Chapter 5:
POPULATION & HUMAN HEALTH

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5 POPULATION & HUMAN HEALTH

5.1 Introduction

This Chapter of the remedial Environmental Impact Assessment Report (rEIAR) assesses the existing environment in addition to the potential effects on population and human health arising from the historical and current quarrying activities.

Section 5.2 focuses on Population including potential direct and indirect effects of the development regarding principal socio-economic indicators, including population, land use, employment, tourism and residential amenity. Section 5.7 assesses the potential effects on human health associated with the development.

A human health risk assessment is the process of assessing the nature and probability of adverse health effects on human beings because of a development. Mitigation measures are discussed where required to mitigate any potential effects arising, or that have arisen, from the development.

Other aspects of potential direct and indirect effects on human beings are also considered in the other chapters of this rEIAR which include the following:

- Chapter 8: *Water*
- Chapter 10: *Noise & Dust*
- Chapter 12: *Material Assets -Traffic*
- Chapter 15: *Landscape & Restoration*

5.2 Population

5.2.1 Methodology

The assessment of impacts on human beings entails the identification of key populations that are most likely to be impacted by the proposed development. Key populations that have the potential to be impacted have been identified as persons residing and engaging in activities in close proximity to the existing quarry, persons with a stake in the general economy of the local and regional area and persons enjoying the recreational and cultural amenities of the area. The principal sources of information are from the Central Statistics Office (CSO). Several other sources of information and guidance documents were referred to as part of the compilation of this section and are listed in section 5.9 (References).

5.2.2 The Existing Environment

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.

As described in Chapter 3, *Project Description,* the existing working quarry consists of an extraction area where rock is extracted and a small processing area where rock is guillotined and cut.

In describing the receiving environment in relation to human beings, this section provides an overview of the local area, including settlement patterns, age structure, population change, social indicators including employment, education, and social class, and economic activity.

5.2.3 Population & Age Profile

The Central Statistics Office (CSO) is the Government agency responsible for the collection and publication of most Irish official statistics. The CSO disseminates the results of its statistical enquiries through several different statistical publications. In this assessment, the following CSO publications were consulted to get both a historic and up to date picture of the current population of Ireland, Donegal and the Drumbeagh townland areas:-

- Census of Population 2002, 2006, 2011, 2016 and 2022;
- Small Area Population Statistics 2011,2016 and 2022 (SAPS).

The townland is located within the Donegal Local Electoral Area (2019), one of 7 LEAs in County Donegal. The existing quarry is located within the Small Area Population (SAP) A057138002.

The population for SAP A057138002 in 2011 was 129 and this decreased slightly to 123 in 2016 (-4.88 %) and increased in 2022 to 141 (+ 12.88%). The population for the county of Donegal was 161,137 in 2011, falling to 159,192 in 2016 (- 1.2%) and rising to 167,084 in 2022. Results from the 2022 census put the increase in population of County Donegal at 7,892 (+ 4.72 %).

The age profile of the population is outlined in Table 5.1 below. The 45-64 (29.1%) age group consists of the highest proportion of people in the SAP which is marginally higher than that of the County (26.3%). The lowest portion of the population in the study area is the 65+ (10.6%) age group compared to both the County (17.7%) The study area has a considerably lower dependency ratio (27.6%) than the County (38.1%) and State (34.7%). This is predominantly due to the lower proportion of the population aged between 0-14 and 65+ than that of that the County.

Table 5.1: Age profile of the Study Area

Area	0-14	15-24	25-44	45-64	65+	Dependency Ratio
SAP	17%	9.2%	19.1%	29.1%	10.6%	27.6%
Co. Donegal	20.4%	11.8%	23.7%	26.3%	17.7%	38.1%

5.2.4 Principle Economic Status

Details of the labour force in the study area are shown in table 5.2 below. In 2022, the study area had a labour participation rate of 48.7% which is slightly lower than that of the participation rate in the County at 51.1% . The study area had an unemployment rate of 3.4% which is lower than the County rate of 5.2%.

Table 5.2: Labour force by Principle economic Status (over 15 years of age)

Area	At work	Looking for first regular job	Unemployed having lost/given up previous job	Student	Looking after home / family	Retired	Unable to work	Other
SAP	48.7%	0	3.4%	7.7%	10.3%	25.6%	4.3%	0
Co. Donegal	51.1%	0.9%	5.2%	10.3%	7.1%	19.5%	5.4%	0.5%

5.2.5 Socio-Economic Groups

The CSO establishes several principal socio-economic groups within the population. These are classified as follows:

- Professional workers
- Managerial & technical
- Non-manual
- Skilled manual
- Semi-killed
- Unskilled
- All others gainfully occupied and unknown

Table 5.3 below indicates that the main socio-economic group for the study area is Managerial and technical and semi-skilled. The percentage of most classes are similar in the study area to the county statistics except the semi-skilled category. Semi-skilled workers represent 20.6% of the population compared with 13.9% at the County level.

Table 5.3: Percentage distribution of socio-economic groups

Area	Professional workers	Managerial & technical	Non-manual	Skilled manual	Semi-skilled	Unskilled	Unknown
SAP	3.5%	27.7%	14.2%	16.3%	20.6%	2.1%	15.6%
Co. Donegal	6.3%	28.3%	16.4%	15.2%	13.9%	4.1%	15.7%

5.2.6 Employment Sources and Travel Patterns

The CSO establishes several modes of travel/transport within the population. These are classified as follows:

A On foot
B Bicycle
C Bus, minibus or coach
D Train, DART or LUAS
E Motorcycle or scooter
F Motor car: driver
G Motor car: passenger
H Van
I Other (inc lorry)
J Work mainly at or from home
Z Not stated

Table 5.4 below indicates the main modes of travel/transport in the study area as compared to County figures. The vast majority of people in the study area travel by motor car as the principal driver (48.2%) which is above the County figure (37.2%). A similar percentage of people travel as a passenger in a car in the study area (23.5%) compared to the County figure (24.2%). The high car usage is most likely reflective of the rural nature of the study area and lack of public transport links.

Table 5.4: Means of travel to work, school or college.

Area	A	B	C	D	E	F	G	H	I	J	Z
SAP	0	1.2%	5.9%	0	0	48.2%	23.5%	9.4%	0	7.1%	4.7%
Co. Donegal	6.8%	0.4%	10.6%	0.1%	0.1%	37.2%	24.2%	7.1%	0.6%	7%	6%

5.2.7 Land Use and Housing

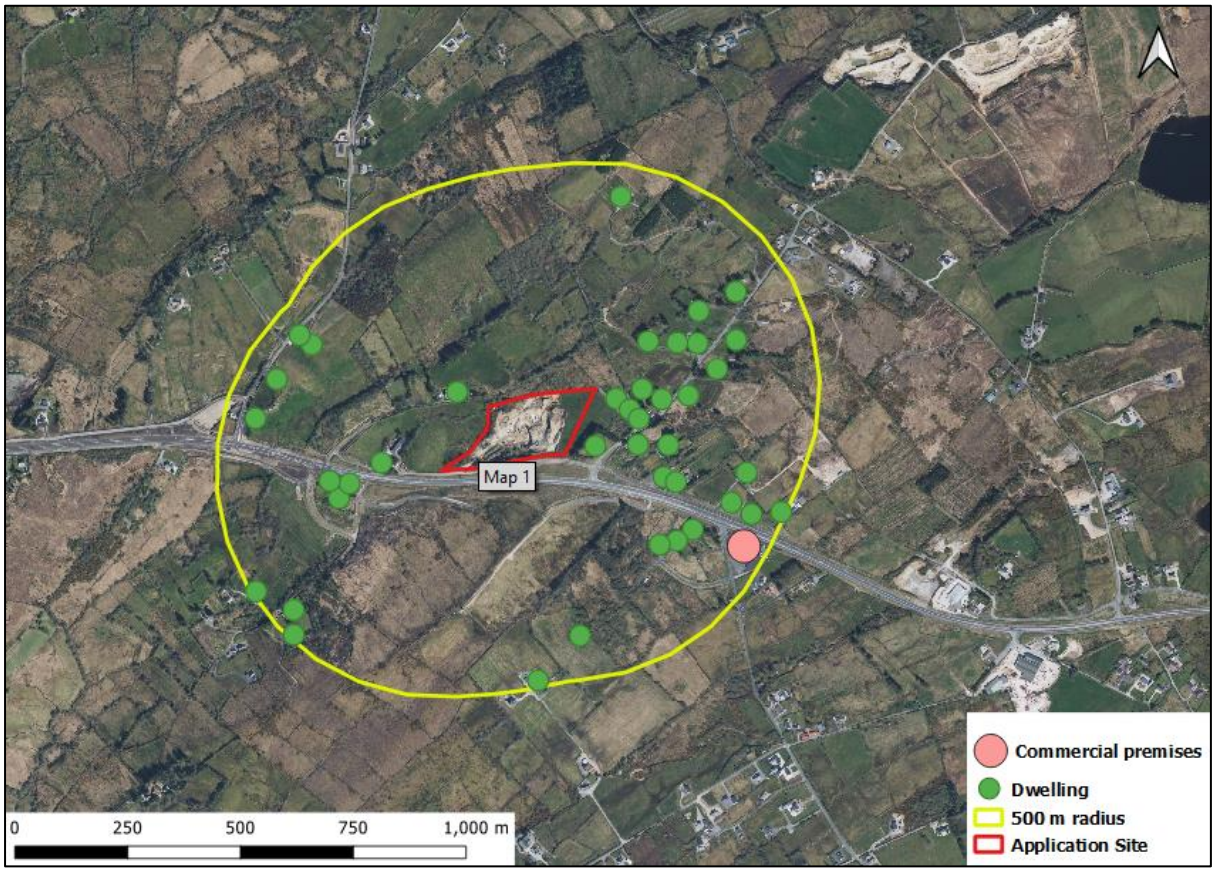
Table 5.5 contains information on the number of private households and the number of persons in these households. This table shows that the average household size in the study area is 2.3 with the average household size for the County at 2.7.

Table 5.5: Household formation and size

Area	No. of households	No. of persons in household	Average household size
SAP x 2	60	140	2.3
Co. Donegal	61,780	164,501	2.7

The quarry is located in a rural area with once off housing and farmsteads abundant in the immediate vicinity. Figure 5.1 below shows all habitable dwellings within a 500m radius of the subject site. The principal sensitive receptors within the environs of the subject site are the residential properties predominantly to the west and east of the quarry. There are 40 dwellings within 500 m of the quarry boundary. Most are located along the N56 running east-west to the south of the quarry, along the L-65115-1 running north-south to the east of the quarry and along the R 262 running north-south to the west of the quarry. There is also one commercial premises, Kelly's Toyota dealership and garage located almost 500m southwest of the quarry along the N56.

Figure 5.1: Location of site in relation to neighbouring dwellings and commercial premises



(Created using QGIS software and Bing satellite imagery)

The main land use in this study area is agriculture with sheep and beef enterprises most common. Small areas of commercial forestry are also present. 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.

5.2.8 Tourism, Recreation and Amenity

Tourism is regarded as one of the greatest sources of potential employment nationally and also has the potential to benefit the community in an environmentally sustainable way. The following is a summary of key statistics taken from the Fáilte Ireland latest available research report 'Tourism Facts 2022' published in October 2023:

- Domestic tourism delivers 2.93 billion in exchequer revenue
- 13.3 million domestic trips were taken
- 34% of domestic trips were to visit family and friends
- €53 average per capita spend on day trips

Some of the tourist attractions located close to the study area include:

- Aradara Heritage town located approximately 16 Km northwest of the subject site. Ardara, one of the five designated heritage towns in Donegal, is situated in the beautiful southwest region of Donegal. Ardara has been long associated with the tweed and knitwear industries. From the 1870's this trade became a cottage industry with home spun and hand dyed woollen and tweed items being created. The Ardara Heritage Centre, formally the town Courthouse, profiles the development of the tweed industry. To this day several shops in the town still sell high quality tweed and knitwear.

- Bruckless House Gardens – located 10 km west of the subject site. Bruckless House, the home the Evans family, is an attractive 18th century Classical house. Listed nationally as a protected building, it has a traditional cobbled farmyard and is set in 18 acres of parkland.Bruckless House borders Bruckless Bay,and has a spacious informal award-winning garden of the Robinsonian kind. It features in the Donegal Garden Trail and in guides to Irish gardens. There is a mature woodland around the House which is carefully developed and protected. Connemara ponies are bred here and can be seen in the parkland and grazing down to the shoreline.

- Donegal Town – located 9 km east of the subject site. Donegal Town is an attractive vibrant town overlooking Donegal Bay with a backdrop of the Bluestack Mountains on the Wild Atlantic Way. Traditionally a Market Town with a Diamond at its centre it is easily accessible for visitors and locals to explore the abundance of shops, dining, cultural and heritage attractions, bars and entertainment suitable for all tastes and ages.

- Fintra Blue Flag Beach – located 15 km west of the subject site. The wide, rural beach of Fintra Bay is set amongst stunning scenery a short drive from the fishing port of Killybegs on County Donegal's south-west coast. It is approached by a steep road down to it which offers fabulous vistas of both the beach and Donegal Bay as far as Benbulben mountain in County Sligo. The sandy beach is backed by dunes and grassy hills and provides a vast open space perfect for getting away from the hustle and bustle of everyday life.

- Glencolmcille Folk Village – located 30 km west of the subject site. The Glencolmcille Folk Village is built in the form of a village in which each house is an exact replica of a dwelling used by the local people in each of the three successive centuries (18th, 19th 20th) and is equipped with the furniture, artifacts and utensils of its particular period.

- Kilcar – located 23 km west of the subject site. Located in a beautiful part of South-West Donegal, between Ireland's premier fishing port of Killybegs and majestic Slieve League and the parish of Glencolmcille. To the northeast we are separated from Ardara by the spectacular Glengesh Pass, one of the most photographed views in Ireland. Kilcar is the gateway to the Donegal Gaeltacht, situated between mountain and sea - a great centre for both activity and relaxation, offering the best in culture and tradition with modern amenities. The area around Kilcar offers panoramic seascapes, unspoilt beaches, hills and mountains affording magnificent views and superb walks, impressive megalithic tombs and historic sites largely unknown outside the area.

5.2.9 Social Infrastructure

The nearest primary schools are Dunkineely National School, c 8 km west, St Peters National School, Mountcharles c 2.5 km east, or Glebe National School located in Donegal Town, c. 9 km east. There are no Post Primary Schools located in the near vicinity with the closest located in Donegal Town. The nearest third level institute is the Letterkenny campus of the Atlantic Technological University. The nearest local Garda Station is in Mountcharles located approximately 2.5 km east of the site. The closest Fire station is located in Donegal Town. The nearest community facilities for the area are located in Mountcharles and include churches (Roman Catholic and Protestant Church of Ireland), post office, public houses and guesthouses.

5.3 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.

5.3.1 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.

5.3.2 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.

5.3.3 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.

5.3.4 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.

5.3.5 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 ustilised 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.

5.3.6 Stockpiling of Materials

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

5.3.7 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 per week. 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.

5.3.8 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.

5.3.9 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.

5.3.10 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.

5.3.11 Utilities and Services

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

5.3.12 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.

5.4 Population Impact Assessment

The current and historical quarry development is a direct result of the continued demand for construction materials. This section of the report will now examine if there is any significant impact expected on population because of this development, and reference mitigation measures. The impact assessment of this proposal will now be examined under various headings and an appropriate effect level, significance and mitigation (if relevant) will be outlined.

5.4.1 "Do nothing" Scenario

All components of the baseline are constantly changing due to a combination of natural and human processes. When predicting likely direct and indirect effects it is important to remember that there are two available for comparison: (1) the existing baseline environment and (2) the future baseline environment without substitute consent allowing for natural changes only. In socio-economic terms, if substitute consent was not achieved, this would result in no further loss of land to quarry activity. However, this would result in loss of local jobs and employment as the quarry would be forced to close. There are currently 2-3 people employed from the local area.

5.4.2 Population Impact Assessment

The quarry is located in an area which consists of one-off dwellings and farmhouses situated along local and minor roads in the vicinity. As seen from the statistical analysis of the population numbers, there has been a slight increase in population numbers in recent years. Activities associated with quarry sites can deter people from living within proximity to such developments. However, there have been a number of houses built in the vicinity of the quarry in recent years. There are approximately 40 dwellings with a 500m radius of the site (Figure 5.2), of which four were constructed since 2013 (source Donegal County Council Planning Portal)

The applicant has undertaken measures to reduce noise, vibration and dust emissions from the quarry. Dust, noise and vibration emissions are discussed in more detail in Chapters 9 and 10 respectively of this rEIAR.

Noise and water monitoring have been carried out as part of the EIA process and have been shown to be within acceptable limits.

5.4.3 Economic Activity

Murray Stone is a small but significant employer in the area with 2-3 local people directly employed at the quarry site. The quarry supplies products to the construction industry in Donegal and throughout the northwest of Ireland. Therefore, the quarry is deemed to have had a positive impact on the local community in terms of employment levels.

5.4.4 Land-Use and Housing

Prior to quarrying activity commencing the land was used for agricultural purposes. The majority of land in the proximity of the application site is used for agricultural purposes with livestock grazing being the predominant activity practiced; therefore, quarrying activity has not led to a significant loss of an existing land-use in the area. A number of houses have been constructed in recent years in the vicinity of the quarry which demonstrates that quarrying activity to date has not deterred people from living in the area.

5.4.5 Tourism, Recreation & Amenity

The quarry is not located within proximity of any identified tourist attractions in the area. According to the landscape appraisal of County Donegal, the quarry is located in the Donegal Bay Drumlins Landscape Character area (LCA 37). The tourism product is based on the landscape, seascape, history and cultural qualities of the area with a focus around the coast including the 'Wild Atlantic Way' that follows the route of the N56. The topography of the surrounding lands aids in screening the quarry from the surrounding landscape.

Quarrying activity is a long-established land use of the area and has not impacted on the tourist amenity of the study area. The application area is not located on or near a Natura 2000 site or near any protected structure.

5.4.6 Social Infrastructure

It is unlikely that quarrying activity will impact on the social infrastructure of the area and may have a positive impact as materials extracted from the quarry will be used to develop social infrastructure in the study area.

5.4.7 Site Safety

There may be some concerns that there are threats to safety of people and agricultural stock as a result of steep quarry faces. There is also a potential danger to members of the public who may gain access to the site. Security fencing, screening and other landscaping around the perimeter has largely secured the site from unauthorised access.
It is proposed to further improve perimeter fencing and safety notices in order to make the site more secure. Berms have also been used around excavated areas and quarry benches are in line with "Safe Quarry - Guidelines to the Safety, Health and Welfare at Work (Quarry) Regulations 2008".

5.4.8 Traffic

The traffic generated as a result of the quarry during peak production is in the region of one collection lorry (rigid or articulated) per week and one smaller either 3.5T lorry or van and trailer collection per week. The applicant walks to the site from his residence and the other 1-2 employees of the quarry travel to site by car. There may have been more historical vehicle movement prior to the current applicant's direct involvement; for example, when aggregate was being hauled for the quarry for construction of the nearby N56, there are likely to have been several rigid lorry movements per day. The maximum number of vehicle movements per day since the applicant has had involvement is eight (two cars, one articulated lorry and one small lorry/van).

5.4.9 Unplanned Events

Emergency response plans and procedures in place will be implemented should an unplanned event occur.

5.4.10 Mitigation Measures

The quarry has been developed in a manner such that the effect on human beings is minimised. Continued development will secure employment and supply of building materials for the local construction industry. This effect is positive; therefore, no mitigation measures are proposed in relation to employment. Employment at the proposed development may also lead to persons moving into the locality or indeed allowing them to continue to reside in the locality rather than emigrating. Again, this is a positive effect for which no mitigation measures are proposed.
There are no potential negative effects on tourism and amenities in the area and therefore no further mitigation measures are required. Mitigation measures (in place and proposed) for Air, Noise & Vibration, Water, Landscape & Visual and Material Assets are included in the representative chapters of the rEIAR to ensure that the development's effect on the receiving environment is minimised.

5.5 Human Health

5.5.1 Introduction

A human health risk assessment is the process to estimate the nature and probability of adverse health effects in humans as a result of a development. The assessment has had regard to the findings of other chapters of the rEIAR, in particular to:

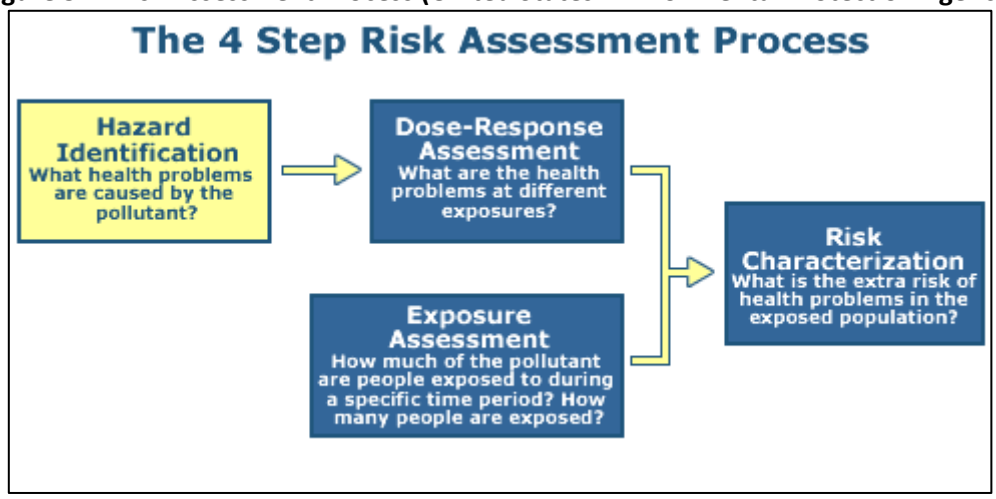
- Chapter 5.2: *Population*
- Chapter 8: *Water*
- Chapter 9: *Noise*
- Chapter 12: *Material Assets – Traffic*
- Chapter 15: *Landscape & Restoration*

This assessment is focused on potential human health effects associated with potential emissions related day- to-day today activities undertaken at the quarry.

5.5.2 Methodology

The methodology used in the assessment has had regard to that provided by the US Environmental Prospection Agency (US EPA) in their Human Health Risk Assessment process[1]. The assessment has also had regard to the Guidelines for Preparing Environmental Impact Assessment Reports (EPA, August 2022)[2]. The EPA has general guidelines on Human Health Risk Assessment however the US guidelines benefit from being more specific and as a result more user-friendly. Nevertheless, there are entirely in keeping with those recommended by the Irish EPA. The assessment methodology advised by the US EPA follows a 4-step process which is detailed in Figure 5.2 and described thereafter:

Figure 5.2: Risk Assessment Process (United States Environmental Protection Agency)



Step 1 - Hazard Identification
Examines whether a stressor has the potential to cause harm to humans and/or ecological systems, and if so, under what circumstances.
Step 2 - Dose-Response Assessment Examines the relationship between exposure and effects.
Step 3 - Exposure Assessment Examines what is known about the frequency, timing, and levels of contact with a stressor.
Step 4 - Risk Characterisation Examines how well the data support conclusions about the nature and extent of the risk from exposure to environmental stressors

Definition of Terms
The following terms are used in the assessment.
Agent - A chemicals or factors in the environment to which humans are exposed that may cause adverse health effects.
Vulnerable / Vulnerable Groups - An individual or group of individuals who, by nature of their age, health status or other factor is more prone to developing adverse health effects.
Robust - Strong and Healthy
Health based Standard - The dosage of an agent scientifically determined to protect against human health effects.
Threshold - The dosage of an agent below which there is no adverse health effect.
PM_{10} - Particulate matter of diameter less than 10 µm. (need to reduce size in line with scientific notation)
$PM_{2.5}$ - Particulate matter of diameter less than 2.5 µm

[1] https://www.epa.gov/risk/human-health-risk-assessment
[2] https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf

5.5.3 Health Based Standards

Health based standards by their nature are set to protect against human health effects. The level at which the standard is set is chosen to protect the vulnerable, not the robust. In determining the most appropriate methodology a number of Guidance Notes were reviewed. The Irish EPA Guidance favours the Health Based Standards approach. In its publication "EPA Guidelines on the Information to be contained in Environmental Impact Statements (May 2022)" it states:-

> *'The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment.'*

These Health Based Standards will be discussed further but it is appropriate to understand the principal behind the setting of such standards. In this, it is useful to consider Guidance by the US EPA in performing a Human Risk assessment.

Baseline information gathered to date and predictions of future emissions associated with the day-to-day operations of the existing and proposed development have been used as part of the assessment. These can be compared to various thresholds for air, noise, vibration etc. No detrimental health effects are expected below these thresholds.

5.5.4 Significance of Health Effects

There is a difficulty in assigning levels of significance to Human Health effects. In medicine, as in all science, the concept of statistical significance is used. That is putting a value, often in terms of percentage levels of confidence in the data. This is a valid approach for the study of the effects on a population but is not possible in the assessment of a significant effect on human health in smaller scale projects. It does not, for example, absolutely exclude a response in an individual. This may be best explained with an example such as low levels of noise emissions from a process undertaken at the proposed development. The vast majority of the population do not notice it but one individual may find this noise annoying, even when other people in exactly the same location do not.

The significance criteria used in the assessment as adapted from the Irish EPA Guidelines, are set out in Table 5.6 below.

Table 5.6: Criteria Used in the Assessment of Population and Human Health

Effect Level	Significance Criteria
Imperceptible	No significant human health impacts are apparent. An example is no measurable effect attributable to the proposed development.
Slight	A small impact on individual reported symptoms but no change in health status can be attributed to the proposed development. An example is a temporary increase in symptoms in an individual but no change in the severity of the underlying condition or treatment required.
Moderate	A small impact on health status of individuals but no change in morbidity or mortality can be attributed to the proposed development. An example is an individual increasing their use of a treatment attributable to the development but no change in underlying condition.

Effect Level	Significance Criteria
Significant	A proposed development has the potential to impact on individual health status. An example is an individual's condition becoming measurably more severe as a result of the proposed development.
Very Significant	A proposed development has the potential to impact on the health status of groups. An example is a group of individuals' conditions becoming measurably more severe as a result of the proposed development.
Profound	A proposed development has the potential to impact on the health status of communities. An example is a measurable increase in the incidence or severity of a condition in a community.

5.6 Human Health Impact Assessment

The quarry development is a direct result of the continued demand for construction materials. This section of the report will now examine if there is any significant impact expected on human health as a result of this proposal, and reference mitigation measures.

5.6.1 Hazard Identification

The quarry has been existence for over 100 years and the applicant has been working in the quarry for the past 17 years. The following chapters of the rEIAR provide detailed information on the existing and predicted emissions relating to their respective Chapter.

- Chapter 8: *Water*
- Chapter 9: *Noise & Vibration*
- Chapter 10: *Air*
- Chapter 12: *Material Assets - Traffic*
- Chapter 15: *Landscape and Restoration*

Of relevance to the human health are air emissions, noise and vibration emissions, emissions to water and traffic associated with day-to-day activities and therefore these are assessed as part of this Chapter.

5.6.2 Dose – Response Assessment

Emissions to air including noise and vibration emissions, emissions to water and traffic associated with the development are identified as the main areas which could impact on human health. The concept of dose response suggests that the greater the dose to which an individual is exposed the greater either the likelihood of a health response and/or the greater the severity of that response. Inbuilt to this concept is the principle of a threshold. The threshold is the level of an agent below which one would expect no adverse response. This is a concept on which health-based standards are based.

Thresholds are set in relation to emissions to various elements of the environment such as stack emissions to air, noise associated with day-to-day operations, vibration emissions from blasting and discharge of water to surface water or ground water. These are set by way of standards and recommended guideline values which are attached as conditions to a grant of a planning permission or by way of an air emissions licence or discharge licence. To ensure compliance, routine monitoring of the emissions is undertaken. Emission levels which are below the threshold are taken to have no significant health effects. If, however, the levels increase above the

threshold it is anticipated that an increasing number of people will be affected, and the severity of that effect increases with increase in level.
The key elements of the proposed development which have potential to impact on human health are detailed below. Each element has been assessed under specific Chapters of this rEIAR, for example, noise is assessed under Chapter 10, *Noise*. It can be assumed that, provided impacts do not result in exceeding the threshold for each element, that there will be, or has been, no significant risk or impact to human health.

5.6.3 Exposure Assessment

This is the process of measuring or estimating the magnitude, frequency, and duration of human exposure to an agent in the environment or estimating future exposures for an agent that has not yet been released. An exposure assessment includes some discussion of the size, nature, and types of human populations exposed to the agent, as well as discussion of the uncertainties in the above information.
Health based standards therefore rely on the dose response concept and try to identify by scientific means the threshold below which no significant health effects would occur. When standards are scientifically set by reliable and recognised or statutory agencies, they are a useful method in assessing the impact of any proposed change.
Health standards are not established based on the threshold to protect the robust who may be more resilient but are primarily there to protect the vulnerable. They are to protect the elderly, the very young, and the ill and by extension thereby, the robust are not affected.

5.6.4 Risk characterisation

Risk characterisation is the fourth step of the risk assessment process, integrating information from the exposure assessment and the hazard characterisation to produce the judgment as to the nature and presence or absence of risks. In practice, each component of the risk assessment (e.g. hazard assessment, dose-response assessment, exposure assessment) has an individual risk characterization written to carry forward the key findings, assumptions, limitations, and uncertainties.
It involves comparing the predicted impacts of the change in the environment associated with the development and comparing those predicted changes with the relevant health-based standards. It can be assumed that provided the predicted changes do not result in any exceedances of the health-based standards, there will be no significant risk.

5.6.4.1 Assessment of Impacts Associated with Emissions to Water

The potential impacts of the proposed development on the water environment have been assessed in Chapter 8, *Water*, of thisrEIA Report and mitigation measures are proposed in order to safeguard the water environment. The assessments concluded that given the mitigation in place, and proposed, there will be, and has been, no significant impact on surface water or groundwater.

Assessment of Effect

Given that there will be no effect on water quality standards, the effects on human health from water are assessed as imperceptible.

5.6.4.2 Assessment of Impacts Associated with Noise & Vibration

As detailed in Chapter 9, *Noise & Vibration*, of the rEIAR, noise monitoring undertaken at the quarry shows that the quarry is compliant with the limits of 55dB(A) LAeq (60 minutes) daytime. The likely historical noise associated with development may have been higher than that currently measured due to certain mitigation measures not being in place such as berms, and extraction areas may have been at topographically higher levels. However, due to the proximity of the N56 and dominant noise from this source it is not expected that there would have been any significant noise impact form quarrying activity.

Difficulties exist in the assessment of vibration impacts due to the lack of historical records. The following information has been supplied by the applicant:

- The last blast carried out was in 2007
- Previous to 2007, approximately one blast was carried out per year from 2004.
- Previous to 2004, approximately one blast was carried out every 5 years.

Noise and vibration assessments concluded that given the mitigation in place & proposed, there has been, and will be, no significant noise and vibration impact as a result of the development.

Assessment of Effect
The human health effect for all receptors arising from noise and vibration are assessed as being Imperceptible.

5.6.4.3 Assessment of Impacts Associated with Emissions to Air
The main potential sources of emissions to air in relation to the development will be associated with plant and machinery undertaking day to day activities such as extraction, processing and transportation of material and dust blow generated during dry windy conditions and operation of the asphalt plant.
The most commonly applied guideline is the German (TA Luft) guideline of 350mg/m2 /day as measured using Bergerhoff type dust deposit gauges as per the German Standard Method for determination of dust deposition rate (VDI 2119). This is commonly applied to ensure that no nuisance effects will result from specified industrial activities. Below these thresholds dust problems are considered less likely. Dust Deposition is normally measured by gravimetrically determining the mass of particulates and dust deposited over a specified surface area over a period of one month (30 days +/- 2 days).
The EPA Document Environmental Management in the Extractive Industry (Non- Scheduled Minerals) (EPA, 2006) recommends that the following TA Luft dust deposition limit value be adopted at site boundaries associated with quarry developments – total dust deposition (soluble and insoluble): 350 mg/m2 /day (when averaged over a 30-day period).
Dust deposition is assessed in Chapter 10, *Air*, of this rEIAR and the results of a dust deposition study are presented within Chapter 10. The results of dust deposition monitoring were below the recommended guideline value of 350mg/m2 /day.

Assessment of Effect
The quarrying activities on site are relatively low impact. There is no aggregate produced at the site, therefore there are no crushing or screening activities taking place. These are the activities that tend to generate large amounts of fugitive dust during dry periods. Results of dust deposition monitoring have been below the recommended guideline value of 350 mg/m2 /day at the site boundaries. The day-to-day activities undertaken at the quarry were assessed and provided that mitigation measures in place, and those proposed, are adhered to, the impact on human health associated with these activities are assessed as, having been, and being Imperceptible.

5.6.4.4 Assessment of Impacts Associated with Traffic
The existing quarry development generates a small number of traffic movements associated with the transport of material to and from the quarry to market, and from employees travelling to their workplace. A weekly maximum of 4 HGV movements and 12 car movements has been estimated. The volume of traffic associated with this quarry is insignificant in comparison with the volume of traffic using the N56 daily. Road surfaces are good, and access is more than adequate with the upgraded junction to the recently re-aligned Drumbeagh-Mountcharles section of the N56.

Assessment of Effect
The historical and current impact of traffic has not, and will not, resulted in a significant increase in traffic on the public road infrastructure.

5.7 Mitigation Measures
No mitigation measures other than those detailed elsewhere in this rEIA Report, are required.

- Chapter 8: *Water*
- Chapter 9: *Noise & Vibration*
- Chapter 10: *Air*
- Chapter 11: *Climate*
- Chapter 12: *Material Assets - Traffic*
- Chapter 15: *Landscape & Restoration*

5.8 Residual Effects
The findings of the assessment is that the proposed development will not give rise to effects on human health.

5.9 Monitoring
Environmental monitoring will be carried out in accordance with the requirements of the conditions attached to the grant of substitute consent or any subsequent planning permission.

5.10 Technical Difficulties
No records remain of blasting undertaken.

5.11 References

- Central Statistics Office – Results of the 2011,2016 & 2022 Census – www.cso.ie
- Discover Ireland - https://www.discoverireland.ie/donegal/muckish-lub-loch-achair
- Fáilte Ireland - https://www.failteireland.ie/Research-and-Insights.aspx
- Donegal County Council - https://www.donegalcoco.ie//media/donegalcountyc/planning/pdfs/viewdevelopmentplans/countydonegaldevelopmentplan2018-2024/partaandb/Document.pdf
- United States Environmental Protection Agency - Conducting a Human Health Risk Assessment - https://www.epa.gov/
- Environmental Protection Agency – Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIARs) (May 2022).