

Chapter 7: LAND, SOILS & GEOLOGY

Table of Contents

List of Figures	107
List of Photographs.....	107
List of Tables	107
 7 LAND, SOILS AND GEOLOGY	 108
7.1 Introduction	108
7.2 Methodology.....	108
7.2.1 References	108
7.3 Impact Assessment Methodology.....	108
7.4 Existing Environment	110
7.4.1 Site Description & Location	110
7.4.2 Topography and Drainage	111
7.4.3 Land Use	111
7.4.4 Soils and Subsoils	112
7.4.5 Bedrock Geology.....	112
7.4.6 Geological Heritage.....	113
7.4.7 Economic Geology	114
7.4.8 Historic Quarrying Activity.....	114
7.5 Characteristics of the Development	115
7.5.1 Overburden and Berm Construction	115
7.5.2 Extraction of Material.....	115
7.5.3 Sequence of Extraction	116
7.5.4 Processing of Material	116
7.5.5 Products.....	116
7.5.6 Stockpiling of Materials	116
7.5.7 Transport to Market	116
7.5.8 Fuel and Chemical Storage	116
7.5.9 Surface and Groundwater Management.....	116
7.5.10 Working Hours and Employment	116
7.5.11 Utilities and Services.....	117
7.5.12 Facilities	117
7.6 Impact Assessment	117
7.6.1 Construction Impacts – Preparation for Extraction.....	117
7.6.2 Operational Impacts	117
7.6.3 Cumulative Impacts	118
7.6.4 'Do Nothing' Option.....	119
7.7 Mitigation Measures (Implemented and Proposed)	119
7.8 Monitoring	119
7.9 Decommissioning / Re-instatement	119
7.10 Residual Impacts	119
7.11 Technical Difficulties	119
7.12 Determination of Significance of Impact Pre-mitigation	120
7.13 Summary of Mitigation Measures	120
7.14 Determination of Significance of Impact Following Mitigation	121
7.15 Impact Assessment Conclusion.....	121

List of Figures

Figure 7.1: Location of Subject site	111
Figure 7.2: Bedrock Geology	112
Figure 7.3: Historical 25-inch map showing quarrying on site (1863-1924)	115

List of Photographs

Photograph 7.1: Typical slate with no obvious bedding	113
Photograph 7.2: Area of complex folding in NE of quarry	113

List of Tables

Table 7.1: Description of Potential Environmental Impacts.....	108
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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 development and the activities 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 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

- *Teagasc Soil mapping*: online
- *GSI Mapping*: online
- *Survey of Murray Stone*. Digital Land Surveyors Ltd, 2023

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

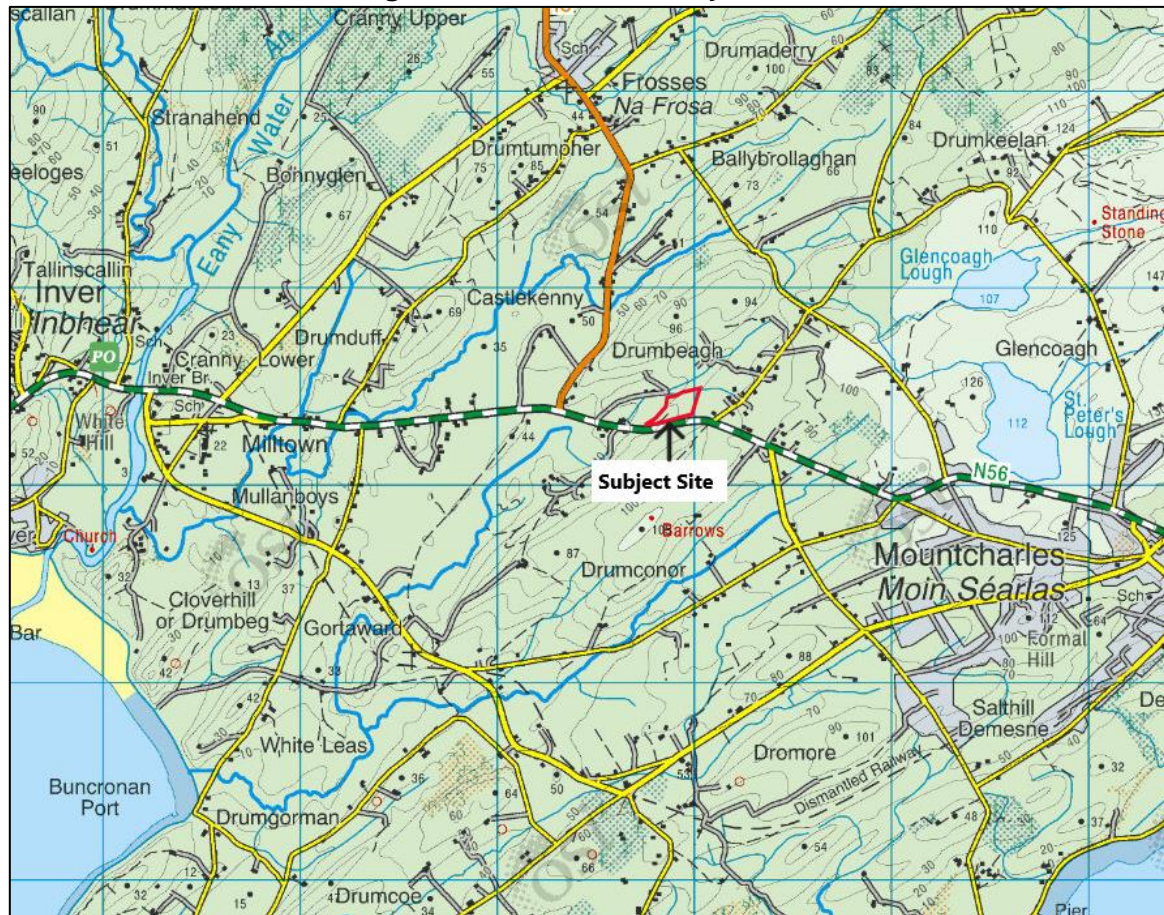
	An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects An effect that alters the character 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 SO _x and NO _x to produce smog).

7.4 Existing Environment

7.4.1 Site Description & Location

The development consists of a quarry located on a 3.45-hectare site in the rural townland of Drumbeagh. The site is located immediately north of the N56 between the villages of Mountcharles and Inver. The site is approximately 2.5 km west of Mountcharles, 3 km east of Inver and 1.7 km south of the villages of Frosses. The site is accessed off a local slip road immediately off the N56. The access road also serves the quarry owner and one other local resident. The site is surrounded by a mixture of poor-quality agricultural land, improved agricultural grassland and one-off rural houses and farmsteads. There are also peatlands and isolated forestry blocks in the surrounding area. The subject site location is outlined in Figure 7.1 below.

Figure 7.1: Location of Subject site

CYAL50381113 © Ordnance Survey Ireland/Government of Ireland

7.4.2 Topography and Drainage

The topography of the study area is undulating and the topography within the quarry site varies from c.73 mOD on top of the screening berms in the east to c.54 mOD in the central deck of the site.

There are several large depressions on the quarry deck which act as settlement facilities on site. The main settlement pond is located in the central southern part of the site. This pond receives runoff from most of the site. Following settlement, the outflow from this pond is through a heavily vegetated open channel discharging to a tributary of the Eany Water River at the site entrance. A smaller settlement pond is located on the northern boundary of the site at the outer side of the screening berms and captures runoff from this immediate area. Following settlement this discharges to a separate tributary of the Eany Water River flowing past the northern boundary of the site.

7.4.3 Land Use

The site is surrounded by a mixture of poor-quality agricultural land, improved agricultural grassland and one-off rural houses and farmsteads. There are also peatlands and isolated forestry blocks in the surrounding area. The current land use for the application site is as a working quarry. Extraction takes place in the central part of the site on the quarry deck with some minor processing of extracted material occurring in the western portion of the site.

The Ordnance Survey of Ireland historical map series was examined for land use on the application site. In the 25" series mapped between 1863 and 1924 the site is seen as partially excavated ground. The current applicant started excavation and processing on the site in 2004 while the site was in the ownership of his family.

7.4.4 Soils and Subsoils

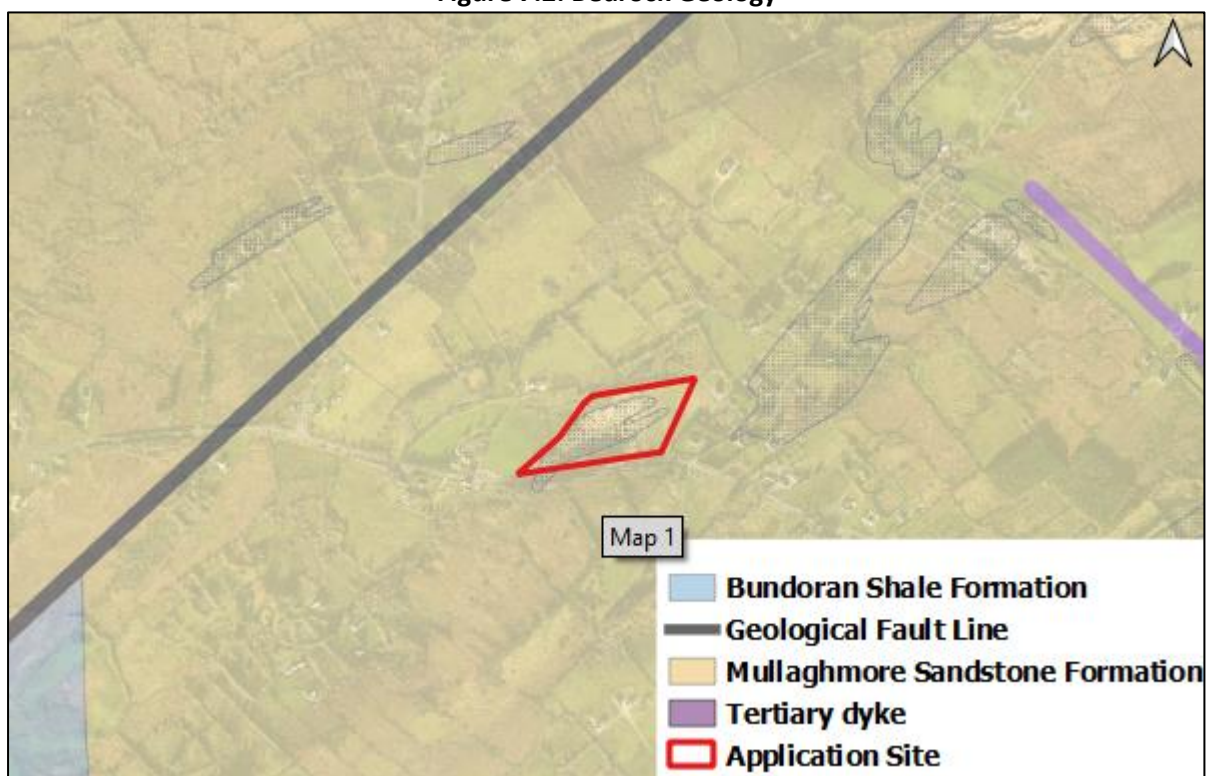
The only undisturbed soils remaining on the site are in the far eastern side where extraction has not taken place. Almost all ground has been stripped of soil for excavation or for the creation of other site infrastructure. Pre-development the site is most likely to have been covered by the same soil type as that remaining in the east of the site – poorly drained mineral soils (mainly acidic). The GSI describe the soil as a surface water Gley and the subsoil as a till derived from lower Carboniferous sandstones and shales. Many of the soils stripped from the site to facilitate extraction were used to create the screening berms on the eastern boundary of the site and along the northwestern boundary of the site. Most of these berms are now vegetated and providing excellent screening cover for the quarry.

7.4.5 Bedrock Geology

Details of the bedrock geology have been compiled from site examination and consultation with GSI information. The area is underlain by sedimentary rocks belonging to the Mullaghmore Sandstone Formation which is part of the Dinantian Sandstone Group.

The British Geological Survey describe the Mullaghmore Sandstone Formation as a brown to grey, fine to coarse-grained, silty, bioturbated interbedded with micaceous, carbonated mudstone and siltstone, immediately overlying basal Dromore Sandstone Member, are thin stromatolitic limestones, black ostracodal packstones and bitumous pyritous shales. The colour of the sandstone on site varies from a buff light brown to a grey/blue depending on the strata. Beds are seen to dip gently to the southeast. The rock cleaves very well and is suited to high end uses as facing stone, dimension stone and for ornamental uses. Figure 7.2 shows the bedrock geology of the site and surrounding area.

Figure 7.2: Bedrock Geology



(Created using QGIS and datasets from the GSI)

Photograph 7.1 below shows typical stone found on site exhibiting strong cleavage patterns. Photograph 7.2 below shows a redundant quarry face with strong bedding features.

Photograph 7.1: Typical stone on site**Photograph 7.2: Bedding with the sandstone formation**

7.4.6 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.

The site is within a large area designated as the Donegal and Inver Bays County Geological Site (DL011). This is described as a large area of rolling countryside forming the hinterland around Donegal and Inver Bays which is a drumlinized basin – one of the finest fields of ribbed moraines and drumlins in the country.

There are also two County Geological Sites near the application site:

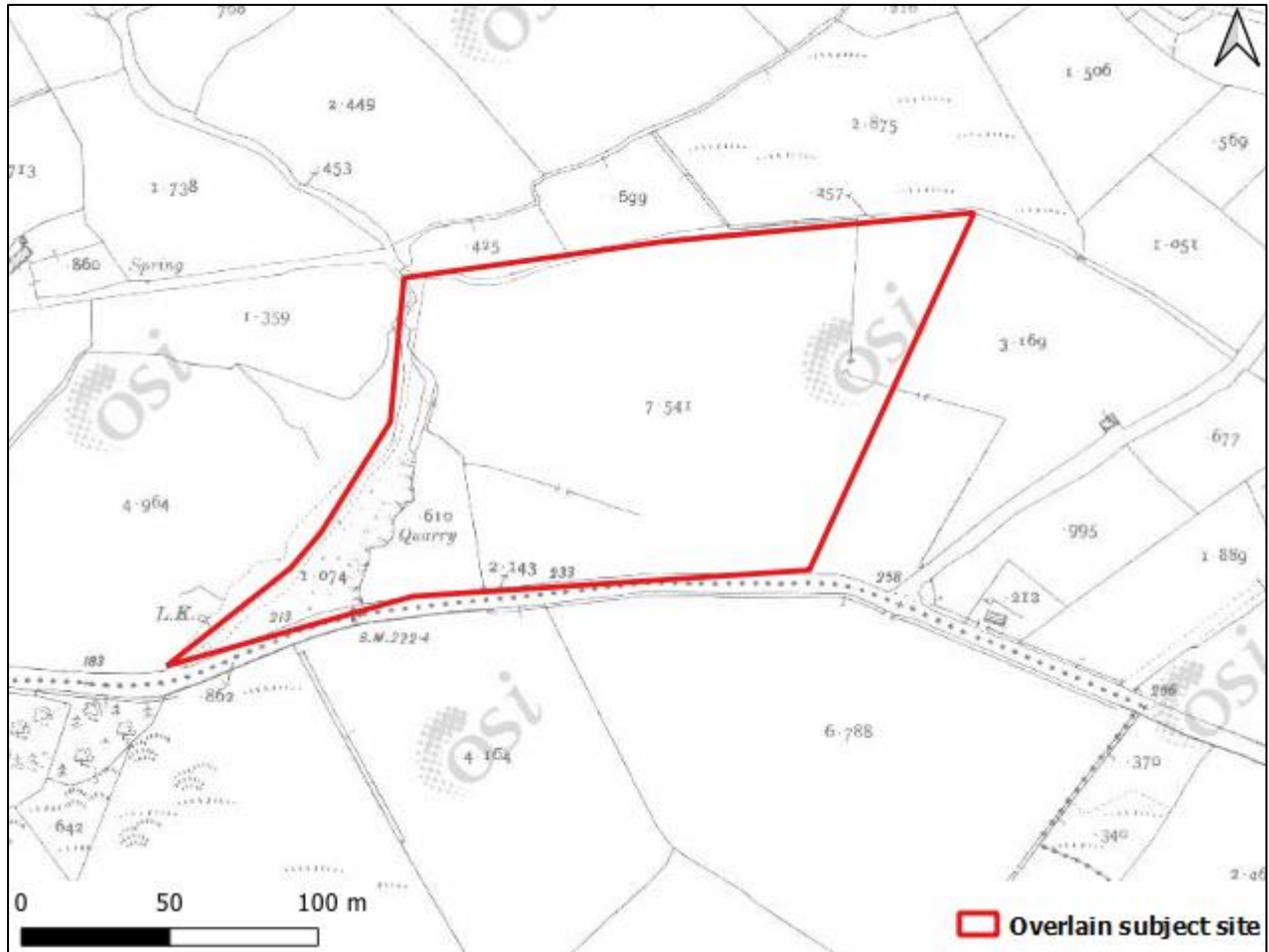
- The nearest County Geological Site is the Mountcharles Sandstone Mine c. 1.5 km northeast of the site. The Mountcharles Sandstone Mine (DL029) is an old sandstone mine with extant adits and excellent exposures of the Mullaghmore Sandstone Formation.
- Doorin Point (DL012) is located c. 3.2 km southwest of the site, where there are good exposures of the Bundoran Shale Formation and composite dolerite dyke along a 6 km length of coast which exhibits coastal erosion.

7.4.7 Economic Geology

There is a strong tradition of quarrying activity around the study area. There are 3 other quarries within 3 km of the subject site. The GSI aggregate potential online map was consulted and the area around the subject site is classified as ‘very high potential’.

7.4.8 Historic Quarrying Activity

Quarrying activity in the general area has been noted since the 1200’s when the Mountcharles Sandstone Mine was first active. There are records of quarrying on the site on maps drawn up in the late 1800’s and early 1900’s. It can be assumed that quarrying, although likely to have been sporadic, has been ongoing on the site for at least 100 years.

Figure 7.3: Historical 25-inch map showing quarrying on site (1863-1924)

(Reproduced from OSI (CYAL50381113) and using QGIS)

7.5 Characteristics of the Development

The site area is 3.45 hectares and is irregular in shape runs generally uphill from southwest to northeast with the lowest point at c. 54 mOD in the central western part of the site and the highest point in the east on top of the screening berms at c. 73 mOD. The quarry contains a central access road leading to the main quarry deck where stockpiles of product are stored on pallets and tonne bags awaiting collection. This central area is also used to park vehicles and to access the working quarry faces.

7.5.1 Overburden and Berm Construction

Overburden removed from areas of extraction have been used to create screening berms along the eastern and northwestern boundaries of the site. These berms have largely re-vegetated and provide screening for quarrying activities.

7.5.2 Extraction of Material

Extraction of the product is by mechanical means using a ripping claw on an excavator. Occasionally boulders have to be broken down further using an impact breaker mounted on an excavator down into smaller more manageable pieces. In the distant past, the applicant states that occasionally blasting occurred on site to win rock. The practice was discontinued after it was seen to induce unwanted fracture patterns into the rock lessening its value as cut-stone product. No blasting is planned for the site.

7.5.3 Sequence of Extraction

There are a number of lithologies present in the quarry. The dominant rocks are brown sandstone and a blue sandstone. Historically these have been extracted from west to east within the site. Current extraction areas are in the central eastern part of the site.

7.5.4 Processing of Material

Won rock is then transported using excavator bucket or telehandler to the guillotine area. Rock is then guillotined by hand and stacked on pallets ready for collection. Some rock pieces are cut with a circular saw to size and then stacked on pallets ready for collection.

7.5.5 Products

The main products produced are cut stone and dimension stone. Most of the product is used for facing houses with some product used for garden features, and ornamental features. Stone not utilised for cut stone is used to level out previous extraction areas.

Historically, the lower value stone was used as aggregate. In the 1960's aggregate was used as fill for the construction of the nearby N56 national route. The current product is not used for road surfacing, structural building or as a constituent of concrete.

7.5.6 Stockpiling of Materials

Cut stone and dimension stone are stored on site either on pallets or in ton bags awaiting collection from the customer.

7.5.7 Transport to Market

There are no delivery lorries associated with the quarry activity as customers usually collect the product directly from the site. On average, there is one lorry pick-up (rigid or articulated) from site. Product is loaded onto the lorry using the on-site telehandler. There are also occasional smaller loads collected from the site by customers. These are usually done in smaller pick-up 3.5 T lorries or using vans and trailers. On average there is one of these smaller collections per week.

7.5.8 Fuel and Chemical Storage

Fuels and lubricants are stored in a bunded area within the applicant's workshop offsite.

All re-fueling operations are carried out with strict adherence to pollution prevention protocols.

7.5.9 Surface and Groundwater Management

Protection of the wider surface water environment is achieved on site is settlement ponds. The main settlement pond is in the central southern portion of the site which captures runoff from the main extraction area. Another smaller linear settlement pond is located on the northeastern boundary and captures runoff in the immediate area. The settlement ponds discharge to separate tributaries of the Eany Water River which discharges to the sea at Inver Bay approximately 3 km southwest of the subject site. The guillotining and cutting area is serviced by a sump which collects all runoff. Water is recycled from this sump and sludge periodically emptied and used to supplement the screening berms.

7.5.10 Working Hours and Employment

Normal quarrying operations are confined to the hours of 8.00 am to 5.00 pm, Monday to Friday. The quarry is shut on Saturdays, Sundays and Public Holidays. The applicant provides employment for approximately 2-3 people directly.

7.5.11 Utilities and Services

There is no electricity supply or mains water supply to the site. There is no telecommunications connection to the site.

7.5.12 Facilities

There is no weighbridge on site. Canteen, toilet and welfare facilities are provided at the applicant home approximately 130 m west of the quarry entrance.

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

7.6 Impact Assessment

There was a defined construction phase associated with the 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 vehicles & plant has been / is carried out using a mobile bunded bowser and drip tray with appropriate spill kits available. Maintenance has been / is carried out off site in a concreted maintenance bay to ensure any potential leak/spillage cannot escape to ground. 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. 2.5 hectares. Historical quarrying activity has also altered the topography of the application site.

The loss of overburden and rock in the extraction areas has led to the inevitable loss of some habitat. Chapter 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 Chapter 6, *Biodiversity*, and proposals for re-instatement are discussed in Chapter 15, *Landscape and Restoration*.

The cut stone 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. There are plans to continue quarrying into previously unextracted areas. This will be done in line with the regulations and a suitable buffer strip will be left to ensure stability.

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 small 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.

Welfare facilities are provided at the applicant's dwelling house a short distance off-site. Wastewater treatment at the applicant's dwelling is via approved 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. A recorded oil leak is discussed in Chapter 8, Water, and testing carried out following remediation to shown that there was no significant residual contamination.

Refuelling of vehicles & 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/spillage 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 Mountcharles Sandstone Mine approximately 1.5 km northeast of the site.

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 are quarry developments within 2.5 km to the northeast of the site. The developments are of similar or greater size and the current status of these developments is unclear. There will be a cumulative effect regarding the loss of bedrock geology for all 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. There are no other commercial enterprises which are likely to bring cumulative effects.

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 from further afield. This will result in a higher carbon footprint for these products. The provision of 2-3 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 main drainage system downstream of Settlement Pond 1
- Oils and lubricants are stored in a bunded area off site.
- Refuelling of plant/vehicles 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, (Chapter 15, *Landscaping and Restoration*) must be implemented when activities on site have ceased.

7.8 Monitoring

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 Chapter 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 the main settlement pond.
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.