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## INTRODUCTION

### Background

- 6.1 This Chapter of the Environmental Impact Assessment Report (EIAR) addresses the potential effects on land, soils and geology of the proposed backfilling of an existing hard rock quarry by way of an inert landfill and the operation of a construction and demolition (C&D) waste recovery facilities at Ballinclare Quarry, near Kilbride, Co. Wicklow.
- 6.2 The proposed development provides for backfilling of the quarry to its original ground level using imported inert waste, principally soil and stone, generated by construction projects in Counties Wicklow, Dublin and Wexford and its long-term restoration to a grassland / scrub habitat, similar to that which existed prior to quarry development.
- 6.3 The key elements of the proposed development relevant to this topic are as follows:
- The backfilling of the existing quarry void by developing and operating an inert waste landfill facility with a total intake capacity of approximately 6,165,000 tonnes of inert soil and stone waste and (non-waste) soil and stone by-product and its progressive restoration to long-term grassland / scrub habitat thereafter;
  - Continued use of established site infrastructure and services including, site / weighbridge office, staff welfare facilities, wastewater treatment plant, weighbridge, garage / workshop, wheelwash, hardstand areas, fuel and water storage tanks to service the proposed development;
  - Installation of a new weighbridge along the inbound lane of the quarry access road;
  - Decommissioning of any remaining fixed plant and infrastructure associated with former rock extraction activities or with aggregate, concrete and asphalt production activities at the application site;
  - Off-site removal of any materials or bulky wastes associated with the former quarrying and production activities;
  - Construction of an industrial shed (portal frame structure) at the paved blockyard area to house crushing and screening equipment and process / recycle inert C&D waste (principally solid / reinforced concrete, bricks, ceramics and solid bituminous waste mixtures);
  - Use of any remaining external paved area surrounding the C&D waste processing shed as a hardstanding area for the external handling and storage of both unprocessed and processed C&D wastes;
  - Installation and operation of a soil washing plant in the former concrete / asphalt yard in the south-eastern corner of the application site to recover sand and gravel aggregate for use in construction.
  - Construction of an on-site (passive) wetland treatment system and attendant drainage infrastructure to treat surface water run-off / groundwater collecting in the floor of the quarry area during backfilling / landfilling operations and surface water run-off from the C&D waste recovery area prior to its discharge off-site;
  - Re-use of an existing storage shed as a dedicated waste inspection and quarantine facility to inspect and store suspect waste consignments as required;
  - Upgrading and ongoing maintenance of established internal haul roads across the application site;

- Temporary stockpiling of topsoil pending re-use as cover material for final restoration of the inert landfill / backfilled quarry;
- Environmental monitoring of noise, dust, surface water and groundwater for the duration of the site backfilling and restoration works and for a short period thereafter.

6.4 Further details on the proposed development (site infrastructure, operations, environmental management systems, and controls etc.) are provided in Chapter 2 of this EIAR.

### Scope of Work / EIA Scoping

6.5 This EIAR Chapter is based on a geological desk study of the application site and surrounding lands undertaken using published geological data, previous field investigations (groundwater and geological borehole logs) and information obtained from previous site inspections by SLR personnel, including assessments of quarry face exposures.

### Consultations / Consultees

6.6 A pre-planning consultation meeting was held between officials of Wicklow County Council and representatives of Kilsaran Concrete and SLR Consulting Ireland on 7<sup>th</sup> February 2019 at the offices of Wicklow County Council in Wicklow Town. Staff from the roads, water and environment services departments of Wicklow County Council were also in attendance. Specific concerns were raised at that meeting in respect of the potential for contaminant emissions from the inert landfill and their impact on surrounding ground and on local groundwater resources in particular.

6.7 The Geological Survey of Ireland (GSI) Irish Geological Heritage (IGH) Programme ([www.gsi.ie](http://www.gsi.ie)) was consulted to identify what geological heritage sites are present locally around the application site.

6.8 Following a review of available information, it was considered that there was no requirement for any further formal external consultations to be carried out in respect of land, soil and geology for the purposes of this assessment. There was consultation with other specialist contributors, most notably hydrogeologists preparing the water chapter of this EIAR (Chapter 7).

6.9 As this development constitutes Strategic Infrastructure Development (SID), a formal consultation exercise was also undertaken with statutory consultees and nearby residents / members of the general public between October and December 2020. Details of these consultations and the feedback obtained therefrom is provided in a separate report submitted in support of the SID application to An Bord Pleanála. Any specific feedback provided in respect of land, soils and geology has been considered and addressed as appropriate in drafting this Chapter of the EIAR.

### Author

6.10 This EIAR section relating to Land, Soils and Geology was prepared by Paul Gordon (EurGeol PGeo) of SLR Consulting. Paul has a BSc in Geology and an MSc in Environmental Management and has over 20 years' professional experience, primarily in the Irish minerals industry.

### Limitations / Difficulties Encountered

6.11 This EIAR has been prepared based on available desktop information, inspection of the existing quarry faces, groundwater and geology borehole logs, a recent geological assessment of the site and professional experience.

6.12 No difficulties were encountered in the preparation of this section.

## REGULATORY BACKGROUND

### EU Directives

- 6.13 The following European Union (EU) Directive relate to Land, Soils and Geology at the site in this EIAR:
- Environmental Impact Assessment Directive (2011/92/EU);
  - Environmental Impact Assessment Directive (2014/52/EU);
  - European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. 296 of 2018);
  - The management of waste from extractive industries (2006/21/EC); and
  - Environmental Liability Directive (2004/35/EC).
- 6.14 The EU EIA Directive regulates the environmental impact assessment process and type of information and assessment to be provided in this EIAR Chapter. The Waste Framework Directive and the Environmental Liability Directive will regulate future inert landfilling and C&D waste recovery activities at the application site.

### Irish Legislation

- 6.15 The following legislation relating to Land, Soils and Geology informs the planning / environmental assessment presented in this Chapter of the EIAR:
- The Planning and Development Acts, 2000 as amended;
  - The Planning and Development Regulations (S.I. 600 of 2001) and subsequent amendments thereto, including, S.I. No. 364 of 2005, S.I. 685 of 2006.
  - The European Communities (Environmental Impact Assessment) Regulations, S.I. No. 349 of 1989, and subsequent amendments (including S.I. No. 84 of 1994, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001);
  - The European Union (Planning and Development) (Environmental Impact Assessment) Regulations (S.I. No. 543 of 2014) and European Union (Planning and Development) (Environmental Impact Assessment) Regulations (S.I. No. 296 of 2018)
  - European Union (Environmental Impact Assessment and Habitats) Regulations S.I. No. 473 of 2011, and European Union (Environmental Impact Assessment and Habitats) (No.2) Regulations S.I. No. 584 of 2011;
  - European Union (Environmental Impact Assessment) (Minerals Development Act 1940) (Amendment) Regulations, S.I. No. 384 of 2018, and subsequent amendment (including S.I. No. 164 of 2019)

### Planning Policy and Development Control

- 6.16 The Planning Policy and Development Control relating to Land, Soils and Geology at the application site is governed by the current Wicklow County Development Plan 2016-2022. The plan sets out conservation objectives in relation to natural heritage and landscape, including geology within the County. It also recognises the importance of the extractive industry to the economy of the county and that extraction activities are a tied or resource-based land use.
- 6.17 The County Development Plant sets out the following objectives in respect of soils and geology
- Objective NH25: Geological and soil mapping where available shall be considered in planning decisions relating to settlement, excavation, flooding, food production value and carbon sequestration, to identify prime agricultural lands (for food production), degraded /

contaminated lands (which may have implications for water quality, health, fauna), lands with unstable soils / geology or at risk of landslides, and those which are essential for habitat protection, or have geological significance.

- Objective NH26: Protect and enhance ‘County Geological Sites’ from inappropriate development at or in the vicinity of a site, such that would adversely affect their existence, or value.
- Objective NH27: To consult with the Geological Survey of Ireland as is deemed necessary, when dealing with any proposals for major developments, which will entail ‘significant’ ground excavation, such as quarrying, road cuttings, tunnels, major drainage works, and foundations for industrial or large buildings and complexes.
- Objective NH28: To facilitate public access to County Geological Heritage Sites, on the principle of “agreed access” subject to appropriate measures being put in place to ensure public health and safety and subject to the requirements of Article 6 of the Habitats Directive.
- Objective NH29: To facilitate the Geological Survey of Ireland, and other interested bodies with the interpretation of geological heritage in Wicklow, and to facilitate the development of a “Wicklow Rock Trail”, Geopark or other similar geo-tourism initiatives.
- Objective NH30: To facilitate the exploitation of mineral resources, in an environmentally sensitive manner, in accordance with the objectives and control measures set out in Chapter 5 and in the Design and Development standards of this plan.

### Guidelines

6.18 This Land, Soils and Geology section of this EIAR has been prepared with regard to the following guidelines:

- Environmental Protection Agency (2017) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*. Draft dated May 2017. Environmental Protection Agency, Johnstown Castle Estate, Co. Wexford.
- DoEHLG (2010) *Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities*;
- Environmental Protection Agency (2002) *Guidelines on the information to be contained in Environmental Impact Statements*;
- Environmental Protection Agency (2003) *Advice Notes on current practice (in the preparation of Environmental Impact Statements)*;
- Geological Survey of Ireland, Irish Concrete Federation (2008) *Geological Heritage Guidelines for the Extractive Industry*;
- Institute of Geologists of Ireland (2013) *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements*;
- National Roads Authority (2008) *Environmental Impact Assessment of National Road Schemes - A Practical Guide*;
- National Roads Authority (2008) *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*.
- National Roads Authority (2006) *A Guide to Landscape Treatments for National Road Schemes in Ireland*; and
- Transport Infrastructure Ireland (March, 2013). *Specification for Road Works Series 600 – Earthworks*.

## RECEIVING ENVIRONMENT

### Study Area

- 6.19 The study area for this Land, Soils and Geology section of the EIAR comprises two principal areas:
- *the existing quarry void at Ballinclare which was previously worked for aggregate extraction and the surrounding land which was previously developed for related activities, including aggregate processing / storage and production of value added construction products and*
  - *the area immediately beyond the quarry landholding, within an area which extends up to 1km from the application site boundary.*

### Baseline Study Methodology

- 6.20 The baseline study undertaken for Land, Soils and Geology, presented herein involves a review of published literature and information, borehole information, geophysical survey and the findings from a walkover survey / inspection of the application site and the surrounding geological / landscape / environmental context.
- 6.21 This baseline study describes the receiving environment at and in the immediate vicinity of the application 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.
- 6.22 The baseline study is a qualitative assessment of the available information based on professional experience and interpretation of the available data.

### Sources of Information

- 6.23 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](http://www.gsi.ie));*
  - *Teagasc soil and subsoil mapping for Irish Forestry Soils Project ([www.epa.ie](http://www.epa.ie));*
  - *Irish Soils Information System ([www.teagasc.ie/soils](http://www.teagasc.ie/soils));*
  - *Irish Geological Heritage Programme ([www.gsi.ie](http://www.gsi.ie)); and*
  - *Ordnance Survey of Ireland ([www.osi.ie](http://www.osi.ie)).*
- 6.24 Five investigative boreholes were drilled at the application site in October 2014. Of these 3 No. were drilled to establish groundwater levels around the quarry and 2 No. were drilled to provide more detailed information on bedrock geology beneath the quarry floor at the time. The findings on underlying geology and groundwater conditions obtained by these investigations are presented and used to inform this assessment.
- 6.25 When the quarry was operational previously, it was visited several times by SLR geological staff when undertaking geotechnical and/or resource assessments. It was also visited subsequently following closure to assist in appraisal of long-term land use / restoration options. The work undertaken

included inspections of existing pit / face exposures around the quarry and validation of published information in respect of local quaternary geology.

### Land Baseline

- 6.26 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.
- 6.27 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'.*
- 6.28 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. Excess or unnecessary land take may therefore result in the loss or sterilisation of key land resources. This in turn has the potential to have adverse social and economic consequences for society.
- 6.29 The application site principally comprises an existing quarry where soil cover and the underlying subsoil have previously been stripped and removed over a significant proportion of the area to facilitate the extraction of the underlying rock and its use in the production of construction materials.
- 6.30 The proposed inert landfilling and waste recovery activities at the application site will be largely confined within the existing development footprint. The proposed constructed wetland area which will be developed to treat surface water run-off from the inert landfill land and C&D waste recovery facilities will be located in an area in the south-western corner of the application site which currently hosts the existing settlement ponds and an adjoining area of wet and/or improved agricultural grassland.
- 6.31 In the long term, once the former quarry has been backfilled with inert waste to its original (pre-extraction) ground level, it will be restored to grassland / scrub habitat, and potentially some grassland based agriculture, thereby re-establishing its original pre-development land-use within the local area.

### Soils Baseline

- 6.32 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.
- 6.33 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.
- 6.34 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 Mapping

- 6.35 The Irish Soil Information System (ISIS) project which was jointly undertaken by the EPA and Teagasc between 2008 and 2014, gathered together pre-existing information and data from soil survey work in Ireland and augmented it with new field data, to produce a new national soil map of Ireland at a scale of 1:250,000 ([www.teagasc.ie/soils](http://www.teagasc.ie/soils)).
- 6.36 The ISIS project 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. Properties for each soil type are recorded in a database maintained by Teagasc.
- 6.37 The soil association at the application site is identified as the Clonroche Soil Association (ISIS Code 1100a), described as a fine, loamy drift with siliceous stones. The Clonroche Soil Association is indicated to comprise Brown Earths with some Brown Podzolics on upper slopes and Gleys in depressions<sup>1</sup>. The Brown Earths will generally have better drainage than other soils in this series and are considered to be free draining.
- 6.38 The Clonroche series is defined as coarse loamy drift with sandstones, which means that these soils are naturally moderately draining, and are considered to have good agricultural potential being friable deep soils with plentiful, well-developed roots, a high base saturation with good nutrient retention (Creamer *et. al.*, 2018).

## Teagasc Soils Mapping

- 6.39 The Teagasc soil mapping for the Irish Forestry Soils (IFS) mapping project, reproduced in Figure 6-1, indicates that the soils which previously occurred around the application site comprised
- Acid Brown Earths and Brown Podzolics around the existing treatment ponds / grassland area – these are shallow well drained soils, largely derived from siliceous parent material (eg. diorite and sandstone);
  - Lithosols and Regosols, around the quarry / development footprint – these are deep, well-drained soils derived mainly from shales and sandstones; and
  - Surface water and Groundwater Gleys along the eastern site boundary – these are shallow, poorly drained soils derived from bedrock at or close to surface.
- 6.40 Acid Brown Earths support a wide range of agricultural uses including high quality grassland and tillage. Podzolics are generally lower in fertility and productivity, but where improved (continually fertilised) can support grassland. Gley soils are of somewhat limited agricultural value and, where improved, can be used for rough grazing or seasonal grassland.
- 6.41 Lithosols are typically described as thin stony soils which typically comprise weathered rock fragments overlying bedrock and generally lack an underlying subsoil. Rendzinas are described as humus rich shallow stony soils which overlie solid or fragmented limestone bedrock. The presence of these soils typically suggests rock occurs at or close to the ground surface.
- 6.42 The soils above formed in a low-lying river valley in the foothills of the Wicklow mountains, on well drained glacial till subsoils. Most of the soils at the application site have previously been stripped to facilitate the extraction of the underlying bedrock resource and are no longer in place over the quarry footprint or across former production areas (concrete yard or block yard). It is likely that any soils along existing haul roads around the site were also removed prior to their construction.

<sup>1</sup> EPA Report No. 130 (2014), Irish Soil Information System: Synthesis Report

- 6.43 Although soils have been removed across the quarry development footprint, some are likely to remain in place around the south-western corner of the site, in grassland areas adjoining the existing settlement ponds. Some of the stripped soils are likely to have been used to create the perimeter screening berms around the application site. Any pre-existing berms around the western or southern site boundaries will remain in place for the duration of the proposed development and will not be excavated for incorporation into the final restored landform at the inert landfill.

### Subsoils Baseline

#### *Regional Subsoils*

- 6.44 Quaternary (subsoil) deposits were laid down during the last 2 million years, and essentially comprise the unconsolidated materials overlying bedrock. The two predominant 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 subsoils in Ireland include peat, river alluvium and coastal process deposits. Most Quaternary subsoils in Ireland were deposited after the maximum of the last glaciation, the Midlandian, which occurred approximately 17,000 years ago.
- 6.45 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.
- 6.46 The published subsoil map for the area around the application site, reproduced in Figure 6-2, indicates that shallow bedrock occurs over much of the northern and eastern area and that the south-western area of the site is underlain by till derived from lower Palaeozoic sandstone and shale. As with soils, subsoils have previously been removed across the existing quarry development footprint to facilitate the extraction and processing of rock.
- 6.47 Till generally occurs in the lower lying areas beyond the application site, while rock outcrops at or close to the surface on locally higher ground. Mapping indicates that areas of alluvial soil occur along the Potters River approximately 200m to the north and west of the application site and approximately 300m to the south and east of it, refer to Figure 6-2.

### Bedrock Geology Baseline

#### *Regional Setting*

- 6.48 The Geological Survey of Ireland (GSI) 1:100,000 regional bedrock map, reproduced in Figure 6-3, indicates that the quarry at Ballinclare is developed within Silurian Intrusive Diorite. The diorite body in which the quarry is developed is identified as the Carrimore Diorite and is described as massive, uniform dark grey-green, fresh, very strong diorite.
- 6.49 The diorite is indicated by the GSI as occurring at the centre of a volcanic intrusion, grading outwards to a quartz-diorite at the intrusion margins, although diorite is also recorded at the south eastern part of the intrusion and granodiorite at the south-western part. The diorite is recorded as being composed of augite, plagioclase and biotite, with minor amounts of quartz and K-feldspar and rare hypersthene and olivine. The intrusion extends approximately 1.9km from west to east and 2.1km from north to south.
- 6.50 The GSI notes that the diorite has been deformed by regional deformation in the area and chlorite coated jointing or slickensides and breccia zones are recorded. It is noted that veining of fibrous amphiboles, sparry calcite and quartz may be present.

6.51 The south-western corner of the application site is underlain by the Kilmacrea Formation, described as a dark grey slate, with minor pale sandstone. The GSI 1:100,000 scale regional bedrock map reproduced in Figure 6-3 indicates that there is faulting at the contact between the Kilmacrea Formation and the Diorite.

*Local Detail*

6.52 Examination of the exposed quarry faces at Ballinclare confirms that the quarry is entirely developed within massive Silurian Diorite. One thin zone of sheared and weaker rock with associated quartz veining was identified within the existing quarry, but this zone is thin and does not materially affect the resource present.

6.53 Extraction activity at the quarry ceased after a thin vein of naturally occurring asbestos (NOA) was exposed within the diorite at the quarry. This vein exposure has been contained and the associated risks to human health have been deemed by the Health and Safety Authority (HSA) to be acceptably low. Subsequent detailed visual assessment of fibrous coated discontinuities within the exposed diorite indicated that they were typically very thin (<5mm), with the quantity of fibrous material present within them described as rare / very rare.

6.54 There is currently no risk to public health posed by naturally occurring asbestos, as it tightly bound within the host rock formations at Ballinclare. The proposed development will provide for the placement of landfill clay liners across the exposed rock faces at the quarry and the backfilling of the quarry void using imported inert soils and stone. This should provide further reassurance to the general public and remove any cause for concern in respect of the long-term health risk associated with the naturally occurring asbestos within existing rock exposures.

6.55 Boreholes logs produced on foot of investigative fieldworks undertaken in October 2014 and groundwater well drilling records indicate that diorite at the application site extends to a depth of at least c. 65m below the surface (corresponding to a reduced level of between -9mOD and -10mOD). Borehole and well installation details are summarised in Table 6-1 and their location within the quarry shown in Figure 6-4. Copies of borehole logs are presented in Appendix 6-A.

**Table 6-1  
Borehole and Well Installation Summary**

Borehole ID	Easting (ING)	Northing (ING)	Elevation (mOD)	Depth to bedrock (m)	Bedrock Description	Final Depth (m)
14-BH1	218045	094947	37.9	0	Diorite with quartz veins	40.1
14-BH2	218186	094582	39.0	0	Diorite with quartz veins	40.1
GW1	Unknown	Unknown	61.0	1.8	Diorite	68
GW2	Unknown	Unknown	51.9	7.0	Diorite	61
GW3	Unknown	Unknown	55.4	6.0	Diorite	65

*Structure*

6.56 The diorite has been affected by regional deformation and veining and fault gouge associated with the deformation is observed in the quarry faces.

## Karstification

- 6.57 Karstification does not occur in diorites, nonetheless, a review of the GSI karst database was carried out. The review confirmed that there is no karst development in the area.

## Geological Heritage Baseline

- 6.58 An audit of County Geological Sites in County Wicklow was completed by the Geological Survey of Ireland (GSI) Irish Geological Heritage (IGH) Programme in 2014. The GSI Geological Heritage map viewer (at <https://www.gsi.ie/en-ie/data-and-maps/Pages/Geoheritage>) was reviewed to establish if any geological heritage sites or features were present at the application site or in the immediate vicinity thereof.
- 6.59 The GSI database indicates that Kilmacurra Quarry, a previously operated quarry which is located approximately 500m south of the application site, on the opposite side of the L1157 Local Road, is a designated County Geological Site (Ref. No. WW038), refer to location shown on Figure 6-4.
- 6.60 Kilmacurra Quarry has been recommended as a County Geological Site under IGH Theme No. 11, Igneous Intrusions. The IGH summary notes that diorite is an important minor igneous rock in Wicklow and that the quarry provides good exposure of diorite on quarry faces and in loose blocks. This site and any geological heritage features therein will not be affected by the proposed development of an inert waste management facility at Ballinclare Quarry.
- 6.61 Further detail in respect of the geological heritage interest at Kilmacurra Quarry is presented in the GSI Geological Heritage Site Report reproduced in Appendix 6-B of this EIA. There are no other designated County Geological Sites located in the vicinity of the application site.
- 6.62 There will be no new excavations or exposures resulting from the proposed development. The Applicant has a long-standing, positive relationship with GSI and continues to provide access to all facilities. The Applicant is willing to accommodate site visits and quarry face inspections by GSI by prior arrangement.

## Sensitive Receptors

- 6.63 In terms of land, soils and geology baseline considered above, the principal sensitive receptor is the County Geological Heritage Site at Kilmacurra Quarry (Ref. No WW038). This site and any geological heritage features therein will not be impacted by the proposed development at Ballinclare Quarry.

## IMPACT ASSESSMENT

### Evaluation Methodology

- 6.64 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

- 6.65 This assessment will focus on the potential impact of the proposed inert landfilling activities and C&D waste recovery facilities on land, soils and geology at the application site and surrounding local area. Full details of the proposed development, which provides for the ultimate backfilling of the quarry void to former ground level using imported inert soil and stone waste and its long-term restoration to grassland / scrub habitat are provided in Chapter 2 of this EIA.

6.66 The status and importance of existing land, soil and geology attributes identified at the application site is assessed in Table 6-2 below.

**Table 6-2**  
**Status and Importance Land, Soil and Geology Attributes**

Attribute	Status / Occurrence	Importance
Land	The land at the application site comprises a large quarry void and adjoining areas previously used for processing activities. It also includes a grassland area in the south-western corner with some water settlement ponds.	As the application site is located in a rural area and has been significantly impacted by quarry related development and as the previously undeveloped area in the south western corner comprises marginal grassland, the lands are not likely to be suitable for many land uses and are therefore considered to be of low value and importance.
Soils	The soils across much of the application site have previously been stripped to facilitate rock extraction and associated production activities.	There are no productive or useable soils remaining across much of the application site. The area of undisturbed soils in the south western corner comprises marginal grassland. In light of this, soils at the application site are considered to be of low importance.
Subsoils	The bulk of the mineral subsoils across the application site have previously been excavated / stripped.	Any subsoils remaining in-situ in the south-western corner or in perimeter screening berms is of no economic value and in their present condition are considered to be of low importance.
Bedrock Geology	Rock at the site was previously extracted and used to produce aggregate. Extraction has ceased following identification of rare, fibrous, naturally occurring asbestos within the diorite rock	Further bedrock extraction at the quarry is not considered feasible or viable given the presence of naturally occurring asbestos and effectively renders the bedrock of low value and importance
Geological Heritage	The rock exposures in diorite at Kilmacurra Quarry, located c.500m to the south are classed as being of geological heritage value	The diorite exposures are of high heritage importance at a local level and provide an opportunity to examine the rock <i>in situ</i> . The exposures at Kilmacurra Quarry (County Geological Site WW038) are classified as being of medium importance.

## Construction Stage

6.67 In the context of the proposed inert landfilling and C&D waste recovery activities at Ballinclare Quarry, the construction stage is taken to comprise advance, site preparation works. These works involve installation of some site infrastructure and structures, removal of vegetation, construction of the wetland area, installing and connecting site services, upgrading internal access roads and establishing environmental control and monitoring infrastructure.

- 6.68 During the construction / site preparation stage, the only direct impact on land and soils will be the disturbance and loss of existing soil cover across the planned wetland area in the south-western corner of the application site. Much of the stripped soil will be re-used to create the wetland area and any excess soil materials will be temporarily stockpiled pending their re-use in the restoration of the landfilled landform.
- 6.69 There will be no other direct or indirect impacts on the existing land, soil or geology resources at the application site.

## Operational Stage

- 6.70 During the operational stage, inert waste materials (principally comprising soil and stone and C&D wastes) will be imported to the quarry for construction of the inert landfill liner, landfilling and/or recovery purposes. On completion of landfilling, the final landform will be topsoiled, seeded and restored to grassland / scrub habitat. The magnitude of the construction and operational stage impacts on the land, soils and geology attributes is assessed in Table 6-2 below.
- 6.71 The magnitude of these impacts on the land, soils and geology attributes is assessed in Table 6-3 below.

**Table 6-3**  
**Magnitude of Potential Impacts on Land, Soil and Geology (No Mitigation)**

Attribute	Impact of Proposal on Land, Soil and Geology	Magnitude of Potential Impact (with No Mitigation)
<b>Construction Stage</b>		
Land	Development / change of land use in SW corner of application site	Given the limited productive capacity and range of potential future land-use options, the scale of the change on local land use potential is considered small and negative.
Soil	Loss of existing soil resource in area of marginal grassland in SW corner of application site	Small negative impact on the local productive soil resource.
<b>Operational Stage</b>		
Land	Restoration of excavated / disturbed land around former quarry and return to long-term grassland / scrub	Minor positive over medium to long term at a local level as the disturbed landform is restored. This will present some limited future land use potential involving the establishment of new habitat or some grassland based agriculture.
Soils	Reinstatement of soil cover over the former quarry /development footprint	Moderate positive impact over medium to long term due to the progressive re-establishment of soil as a growth medium and carbon sink and the restoration of its environmental functions on site
Subsoils	HGV traffic movements and earthworks plant introduce risk of potential subsoil contamination by way of fuel leaks and/or oil spills	Moderate negative impact over medium to long term.

Attribute	Impact of Proposal on Land, Soil and Geology	Magnitude of Potential Impact (with No Mitigation)
Bedrock Geology	HGV traffic movements and earthworks plant introduce risk of potential bedrock contamination by way of fuel leaks and/or oil spills  Inhibits potential future extraction / exploitation of bedrock resource at application site	Moderate contamination impact over the medium to long term given that there is little existing protective soil cover to exposed bedrock.  Small impact in restricting future extraction of bedrock. Although backfilling of quarry with inert wastes would render any future physical rock extraction excessively difficult, such extraction is already commercially unviable at present due to presence of naturally occurring asbestos.
Geohazards	Elimination of localised erosion at existing rock slopes and/or stockpiles.	Small negative short-term / small positive long-term <i>(Refer to 'Unplanned Events' below)</i>
Geological Heritage	Closest designated geological heritage site located 0.5km from application site	No impact.

- 6.72 The inert landfilling and restoration of the existing extractive void at Ballinclare Quarry will restore the ground surface to its original, pre-extraction level and re-establish the site topography to re-integrate it into the surrounding rural landscape. The progressive return of the site to grassland / scrub habitat, the progressive re-establishment of soil as a growth medium and carbon sink and the restoration of its environmental functions on site all constitute moderate-to-long-term improvements on attributes of low importance. The significance of these impacts is assessed as slight and positive.
- 6.73 Without mitigation, the generation of on-site traffic and handling of imported wastes could increase the risk of a leak or spillage of fuels and/or oils at the application site. Without mitigation there is also a risk that contaminated, non-inert waste materials could be imported to the facility, thereby introducing potential risk to existing mineral subsoils and bedrock at the application site. The potential impact of imported contaminated (ie. non-inert) waste soils or hydrocarbon spills, were they to occur, would be localised and long-term.
- 6.74 Assuming the inert landfilling and C&D waste recovery activities are undertaken and managed in accordance with established waste management practices at EPA licensed facilities, the scale of associated risk of introducing ground contamination in imported soils / subsoils and C&D waste is assessed as moderate negative.
- 6.75 Given that the risk of contaminating existing subsoil and/or bedrock of low importance is moderate, the significance of this potential impact is assessed as slight and negative. Given the potential for interactions with, and implications for, the underlying groundwater resource however, it is considered that mitigation measures are required to manage / limit potential impacts. These potential interactions are discussed in greater detail in Chapter 7 (Water) of this EIAR.
- 6.76 There will be no indirect impacts on land, soils or geology as a result of the inert landfilling and waste recovery activities at the application site.

## Unplanned Events (i.e. Accidents)

- 6.77 Unplanned events within the application site have the potential to impact on the land, soils and geology adjoining the site. Ground instability, particularly of any existing near vertical quarry faces, could have the potential to arise over the extended long-term as the exposed rock weathers. Backfilling of the quarry by way of inert landfill will safeguard against any future (long-term) instability of existing quarry faces.
- 6.78 Unplanned events in relation to the proposed development could potentially arise from instability caused by over-steep placement or stockpiling of imported inert waste soils / materials at the application site. Any short-term instability in the imported materials, were it ever to arise, is likely to be localised at small areas within the application site.
- 6.79 The risk of such instability will be minimised by site management procedures which limit the height and gradient of slopes developed in them, by adhering to the Health and Safety Authority (HSA) Safe Quarry Guidelines and implementing the Safety Health and Welfare at Work (Quarries) Regulations 2008. Specifically, risks arising from potential instability will be mitigated by annual geotechnical assessments of slope stability at the landfill and rock stability of the remaining quarry faces.
- 6.80 In light of the above, it is considered unlikely that material / soil instability will have any adverse impact on land, soils and geology at the application site.
- 6.81 From a land, soils and geology perspective, any potential impacts on human health from inert landfilling and recovery activities at the application site would not be via soil / geology pathways but via other pathways such as air (principally dust) and water (principally groundwater). These are addressed in detail in the relevant Chapters of this EIAR.

## Cumulative Impacts

- 6.82 Cumulative impacts are those which result from incremental changes caused by other past, present or reasonably foreseeable actions, together with those generated by the proposed development. Therefore, the potential impacts of the proposed development cannot be considered in isolation but must be considered in addition to impacts already arising from existing or planned development.
- 6.83 A review of Wicklow County Council online planning search facilities indicates that no other major developments are planned or have been granted planning permission in the last five years in the vicinity of the application site or in surrounding townlands. Planning permission for Ballynagran landfill has recently been extended for 5 years to 2026 (Planning Ref. 20/21), but all of the associated environmental impacts are established and will remain in existence, with no change arising in the local environment.
- 6.84 In light of the above, it is considered that there is no potential for other planned development to create significant adverse cumulative impacts for land, soils or geology in the local area.

## Interaction with Other Impacts

- 6.85 The risks associated with the introduction or handling of potentially contaminated (non-inert) wastes when landfilling and restoring the former quarry or in producing recycled aggregates at the C&D recovery facility or soil washing plant could have implications for groundwater quality, were infiltrating rainfall to leach any contamination out of the waste materials to the underlying groundwater aquifer. This aspect is discussed in more detail in Chapter 7 of this EIAR (Water).



- 6.86 When successfully completed, the proposed landfilling and restoration works across the former quarry footprint will provide an increased thickness of soil and subsoil cover above the groundwater table, thereby reducing the potential risk of any future groundwater contamination from activities at the surface.
- 6.87 During the inert landfilling and waste recovery activities, the presence of wider areas of exposed, unvegetated soil surfaces could give rise to dust blows during dry windy weather. The impacts from landfilling activities will however be mitigated by progressive establishment of vegetation / grass cover over the final landform. These issues are discussed in more detail in Chapter 8 of this EIA (Air Quality).

### ‘Do-nothing Scenario’

- 6.88 Under a ‘do-nothing scenario’, the proposed landfilling and waste recovery activities would not proceed at the application site and the bare, disturbed landform which currently exists across much of the existing site would remain unchanged, with only very slow and gradual recolonization of natural vegetation occurring over time, given the absence of any soil medium or nutrients to support plant growth.
- 6.89 In dry periods, in the absence of any site management practices, dust emissions would be likely to arise from the site on an ongoing basis and surface water bodies / groundwater would be vulnerable to impacts from any future human activities within and/or around the quarry.

## MITIGATION MEASURES

- 6.90 Mitigation measures outlined below will be implemented during the proposed inert landfilling and waste recovery activities at the quarry to mitigate against any potential adverse impacts on the receiving soil, subsoil and bedrock environment which could arise during either the construction or operational phase.
- 6.91 The proposed mitigation include the following measures to deal with potential fuel / oil spills :
- Soils excavated in grassland areas in the south-western corner of the application site will be re-used where possible in wetland construction, with any excess soil stockpiled pending its re-use in restoration / landscaping works;
  - Ensuring routine servicing of plant and machinery (and HGVs and lorries on occasion) takes place over a sealed concrete pavement which drains via a hydrocarbon interceptor to a soakaway area;
  - Any refuelling of mobile plant undertaken within the quarry void is only undertaken using double skinned bowsers;
  - Oils, greases and hydraulic fluids will be stored under cover, over fuel spill trays / bunded containers within the existing site workshop / garage;
  - Good site management practices will be implemented to reduce risks of spills, including regular monitoring and inspection of storage vessels and regular maintenance and servicing of construction plant and equipment;
  - The construction and installation of a relatively impermeable clay liner on the base and sides of the proposed landfill will afford protection to the ground and geological elements which would otherwise be in direct contact with it with the waste materials;
  - The Applicant will ensure that such plant and resources as are necessary to ensure that the landfilling and recovery activities will be managed and operated in accordance with best

waste management practice and that activities comply fully with environmental management systems, planning consents and waste licence conditions;

- Contingency plans / procedures will be developed to deal with potential leaks and spills. An emergency spill response kit will be held on site.

6.92 In order to minimise the risk of importing and introducing non-inert contaminated soil / subsoil to the application site, management systems will be introduced to establish the source of imported materials in advance and to confirm that they are inert. Once received at the intake site at Ballinclare Quarry, a multiple level soil / waste testing regime is envisaged which will test the material for compliance, in line with established EPA waste licence methodologies. These include:

- comprehensive on-site verification, comprising visual inspection and record of imported wastes end-tipped / unloaded at the site;
- basic characterisation testing covering a range of parameters to determine the leaching behaviour of the inert wastes imported to site;
- frequent, compliance testing covering a limited range of key waste parameters.

6.93 Temporary side slopes in landfilled soils /waste will generally be graded at an angle no steeper than 35° (approximately 1v:1.5h) and often much shallower, sufficient to ensure no large scale instability arises over the short-term. Ongoing assessment of stability will be undertaken at the application site as landfilling progresses and C&D wastes / recycled aggregates are stockpiled. Where necessary, slopes developed in these materials will be graded having due regard to safe systems of work.

6.94 During inert landfilling activities, all temporary surfaces will continue to be graded to facilitate overground run-off to the quarry sump or to surface water ponds developed in closed depressions within the landfilled waste, thereby minimising the volume of rainfall percolating through the landfilled materials. This helps reduce further any residual risk of potential contaminants being leached into the underlying soil and bedrock (or groundwater).

6.95 In order to confirm that there are no residual risks to in-situ soil and geology, provision is made for regular, continued monitoring of the recently installed groundwater wells for the duration of the landfilling and C&D waste recovery activities and for a short aftercare period thereafter.

6.96 Regular groundwater monitoring will also be re-established at pre-existing groundwater wells around the application site to ensure there is no adverse impact on groundwater quality.

6.97 In order to reduce the risk of localised erosion (and potential dust emissions) during the landfilling and restoration operations, the area of bare or exposed soils / wastes will be kept to a minimum, insofar as practicable, by ongoing progressive restoration of the restored landform and the establishment of grass cover at the earliest opportunity. Where required, consideration can also be given to establishing temporary vegetation cover over any stockpiled soils (pending re-use) or exposed surfaces (pending further backfilling to final ground level).

6.98 All aspects of the proposed landfilling / operation phase works will be undertaken in accordance with relevant best practice environmental guidance published by the Environmental Protection Agency and other regulatory agencies. All activities will be undertaken in accordance with the provisions in the Waste Management Acts and Regulations.

6.99 In order to maximise the future potential of the restored landform, a minimum 150mm thick layer of topsoil will be placed over the landfilled materials. The final landform will also be graded so as to facilitate long-term overground run-off off-site, toward local surface watercourses and the Potters River.

### RESIDUAL IMPACT ASSESSMENT

6.100 The residual impacts on land, soil and geology are those impacts which remain following the implementation of the mitigation measures outlined above.

#### Construction Stage

6.101 There will be a slight short-term negative impact associated with this stage of the proposed development, principally associated with the disturbance / loss of marginal grassland and existing soil cover at the proposed wetland area in the south-western corner of the application site.

#### Operational Stage

6.102 The potential longer-term impacts of the proposed development upon land, soil and geology have been identified and assessed, and where appropriate, mitigation measures have been identified which will significantly mitigate any potential environmental impacts arising from the proposed inert landfilling, restoration and C&D waste recovery activities at the application site.

6.103 With the implementation of the proposed mitigation measures, it is considered that the potential risks of fuel spill and introduction of contaminated soil / subsoils and the associated short-term impact on land, soils and geology, will reduce to 'small' and negative.

6.104 Given that the risk of contamination of land, soil / subsoil and bedrock of low value and importance will be reduced to 'small', the significance of any mitigated, residual impacts on them arising from the proposed development is assessed as imperceptible.

#### Post Operational Phase

6.105 Following completion of the final restoration works at the inert landfill and the return of much of the application site to grassland / scrub habitat and potentially some grassland based agriculture, the long-term impact of the proposed development will be moderately positive for land and soils at a local scale.

### MONITORING

6.106 As was identified in the previous section on mitigation measures, it is envisaged that a multiple level testing regime will be established to test soils /wastes imported to the proposed waste facility and to ensure compliance with agreed waste intake parameters (as per established EPA methodologies for licensed waste facilities).

6.107 Provision will also be made for continued and extended monitoring of groundwater for the duration of the inert landfilling and C&D waste recovery activities and for a short aftercare period to confirm that there are no residual risks to in-situ soil and geology arising from the proposed development.

## REFERENCES

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- National Roads Authority (2006)** A Guide to Landscape Treatments for National Road Schemes in Ireland
- Teagasc, 2004**, Ireland Subsoil Parent Materials Map (digital version).
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## **FIGURES**

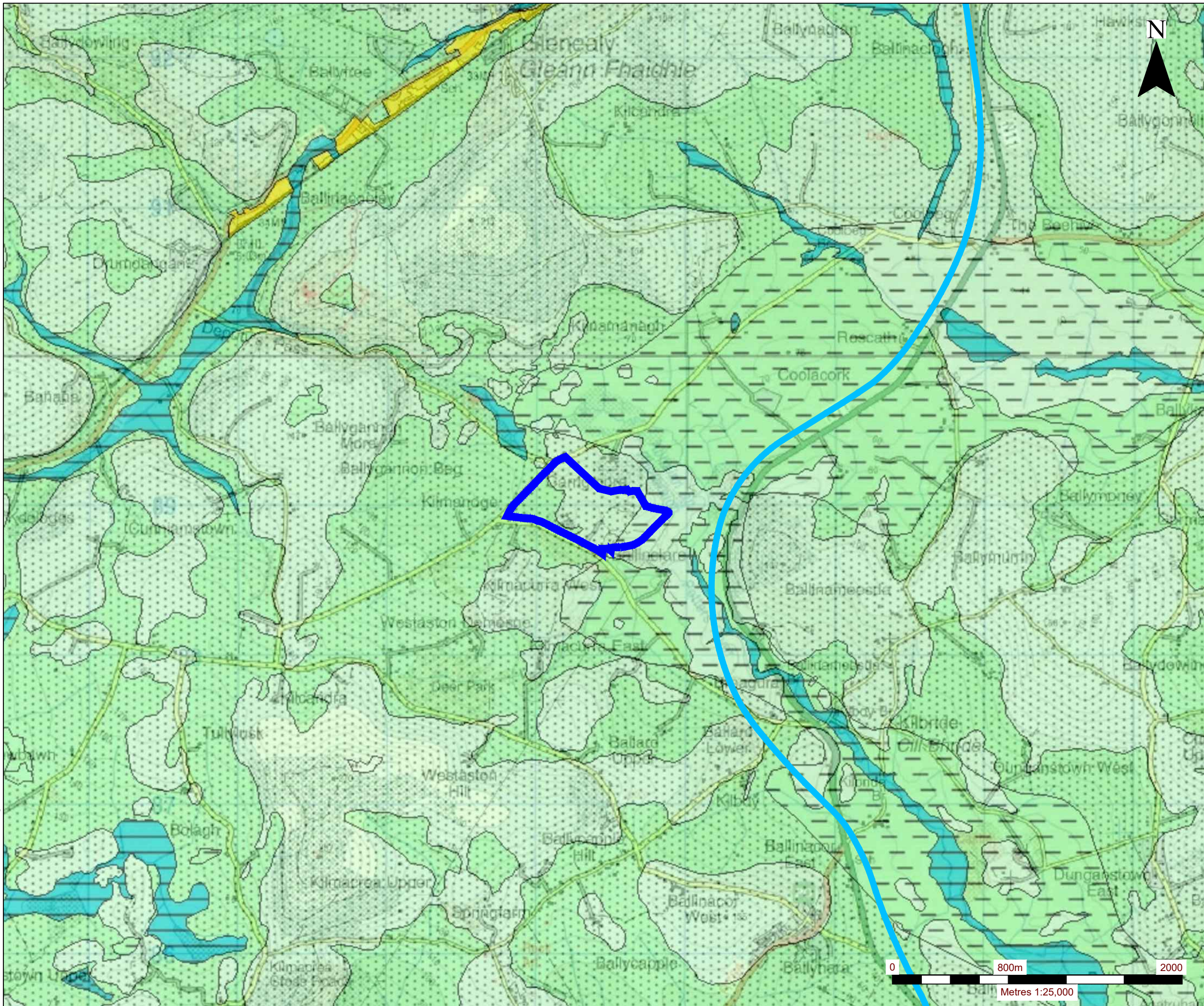
**Figure 6-1  
Regional Soils Map**

**Figure 6-2  
Regional Subsoils Map**

**Figure 6-3  
Geology Map**

**Figure 6-4  
Borehole Locations**

00036.00080.0.16.FIG 6-1.0.Soils Map.dwg



**NOTES**

1. EXTRACT FROM TEAGASC / EPA SOIL MAPPING
2. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY IRELAND/ GOVERNMENT OF IRELAND

**LEGEND**

	LANDHOLDING BOUNDARY (c.36 Ha. / 89 acres)
	ALLUVIUM - MINERAL
	ACID BROWN EARTHS AND BROWN PODZOLICS
	SW & GW GLEYS (DEEP POORLY DRAINED) DERIVED FROM NON-CALCAREOUS
	SW & GW GLEYS (SHALLOW POORLY DRAINED) DERIVED FROM NON-CALCAREOUS PARENT
	LITHOLSOLS AND REGOSOLS
	MADE GROUND

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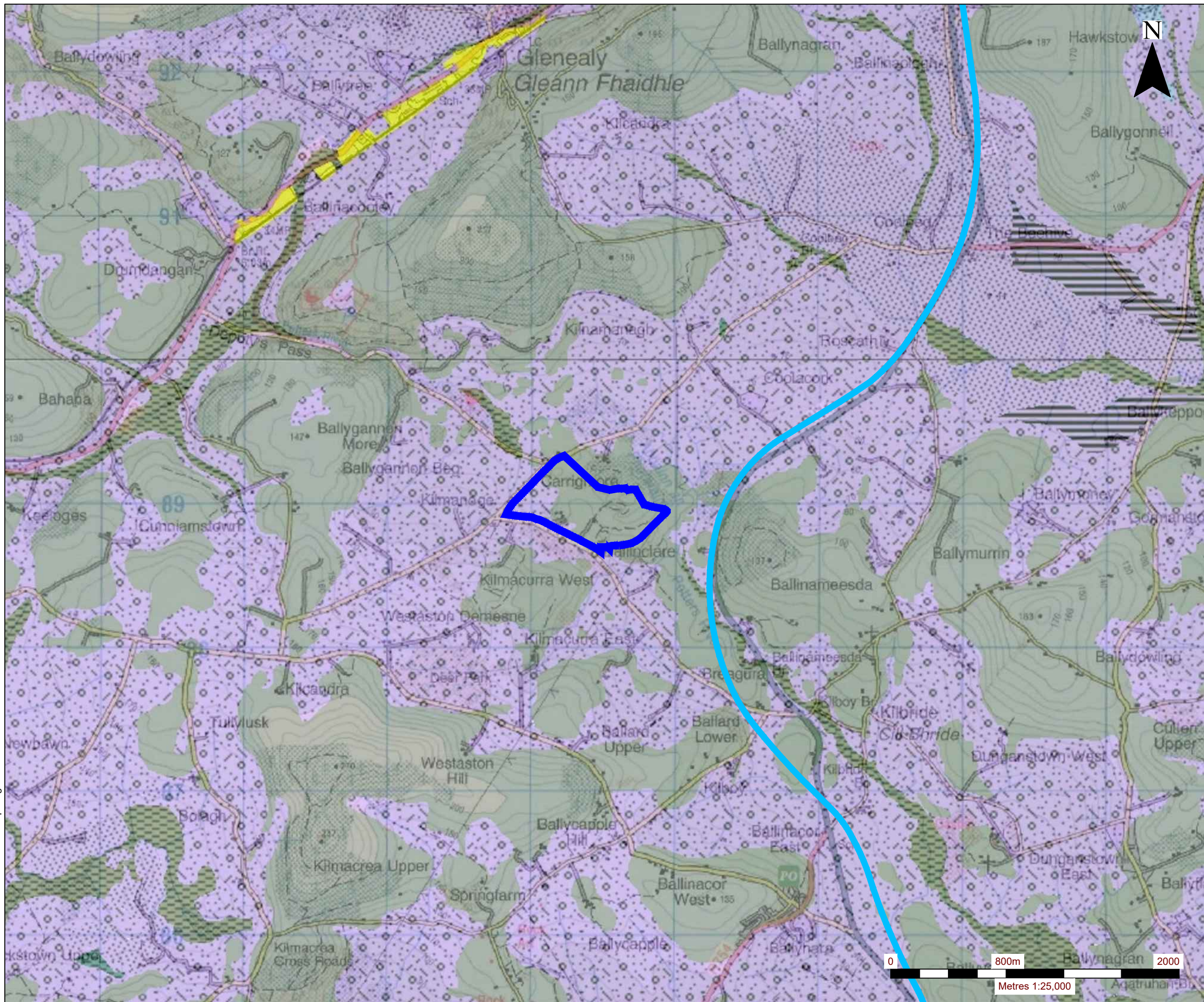
BALLINCLARE QUARRY RESTORATION  
INERT WASTE & C+D WASTE RECOVERY FACILITY  
KILBRIDE (N11), CO. WICKLOW

**SOILS MAP**

**FIGURE 6-1**

Scale: 1:25,000 @ A3      Date: MARCH 2021

00036.00080.0.16.FIG 6-2.0.Subsoils Map.dwg



**NOTES**

1. EXTRACT FROM TEAGASC / EPA SOIL MAPPING
2. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY IRELAND/ GOVERNMENT OF IRELAND

**LEGEND**

	LANDHOLDING BOUNDARY (c.36 Ha. / 89 acres)
	ALLUVIUM - MINERAL
	SAND AND GRAVEL - LOWER PALAEOZIC SANDSTONES AND SHALES
	MADE GROUND
	OUTCROP & SUBCROP
	TILL - LOWER PALAEOZIC SANDSTONES

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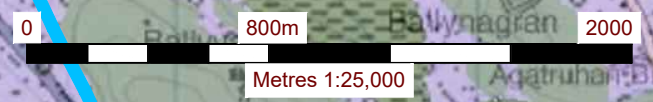
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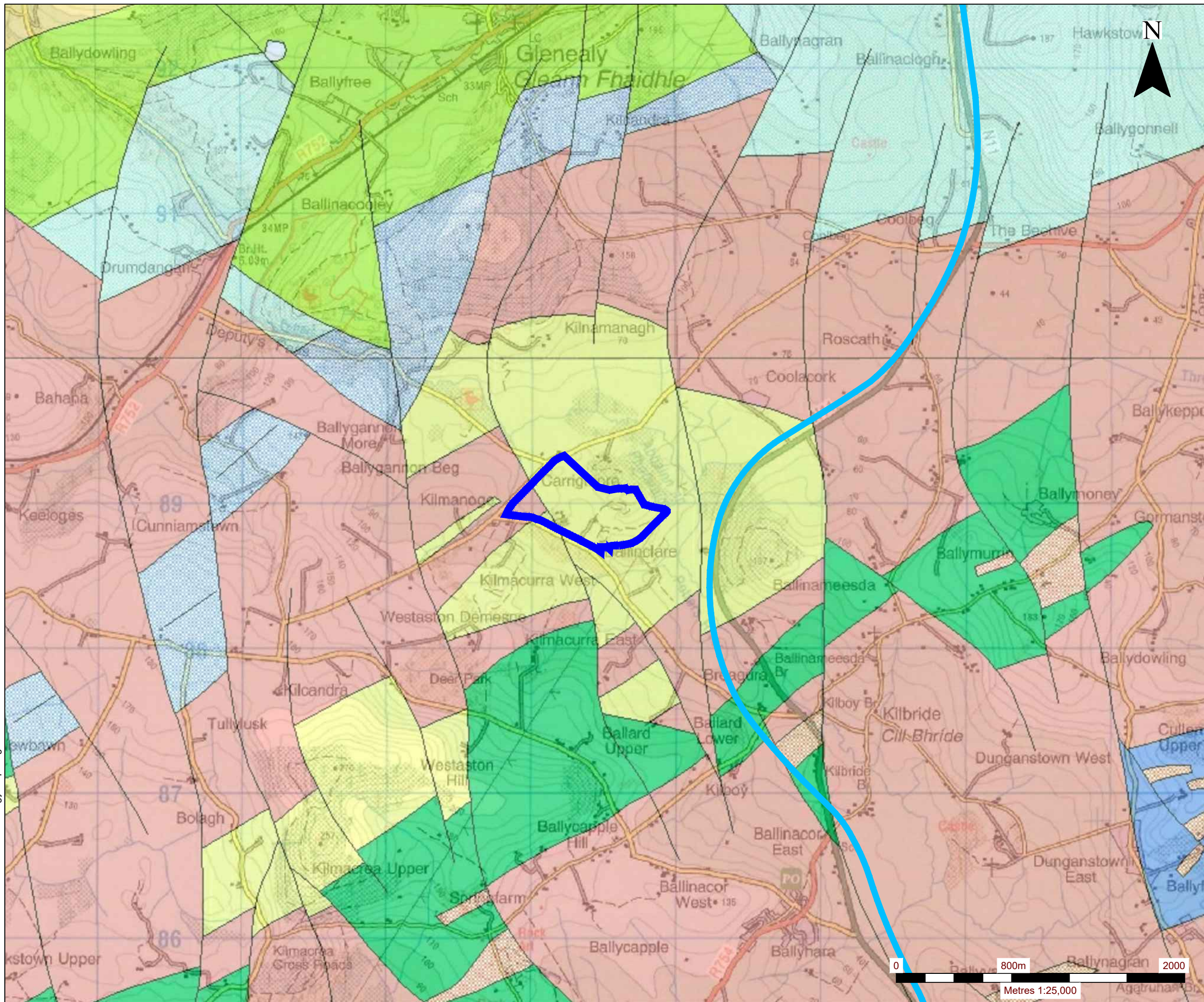
**SUBSOILS MAP**

**FIGURE 6-2**

Scale: 1:25,000 @ A3      Date: MARCH 2021



00036.00080.0.16.FIG 6-3.0.Bedrock Geology Map.dwg



**NOTES**

1. EXTRACT FROM GSI DIGITAL MAP (1:100,000)
2. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY IRELAND/ GOVERNMENT OF IRELAND

**LEGEND**

	LANDHOLDING BOUNDARY (c.36 Ha. / 89 acres)
	AVOCA FORMATION
	BALLYLANE FORMATION
	DIORITE
	KILMACREA FORMATION
	MAULIN FORMATION
	OAKLANDS FORMATION

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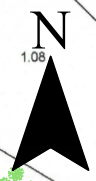
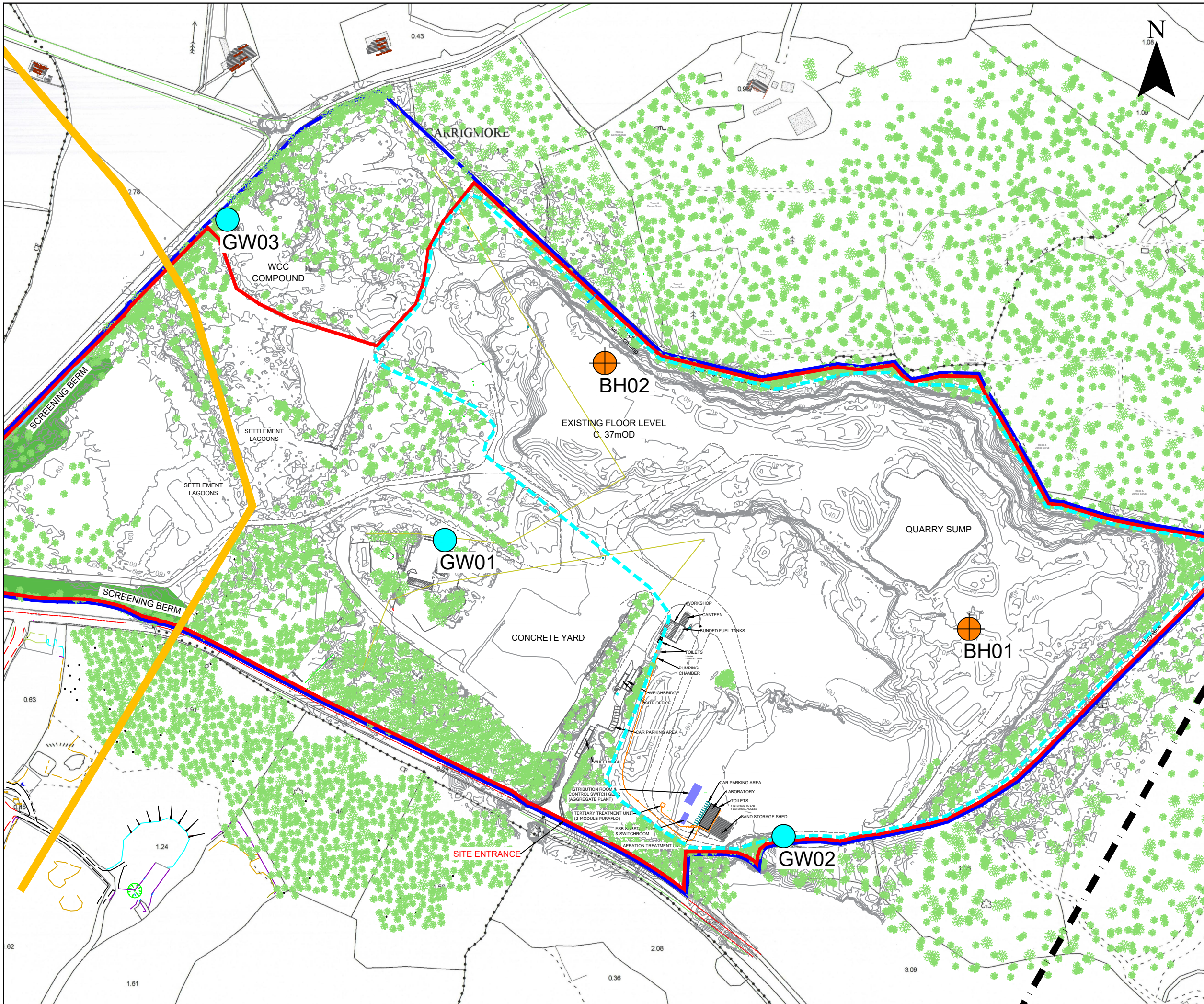
**BEDROCK GEOLOGY MAP**

**FIGURE 6-3**

Scale: 1:25,000 @ A3      Date: MARCH 2021



00036.00080.0.16.FIG 6-4.0.Site Borehole Locations.v2.dwg



- NOTES**
1. EXTRACT FROM ORDNANCE SURVEY 6 INCH MAPPING WW030 & WW0311
  2. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY IRELAND/ GOVERNMENT OF IRELAND
  3. EXISTING SURVEY (MAY 2016) PROVIDED BY KILSARAN

- LEGEND**
- LANDHOLDING BOUNDARY (c. 36 Ha. / 89 acres)
  - PLANNING APPLICATION AREA (c. 32.5 Ha.)
  - PROPOSED INERT LANDFILL AREA (c. 17.0 Ha.)
  - BOREHOLE LOCATION (2014)
  - GROUNDWATER WELL LOCATION (2014)
  - INFERRED GEOLOGICAL CONTACT

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**SITE BOREHOLE LOCATIONS**

**FIGURE 6-4**

Scale 1:3,000 @ A3 Date MARCH 2021

## APPENDIX 6-A BOREHOLE LOGS



Project Name: Ballinclare EIS

Project No.  
501.00036.00030

Co-ords: 325673E - 188872N

Hole Type  
Rotary

Location: Ballinclare, Co. Wicklow

Level: 37.89 m AOD

Scale  
1:50,000

Client: Kilsaran Concrete

Dates: 08/10/2014-13/10/2014

Logged By  
TM / SL

Piezo	Drill Tag	Core Geotechnical Data				Depth (m)	Level (m OD)	Litho	Stratum Description
		TCR	SCR	RQD	FI				
	0.00						+++++	DIORITE Strong to very strong, massive, dark grey to green, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Abundant augite, biotite and plagioclase. Rare scattered pyrite present.  Subtle darkening of the groundmass to 11.71m	
		56	19	16	12	1	+++++		
	1.60					2	+++++		
		55	33	24	4		+++++		
	2.60					3	+++++		
		100	80	70	13		+++++		
	4.10					4	+++++		
		100	100	100	4	5	+++++		
	5.60					6	+++++		
		100	77	51	11		+++++		
	7.10					7	+++++		
		100	84	69	10	8	+++++		
	8.60					9	+++++		
		100	100	87	10		+++++		

Continued next sheet

Remarks: Drilled by IDL



Project Name: Ballinclare EIS	Project No. 501.00036.00030	Co-ords: 325673E - 188872N	Hole Type Rotary
Location: Ballinclare, Co. Wicklow		Level: 37.89 m AOD	Scale 1:50,000
Client: Kilsaran Concrete		Dates: 08/10/2014-13/10/2014	Logged By TM / SL

Piezo	Drill Tag	Core Geotechnical Data				Depth (m)	Level (m OD)	Litho	Stratum Description
		TCR	SCR	RQD	FI				
	10.10					10.20	+	DIORITE	
						10.30	+	QUARTZ VEIN Pale QUARTZ vein with slightly anastomising veinlets	
		100	80	72	10	11	+	DIORITE Strong to very strong, massive, dark grey to green, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Abundant augite, biotite and plagioclase. Rare scattered pyrite present.	
	11.60					12	+	Becoming paler grey-green to 13.15m	
		100	92	92	3	13	+		
	13.10					14	+		
		100	58	58	6	15	+		
	14.60					16	+		
		100	93	93	3	17	+		
	16.10					18	+		
		100	100	100	2	19	+		
	17.60					20	+		
		100	88	81	8	21	+		
	19.10					22	+		
		100	43	33	12	23	+		

Continued next sheet

Remarks: Drilled by IDL



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Borehole No

**14 - BH1**

Project Name: Ballinclare EIS	Project No. 501.00036.00030	Co-ords: 325673E - 188872N	Hole Type Rotary
Location: Ballinclare, Co. Wicklow		Level: 37.89 m AOD	Scale 1:50,000
Client: Kilsaran Concrete		Dates: 08/10/2014-13/10/2014	Logged By TM / SL

Piezo	Drill Tag	Core Geotechnical Data				Depth (m)	Level (m OD)	Litho	Stratum Description
		TCR	SCR	RQD	FI				
	20.60						+++++	DIORITE	
					21		+++++		
		100	82	75			+++++		
					22		+++++		
	22.10						+++++		
		100	89	75			+++++		
					23		+++++		
					24		+++++		
	23.60						+++++		
		100	62	62			+++++		
					25		+++++		
	25.10						+++++	Becoming slightly lighter coloured to 26.34	
		100	89	89			+++++		
					26		+++++		
					27		+++++	Becoming slightly darker to 38.52m	
	26.60						+++++		
		100	37	17			+++++		
					28		+++++		
	28.10						+++++		
		100	95	85			+++++		
					29		+++++		
	29.60						+++++		

Continued next sheet

Remarks: Drilled by IDL



Project Name: Ballinclare EIS

Project No.  
501.00036.00030

Co-ords: 325673E - 188872N

Hole Type  
Rotary

Location: Ballinclare, Co. Wicklow

Level: 37.89 m AOD

Scale  
1:50,000

Client: Kilsaran Concrete

Dates: 08/10/2014-13/10/2014

Logged By  
TM / SL

Piezo	Drill Tag	Core Geotechnical Data				Depth (m)	Level (m OD)	Litho	Stratum Description
		TCR	SCR	RQD	FI				
	31.10	100	79	72	12	31	+	DIORITE	
	32.60	100	97	88	8	31.85 31.95	6.04 5.94	QUARTZ VEIN Pale QUARTZ - CARBONATE vein with minor clasts of host rock  DIORITE Strong to very strong, massive, dark grey to green, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Abundant augite, biotite and plagioclase. Rare scattered pyrite present.	
	34.10	100	58	53	10	33	+		
	35.60	100	89	65	8	35	+		
	37.10	100	83	67	7	36	+		
	38.60	100	82	48	9	37	+		
						38	+		
						38.52	-0.63	TRACHYTE Strong to very strong, massive, medium grey, fine to medium grained (coarsening with depth) TRACHYTE	
						39			
		100	100	100	4	39.29 39.30	-1.40 -1.41	VEIN Fracture filled with soft, fibrous, dark green, slight lustre, possible silicate mineral	

Continued next sheet

Remarks: Drilled by IDL



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 Windy Arbour, Dublin 14  
 Tel. + 353 1 2964667 Fax. + 353 1 2964676  
 www.slrconsulting.com

Borehole No

**14 - BH1**

Project Name: Ballinclare EIS

Project No.  
501.00036.00030

Co-ords: 325673E - 188872N

Hole Type  
Rotary

Location: Ballinclare, Co. Wicklow

Level: 37.89 m AOD

Scale  
1:50,000

Client: Kilsaran Concrete

Dates: 08/10/2014-13/10/2014

Logged By  
TM / SL

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
						40.10	-2.21	▽▽▽	TRACHYTE Detail 39.30m - 40.10m : Strong to very strong, massive, medium grey, fine to medium grained (coarsening with depth) TRACHYTE  End of Borehole at 40.10 m
						41			
						42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			

Remarks: Drilled by IDL



Project Name: Ballinclare EIS

Project No.  
501.00036.00030

Co-ords: 325371E - 189093N

Hole Type  
Rotary

Location: Ballinclare, Co. Wicklow

Level: 39.01 m AOD

Scale  
1:50,000

Client: Kilsaran Concrete

Dates: 13/10/2014-15/10/2014

Logged By  
TM / SL

Piezo	Drill Tag	Core Geotechnical Data				Depth (m)	Level (m OD)	Litho	Stratum Description
		TCR	SCR	RQD	FI				
	0.00						+++++	DIORITE Strong to very strong, massive, dark grey to green, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Abundant augite, biotite and plagioclase. Rare scattered pyrite present.	
		50	14	0	10		+++++		
	2.60						+++++		
		100	48	23	8		+++++		
	4.10						+++++		
		87	65	65	3		+++++		
	5.60						+++++		
		100	77	49	8		+++++		
	7.10						+++++		
		100	100	79	7		+++++		
	8.60						+++++		
		100	100	100	1		+++++		

Continued next sheet

Remarks: Drilled by IDL





Project Name: Ballinclare EIS	Project No. 501.00036.00030	Co-ords: 325371E - 189093N	Hole Type Rotary
Location: Ballinclare, Co. Wicklow		Level: 39.01 m AOD	Scale 1:50,000
Client: Kilsaran Concrete		Dates: 13/10/2014-15/10/2014	Logged By TM / SL

Piezo	Drill Tag	Core Geotechnical Data				Depth (m)	Level (m OD)	Litho	Stratum Description
		TCR	SCR	RQD	FI				
	10.10						+	DIORITE	
		100	90	90	3	11	+		
	11.60					12	+		
		100	100	100	3	13	+		
	13.10					13.55	+		
		100	100	95	5	13.80	+		
						14	+		
	14.60					15	+		
		100	93	80	4	16	+		
	16.10					17	+		
		100	60	60	4	18	+		
	17.60					19	+		
		100	43	20	10		+		
	19.10						+		
		100	80	70	9		+		

QUARTZ VEIN  
 Pale QUARTZ - CARBONATE vein with minor clasts of host rock

DIORITE  
 Strong to very strong, massive, dark grey to green, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Abundant augite, biotite and plagioclase. Rare scattered pyrite present.

Continued next sheet

Remarks: Drilled by IDL



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Borehole No

**14 - BH2**

Project Name: Ballinclare EIS	Project No. 501.00036.00030	Co-ords: 325371E - 189093N	Hole Type Rotary
Location: Ballinclare, Co. Wicklow		Level: 39.01 m AOD	Scale 1:50,000
Client: Kilsaran Concrete		Dates: 13/10/2014-15/10/2014	Logged By TM / SL

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
	20.60					21		+++++	DIORITE
		100	63	41	11			+++++	
	22.10					22		+++++	
		100	90	87	5			+++++	
	23.60					23		+++++	
		100	87	87	2			+++++	
	25.10					24		+++++	
		100	87	87	5			+++++	
	26.60					25		+++++	
		100	90	79	6			+++++	
						26		+++++	
						27		+++++	
						27.78	11.23	▲▲▲▲▲	QUARTZ VEIN
	28.10					27.94	11.07	▲▲▲▲▲	Quartz Vein
						28		+++++	DIORITE Strong to very strong, massive, dark grey to green, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Abundant augite, biotite and plagioclase. Rare scattered pyrite present.
		100	91	81	10			+++++	
	29.60					29		+++++	

Continued next sheet

Remarks: Drilled by IDL



Project Name: Ballinclare EIS

Project No.  
501.00036.00030

Co-ords: 325371E - 189093N

Hole Type  
Rotary

Location: Ballinclare, Co. Wicklow

Level: 39.01 m AOD

Scale  
1:50,000

Client: Kilsaran Concrete

Dates: 13/10/2014-15/10/2014

Logged By  
TM / SL

Piezo	Drill Tag	Core Geotechnical Data				Depth (m)	Level (m OD)	Litho	Stratum Description
		TCR	SCR	RQD	FI				
		100	100	91	4	30.72	8.29	DIORITE	
	31.10					31		DIORITE Strong to very strong, massive, dark grey, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Marked change in mineralogy, laths of pale yellowish minerals possibly micas	
		100	100	100	2	32			
	32.60					32.50	6.51	DIORITE Strong to very strong, massive, dark grey, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Increase in sulphide content, trace visible pyrite content.	
		100	100	93	3	33			
	34.10					33.52	5.49	DIORITE Strong to very strong, massive, dark grey, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Return to similar mineralogy as above 30.72m	
		100	100	97	5	35			
	35.60					36			
		100	100	99	3	37			
	37.10					37.04	1.97	FAULT GOUGE	
						37.14	1.87	FAULT - Weak fault gouge	
						37.33	1.68		
						37.57	1.44	DIORITE Strong to very strong, massive, dark grey to green, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Abundant augite, biotite and plagioclase. Rare scattered pyrite present.	
		100	63	50	13	37.99	1.02	QUARTZ VEIN Quartz Vein	
	38.60							FAULT GOUGE FAULT - Weak fault gouge	
		100	100	100	2	39		DIORITE Strong to very strong, massive, dark grey to green, crystalline, medium to coarse grained DIORITE, fresh with no signs of weathering. Abundant augite, biotite and plagioclase. Rare scattered pyrite present.	

Continued next sheet

Remarks: Drilled by IDL



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Borehole No

**14 - BH2**

Project Name: Ballinclare EIS

Project No.  
501.00036.00030

Co-ords: 325371E - 189093N

Hole Type  
Rotary

Location: Ballinclare, Co. Wicklow

Level: 39.01 m AOD

Scale  
1:50,000

Client: Kilsaran Concrete

Dates: 13/10/2014-15/10/2014

Logged By  
TM / SL

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
						40.10	-1.09	++++	DIORITE
									End of Borehole at 40.10 m
						41			
						42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			

Remarks: Drilled by IDL

## APPENDIX 6-B GEOLOGICAL HERITAGE SITE REPORT – BALLINCLARE QUARRY

## WICKLOW - COUNTY GEOLOGICAL SITE REPORT

<b>NAME OF SITE</b>	<b>Kilmacurra Quarry</b>
Other names used for site	
<b>IGH THEME</b>	<b>IGH11 Igneous Intrusions</b>
<b>TOWNLAND(S)</b>	<b>Kilmacurra West</b>
<b>NEAREST TOWN/VILLAGE</b>	<b>Rathdrum</b>
<b>SIX INCH MAP NUMBER</b>	<b>30</b>
<b>NATIONAL GRID REFERENCE</b>	<b>724682E 688471N (centre of quarry)</b>
<b>1:50,000 O.S. SHEET NUMBER</b>	<b>62</b> <b>GSI Bedrock 1:100,000 Sheet No.</b> <b>16</b>

### **Outline Site Description**

Kilmacurra Quarry is a large, partly flooded quarry developed in a diorite intrusion. It is now abandoned.

### **Geological System/Age and Primary Rock Type**

The bedrock is diorite, part of the Caledonian Carrigmore Diorite suite of intrusions in east Wicklow. The suite has been dated at 410 Ma, slightly older than the Leinster Granite. Wallrocks are slates of the Ordovician Kilmacrea Formation.

### **Main Geological or Geomorphological Interest**

The Carrigmore Diorite suite comprises a series of igneous intrusions of intermediate composition, i.e. a chemical and mineralogical composition intermediate between granite and gabbro. Diorite intrusions occur widely in Ireland but the Carrigmore suite is unusual for the size and internal complexity of the intrusions. Diorite is a relatively hard rock, suitable for aggregate and concrete manufacture, and several quarries have been developed in the Carrigmore suite, including those at nearby Ballinclare and Parnell Quarry near Rathdrum.

### **Site Importance – County Geological Site**

Diorite is an important minor igneous rock type in Wicklow. The Kilmacurra Quarry provides good exposure on quarry faces and in loose blocks. The other quarries developed in the Carrigmore suite are apparently still operational so this site provides an opportunity to examine the diorite in situ.

### **Management/promotion issues**

The quarry is abandoned and partly flooded, with deep water and high vertical quarry faces. It is of interest mainly to geologists and is not suitable for promotion to the general public.



View southwards of western side of quarry, showing vertical faces and flooded quarry floor. Upper faces to right are readily accessible.



Medium-grained grey-green diorite, typical of rock exposed in the quarry.

