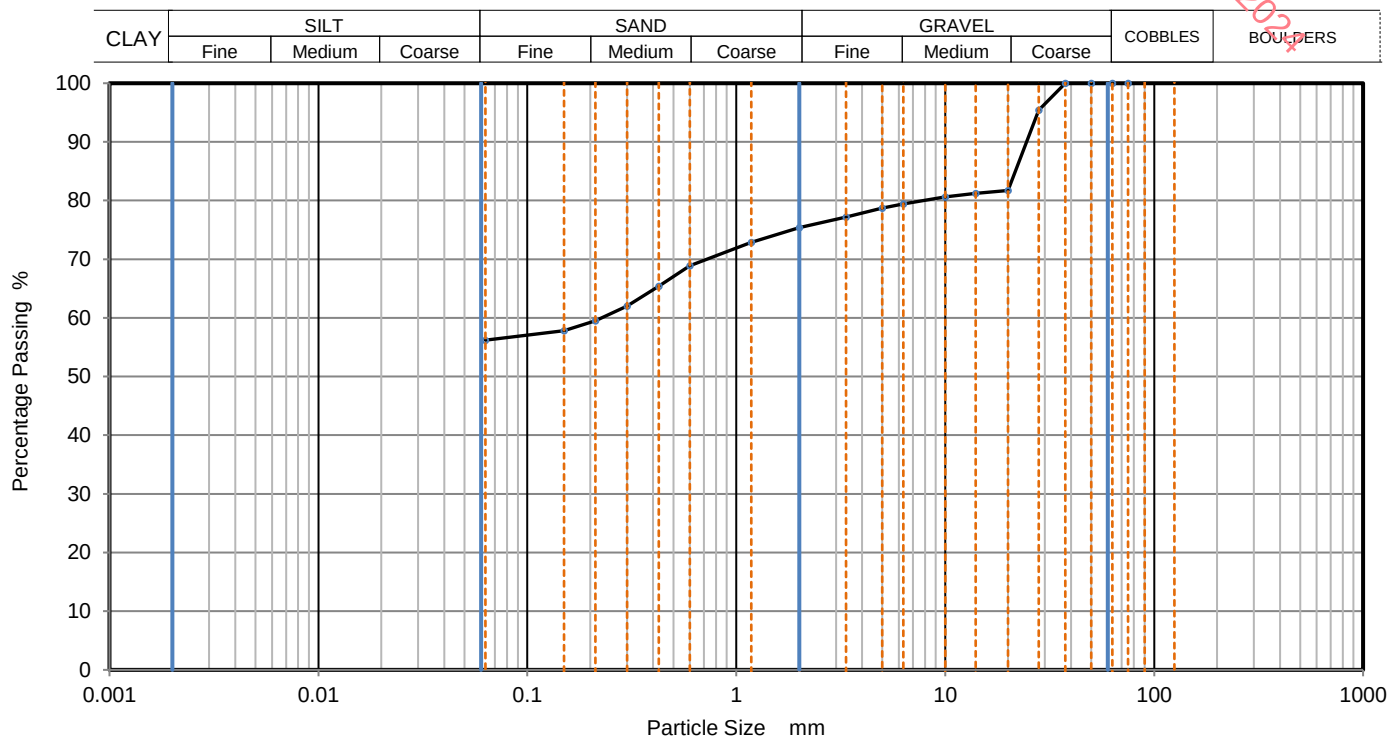
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	BH 02
Site Name	Camross Development			Sample No.	5
Soil Description	Brown slightly sandy slightly gravelly SILT.			Depth, m	7.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL2023030112



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	82		
14	81		
10	81		
6.3	79		
5	79		
3.35	77		
2	75		
1.18	73		
0.6	69		
0.425	65		
0.3	62		
0.212	60		
0.15	58		
0.063	56		

Dry Mass of sample, g

1416

Sample Proportions	% dry mass
Very coarse	0
Gravel	25
Sand	19
Fines <0.063mm	56

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

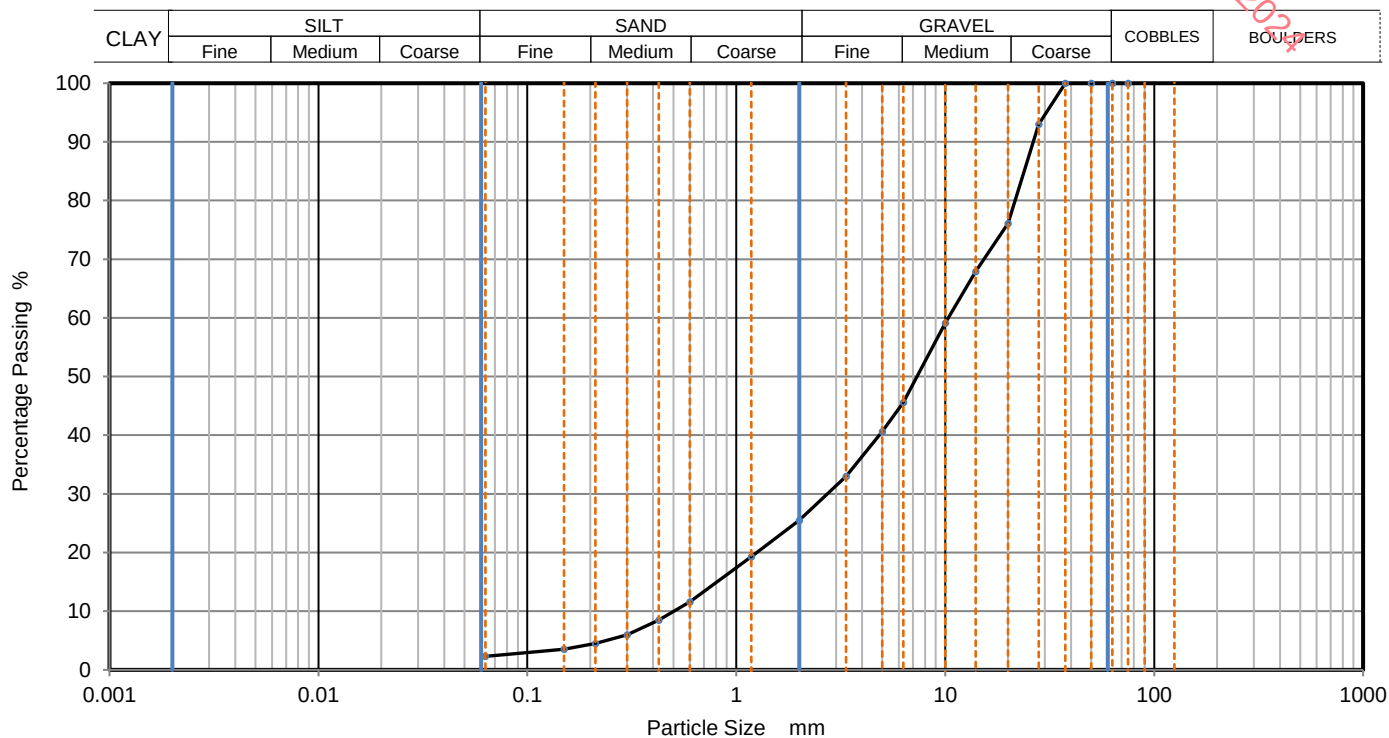
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	BH 02
Site Name	Camross Development			Sample No.	9
Soil Description	Bluish-brown slightly silty very sandy GRAVEL.			Depth, m	13.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL2023030116



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	93		
20	76		
14	68		
10	59		
6.3	46		
5	41		
3.35	33		
2	26		
1.18	19		
0.6	12		
0.425	9		
0.3	6		
0.212	5		
0.15	4		
0.063	2		

Dry Mass of sample, g

1058

Sample Proportions	% dry mass
Very coarse	0
Gravel	75
Sand	23
Fines <0.063mm	2

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	21
Curvature Coefficient	1.4

Remarks

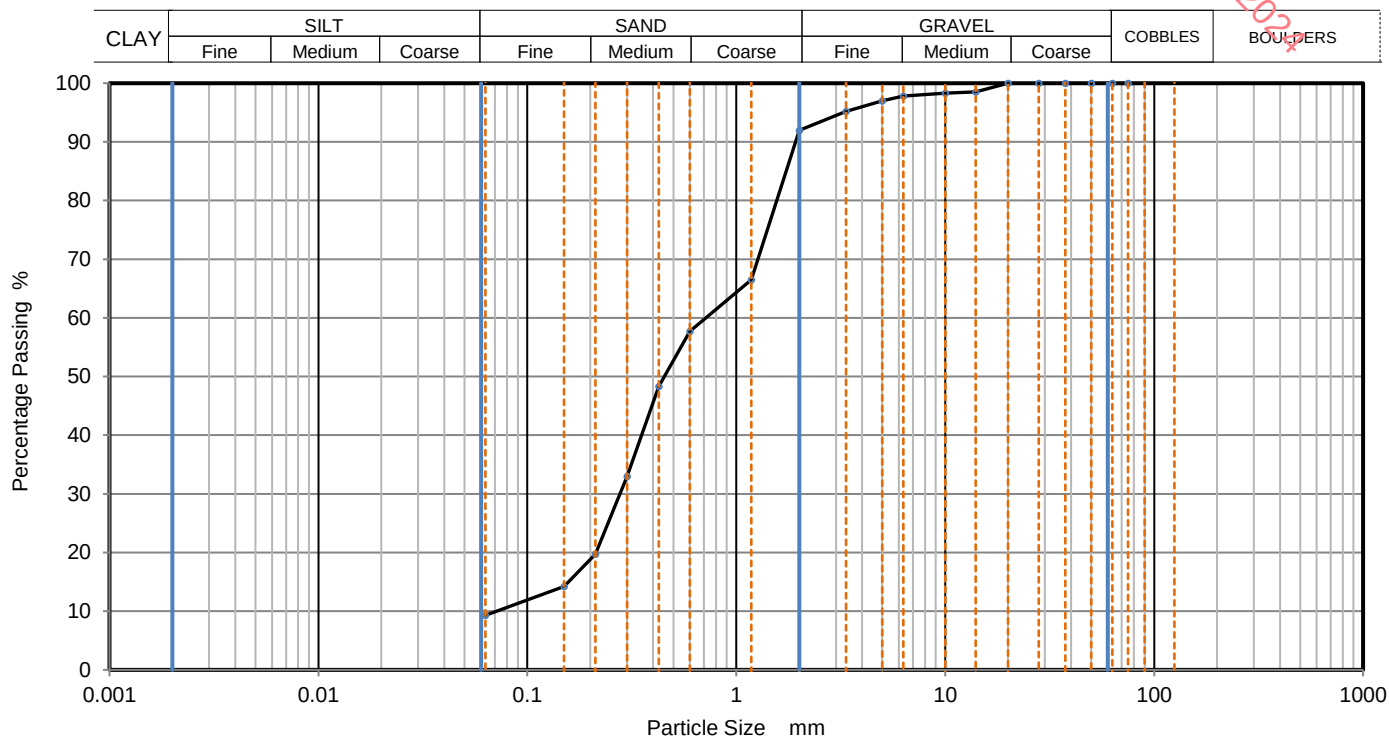
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	BH 02
Site Name	Camross Development			Sample No.	12
Soil Description	Greyish-brown gravelly silty medium and coarse SAND.			Depth, m	18.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL2023030119



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	98		
6.3	98		
5	97		
3.35	95		
2	92		
1.18	67		
0.6	58		
0.425	48		
0.3	33		
0.212	20		
0.15	14		
0.063	9		

Dry Mass of sample, g

1129

Sample Proportions	% dry mass
Very coarse	0
Gravel	8
Sand	83
Fines <0.063mm	9

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	10
Curvature Coefficient	1.5

Remarks

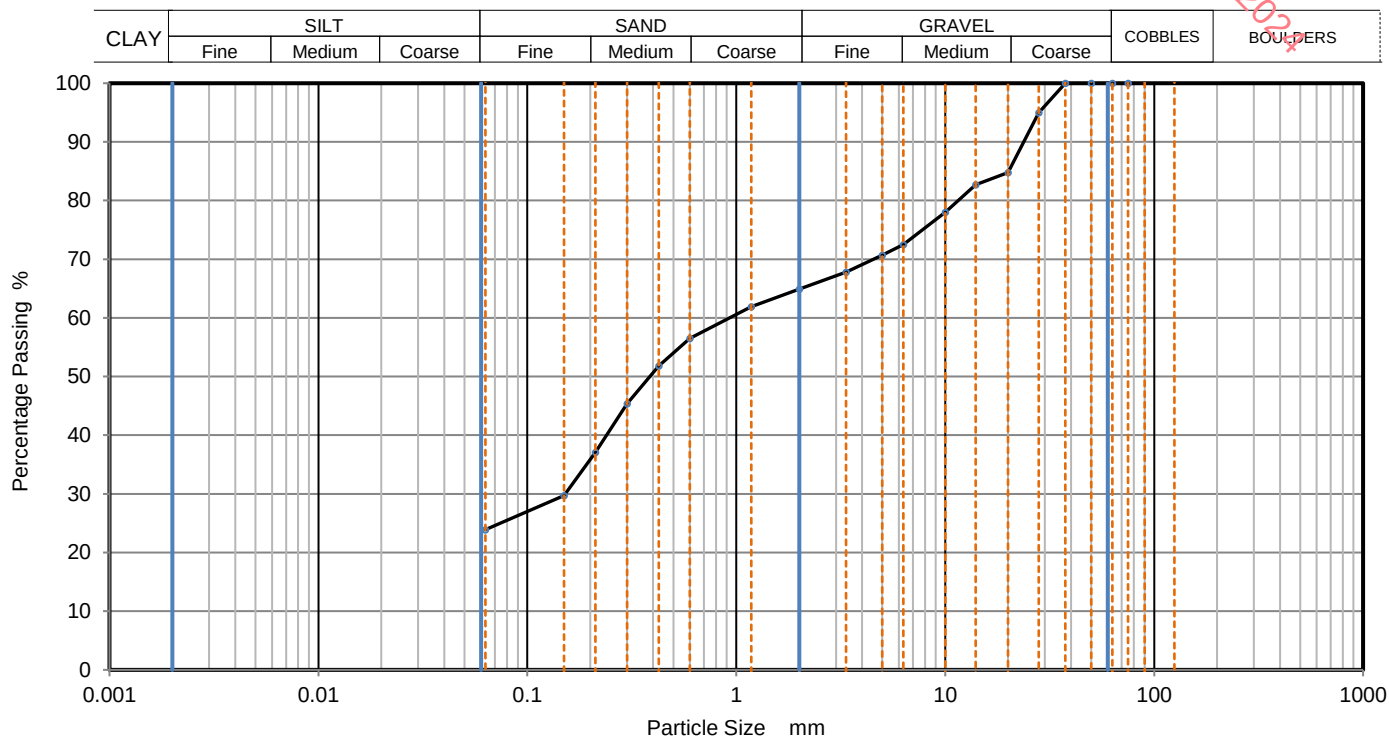
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	BH 02
Site Name	Camross Development			Sample No.	14
Soil Description	Light brown very silty GRAVEL and SAND.			Depth, m	21.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL2023030121



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	85		
14	83		
10	78		
6.3	73		
5	71		
3.35	68		
2	65		
1.18	62		
0.6	57		
0.425	52		
0.3	45		
0.212	37		
0.15	30		
0.063	24		

Dry Mass of sample, g

1336

Sample Proportions	% dry mass
Very coarse	0
Gravel	35
Sand	41
Fines <0.063mm	24

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

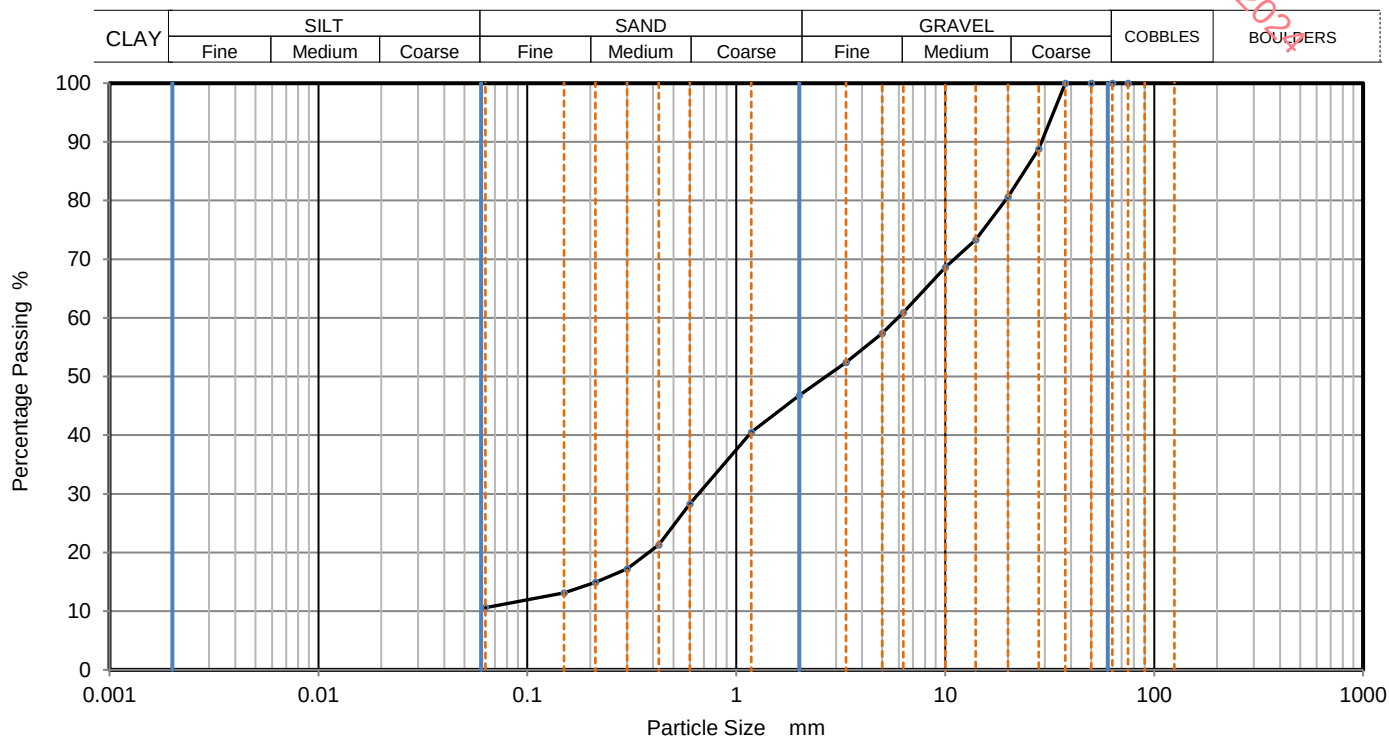
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QC From No:R2

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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION		Job Ref	2022LS101	
			Borehole/Pit No.	BH 03	
Site Name	Camross Development		Sample No.	2	
Soil Description	Orangish-brown silty very sandy GRAVEL. Sand is medium and coarse.		Depth, m	3.00	
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2		KeyLAB ID	IDL12023030124	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	89		
20	81		
14	73		
10	69		
6.3	61		
5	57		
3.35	52		
2	47		
1.18	41		
0.6	28		
0.425	21		
0.3	17		
0.212	15		
0.15	13		
0.063	11		

Dry Mass of sample, g

1123

Sample Proportions	% dry mass
Very coarse	0
Gravel	53
Sand	36
Fines <0.063mm	11

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

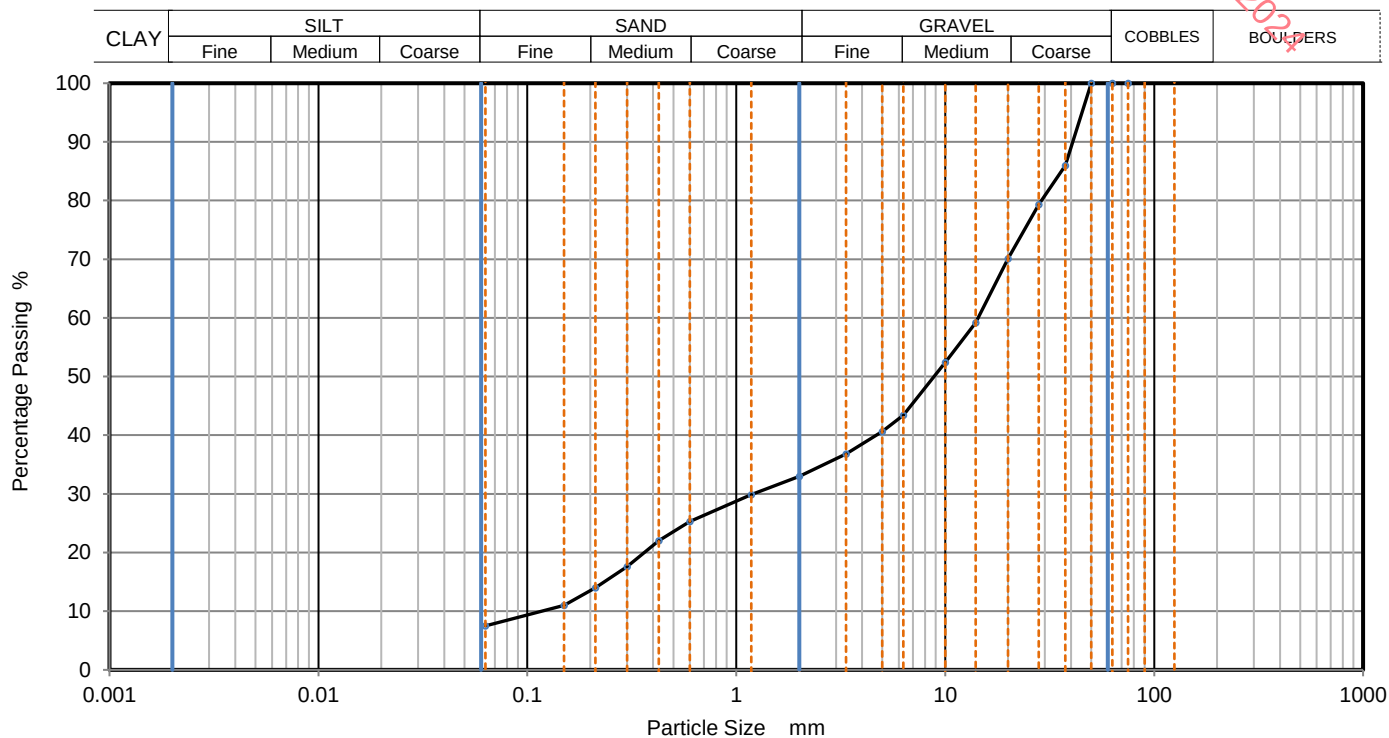
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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	BH 03
Site Name	Camross Development			Sample No.	4
Soil Description	Light brown silty very sandy medium and coarse GRAVEL.			Depth, m	6.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL2023030126



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	86		
28	79		
20	70		
14	59		
10	52		
6.3	43		
5	41		
3.35	37		
2	33		
1.18	30		
0.6	25		
0.425	22		
0.3	18		
0.212	14		
0.15	11		
0.063	8		

Dry Mass of sample, g

1271

Sample Proportions	% dry mass
Very coarse	0
Gravel	67
Sand	26
Fines <0.063mm	7

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	120
Curvature Coefficient	0.84

Remarks

Preparation and testing in accordance with BS1377 unless noted below

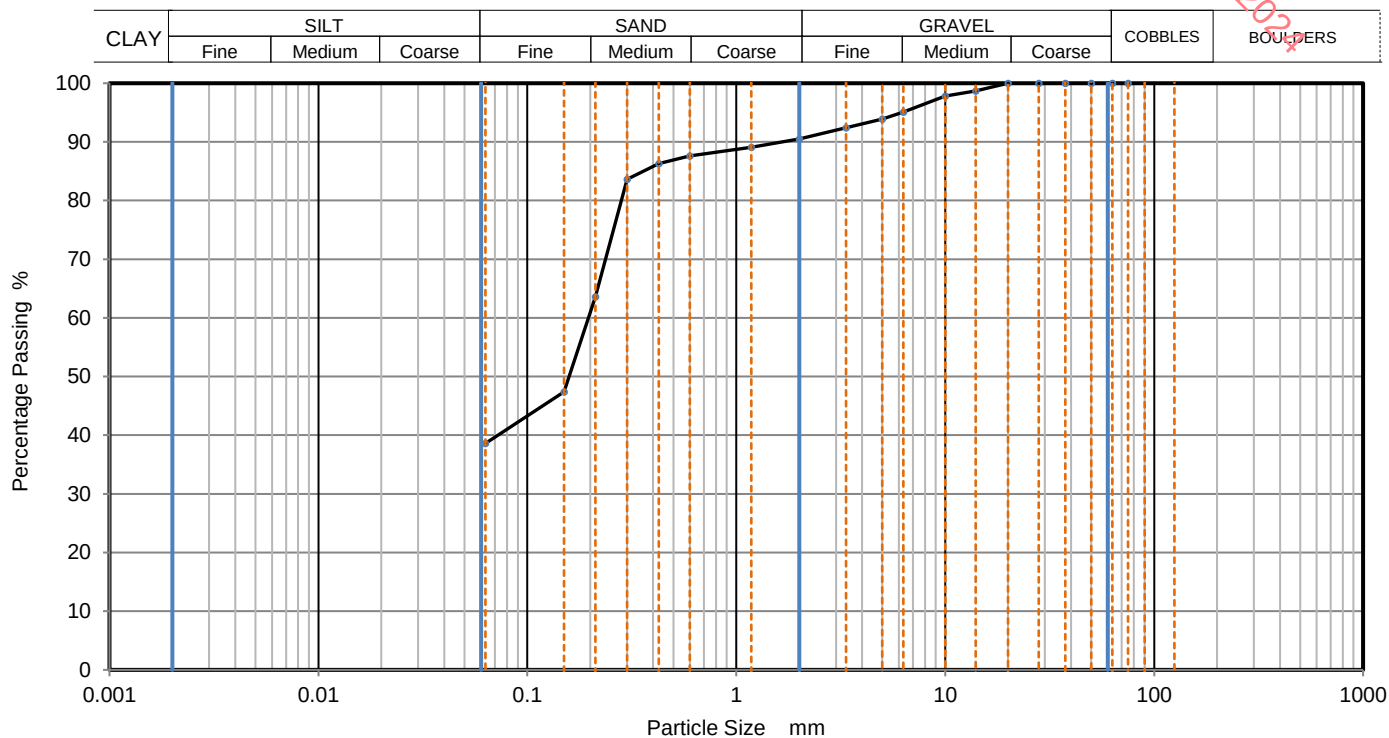
Operator	Checked	Approved	Sheet printed	1
		Dympna Darcy B.Sc.	09/03/2023 11:35	

QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	PARTICLE SIZE DISTRIBUTION			Job Ref	2022LS101
				Borehole/Pit No.	BH 03
Site Name	Camross Development			Sample No.	6
Soil Description	Light brown slightly gravelly sandy SILT. Sand is fine and medium.			Depth, m	9.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12023030128



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	98		
6.3	95		
5	94		
3.35	92		
2	91		
1.18	89		
0.6	88		
0.425	86		
0.3	84		
0.212	64		
0.15	47		
0.063	39		

Dry Mass of sample, g

1196

Sample Proportions	% dry mass
Very coarse	0
Gravel	10
Sand	52
Fines <0.063mm	39

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	1
		Dympna Darcy B.Sc.	09/03/2023 11:35	

QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

APPENDIX 04

Geophysical Report

RECEIVED: 19/09/2024

RECEIVED: 19/09/2024

**REPORT
ON THE
GEOPHYSICAL INVESTIGATION
AT
MOUNTHALL, CAMROSS,
Co. LAOIS
FOR
THE BREEDON GROUP.**



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Co. Wexford**

8TH AUGUST 2022

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