Section 7: LAND, SOILS & GEOLOGY

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7 LAND, SOILS AND GEOLOGY

7.1 Introduction

This section of the rEIAR describes the natural characteristics of the site and surrounding area in terms of land, soils and geology. An assessment is made of the potential impacts associated with the proposed development and the activities that will be undertaken. Existing mitigating measures are reviewed, and further measures proposed where required, to remove or reduce any potential impacts identified.

7.2 Methodology

The assessment is focussed on formations and features associated with the soils and geological succession within the study area. The assessment of the potential impact of the development was carried out according to the methodology specified by the Environmental Protection Agency (EPA) and the Institute of Geologists of Ireland guidelines for Geology in Environmental Impact Statements. All available mapping data from the Geological Survey of Ireland (GSI) and EPA was consulted.

The assessment involved;

- Site walkovers and the examination of soil trial pits and geological material on site
- Desktop reviews on all available literature available regarding the soils and geology of the site and surrounding area.

7.2.1 References

- *Geology of North Donegal*; Geological Survey of Ireland, 1997
- *GSI Mapping*: online
- *Report on Mapping Glentown and Tober, Pl's 3091and 3092, Co. Donegal*. Report by Deirdre Lewis for Tegral Building Products Ltd. Geological Survey of Ireland Open File Report, 1989
- *Survey of Tinney's Quarry*. Digital Land Surveyors Ltd, 2022

7.3 Impact Assessment Methodology

The nature of the potential environmental impacts on the land, soil and geology is based on the matrix presented in Table 7.1 below. This table is derived from the EPA Guidelines on information to be included in Environmental Impact Assessment Reports (May 2022).

Table 7.1: Description of Potential Environmental Impacts

Quality of Effects	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative/adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
Describing the Significance of Effects	**Imperceptible** An effect capable of measurement but without significant consequences.
	Not significant An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight Effects

	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends
	Significant Effects An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
	Very Significant An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound Effects An effect which obliterates sensitive characteristics
Describing the Extent and Context of Effects	**Extent** Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Context Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Describing the Probability of Effects	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Describing the Duration and Frequency of Events	**Momentary Effects** Effects lasting from seconds to minutes
	Brief Effects Effects lasting less than a day
	Temporary Effects Effects lasting less than a year
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years.
	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years
	Reversible Effects Effects that can be undone, for example through remediation or restoration
	Frequency of Effects Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
Describing the Types of Effects	**Indirect Effects (a.k.a. Secondary or Off-Site Effects)** Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects

	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do-Nothing Effects' The environment as it would be in the future should the subject project not be carried out.
	'Worst case' Effects The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects When the full consequences of a change in the environment cannot be described.
	Irreversible Effects When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

7.4 Existing Environment

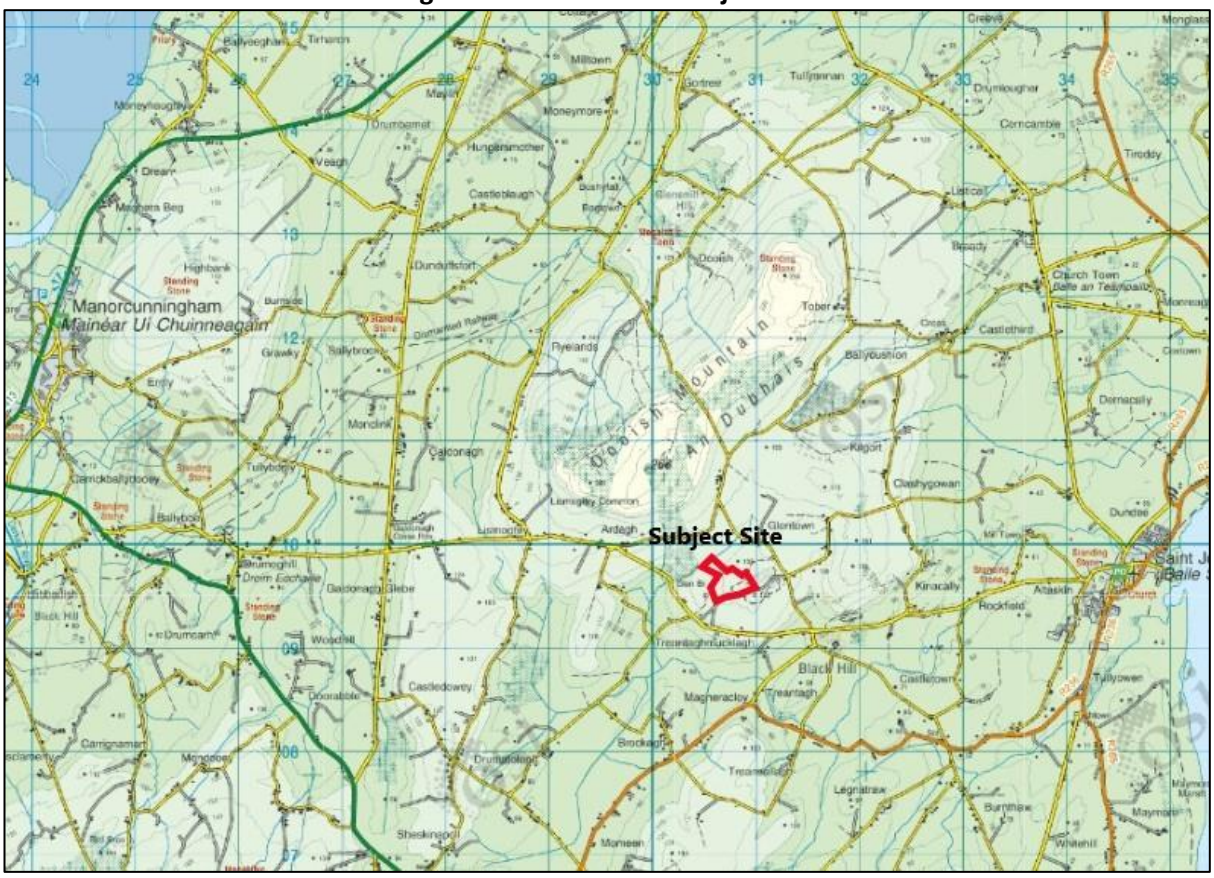
7.4.1 Site Description & Location

The application site is c. 9.9 hectares in size and has been in use as a quarry, extracting and processing material. Historical activity has led to the creation of a quarry void with redundant and active quarry faces and exhausted quarry areas.

The subject site is located approximately 4 km west of the town of St. Johnston in east Co. Donegal. The site is located in the townland of Trentamucklagh and is served by the local road, L-5414. Access to the quarry is off this local road via a concrete and hardcore access road.

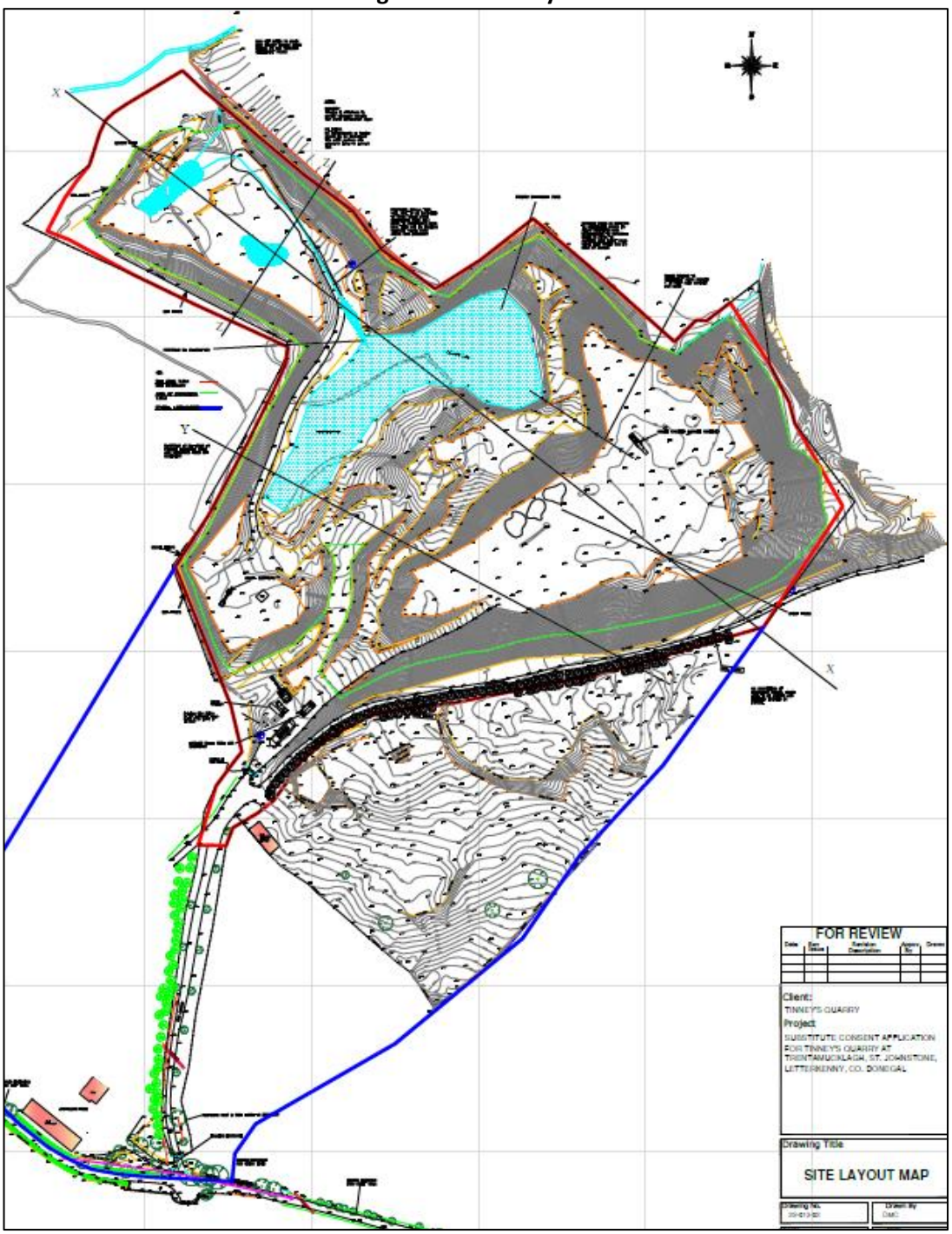
The site is surrounded by agricultural land on all sides apart from to the east where a quarry face separates the site and a separate quarry operated by a different owner. An extensive area of commercial forestry lies to the north and northwest of the site, flanking the slopes of Dooish Mountain. The application site location is outlined in Figure 7.1 and the site layout is shown in Figure 7.2.

Figure 7.1: Location of Subject site



CYAL50244901 © Ordnance Survey Ireland/Government of Ireland

Figure 7.2: Site Layout



(supplied by Dominic Whoriskey Architects)

7.4.2 Topography and Drainage

The site is c. 9.9 hectares in size and has been developed as a stone quarry. Extraction has taken place over approximately 7.7 hectares of the site. The entire site is located on the upper western slopes of a small hill, the summit of which lies immediately south of the site at approximately 140 mOD. The highest point of the site is along the southeast boundary where the vegetated berms are at 136 mOD. The boundary between the application site and the quarry to the north is a rocky ridge at approximately 133 mOD. The lowest point of the site is the quarry deck at approximately 106 mOD. A significant promontory remains in the centre of the site at approximately 125-129 mOD.

Drainage is to the quarry void and to Settlement Ponds 1 & 2. There is one outflow from the site to the north where discharge is to a tributary of the St. Johnston Stream.

7.4.3 Land Use

The site is located in a rural area with sporadic on-off houses and farmsteads. The surrounding countryside is undulating, and land use is predominantly agriculture with some isolated blocks of commercial forestry. More extensive forestry is prevalent in higher ground north of the site on the slopes of Dooish Mountain. The current land use for the application site is as a working quarry. Extraction and processing take part in the central part of the site on the quarry deck within the main quarry void. Large parts of previous quarry workings within the site are partially recolonised with pioneer vegetation, especially along the western boundary and northwest portion of the site. The large settlement pond represents a large part of the site occupying a footprint of approximately 0.87 hectares. Other ponds and wetland areas throughout the site account for approximately 0.38 hectares of land use.

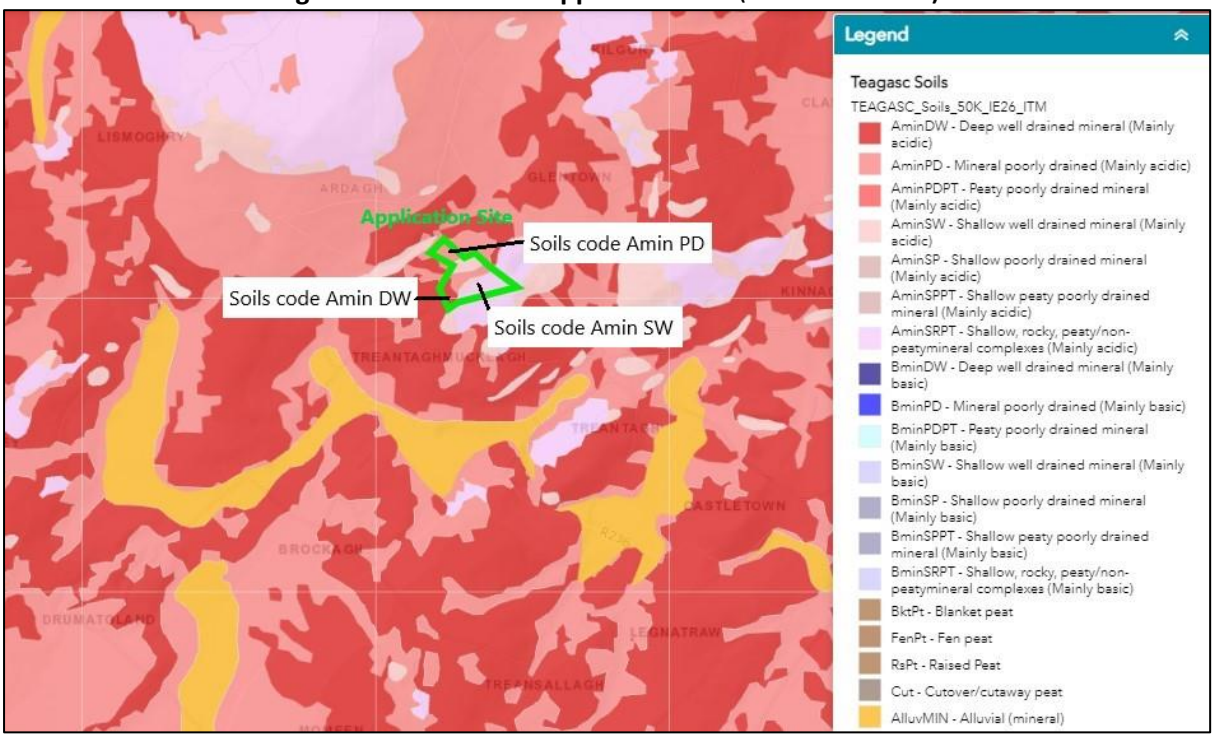
The Ordnance Survey of Ireland historical map series was examined for land use on the application site. In the series mapped between 1829-1841 the site is seen as partially excavated ground. The main excavation seen is northeast of the site in the townland of Glentown, however the collection of excavations is labelled as Glentown Slate Quarries and appears to cover quarry pits in the townlands of Trentamucklagh and Ardagh. The earliest published record of quarrying in the general area is in 1786. Quarrying activity on the site has been sporadic since the mid 1840's and the current applicant started excavation and processing on the site in 1978.

7.4.4 Soils

There are no undisturbed soils left on site. Almost all ground has been stripped of soil for excavation or for the creation of haul roads or other site infrastructure. Pre-development there would have been three classifications of soils on the application site available from the GSI website.

A large portion of the site would have been categorised as Amin SW which is described as a shallow well mineral soil (mainly acidic). A significant proportion of the site would have been classified as Amin PD which is described as a poorly drained mineral soil (mainly acidic. A small portion of the site in the southwest would have been categorised as Amin DW which is described as deep well drained mineral soil (mainly acidic).
Many of the soils stripped from the site to facilitate extraction were used to create the screening berms which surround the site. These berms are now heavily vegetated and in some cases are growing semi-mature native trees. The berms are providing excellent screening cover for the quarry.
Figure 7.3 shows an extract from the GSI web viewer depicting the soils on the application site.

Figure 7.3: Soil on the application site (from GSI web viewer)



7.4.5 Bedrock Geology

Details of the bedrock geology have been compiled from a geological report completed by John Colthurst (EuroGeol) in March 2022 and information obtained from GSI mapping. The geologist's report is attached as Appendix 7.1.

The area is underlain by meta-sedimentary rocks which are assigned to the Lough Foyle Succession of the Dalradian. Most of the rocks in the Lough Foyle Succession belong to the Argyll Group and the Southern Highland Group of Middle to Upper Dalradian age, and the rocks were originally deposited about 600 to 700 million years ago. The most recent geological map of the area is Geology of North Donegal, 1:100,000 scale, published by the Geological Survey of Ireland, in 1997. The quarry itself is in the upper part of the Lough Foyle Succession and the rocks are of Cambrian age. The stratigraphic sequence in the Lough Foyle succession is poorly understood due to intermittent exposure and structural complexity. The main lithologies present are meta-greywackes/psammites and meta-pelites/slates. All the strata exposed in Tinney's Quarry are slates.

Much of the quarry is in blue-black slate with no obvious bedding but there are also clearly bedded, fine grained graded units like those shown in Figures 8 and 9 (of Appendix 7.1), where there are 10 to 15cm thick graded beds with a fine sandy base passing upwards into meta-mudstone. There are also laminated grey-green silty slates (Figure 11) and thinly bedded units where the intersection of the bedding with the dominant slaty cleavage results in a strongly banded slate (Figure 12). Some of the thinly banded slates show very complex folding. Figure 10 shows the face in the north-eastern corner of the active quarry where banded slates are tightly folded.

Photograph 7.1 below shows a typical quarry face with no obvious bedding within the slate. Photograph 7.2 below shows complex folding in banded slates in the northeast part of the quarry.

Photograph 7.1: Typical slate with no obvious bedding

Photograph 7.2: Area of complex folding in NE of quarry

Pyrite is common as ribs and small nodules in some of the slates. The aggregate is very flaky as would be expected. Because of its very flaky nature it is not suitable for use in concrete but it is suitable for use in farm and forestry roads. Some of it might be suitable for decorative purposes or for building stone but care should be taken to avoid pyritic horizons.

7.4.6 Economic Geology and Aggregate Potential

The GSI provide a dataset of Aggregate Potential Mapping of identified sand, gravel and rock resources that are considered useful in the construction industry. The application site is listed in an area that is mapped as having high and very high potential for the supply of crushed rock aggregate. A search of the register of quarries held by Donegal County Council revealed 9 registered quarries within a 15km radius of the application site. These are listed in Table 7.2 below. Many of the listed quarries are redundant and not expected to be operational in the near future.

Table 7.2: Registered quarries within 15 km of application site

Location	Quarry Registration No.	Approximate Distance from Application Site
Glentown, St. Johnston	EUQY42	Adjacent to the E
Islandmore, Clonleigh, Lifford	EUQY43	9 km
Porthall, Lifford	EUQY45	8 km
Calhame, Letterkenny	EUQY46	14 km
Calhame, Letterkenny	EUQY47	14 km
Mondooey, Manorcunningham	EUQY41	5 km
Tober, Newtowncunningham	EUQY55	2.5 km
Porthall, Lifford	EUQY132	8 km
Dooballagh, Letterkenny	EUQY164	8 km

7.4.7 Geological Heritage

Geology is recognised as a fundamental component of natural heritage. In 1998, the Geological Survey of Ireland (GSI) established the Irish Geological Heritage (IGH) Programme, which is a partnership between the GSI and the National Parks and Wildlife Service. Under the IGH Programme, important geological sites to be conserved as Natural Heritage Areas (NHA) are identified. Those not selected for NHA designation are being promoted as County Geological Sites (CGS). There are approximately 114 Irish Geological Heritage (IGH) sites in County Donegal.

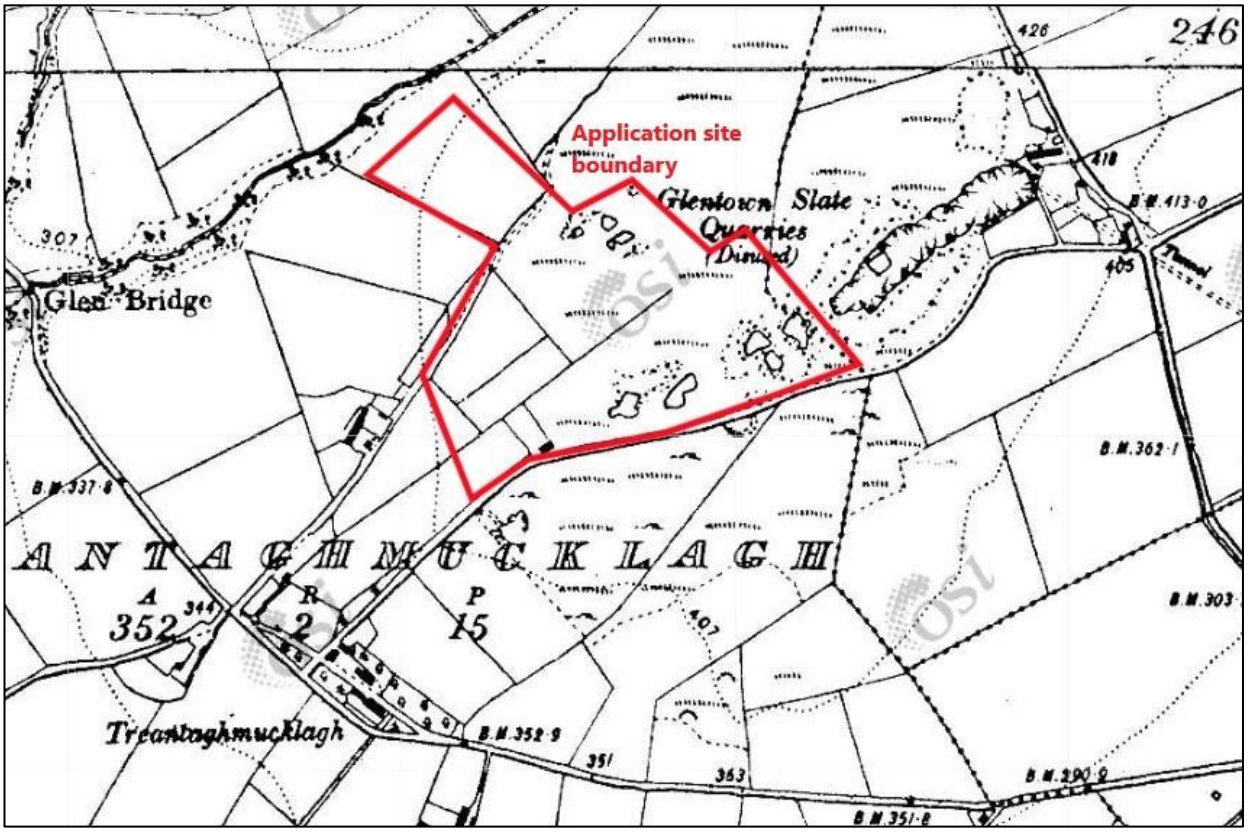
There are no County Geological Sites near the application site. The nearest County Geological Site is Lough Swilly (IGH site code ND015) located approximately 8 km to the north-west of the application site. The geological features of interest of Lough Swilly are the long wide fjord bordered by high bold cliffs in the north, passing to gentler coastal slopes and shallow flats in its southern reaches.

7.4.8 Historic quarrying activity

The St. Johnston & Carrigans historical society report the earliest mention of slate quarrying in the St. Johnson area coming from 21st October 1786 in the townland of Ardagh. There are also newspaper reports of 'unlimited quantity' from trials to ascertain the amount of slate available in the St. Johnston area from 5th April 1837. The quality of the St Johnston slates is reported as being of equal colour and quality to English slates.

The main production area seems to have been the Glentown excavation with smaller excavations in the Trentamucklagh and Ardagh townlands. (See Figure 7.4 below)

Figure 7.4: Historical 6-inch map showing old pits dug on site and adjacent to the site (1829-1841)



GSI map viewer

7.5 Characteristics of the Development

The development of the site as a quarry has been sporadic but ongoing for perhaps 200 years. Activities on site by the current applicant have been relatively simple in quarrying terms with the extraction, crushing and screening of rock and transport to market. The requirement for blasting has been infrequent and most of the extraction has taken place by mechanical means.

Mobile crushers/screeners have been employed moving around the site following extraction activity. Stockpiles of product were generally located near the screeners and transport to market was via rigid lorry. Customers could also bring their own transportation and purchase product directly from the site. No washing of product took place on this site.

Effluent treatment has been by settlement. Current effluent generated in the quarry void is pumped to Settlement Pond 1 for settlement treatment and then flows through Settlement Pond 2 for further treatment before discharge off site to a tributary of the St. Johnston Stream. The site discharge has been under licence (Lwat67) from Donegal County Council since 2009. Noise abatement and dust control measures have been employed by the applicant for all activities on site.

Mature landscaped berms have been created on the perimeter of the site to screen workings. Currently the quarry employs 4 persons and output is estimated at approximately 5 loads per day. In the past during peak trade times there may have been up to 10 people working in the quarry and output would have had been approximately 20 loads per day leaving the quarry.

Further details on the characteristics of development are provided in *Section 3*, *Project Description*, of this rEIAR.

7.6 Impact Assessment

There was a defined construction phase associated with the proposed development as the site infrastructure needed to be put in place before any extraction and processing activities took place. The construction of berms for screening purposes are also considered in the construction phase.

7.6.1 Construction Impacts – Preparation for Extraction

7.6.1.1 Loss of Land

Construction will have involved a certain amount of site clearance of topsoil and bedrock to create the correct levels for the development of site infrastructure. Most of the bedrock, sub-soils and soils will have been re-used within the site for the creation of screening berms along the boundaries of the site. These berms have been colonised by native species and have integrated the development into the landscape.
There was potential for damage or contamination to soils and geology with spillage of hydrocarbon-based materials from construction vehicles and activity. These could be oils or fuels. Mitigation measures were in place to minimise these potential risks (see Section 7.7 below).

7.6.1.2 Accidental Spillages/Leaks

There was potential for accidental spillages or leaks occurring from vehicles on the application site. The risk of a potential spillage was very low. A pollution spill kit was available to deal with any potential spillages/leaks arising. Refuelling of on-site vehicles was carried out in a dedicated re-fuelling area where appropriate spill kits were available. Refuelling of static plant was carried out by a licenced fuel contractor or by mobile bunded bowser adhering to pollution prevention protocols and using drip trays. There was no storage of any fuel/lubricants on site during construction.

7.6.2 Operational Impacts

7.6.2.1 Loss of Land

The development has resulted in the extraction of bedrock material and the altering of the topography of an area of approx. 9.9 hectares. Historical quarrying activity has altered the topography of the application site and adjoining lands.

The loss of overburden and rock in the extraction areas has led to the inevitable loss of some habitat. *Section 6, Biodiversity*, assesses the impact of habitat loss for the development.

The proposed landscaping and restoration of the site, once redundant, will offset the impact to a certain extent with the creation of new habitats. This will increase the biodiversity of the wider area in the longer term. The positive impact of increased biodiversity is discussed in Section 6, Biodiversity, and proposals for re-instatement are discussed in *Section 15, Landscape and Restoration*.

The aggregate production will help meet the local and regional demand for construction materials which is seen as a positive effect.
The impact of rock removal is assessed as a permanent negative effect.

7.6.2.2 Stability of Quarry Faces

Recently extracted rock has been extracted in line with the Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I. No. 28 of 2008). A buffer strip has been left around the external part of the extraction area which will ensure the stability of the external quarry faces. The minimum buffer strip left has been 5m between the boundary and the edge of a quarry face.

7.6.2.3 Waste Generation

Scrap metal from redundant machinery has been collected from the site by a licenced waste collector on an as needed basis. There are significant amounts of scrap metal remaining on site awaiting collection by a licenced waste collector.

There is not likely to be any general waste on the extraction area. Welfare facilities are a short distance off-site and there are appropriate facilities for the collection of recyclable and mixed municipal waste off site at the applicant's dwelling house. Recyclable and mixed municipal waste is collected on an alternate weekly basis by a licenced waste collector.

A septic tank system and associated percolation area had been in place until approximately 2015. The system has since been decommissioned and removed from site. Welfare facilities since 2015 to now are provided at the applicant's dwelling house a short distance off-site. Wastewater treatment is via septic tank and percolation area.

7.6.2.4 Accidental Spillages/Leaks

There has been / is potential for accidental spillages or leaks occurring from plant and vehicles operating within the application site. A pollution spill kit is available to deal with any potential spillages/leaks arising. Regular plant/machinery inspections were/are carried out to ensure all plant/vehicles are properly maintained reducing the risk of an accidental leak/malfunction.

Refuelling of vehicles has been / is carried out off site. Refuelling of static plant has been / is carried out using a mobile bunded bowser and drip tray with appropriate spill kits available. The storage of any fuel/lubricants has been / is off site in securely bunded areas. Maintenance has been / is carried out off site in a concreted maintenance bay to ensure any potential leak/spoilage cannot escape to ground.

7.6.2.5 Geological Heritage Sites

The activities proposed at the application site will have no impact on the geological features of the nearest geological heritage site of Lough Swilly approximately 8 km north.

7.6.3 Cumulative Impacts

The application site must also be considered in association with other developments located within or close to the application site.

7.6.3.1 Other Developments

There is a quarry development immediately adjacent to the site to the east. The development is of similar size and also has a significant history of quarrying. There will be a cumulative effect regarding the loss of bedrock geology for both sites. The impact is assessed as a permanent negative effect.

The application site is situated in a rural environment where the two main land uses are low intensity livestock farming and private commercial forestry.

7.6.4 Do Nothing Option

If the development to extract rock and process aggregate is not granted substitute consent then local construction end users will be forced to source quarry product and aggregate from further afield. This will result in a higher carbon footprint for these products. The provision of four local jobs and the secondary benefits that this brings to the local community will cease if the project does not achieve substitute consent. The permanent negative effect on the geology of the area will remain the same but rock will be extracted at another location to replace that extracted at the application site. Other impacts on soils and land may not be so well mitigated at another site.

7.7 Mitigation Measures (Implemented and Proposed)

The following mitigation measures have been in place, and some additional measures are proposed, to minimise the impacts of quarrying activity on the land, soils, and geology of the application site:

- A hydrocarbon interceptor is to be installed into the drainage system downstream of Settlement Pond 1
- Oils and lubricants are stored in a bunded area off site.
- Refuelling of plant on site is carried out using a fully bunded bowser or by licenced fuel contractor with mobile tanker.
- Drip trays used for all refuelling operations. Best practice for refuelling is incorporated into the Environmental Management System for the site.
- Regular inspections and maintenance scheduling take place for all plant and vehicles to minimise the potential for malfunction or leak.
- An emergency spill kit with oil boom, absorbers etc. kept on site for use in the event of an accidental spillage/leak.
- Regular visual monitoring of all surface waters onsite (including settlement ponds) for any surface sheen or sign of potential hydrocarbon pollution.
- Geotechnical assessments of quarry faces over 20 m height, and those over 30 m height with multiple benches must be conducted by a geotechnical specialist.
- Overburden and unsuitable material have been used for the creation of screening berms around the external boundary of the application site.
- A landscaping and restoration plan, (Section 15, Landscaping and Restoration) must be implemented when activities on site have ceased.

7.8 Monitoring

An inspection of the geological environment and determination of quality of product must be undertaken by a competent Geologist when required by the NSAI. If face heights exceed 20m, or exceeds 30m for those with multiple benches, then a geotechnical assessment must be carried out by a competent geotechnical specialist.

7.9 Decommissioning / Re-instatement

The proposed landscaping and restoration plan must be implemented when activities have ceased on site. Details on the landscaping and restoration are given in Section 15, Landscaping and Restoration.

7.10 Residual Impacts

Residual impacts are those that remain after the implementation of the mitigation measures. By its nature quarrying activity will have a permanent negative effect on the bedrock removed from the site. The removal of the resource is difficult to mitigate against.

The provision of quarry product to the local and regional markets and the creation of new diverse habitats on the restoration of the site will go some way to mitigating the loss of the resource in the longer term.

7.11 Technical Difficulties

There were no technical difficulties encountered.

7.12 Determination of Significance of Impact Pre-mitigation

Impact	Receptor	Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences) Negligible - High	Existing Environment (Significance / Sensitivity) Negligible -High	Significance Imperceptible - Profound
Hydrocarbon contamination through accidental spillages/leaks	Local bedrock geology & soils/subsoils	Low-Medium	Low	Slight
Loss of soils/subsoils due to extraction	Soils/ subsoils	High	Low	Moderate
Loss of bedrock geology as extracted product	Bedrock geology	High	Low	Moderate

7.13 Summary of Mitigation Measures

Summary of Mitigation Measures (Implemented & Proposed)
A hydrocarbon interceptor is to be installed into the drainage system downstream of Settlement Pond 1
Oils and lubricants are stored in a bunded area off site.
Refuelling of plant on site is carried out using a fully bunded bowser or by licenced fuel contractor with mobile tanker.
Drip trays used for all refuelling operations. Best practice for refuelling is incorporated into the Environmental Management System for the site.
Regular inspections and maintenance scheduling take place for all plant and vehicles to minimise the potential for malfunction or leak.
An emergency spill kit with oil boom, absorbers etc. kept on site for use in the event of an accidental spillage/leak.
Regular visual monitoring of all surface waters onsite (including settlement ponds) for any surface sheen or sign of potential hydrocarbon pollution.
Geotechnical assessments of quarry faces over 20 m height, and those over 30 m height with multiple benches must be conducted by a geotechnical specialist.
Overburden and unsuitable material have been used for the creation of screening berms around the external boundary of the application site.
A landscaping and restoration plan, (Section 15, Landscaping and Restoration) must be implemented when activities on site have ceased.

7.14 Determination of Significance of Impact Following Mitigation

Impact	**Receptor**	**Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences)** Negligible - High	**Existing Environment (Significance / Sensitivity)** Negligible -High	**Significance** Imperceptible - Profound
Hydrocarbon contamination through accidental spillages/leaks	Local bedrock geology & soils/subsoils	Low-Medium	Low	Imperceptible
Loss of soils/subsoils due to extraction	Soils/ subsoils	Medium	Low	Slight
Loss of bedrock geology as extracted product	Bedrock geology	High	Low	Moderate

7.15 Impact Assessment Conclusion

There will be an inevitable moderate permanent negative impact due to the extraction of bedrock geology. The impact of the loss of soils is assessed as slight due to the mitigation measures in place. The other activities associated with the project have no negative effects on the land, soils and geology.

APPENDIX 7.1: GEOLOGICAL REPORT BY JOHN COLTHURST