MF Quirke & Sons

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Rangue & Knocknaboola, Killorglin, Co. Kerry

Proposed Continuation of Use and Extension of Extraction Operations

Environmental Impact Assessment Report (EIAR)

Volume III – Non-Technical Summary

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MF Quirke & Sons UC

Rangue & Knocknaboola, Killorglin, Co. Kerry

Proposed Continuation of Use and Extension of Extraction Operations

Non-Technical Summary

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Chapter One - Introduction

1.1 Introduction

M.F. Quirke and Sons Ltd (The Applicant) have been engaged in extraction operations at Rangue, Killorglin, for almost 50 years. The company is presently seeking planning permission to continue operations of processing aggregates, manufacturing Ready Mix concrete and concrete blocks at its Rangue factory site. Additionally, a proposed extraction extension is required to replace the firm's aggregate extraction site at Rangue, known as Riordan's Pit (Planning reference PL 08. 125729), as its reserves of aggregates are almost exhausted. The site is located approximately 2.5 kilometres (km) southwest of Killorglin, Co. Kerry. The sand and gravel pit location is shown on Figure 1.1, Appendix 1 of this document.

OES Consulting has been commissioned to prepare an Environmental Impact Assessment Report (EIAR) and Appropriate Assessment Screening Report for the proposed development which includes the following:

- Continuation of use of the existing factory site at Rangue as presently permitted under Planning Permission PL 08.125728.
- Extraction of aggregates and preprocessing by dry screening and grading in a new contiguous site in the townland of Knocknaboola for supply to the factory site and for direct sale.
- Construction of a temporary entrance from the Caragh Lake Road (L-4021) to the proposed new extraction site at Knocknaboola.
- Construction of an underpass beneath the Caragh Lake Road (L-4021) to facilitate the direct transportation of aggregates from the Knocknaboola site to the factory site at Rangue.

Existing Aggregate Production Factory

The existing factory site is located off the Caragh Lake Road (L-4021) in the townland of Rangue, approximately 2.5km southwest of Killorglin. No extraction of raw aggregates is conducted at this site as viable aggregates are bereft. Production methods at the factory site will not change in any way.

Processing of raw aggregates from Riordan's Pit to the factory site

Riordan's Pit (Rangue) is located within the western section of the facility and currently operates for the production of raw aggregates until its reserves of aggregates are exhausted. Due to this, extraction at Riordan's Pit will cease in 2022. The remaining small reserves will be sold off from the Rangue site when the new Knocknaboola site opens. Subsequently, the Rangue/Riordan's site will be restored in accordance with the original planning particulars or new environmental advice which might supersede it.

Proposed extension at Knocknaboola

The proposed extension site (also termed Knocknaboola site) at the sand and gravel pit is located to the south of both existing sites (existing production factory and Riordan's site) and is contiguous to these. The proposed extraction site at Knocknaboola lies at the opposite side of the Caragh Lake Road to the Rangue factory site and it is proposed to connect both sites via an underpass in order to keep the connecting pit traffic off this public road as well as facilitating the transportation of aggregates from the Knocknaboola site to the factory site for processing. Planning permission for ancillary works to construct the underpass is being sought also in this planning application.

As the Knocknaboola site replaces the exhausted Riordan's site there will be no change in production methods and the usual daily routine will involve one pit operator excavating the aggregate, loading it into an articulated dump truck and transporting it to the factory site.

1.2 Activity Description

The MF Quirke's factory site occupies an area of 18.5 Ha, none of which is used for the extraction of raw aggregates, as little viable aggregates are to be found there. The area consists of naturally regenerated grass and woodland interspersed by various lagoons which attract diverse wildlife including breeding swan, duck and moorhen on the lagoons and various breeding songbirds on the scrubs and trees. These features are more comprehensively covered in the ecology section and they are mentioned here to give a perception of the nature of the site before describing its built environment details.

Raw aggregate is crushed, screened and washed at the site as soon as it is imported from the sand and gravel pit and stockpiles are built up for further use in the production process. Washed aggregates will be retained for use in the production of concrete and concrete blocks.

The block production process includes a large concrete apron for storage, drying and maturing of concrete blocks and is an integral part of the process. Once blocks have been adequately cured, they are stored onsite until taken by delivery trucks for distribution.

Contiguous with these activities on the factory site is a large garage which is capable of admitting 360-degree excavators, front end loaders, forklift trucks and road trucks. Processing of raw aggregates also occurs at the factory site. The company's Head Office is situated beside the garage and this is the administration hub for the entire company.

The extraction extension in contiguous lands at Knocknaboola is to be deployed in order to replace Riordan's Quarry which ceases planning permission and operations in 2022. Extraction rate per annum will equate to 100,000m^3 which gives a daily extraction in the range of 600-800 tonne per day. Overburden is quite shallow at Knocknaboola and it will be transported for the construction of berms at the site. Primary screening will take place on site and this partially processed aggregate will be sold directly to customers, mainly for trucking purposes. Mobile screening plant will be used during this first phase of development and it is this phase that will facilitate the construction of an underpass beneath the Caragh Lake Road.

The aggregate at Knocknaboola consists of sand and gravel and it will be quarried using a 360-degree excavator. As sand and gravel the pit moves into full production the major portion of the aggregate will be loaded into a dump truck, using a 360-degree excavator, and transported to the factory site via the tunnel/underpass for further washing, crushing and screening.

1.3 Site and Surrounding Lands Description

The facility is located on the Caragh Lake local road which links Killorglin with Caragh Village and presently comprises two areas, including; existing factory processing area (18.5Ha) and existing sand and gravel pit (referred to as Riordan's Pit) (11ha). MFQ is seeking planning permission to open an aggregate extraction site in contiguous lands in Knocknaboola, with an area of 16.75 Ha. The proposed new site is to replace the firm's aggregate extraction site at Riordan's Pit, as its reserves of aggregates are almost exhausted.

Thus, the overall area of the sand and gravel Pit can be divided into numerous requirements for two areas, (after cessation of Riordan's Pit) and will equate to (35.25) Ha, given planning permission applications are conferred. The factory site occupies an area of 18.5 hectares, none of which is used for the extraction of raw aggregates. The area consists of naturally regenerated grass and woodland interspersed by various lagoons which attracts diverse wildlife.

The proposed extraction site at Knocknaboola lies at the opposite side of the Caragh Lake Road to the Rangue extraction site. It is proposed to connect both sites via an underpass in order to keep the connecting sand and gravel pit traffic off this public road.

1.4 Regulatory Requirement for an EIA

The requirement to undertake EIA derives from Directive 2014/52/EU. Under the Directive and Regulations, projects of a type specified in Annex I of the Directive necessitate an EIA. Annex II of the Directive permits for the screening of projects for EIA on a case-by-case basis. Those projects are screened against criteria laid down in Annex II of the Directive, namely; characteristics of the project, location of the project and characteristics of the potential impact.

Schedule 5, Part 2, Class 2(b) of the *Planning and Development Regulations 2001-2021*, state that an EIA must be undertaken for the following development:

> ***"Extraction of stone, gravel, sand or clay, where the area of extraction would be greater than 5 hectares."***

The area being proposed for extraction consists of 16.73 ha, and as a result exceeds the specified criteria for which an EIA must be undertaken. Furthermore, the existing processing area and existing sand and gravel pit will be included within the scope of the EIA in order that the overall contiguous operation of the extraction and processing activities will be assessed.

Chapter Two – Planning Context and Need for the Development

2.1 Introduction

This chapter provides a description of the county and local planning policies relevant to the proposed Rangue and Knocknaboola site location and discusses the aims of Kerry County Council for the ongoing development of the extractive development.

2.2 National Policy/Guidelines

National Planning Policy

The proposed development, relating to the extension of an operational pit, is strongly supported and in-line, with National Planning Policy.

This is reflected in the strong compliance with principles set out in The National Planning Framework (NPF). The Irish Mining & Extraction Society (IMQS), founded in 1958, is the representative organisation for all those involved in extractive industries in Ireland. To ensure the effective planning for extraction industries, IMQS recommends that the NPF adopts the following guidelines;

- That the NPF recognise the importance of mining and extraction, as well as the importance of reliable data sets on geology, hydrogeology and geotechnical engineering for good planning practice for the extractive industries
- Ensure that County Development Plans continue to include policies supportive of environmentally responsible mining and extraction

MF Quirke & Sons also comply with 'The Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I No 28 of 2008)'. The regulations place a great emphasis on the management of health and safety, with responsibility placed on all those employed at the extraction site as well as those involved in management and supervisory operations.

2.3 Local Planning Policy

Kerry County Development Plan 2015-2021

The continuation of use of processing activities including sand and gravel pit extension is highly compatible with the Kerry County Development Plan (CDP), 2015-2021. The CDP enforces the importance of the extractive industry in providing employment and economic growth in the local and regional economy. The continual supply of aggregates, including recycled construction and demolition material is necessary for continual economic growth; which is an integral requirement for the implementation of the National Development Plan.

Within the Kerry County Development Plan 2015-2021, Objectives NR-4 to NR-7 states that it is the ambition of the plan to:

Objective NR-4:

"Facilitate the sustainable development of the extractive industry and seek to ensure the ongoing availability of an adequate supply of aggregates for the construction industry, while ensuring environmental protection, through the implementation of the objectives and Development Management, Guidelines and Standards of this Plan."

Objective NR-5 seeks to ensure that applications involving extraction:
"Comply with the objectives of this plan as they relate to development management standards, flood risk management requirements and the protection of landscape, biodiversity, infrastructure, water and air quality, built and cultural heritage and residential amenity".

Objective NR-6 seeks to ensure that pitting proposals:
"Are not permitted in areas where the visual or other impacts of such works would significantly adversely injure the amenities of the area or create significant adverse effects on the road network in the area".

Objective NR-7 states that it is to objective of the plan to ensure:
"Development for aggregates / mineral extraction, processing and associated concrete production will be prohibited in Prime Special Amenity Areas and will not generally be permitted in other open or sensitive landscapes".

Consequently, the CDP policies are strongly supportive of the proposed development; and the proposed development would assist the County in the attainment of key Plan objectives.

Kerry County Development Plan 2022-2028

Emphasis is outlined within the most up-to-date development plan on sustainable use of sand and gravel pits: 'The sustainable use of natural resources including forests and sand and gravel pits must be carefully considered', (KCDP 2022-2028, p. 29). It is also highlighted that biodiversity is to be conserved as well as ecosystem services in rural areas, while improving the management of protected areas and species. This proposal supports objectives within the county development plan as the sand and gravel pit will be deployed in a sustainable manner and will not take place within or nearby any paramount Natura 2000 sites.

Chapter Three – Alternatives

The Planning and Development Regulations 2001-2015 as amended, specifies the information to be contained within an EIAR. Schedule 6 1(d) specifies that an EIAR shall include *"An outline of the main alternatives studied by the developer and an indication of the main reasons for his or her choice taking into account the effects on the environment."*

A number of alternative options were proposed for the development including a 'do-nothing scenario', If the proposed extension is not approved, the remaining viable reserves will only be sufficient until 2022, when their planning application expires (Riordan's Quarry). Following the cessation of operations, the sand and gravel pit would fill with water and the site would be restored in accordance with a scheme as required under current restoration conditions attached to current planning permissions.

The stagnation and cessation of production from the sand and gravel pit would mean that MFQ contribution to all land-won aggregates quarried in the Killorglin area would diminish, cease and then subsequently be closed. The 'Do Nothing' scenario does not contribute to meeting aggregate demand in the Killorglin area and will inevitably require the development of an alternative extraction site or sourcing from a more distant location.

Additionally, the current number of jobs based at the pit is 38, and with the proposed extension, more job vacancies are imminent. Not only will jobs be required for operations at the sand and gravel pit when extension area is operational, but also for construction of the preliminary works for the extension. Thus, the increase of job vacancies on site is catalysed by proposed works which will in turn improve the local economy. Consequently, the 'do nothing scenario' would result in the long-term loss of a number of direct and indirect jobs and the reduction of the associated financial benefits introduced into the local economy by the presence of a sand and gravel pit.

Alternatives to primary aggregates were considered, including recycled aggregates and secondary aggregates. However, these were not fully deliberated as both are not capable of fully replacing primary aggregates as there can never be a guarantee of supply of material of suitable quality to meet specific demand.

MFQ operate other pit sites within Co Kerry, which supply their products throughout the County and to border counties. The site at Rangue is the head office.

A number of alternative locations within different parts of the County Kerry environs were assessed as potential options for the development other than the townlands of Rangue and Knocknaboola, including two locations in Waterville (Dromnakilly and Canuig), three areas in Killarney (Gortahoosh, Ballahacommane and Minish), Tralee, Ballinskelligs and Castleisland.

However, a number of significant constraints faced the development of each of the alternative sites assessed that would prevent the development of extraction, including planning permission difficulties, roads substandard for transportation of aggregates and corresponding financial costs. Furthermore, the aforementioned sand and gravel pits are too distant to the ready-mix concrete and these sites have faced challenges within the sand and gravel pit industry.

From an environmental impact perspective, the location and nature of the development site holds a number of key benefits over the alternative sites assessed. The site avoids a number of key impacts as

it is not situated within or directly adjacent to a designated ecological site and the habitats within the proposed development site are considered to be of low ecological value.

Chapter Four – Impacts

4.1 Introduction

This chapter provides a summary of the technical assessments completed for the EIAR including:

- 4.2 Biodiversity;
- 4.3 Land (Soils, Geology and Hydrology);
- 4.4 Water (Hydrology);
- 4.5 Noise and Vibration;
- 4.6 Air Quality, Odour & Climate;
- 4.7 Cultural Heritage;
- 4.8 Population and Human Health;
- 4.9 Landscape and Visual;
- 4.10 Material Assets;
- 4.11 Traffic and Transport, and
- 4.12 Interactions.

4.2 Biodiversity

The potential impacts of the proposed development (direct, indirect and cumulative) of the proposed development on biodiversity were assessed as part of the EIAR by an experienced ecologist using both desks based and site assessment techniques.

The proposed development site is located at Rangue, approximately 2.5km southwest of Killorglin, Co. Kerry. The existing quarry at Rangue includes the main processing site and Riordan's Quarry. The main processing area, located within the confines of the factory site, currently processes aggregates and is located on the northern side of Caragh Lake Road. Extraction and processing are permitted by planning permissions 00/93744 and 00/93746. It is proposed to commence extraction of aggregates at a new site within adjoining lands at Knocknaboola, on the southern side of Caragh Lake Road.

Construction works required at the outset will involve the creation of the Caragh Lake Road underpass, and the onsite haul roads at both ends of the underpass. Construction works will also involve removal of overburden over the phase 1 area, and the clearing of the crushing zone.

The potential impacts of the proposed continuation of use, extraction extension, and construction of underpass on the Natura 2000 network of sites (European sites known as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) were assessed in a standalone Appropriate Assessment Screening Report. The proposed development site is not located within any SAC, SPA, NHA or pNHA. However, the site is potentially hydrologically connected to three Natura 2000 sites and one pNHA, Castlemaine Harbour SAC and Castlemaine Harbour SPA and the Killarney National Park, Macgillycuddy Reeks and Caragh River Catchment SAC and Castlemaine Harbour pNHA. Following mitigation, there will be no adverse impacts on designated sites. The CEMP implemented by the Contractor will contain the industry standards and appropriate measures regarding pollution prevention.

Natural and semi-natural habitats within the extension area will be removed. A number of rare bryophyte and lichen species were recorded within Wet heath habitat. Overall, there will be a net loss of habitats at the site.

One species of foraging and commuting bats was identified using the extension area, mainly immature woodland and bog habitat. Other than this, no bats were identified roosting in buildings or trees within the site No light sensitive Myotis species were recorded. Lighting design and replacement tree planting will be implemented to minimise impacts on bats.

Irish Hare was recorded on a number of occasions. No Otter or Badger were recorded at the site.

The site currently includes moderate value habitat for breeding birds, including a number of birds of conservation concern. Timing of vegetation removal will be scheduled to avoid impacts to breeding birds, whilst replacement planting will reduce the impacts to breeding and nonbreeding birds within the site.

Common Frog was recorded in wet grassland habitat at the site. Wet grassland habitat at the site will be removed. Mitigation measures including removal of this species under licence have been outlined to avoid direct mortality impacts to Common Frog. Additional mitigation measures have been drawn up in line with current best practice, including a buffer (ca. 15m) to be maintained along the eastern boundary within which existing vegetation will not be disturbed. Also, habitats that are disturbed will be left to regenerate naturally or will be rehabilitated and landscaped.

No rare invertebrate species were recorded as well as no invasive species were recorded within the proposed development site.

A restoration plan for the extractive site and proposed extension area will be conducted and the applicant will clearly define the management responsibility for the site restoration work. The supervising ecologist will draw up a management plan for the aftercare of the site following closure.

A survey for invasive species and in particular Japanese knotweed will be carried out prior to closure and a site-specific invasive management plan will be prepared and implemented if required.
Sand martin nests within the existing quarry and vertical sandy faces will be identified by the supervising ecologist which are suitable for nesting. These faces will be preserved.

Beneficially, there will be no surface water discharges associated with the development and thus the long-term cumulative impact is predicted to be negligible.

Considering the nature of the proposed development together with the type and extent of habitat that will be affected, the biodiversity assessment predicted that there will be no significant adverse direct, indirect, or cumulative impacts on the flora and fauna of the site and its surroundings from the development of the proposed project.

4.3 Land (Soils, Geology and Hydrogeology)

The impact of the proposed development on land, soils, geology and hydrogeology was assessed.

The existing pit at Rangue occupies some relatively low lying ground to the north of the foothills of Mcgillicuddy Reeks, and to the south of Castlemaine Harbour. The pre-development site had an elevation of between c. 37m AOD in the southwest, to c. 22m AOD in the northeast, but has been worked down to c. 17m AOD.

The majority of the proposed extension area is underlain by shallow cutaway peat bog. Small scale peat harvesting takes place from the deeper parts of the bog along the southwestern site boundary (this area is not within the proposed extraction area). The site (and bog) is heavily drained, with numerous shallow drains discharging to the Glashacoomnafanida stream, which flows in a northerly direction along the eastern boundary of the site.

The soils in the general area are classified as Rolling Lowland Soils (Gardiner and Radford, 1980) and consist mainly of low level (Atlantic Type) blanket peat. These are often quite thick soils that have low permeability and therefore are poorly drained. The soils do benefit from land drainage.

All of the soil and much of the subsoil from the Rangue sandpit has been removed due to extensive quarrying. According to GSI Soil Maps, the proposed extension is underlain by peat. According to the IFS soil description, it is comprised of cutaway/cutover peat.

There are very significant Quaternary overburden (or subsoil) deposits in this region. Killorglin was located at the junction of two ice flows; one from the west, and the other one from the east. The enormous amounts of rock that were eroded from the mountains (Devonian rocks) by the ice sheets were deposited close to the margins of these ice sheets (Pracht, 1997). These sediments can be very thick in the Killorglin and Rangue areas. The sediments on the low land are generally interbedded tills (boulder clays) and gravels.

It is reported that the depth to bedrock in the area of the existing and proposed development sites is approximately 30 metres (EDA, 2000). Site specific borehole drilling was completed to depths of 8.5m below the floor of the Rangue pit, and 17.5m below ground level at the proposed extension. Bedrock was not encountered in any of the site investigation boreholes.

The subsoil sediments generally consist of interbedded tills (boulder clay) and sands and gravels. Owing to the chaotic type of deposition by ice sheets, very rapid vertical and horizontal variations in lithology can be expected in this type of deposit.

The Geological Survey of Ireland (GSI) Sheet 20, Geology of Dingle (Pracht, 1996), shows that the Rangue and Knocknaboola sites are underlain by limestones of Lower Carboniferous age. Owing to the absence of rock outcrop in the area, the limestones are taken as one undifferentiated unit called the Dinantian Limestones. This bedrock is classified by the Geological Survey of Ireland (GSI) as being a Regionally Important Aquifer (Rkc). This indicates possible well yields of greater than 400 m^3/day from bedrock.

The development site is not currently zoned or used for agricultural purposes and the proposed continue of use, extractive extension area in conjunction with the temporary construction of an underpass at this location will not result in the utilisation of prime agricultural land as a local resource.

The assessment concluded that the proposed impacts on soil, geological and hydrogeological features during both the construction and operational phases of the development will be insignificant.

Mitigation measures are proposed to ensure minimal disturbance to the surrounding landscape and to prevent any degradation to groundwater underlying the sites. Furthermore, a designated person within the quarry team will have overall responsibility for ensuring that the excavation is conducted in such a way as to minimise possible pollution of soils and geology. Any potential impact on land use will be negligible, minor and short-term in nature.

4.4 Water (Hydrology)

The potential impact from the construction of the underpass and operation of the proposed extraction extension area, as well as continued use of factory/processing area on the receiving environment with respect to water, including surface water bodies (such as rivers, lakes and estuaries) was assessed.

The regional hydrology is dominated by both the River Laune, which is located c. 3.1km north-east and downgradient of the proposed extension at Knocknaboola; and Castlemaine Harbour, which is located c. 3.8km north north-west and downgradient of the existing pit at Rangue. Both the River Laune and Castlemaine Harbour are part of the Castlemaine Harbour Special Area of Conservation (SAC) (site code 000343).

The River Laune, which is the principal river draining into Castlemaine Harbour, meanders its way from Lough Leane, which is located 14.3km east south-east of the proposed extension and immediately southwest of Killarney, through Beaufort and Killorglin, before flowing into Castlemaine Harbour c. 2.5km north of Killorglin. There is no direct connection between the existing sandpit at Rangue and the proposed extension at Knocknaboola and the River Laune.

On a more local scale there are two small streams adjoining or adjacent to the existing sandpit at Rangue and the proposed extension at Knocknaboola. They both flow in a northerly direction and flow

into Castlemaine Harbour c. 3.8km northwest of the pit at Rangue. These are the Upper Keal Stream and the Glashacoomnafanida.

There is a stream adjacent to the eastern boundary of the site known as Douglas stream. , which is a part of the Glashacoomnafanida stream. A review of the Catchments.ie website indicates that the 'Douglas_010' waterbody status is under review. This stream has no assigned ecological status and no record of water chemistry is available from the catchment.ie site, hence no status has been assigned. The Douglas_010 waterbody discharges into Castlemaine Harbour ca. 3.8km Northwest and downstream of the existing pit at Rangue. Castlemaine Harbour is assigned an overall 'Good' status and is considered 'not at risk' under the 3rd cycle of the Water Framework Directive.

The proposed quarry extension at Knocknaboola is heavily drained, with numerous shallow drains discharging to the Glashacoomnafanida stream, which flows in a northerly direction along the eastern boundary of the site.

The Office of Public Works (OPW) Indicative River and coastal flood map was consulted to identify those areas as being at risk of flooding. No areas within the site boundary were identified. The Past Flood Event maps were consulted and no past flood event has been logged downstream of the existing pit or the proposed extension.

Mitigation measures are required during the operational phase of the proposed quarry extension to reduce and possibly eliminate the impacts on the hydrology within the area.

A quarry restoration plan has been prepared for the existing quarry and the proposed extension. Restoration of the proposed extension will be completed in a phased and progressive basis. Phase 1 of the proposed excavation will be restored as phase 2 of the proposed excavation will take place.

There will be no discharges directly to surface waters during the construction or operation of the proposed facility. There will also be no direct discharges to ground during the operational phase of the facility, with the site primarily covered with hardstanding, roads, parking and yard areas, apart from the 20m band of trees on the western site boundary. All run-off and process water will be controlled and directed immediately to the proposed site drainage network.

It is considered that the operation of the development will have negligible or no variation to hydrology on and nearby the site. The vast majority of the site in which process activities will take place will be located on made ground and hard standing. Site infrastructure has been designed to include sufficient site drainage to divert and control any potential spills or leaks which may otherwise enter soils or groundwater.

The assessment considered that impacts on the hydrological environs during both the construction and operational phases of the development will be insignificant.

4.5 Noise and Vibration

The noise impact assessment completed for the proposed development has been completed through site surveys, desk-based review of historical data pertinent to this site as well as the conduction of noise modelling. Assessment of noise impacts and effects were conducted in accordance with recognised standards and guidance.

The operational phase of the project will involve the extraction of aggregates at the proposed extension area, and transfer to the applicant's existing operations area. Initial enabling works will be required, and these will constitute the construction stage. Potential noise and vibration impacts may be divided into the following categories:

- Construction phase noise impacts on surrounding receptors.
- Construction phase vibration impacts on surrounding receptors.
- Operational phase noise impacts on surrounding receptors.
- Operational phase vibration impacts on surrounding receptors.

The proposed development is highly unlikely to give rise to perceptible groundborne vibration, and vibration is not typically associated with sand and gravel pits. Vibration has therefore been scoped out of the assessment.

Construction phase:
Noise levels at surrounding receptors due to construction operations, combined with ongoing operations at the existing pit, will not exceed the 65 dB criterion at any time. Where construction noise emissions are audible, they will occur for several days or several weeks, depending on the activity.
No specific mitigation measures are required.
Albeit general measures have been agreed with the applicant. This includes residents at the dwelling adjacent to the site entrance being notified in advance of construction works associated with the proposed haul road and underpass, and berm construction at the northeast corner. Furthermore, construction operations at the haul road, underpass and northeast corner will not occur before 08:00 or continue after 18:00.

Operation phase
No specific mitigation measures have been identified, apart from the erection of 3 m berms around the site perimeter, and the introduction of screening only from the end of phase 2 onwards.
The following general measures will be implemented:

- Plant used onsite will be maintained in accordance with manufacturer specifications.
- Exhaust silencers will be maintained in a satisfactory condition.
- Communication through plant horns will be prohibited.
- Unnecessary revving of truck engines will be prohibited.
- Site haul roads will be maintained in a satisfactory condition, and free from surface defects that may generate rattles in empty truck bodies.
- The current noise monitoring programme will be continued and will be modified to take into account the cessation of Riordan's pit activity, and the commencement of extraction at the extension. This will ensure compliance with criteria set out in conditions attached to planning permission.

Noise levels throughout the operation phase will be lower than the identified 55 dB criterion. The highest levels will arise at the dwelling adjacent to the site entrance. However, impacts here will be imperceptible due to elevated road traffic noise.
At all other dwellings, levels will be considerably lower. Cumulative noise levels (i.e., proposed extension plus existing operations) will also not exceed the 55 dB limit at receptors.

Both the construction and operational phases of the proposed development were assessed as part of the EIAR. The construction phase is not considered likely to result in a potential impact on the nearest NSLs. Previous noise monitoring has noted that any noise which is audible in this area was emitted from road traffic and agricultural practices.

Overall, the noise and vibration assessment concluded that the proposed development will not give rise to significant adverse effects on nearby noise sensitive locations, i.e., residential housing.

4.6 Air Quality, Odour and Climate

In order to assess the potential impacts on air quality, a detailed air quality and odour assessment was undertaken. The air quality impact assessment completed for the proposed development has been completed through site surveys, desk-based review of historical data pertinent to this site, together with air dispersion modelling (ADM). Assessment of air quality impacts and effects were conducted in accordance with recognised standards and guidance and results compared to National Air Quality Standards (NAQS) for the relevant parameters.

The potential effects of dust/particulate material (PM, PM_{10}) were assessed using ADMS5 to predict concentrations (monthly dust deposition, daily/annual PM10) based on maximum quarry output.

In terms of the assessment, particular attention was given to sensitive receptors, including houses nearby. However, the number of houses nearby are low. No other sensitive receptors, such as nursing homes or hospitals, garden centres or similar businesses were identified within 500m of the site.

The excavation of aggregate will generate a small amount of dust and PM may be re-suspended close to the loading operation. However, dust emissions during excavation are thought to be minor and so implications on local air quality beyond the site vicinity will be imperceptible.

Dust is potentially generated from the passing of trucks along the unpaved haul route to the entrance, albeit this is predicted to be slight. A mobile tanker sprayer may be used to wet the road surface especially during dry weather conditions.

Current traffic volumes passing the L-4021 along the Rangue site is low and there is no significant change in exhaust-pipe emissions from trucks entering/departing the factory. Therefore, future exhaust-pipe emissions will be comparable to existing levels.

Although dust and PM_{10} emissions are imperceptible, numerous mitigation measures will be undertaken to limit and avoid emissions where possible. For example, truck speeds within the Knocknaboola lands will be restricted to 25 km per hour. Mitigation measures are detailed further in the EIAR.

In summary, the impact of atmospheric emissions ensuing from the proposed sand and gravel pit development at Knocknaboola is predicted to be imperceptible in terms of additional loading on existing air quality at the nearest houses. The scale and type of aggregate recovery and processing operation, with low potential dust/PM emissions from the sand and gravel pit activities during the phases over the life-time of the extraction, will not result in significant impacts on the air quality beyond the site vicinity.

4.7 Cultural Heritage

An archaeological, architectural and cultural heritage assessment of the proposed development at Rangue and Knocknaboola was included as part of the EIAR. The assessment utilised desk based historical information and records and also a field inspection of the proposed development area which sought to assess whether any areas or sites of archaeological potential were present. During the

course of the field investigation, the proposed development site and its surrounding environs were inspected for known or previously unknown archaeological sites.

The assessment determined that there are no known items of cultural heritage, recorded monuments or buildings of special architectural interest known within the application area or vicinity. No direct or impacts will occur on any of the aforementioned items of interest as these are located too far way.

All the lands of the application area have been archaeologically tested and no potential sub-surface archaeological features or deposits were encountered and no impacts on any features were identified. The overall archaeological potential of the proposed development site is regarded as low, and no mitigation measures are therefore recommended.

No cumulative or residual impacts upon the cultural heritage resource were identified as a result of the proposed development going ahead.

4.8 Population and Human Health

An EIAR for the type of development being proposed by MF Quirke & Sons is required to include an assessment of potential impacts on population and human health with respect to the socio-economic effects and potential adverse impacts on human beings.

In carrying out development, one of the principal concerns is that human beings should experience no reduction in the quality of life as a consequence of the construction and occupational phases of a development.

The Rangue & Knocknaboola site is located within a rural setting and there are 8 houses located within a couple of hundred metres. Past noise reports have concluded that audible noise is derived from road traffic as well as agricultural practices and not that of extraction operations.

Potential impacts on human beings include those relating to noise, odour, air quality, landscape and visual and a number of other impacts which have been identified and assessed as part of separate technical assessments within the EIAR.

The noise assessment concluded that the proposed development will not result in significant adverse impacts on surrounding residents, including the few number of houses sparsely distributed nearby the site. As a result, noise related impacts of the proposed development on human health were determined insignificant.

The proposed development will not impact on the potential for local residents to enjoy the amenity and outdoor spaces of the area as it will not incur any significant impacts in respect of local landscape character or sensitive visual receptors in the environs of the site, including views from those houses nearby.

The transportation assessment completed to inform the EIAR demonstrated that the proposed development will have a slight impact upon the established local traffic conditions and can easily be accommodated on the road network, especially given the fact that employees begin work before the peak rush hour within the area.

The primary aspects of the development and environmental factors that can impact on population and human health were assessed as part of the EIAR and it was determined that there will be no adverse impact on human health.

4.9 Landscape and Visual

The assessment of Landscape and Visual Impact Assessment (LVIA) is imperative as a tool used to identify and assess the significance of and the effects of change resulting from the development on both the landscape as an environmental resource in its own right and on people's views and visual amenity. Included in the assessment was a desktop study, review of proposed development drawings and a site visit carried out in June 2021. Numerous viewpoints in the vicinity of the site were visited and photographed to aid the assessment.

Visual receptors have been addressed from high to negligible sensitivity. Highly sensitive receptors would include those living in close proximity that have visual access to the site. Sensitive receptors of lower value would include those driving at higher speeds or those engaged in activities where there is not a focus on landscape.

There are several potential sensitive visual receptors, including locally relevant locations such as the Caragh Lake shoreline and Coillte Forest Recreation Area. The site cannot be viewed from the Ring of Kerry scenic route. However, the site can be viewed from Caragh Lake Viewing Point. Additionally, there are also a small number of residences with potential visibility along the local road in Rangue to the east and Knocknaboola to the south of the proposed extension, where there are gaps in vegetation.

The existing aggregate and production factory area in Rangue will undergo insignificant changes. The landscape will continue to be regenerated in certain areas and therefore the change is considered to be negligible. The underpass and the Caragh Road is also considered as a low magnitude of change. The proposed sand and gravel pit at Knocknaboola (the proposed extension) will result in a pronounced change, including the activities of stripping overburden. Therefore, landscape effects on the Knocknaboola site as the proposed extraction progresses are considered slight, adverse and temporary.

Visual effects were assessed in order to represent areas where the proposed development is likely to be visible. The main elements relevant to the assessment of visual effects include the proposed extension area, as the elements within the existing processing area, which is to be continued, are currently present.

Seven Viewpoints were selected and a number of photos were taken from a number of locations surrounding the site. The likely visual effects ranged from Slight to Significant, in the short term, with some views (such as the Ring of Kerry N70) being screened out. Generally, visibility is localised and confined to the roads and areas in the immediate vicinity. Over time, screening and mitigation will result in restricted visibility.

Mitigation measures enforced will curtail impacts on visual receptors on landscape. An example of a mitigation measure would include proposed dense screen planting is proposed along the site boundary to the south of the houses along the Caragh-Killorglin road to screen potential views. Additionally, during the construction phase, shallow peat, where present, will be excavated and largely removed from the excavation area of the site and stored for reuse. Mitigation measures are further discussed in Chapter 14 of the EIAR.

4.10 Material Assets and Climate

An assessment of material assets and climate has been conducted as part of the EIAR to ensure compliance with EPA guidelines.

The objective of a material assets assessment is to ensure that local and regional assets are used in a sustainable manner and to ensure their continued availability for future generations following the development of the project. Examples of material assets relevant to the proposed development include the assimilative capacity of air and water and the sterilisation of resources such as agricultural lands. Other assets include resources of minerals, soils, oil, gas, regional and local transportation infrastructure (roads, railways, canals, airports etc.), and major utilities (water supplies, sewage, power systems, telecommunication systems).

The proposed continuation of use and extraction extension along with operational processes have been designed to control and mitigate implications (if any) regarding air quality and odour and emissions occurring at the site. It is not envisaged that the proposed facility will impact on local air quality or generate adverse odours. The proposed development will not result in significant impacts on local air quality or produce emissions that would have the potential to impact on the local climate.

As the proposed development will not emit significant air emissions during operation and emissions of carbon from the vehicles servicing the site will be small, the contribution made to the Greenhouse Effect as a result of operations at the proposed facility will be negligible.

The traffic and transport assessment completed to inform the EIAR considered that the proposed development will result in no significant operational traffic safety or road capacity issues affecting the established vehicular access or the established road network.

The proposed development will not adversely impact on local and material assets within and surrounding the Rangue and Knocknaboola extension site. Local air quality and water resources in the form of rivers, streams and lakes will not be adversely impacted by the proposed activity and future operations. Future operations at the facility will not place undue pressure on the provision of local utilities such as electricity, water and sewage. The proposed development is not at risk of flooding, will not increase flood risk elsewhere and will not result in a significant impact on greenhouse gas production or local air quality within the Rangue and Knocknaboola site.

4.11 Traffic and Transport

A traffic and transport assessment was produced as part of the EIAR to address the traffic capacity considerations relating to the proposed development and assess the impact on the adjacent road network for both the critical weekday AM and weekday PM Peak hours.

The nature of the surrounding area is Greenfield with some intermittent dwellings. The lands are located adjacent to the L-4021 and L-7504 local roads which run east-west between Killorglin and Caragh Village, and north-south from the L-4021 to the N70 national secondary road, respectively.
The site is accessed via two entrances; one "non-HGV" entrance from the L-4021 (south), and one HGV entrance from the L-7504 (west). A temporary access to the contiguous Knocknaboola lands from the L-4021 will be in operation from 2023 to 2025.

From a traffic analysis perspective, it is worth noting that a second aggregate production and processing site (not owned by this company) is also located at the western side of local road L7504

and while planning permission is still current at this site it is no longer in use by its owners, John A Wood/Roadstone Limited. Its fixed processing plant has been removed from site; so, it cannot be considered as a cumulative impact in this planning application and is one less traffic source which could potentially increase congestion in the area.

However, the proposed development will impact on the surrounding roads network during operation. Mitigation measures are proposed as follows to minimise disruption to the local roads network.

In general, workers will travel to site before the measured AM peak hour of 08:15 – 09:15, to be on location for a 07:00 start-time. A limited number of employees are likely to travel to the site during peak hours. Working hours for the site will continue to be from 07.00 to 18:00, Monday to Saturday, through each phase of the operation. The PM peak period will conflict with that of background traffic.

Typically, HGV's carrying material to and from the site will arrive interspersed throughout the day avoiding a clustered arrival. It is anticipated that HGV's will predominantly be restricted to movements on the local road network during off-peak periods.

With mitigation measures enforced, traffic implications within the surrounding site are believed to be negligible.

4.12 Interactions

An EIAR is required to assess the interactions between topics/factors discussed as part of the EIA i.e., population and human health, biodiversity, land, soil, water air and climate, material assets, cultural heritage and landscape where relevant. This section describes and assesses the inter relationships between the different potential impacts of the proposed development.

Noise, Human Health and Biodiversity

Noise has the potential to impact upon the amenity enjoyed by residents living nearby the Rangue and Knocknaboola site as well as disturbing the habits of natural species surrounding a development.

The noise assessment concluded that the proposed development will not give rise to significant adverse noise related effects on nearby noise sensitive locations. Noise resulting from the construction and operation of the proposed development will not result in significant adverse impacts on biodiversity. Construction noise and increased human activity (including heavy vehicular access) are likely to result in the temporary displacement of birds and mammals from the immediate surroundings, however this is considered a short-term imperceptible negative impact due to construction ceasing once the underpass is established.

Air Quality, Human Health and Biodiversity

A significant decrease in air quality and the emission of harmful contaminants can pose a risk to the health of human beings and animals over periods of time.

Landscape and Visual and Human Health

Developments have the potential to cause adverse impacts on the local and regional visual landscape and as a result can reduce visual amenity for local residents. Negative impacts on views from windows and outdoor spaces such as back gardens can reduce the enjoyment of specific views valued by local residents. The landscape and visual assessment completed as part of the EIAR determined that the

proposed development will not result in any significant impacts in relation to local landscape character or sensitive visual receptors in the environs of the site, i.e., local or distant residents or users of the surrounding road network infrastructure. Local residents enjoying garden spaces, open windows and the general environs of the Rangue and Knocknaboola site will not be negatively impacted by the proposed development with no decrease in amenity enjoyment.

Overall, visibility is localised and confined to the roads and areas in the immediate vicinity. Over time, screening and mitigation will ensue in limited visibility.

Water Quality and Ecology

The proposed development will not result in any adverse impacts on local hydrological features or on the fauna and flora which avail of the available natural water resources.

It is considered that the operation of the development will result in negligible or no variation to hydrology and water quality on and surrounding the site and will not result in any adverse impacts on local hydrological features or on the fauna and flora which avail of the natural water resources.

Transport Traffic

The traffic transport assessment addresses that the activity will impact on surrounding roads during operation. Albeit, traffic congestion can be circumvented with mitigation measures enforces, such as workers travelling to work before peak times. Therefore, interactions with the surrounding environment and commuters can be circumvented.

MF Quirke & Sons

MF Quirke & Sons UC

Rangue & Knocknaboola, Killorglin, Co. Kerry

Proposed Continuation of Use and Extension of Extraction Operations

Environmental Impact Assessment Report (EIAR)

Volume I – Main Report

December 2021

NSAI Certified NSAI Certified NSAI Certified

Liber House
Tralee, Co. Kerry

OES Consulting
Crescent Building, Northwood
Santry, Co. Dublin

Osborne Promenade
Warrenpoint, Co. Down

Control Sheet

Document Title:	Proposed Continuation of Use and Extension of Extraction Operations Rangue & Knocknaboola, Killorglin, Co. Kerry	Document No.	1243_09_01

Rev	Description	Originator	Reviewer	Change	Date
01	Planning Issue	DH/JB			17/12/2021

This report is produced solely for the benefit of Michael F. Quirke & Sons. and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise. This report refers, within the limitations stated, to the condition of the site at the time of preparation of this report. No warranty is given as to the possibility of future changes in the condition of the site.

MF Quirke & Sons UC

Rangue & Knocknaboola, Killorglin, Co. Kerry

Proposed Continuation of Use and Extension of Extraction Operations

Contents

Chapter One - Introduction

1.1 Introduction

M.F. Quirke and Sons Ltd (The Applicant) have been engaged in extraction operations at Rangue, Killorglin, for almost 50 years. The company is currently seeking planning permission to continue processing aggregates, manufacturing Ready Mix concrete and concrete blocks at its Rangue factory site. This proposed new site is to replace the firm's aggregate extraction site at Rangue, known as Riordan's Pit (Planning reference PL 08. 125729), as its reserves of aggregates are almost exhausted. The site is located approximately 2.7 kilometres (km) southwest of Killorglin, Co. Kerry. The sand and gravel pit location is shown on Figure 1.1, Attachment 1: Figures.

OES were commissioned by the Applicant to complete Environmental Impact Assessment Report (EIAR) for the continuation of use of its factory along with a proposed extension which will become the new extraction site.

This EIAR/EIS has been prepared as mandated under Directive 2014/EU/52 of the European Parliament and of the Council of 16 April 2014 revising Directive 2011/92/EU on the assessment of the effects of particular public and private projects on the environment and Assessment under the EU Habitats Directive.

1.2 The Applicant

Michael Francis Quirke Senior entered the pit business in the 1950's and in 1974, incorporated the company Michael F. Quirke and Sons with an address at that time listed as Church Street, Cahersiveen, Co Kerry. Once the sand and gravel pit at Rangue, Killorglin was operational, the company established another pit only 2 miles west, known as Caragh Lake pit.

M.F.Q activities at the Pit initially commenced in the 1970's. It is noted that extraction commenced at the location before the 1963 Planning Act.

1.3 Location

The application for permission relates to lands in Killorglin, Co Kerry. The application for continuation of use of the existing factory is located in the townland of Rangue and the proposed extension extraction site located within the contiguous townland of Knocknaboola.

Figure 1.1 provided in Attachment 1: Figures, shows the general location of the Pit in southwest Kerry. The Pit is located approximately 1.7km south of the Killorglin to Glenbeigh National Secondary Road N70 (Ring of Kerry). Killorglin Town is 2.5 km northeast on the N70 and Glenbeigh is c. 6.9 km to the southwest on the N70.

The existing factory and processing site is located off the Caragh Lake Road (L-4021) in the townland of Rangue, approximately 2.5km southwest of Killorglin. The immediate surrounding lands are characterised by detached dwellings set in a general area of cut-away bog (for fuel) and heathland. The surrounding land is also used for agricultural purposes. Features in the immediate vicinity of the sand and gravel Pit include a disused railway line. The Douglas Stream lies to the east of the sand and gravel Pit, ultimately draining to Castlemaine Harbour, and Caragh Lake lies some 2.5km to the southwest of the facility. Lough Yganavan is a smaller water body located approximately 3.6 km to the northwest, Castlemaine Harbour SPA is located approximately 3.5 Km North and the Slieve Mish Mountains SAC are located a farther 9.6km North from the site.

Two other distinct sand and gravel pit businesses are identified within 3 km of the site. The nearest pit is located 1.5 Km west of the pit, in the townland of Glounagillagh. A second sand and gravel pit business is identified approximately 1.7 Km east southeast in the townland of Ownagarry.

1.4 Site and Surrounding Lands Description

The site is situated on the Caragh Lake local road which links Killorglin with Caragh Village and presently comprises two areas, including; existing factory processing area (18.5Ha) and existing sand and gravel pit (referred to as Riordan's Pit) (11ha). MFQ is seeking planning permission to open an aggregate extraction site in contiguous lands in Knocknaboola, with an area of 16.75 Ha. The proposed new site is to replace the firm's aggregate extraction site at Riordan's Pit, as its reserves of aggregates are almost exhausted.

Thus, the overall area of the sand and gravel Pit can be divided into numerous requirements for two areas, (after cessation of Riordan's Pit) and will equate to (35.25Ha), given planning permission applications are conferred.

The factory site occupies an area of 18.5 hectares, none of which is used for the extraction of raw aggregates. The area consists of naturally regenerated grass and woodland interspersed by various lagoons which attracts diverse wildlife.

The proposed extraction site at Knocknaboola lies at the opposite side of the Caragh Lake Road to the Rangue extraction site. It is proposed to connect both sites via an underpass in order to keep the connecting sand and gravel pit traffic off this public road.

1.5 General Overview of Site Activities

The facility may be divided into three sections, including; Existing factory where aggregate production occurs, Riordan's Pit and the proposed extension area, where aggregate extraction will be deployed. Extraction of sand and gravel and typical associated activities currently occur at Riordan's Pit. The proposed extraction site at Knocknaboola lies at the opposite side of the Caragh Lake Road to the Rangue extraction site and it is proposed to connect both sites via an underpass in order to keep the connecting sand and gravel pit traffic completely off this public road.

A temporary new and separate entrance will also be used during the construction of the underpass for the first 12 months of the development, from the Caragh Lake Road to the Knocknaboola Site. Planning permission to construct the underpass and new temporary entrance is being sought also in the planning application.

Ultimately, there will only be two areas (Factory site and new proposed pit at Knocknaboola), once Riordan's Pit is exhausted and its planning permission ceases by 2022.

1.5.1 Existing Aggregate Production Factory

The existing aggregate production factory site is within the eastern section of the facility. Activities undertaken within the factory site are explained in further detail in Chapter 2.

1.5.2 Processing of raw aggregates from Riordan's Pit to the factory site

Riordan's Pit is located within the western section of the facility and currently operates for the production of raw aggregates until its reserves of aggregates are exhausted. Due to this, extraction at

Riordan's Pit will cease in 2022. Activities at Riordan's Pit comprise of the use of an underpass beneath Local Road L7504, for haulage of raw aggregate from Riordan's site to the Factory site.

1.5.3 Proposed extension at Knocknaboola

The proposed extension site (also termed Knocknaboola site) at the sand and gravel pit is located to the south of both existing sites (existing production factory and Riordan's site) and is contiguous to these. The proposed extraction site at Knocknaboola lies at the opposite side of the Caragh Lake Road to the Rangue factory site and it is proposed to connect both sites via an underpass in order to keep the connecting pit traffic off this public road. Planning permission for ancillary works to construct the underpass is being sought also in this planning application.

As the Knocknaboola site replaces the exhausted Riordan's site there will be no change in production methods and the usual daily routine will involve one pit operator excavating the aggregate, loading it into an articulated dump truck and transporting it to the factory site.

1.6 Objectives of Proposed Development

The extraction industry in Ireland is a significant sector of the Irish economy. The sand and gravel Pit site at Rangue contributes substantially to the regional economy of the southwest through direct and indirect employment, as well as contributions to the local authorities in the form of rates. The proposed development will see the replacement of Riordan's sand and gravel pit, as its planning permission expires in 2022 and its reserves are near exhaustion presently. Thus, if planning permission is granted for the separate but connected aforementioned applications, this will enable the sand and gravel pit to continue to support the regional economy and sustaining employment in a rural area.

Furthermore, the proposed extension aggregate area is essential as it will ultimately replace Riordan's site, as of 2022. The new extraction site will also be larger (16.75Ha) than Riordan's site (11Ha) and, as it is intended that extraction operations will be continued with the same intensity as currently the case, accordingly will have a longer operational life.
and.

1.7 Planning and Consents History

A summary of the planning permissions sought and granted at the Rangue site are provided in Table 1.3 below.

Table 1.1: Planning Permissions at the site of the Proposed Development

Planning Reference	Development Description
915/83	Permission for the construction of a plant for the manufacture of ready-mix concrete
98/89	Permission to retain the use and extension of gravel pit at Rangue
W61	License to discharge trade and sewage effluent from MFQ site at Rangue
1512/94	Permission to retain garages, stores and offices and use of extended gravel pit at Rangue
3746/00	Permission to extract aggregate from 11.75-hectare site at Rangue
PL.08.125728	Permission for the continuance of the production of concrete, concrete blocks and surface dressing chippings and all associated buildings and works at the existing pit
PL.08.125729	Permissions to extract aggregates from 11.75-hectare site at Rangue

1.8 Regulatory Requirement for Environmental Impact Assessment (EIA)

The requirement to undertake EIA derives from Directive 2014/52/EU. Under the Directive and Regulations, projects of a type specified in Annex I of the Directive necessitate an EIA. Annex II of the Directive permits for the screening of projects for EIA on a case-by-case basis. Those projects are screened against criteria laid down in Annex II of the Directive, namely; characteristics of the project, location of the project and characteristics of the potential impact.

Schedule 5, Part 2, Class 2(b) of the *Planning and Development Regulations 2001-2021*, state that an EIA must be undertaken for the following development:

> ***"Extraction of stone, gravel, sand or clay, where the area of extraction would be greater than 5 hectares."***

The area being proposed for extraction consists of 16.75 ha, and as a result exceeds the specified criteria for which an EIA must be undertaken. Furthermore, the existing processing area and existing sand and gravel pit will be included within the scope of the EIA in order that the overall contiguous operation of the extraction and processing activities will be assessed.

The output of EIA process is a document with records the assessments undertaken and their findings – an Environmental Impact Assessment Report (EIAR).

The EIAR will be prepared in accordance with statutory requirements of the Planning & Development Acts 2001 - 2018 and associated Regulations 2001-2021 and the European Communities (Environmental Impact Assessment) Regulations, specifically the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) and associated amending regulations where relevant.

Accordingly, the EIAR will broadly contain the following:

- A Non-Technical Summary;
- A Project Description;
- A description of the receiving environment for a number of environmental topics. This will be focused on identifying the current baseline conditions.
- An assessment of actual impacts and potential impacts liable to occur as a result of the proposed development. Direct, indirect and cumulative impacts of mixed waste processing operations and transfer from the proposed facility will be assessed for each environmental topic.
- A detailed assessment of alternatives assessed against environmental impacts.
- Details of mitigation factors and/or measures undertaken or proposed will be identified.

The EIAR will provide a description of the receiving baseline environment in which the sand and gravel pit is located. Available environmental data on the interactions between the different environmental impacts on receptors such as; groundwater, surface water, noise, traffic, landscape and air quality will be used as part of the assessment. Historical information available on cultural heritage will be used as part of the assessment to establish the impact of the existing development on cultural heritage. The impact on traffic and road infrastructure and visual landscape will also be addressed.

1.9 Consultation and Scoping for the EIAR

Consultation is a practice that is carried out to ensure that all relevant issues are addressed in the EIAR. The consultation process for the current facility involved the distribution of a formal Scoping Consultation Document to a number of consultees asking them for a written opinion on the proposed content of the EIAR. The following bodies were consulted on 25th March 2021:

- An Bord Pleanala
- An Taisce
- Bat Conservation Ireland
- Birdwatch Ireland
- Commission for Regulation of Utilities (CRU)
- Department of Agriculture, Food and the Marine
- Department of Business, Enterprise and Innovation
- Department of Communications, Climate Action and Environment
- Department of Communications, Energy and Natural Resources
- Department of Culture, Heritage and the Gaeltacht – Development Applications Unit (DAU)
- Department of Justice and Equality
- Department of Rural and Community Development
- Department of Housing, Local Government and Heritage
- Environmental Protection Agency (EPA)
- Fáilte Ireland
- Geological Survey of Ireland (GSI)
- Health and Safety Authority (HSA)
- Health Service Executive (HSE)
- Iarnrod Eireann
- Inland Fisheries Ireland (IFI)
- Irish Aviation Authority (IAA)
- Irish Raptor Study Group
- Irish Water (IW)
- Irish Wildlife Trust
- Kerry Airport
- Kerry County Council - County Archaeologist
- Kerry County Council - Director of Services, Operation and H&S
- Kerry County Council - Environmental Department
- Kerry County Council - National Roads Design Office (NRDO)
- Kerry County Council - Planning Department
- Kerry County Council - Roads Department
- National Parks and Wildlife Service (NPWS)
- National Road Authority (NRA)
- National Transport Authority (NTA)
- Office of Public Works (OPW)
- Southern Regional Assembly
- The Arts Council
- The Heritage Council
- Transport Infrastructure Ireland (TII)

Scoping responses received from bodies who provided feedback are provided in **Appendix 1.1** of **EIAR Volume II: Appendices.**

A pre-submission meeting with members of the Kerry County Council planning department took place on November 25, 2020, to discuss the scope of the EIAR and explain both the categories of development requiring an EIAR which the proposed development was assessed against.

1.10 Difficulties Encountered

There were no particular difficulties encountered in the production of the EIAR for the proposed development that would lead to deficiencies in the assessment.

Chapter Two — The Environmental Impact Assessment Report

2.1 The Environmental Impact Assessment Report (EIAR)

The EIAR has been prepared in line with requirements of European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018). This section outlines the primary sections of this document.

2.2 General Guidance

This EIAR has been prepared in accordance with requirements of the *Planning and Development Act 2000 and the Planning and Development Regulations 2001 – 2018 and* EU (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018).

The EIAR has also been prepared in accordance with the following EPA documents and relevant best practice guidelines:

- "Guidelines on the information to be contained in Environmental Impact Assessment Reports" (draft, May 2017).
- "Advice notes on current practice in the preparation of Environmental Impact Statements" (draft, September 2015);
- "Guidelines for Planning Authorities and An Bord Pleanala Carrying out Environmental Impact Assessment" Department of the Environment, Community and Local Government (2018).

Where a specialist chapter incorporates additional best practice or guidance documents these are outlined within the relevant section's methodology.

2.3 Structure of the EIAR

This EIAR is accompanied by an Appropriate Assessment screening report and Natura Impact Statement (NIS), Planning Application and a Non-Technical Summary (NTS) of the EIAR. These documents are separate from this EIAR but form part of the overall development application. The structure of this EIAR adopts a sequence as follows:

- General Description of the EIAR and how it relates to the development;
- Description of the Development, Need and Planning Context;
- Alternatives Considered based on environmental impacts;
- Impacts – incorporating baseline data and specialist findings;
- Interactions.

In the description of the impacts of the activity the following attributes of the receiving environment and their interactions are described which reflect the amendments being introduced through the transposition of EIA Directive 2014/52/EU:

- Biodiversity;
- Land (Soils, Geology and Hydrogeology and Land Use)
- Water (Hydrology,)
- Noise and Vibration;
- Air Quality, Odour and Climate;

- Cultural Heritage;
- Traffic and Transport;
- Population and Human Health;
- Landscape and Visual;
- Material Assets;
- Traffic and Transport;
- Consideration of Alternatives, and
- Interactions

The EIAR is provided in the following format:

- Volume I: EIAR Main Text
- Volume II: EIAR Appendices
- Volume III: Non-Technical Summary

2.3.1 Content of the EIAR

The content of the information to be included in the EIAR and the technical assessments required for different categories and classes of development are provided within the project list in the draft 2015 EPA document "Advice notes on current practice in the preparation of Environmental Impact Statements" under Project Type 18:

- **Project Type 18:**
  - Quarries and open-cast mining of stone, gravel, sand or clay;
  - Extraction of stone, gravel, sand or clay by marine dredging or fluvial dredging.

Therefore, this EIAR has been informed by the Project Type 18 information requirements where relevant and is informed by the technical assessments discussed above in Section 2.3.

2.4 Methodology

2.4.1 Assessment of the Effects – Evaluation Criteria

The assessment of effects has been undertaken in accordance with best practice, legislation and guidance notes. The significance criteria as set out in the EPA Guidelines (2015 and 2017 (Draft)) and listed in Table 2.1 below have been followed throughout this EIAR unless otherwise stated in the methodology for each chapter and/or specialist reports.

Table 2.1: EIAR Assessment Criteria

Significance Level	Criteria
Profound	An impact which obliterates sensitive characteristics
Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Moderate	An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Slight	An impact, which causes noticeable changes in the character of the environment without affecting its sensitivities.
Imperceptible	An impact capable of measurement but without noticeable consequences.

As per the EPA Guidelines, impacts are considered as being negative, neutral or positive in nature. Impacts are also considered as being direct, indirect and/or cumulative, as appropriate. Duration of impact is considered as being:

- Temporary (up to one year);
- Short-term (from 1 to 7 years);
- Medium-term (7 to 15 years);
- Long-term (from 15 to 60 years); or
- Permanent (in excess of 60 years).

2.5 Project Team

This EIAR has been prepared by an OES EIA Project Manager assisted by a team of qualified and experienced environmental specialists outlined in Table 2.2 below with detailed descriptions of competent expertise provided at the beginning of each technical chapter:

Table 2.2: Environmental Consultants

Technical Area	Consultant
Biodiversity	Carl Dixon
Water	OES Consulting
Land and Soils	OES Consulting/Farkmore Environmental
Noise and Vibration	Damian Brosnan, DB Acoustics
Air Quality, Odour and Climate	Michael Bailey, Envirocon Ltd.
Cultural Heritage	Dr. Charles Mount
Landscape and Visual	Cunnane Stratton Reynolds
Traffic and Transport	MHL Ltd.
Material Assets	OES Consulting
Population and Human Health	OES Consulting
Consideration of Alternatives	OES Consulting

2.6 Guide to the Document

The document has been structured to facilitate a clear presentation of the proposed development, the potential impacts on the environment and the measures to mitigate these. Accordingly, the remainder of the document is set out as follows:

Chapter Three – Planning Policy Context

Chapter 3 provides a discussion on the planning policy context of the proposed development including a description of the regional and local policies relevant to the proposed site and the surrounding land uses and designated sites. National and regional policy is also described with a discussion provided on how the proposed development is seeking to aid meet national and regional objectives.

Chapter Four – Description of the Proposed Development

Chapter 4 describes the existing environment at the Rangue and proposed Knocknaboola site and provides detailed information on the proposed development and operational strategy being put forward as part of the planning application to Kerry County Council.

Chapters 5 to 16 – Impact Assessments

Chapters 5 to 16 comprise a number of detailed technical assessments of the proposed development to ensure all potential impacts of the proposed development on the environment are addressed, including:

- Biodiversity - (Chapter 5);
- Land (Soils, Geology and Hydrogeology and Land Use) - (Chapter 6);
- Water (Hydrology) (Chapter 7)
- Noise and Vibration (Chapter 8);
- Air Quality, Odour and Climate (Chapter 9);
- Cultural Heritage (Chapter 10);
- Population and Human Health (Chapter 11);
- Landscape and Visual (Chapter 12);
- Material Assets (Chapter 13);
- Traffic and Transport (Chapter 14), and
- Consideration of Alternatives (Chapter 15).

Chapter Sixteen – Interactions

Chapter 16 assesses the interactions between the aspects of the environment likely to be significantly affected by the proposed development.

Chapter Three - Planning Context and History

3.1 Introduction

This Chapter of the EIAR explains the planning context of the proposed sand and gravel pit extension site in relation to local planning policy and discusses the history of planning applications and consents on the wider sand and gravel pit site.

3.2 Planning Context

The proposed sand and gravel pit extension site, like the existing pit, is located outside of the Killorglin Town settlement boundary. Three Natura 2000 sites are located within 5km of the sand and gravel pit and proposed extension area.

There are no ecologically designated sites within or directly adjacent to the existing and proposed sand and gravel pit extension lands with the nearest being the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment Special Area of Conservation (SAC) and proposed Natural Heritage Area (pNHA) which includes the nearby Lake Caragh, 2.5km to the southwest at the nearest point. Further from the site lies the Lough Yganavan and Lough Nambrackdarrig SAC, located approximately 3.6 km to the northwest of the proposed pit extension lands, whilst the Castlemaine Harbour SAC, pNHA and Special Protected Area (SPA) is 3.5 km to the north at the nearest point.

A review of the Preliminary Flood Risk Assessment Mapping (map 2019/MAP/58/A), produced by the Office of Public Works (OPW) as part of the Catchment Flood Risk Assessment and Management (CFRAM) programme, shows that the proposed pit extension lands and existing pit sites are not at risk of fluvial or coastal flooding.

3.3 Planning History

Michael F. Quirke & Sons have operated a sand and gravel pit at Rangue Killorglin, Co. Kerry since 1974. Initially the site was only used for the extraction of sand and gravel material which was crushed, screened and washed on site. In 1983 an additional facility for the manufacture of ready-mix concrete and concrete blocks was commissioned at the site. A service garage for trucks and offices were erected in 1984.

915/83 - Permission for the construction of a plant for the manufacture of ready-mix concrete at Rangue, Killorglin, Co. Kerry

98/89 - Permissions to retain the use and extension of gravel pit at Rangue, Killorglin, Co. Kerry

W61 - License to discharge trade and sewage effluent from Michael F. Quirke & Sons Ltd at Rangue, Killorglin, Co. Kerry

1512/94 - Permission to retain garages, stores and offices and use of extended gravel pit at Rangue, Killorglin, Co. Kerry

3746/00 - Permission to extract aggregates from an 11.75-hectare site at Rangue, Killorglin

PL.08.125728 - Permission for the continuance of the production of concrete, concrete blocks and surface dressing chippings and all associated buildings and works at the existing pit.

PL08.125729_-_Permissions to extract aggregates from 11.75-hectare site at Rangue, Killorglin, Co. Kerry.

The sand and gravel pit was in existence prior to the Planning Act of 1963 and was operated privately and on an informal basis by Kerry County Council (KCC). The land was subsequently bequeathed to a Mr Kevin Griffin and he entered into a written formal agreement with KCC at a time when the Council had local use for its products. During the 1980s, KCC, similar to other County Councils throughout the country, abandoned the policy of producing its own aggregate and began buying it from commercial operators whenever it was required. Accordingly, the lease that existed between Mr Griffin and KCC was abandoned and subsequently, as a result, Mr Griffin rented the land to M. F.Q. prior to the eventual sale of the land to the firm in 1988.

M.F.Q. began working the Pit and, although it was categorised as a pre '63 development, decided to apply for planning permission to regularise operations on the site. The application for the existing Riordan's Pit and Existing Factory currently operates under planning PL 08. 125729 & PL 08. 125728.

It is therefore imperative to MFQ to continue extraction operations at Rangue, Killorglin, as they have been operational at this location for almost 50 years and wish for operations to continue.

3.3.1 Current Planning

The current planning application comprises numerous separate but connected activities as follows:

1. Continuation of use of the existing factory site at Rangue as presently permitted under Planning Permission PL 08.125728.
2. Extraction of aggregates and pre-processing by dry screening and grading in a new contiguous site in the townland of Knocknaboola for supply to the factory site and for direct sale.
3. Construction of temporary entrance onto the Caragh Lake Road (L-4021) to the proposed new extraction site at Knocknaboola.
4. Construction of an underpass beneath the Caragh Lake Road (L-4021) to facilitate the direct transportation of aggregates from the Knocknaboola site to the factory site at Rangue.

The above combined planning application is for continuation of extraction by replacing the exhausted sand and gravel pit with a new one, in a manner which satisfies planning laws and regulations. There is no extra production or extra heavy vehicle traffic proposed or, in short, no intensification of use. No processing of aggregate will be conducted within the proposed sand and gravel pit extension development area.

3.4 Planning Policy Context

The continuation of use of processing activities including sand and gravel pit extension is highly compatible with the Kerry County Development Plan (CDP), 2015-2021. The CDP enforces the importance of the extractive industry in providing employment and economic growth in the local and regional economy. The continual supply of aggregates, including recycled construction and demolition material is necessary for continual economic growth; which is an integral requirement for the implementation of the National Development Plan.

Within the Kerry County Development Plan 2015-2021, Objectives NR-4 to NR-7 states that it is the ambition of the plan to:

Objective NR-4:

"Facilitate the sustainable development of the extractive industry and seek to ensure the ongoing availability of an adequate supply of aggregates for the construction industry, while ensuring environmental protection, through the implementation of the objectives and Development Management, Guidelines and Standards of this Plan."

Objective NR-5 seeks to ensure that applications involving extraction:
"Comply with the objectives of this plan as they relate to development management standards, flood risk management requirements and the protection of landscape, biodiversity, infrastructure, water and air quality, built and cultural heritage and residential amenity".

Objective NR-6 seeks to ensure that pitting proposals:
"Are not permitted in areas where the visual or other impacts of such works would significantly adversely injure the amenities of the area or create significant adverse effects on the road network in the area".

Objective NR-7 states that it is to objective of the plan to ensure:
"Development for aggregates / mineral extraction, processing and associated concrete production will be prohibited in Prime Special Amenity Areas and will not generally be permitted in other open or sensitive landscapes".

Consequently, the CDP policies are strongly supportive of the proposed development; and the proposed development would assist the County in the attainment of key Plan objectives.

3.5 Implementing National Planning Policy

The proposed development, relating to the extension of an operational pit, is strongly supported and in-line, with National Planning Policy.

This is reflected in the strong compliance with principles set out in The National Planning Framework (NPF). The Irish Mining & Extraction Society (IMQS), founded in 1958, is the representative organisation for all those involved in extractive industries in Ireland. To ensure the effective planning for extraction industries, IMQS recommends that the NPF adopts the following guidelines;

- That the NPF recognise the importance of mining and extraction, as well as the importance of reliable data sets on geology, hydrogeology and geotechnical engineering for good planning practice for the extractive industries
- Ensure that County Development Plans continue to include policies supportive of environmentally responsible mining and extraction

3.6 Compliance with EU Policies pertinent to Proposed Development

The proposed development is strongly compliant with a range of EU policies aimed at ensuring the extractive industry does not hinder environmental attributes within the surrounding area.

The company is compliant with the local government (Water Pollution) Act 1977. Licence No. W61 was issued to discharge trade effluent to waters in accordance with Section 4 of the Water Pollution Act 1977. This licence gave rise to the construction of settling ponds onsite where effluent would later be generated to.

Appropriate Assessments have been undertaken in accordance with Articles 6(3) and 6(4) of the Habitats Directive to prevent significant adverse effects on European sites, also known as Natura 2000 sites.

Chapter Four - Description of the Proposed Development

4.1 Introduction

This Chapter provides the requirement for the description of the proposed development. It also entails details with respect to the activities carried out at the Pit and specifically within the proposed pit extension within the meaning of Regulation 3 of the *EU (EIA and Habitats) (No.2) Regulations 2011 (SI 584 of 2011)* which defines a pit as *"an excavation or system of excavations made for the purpose of, or in connection with, the getting of minerals being neither a mine or a well and is deemed to include:*

- *Any place on the surface surrounding or adjacent to the pit occupied together with the pit for the storage or removal of the minerals or for the purposes of a process ancillary to the getting of minerals including the breaking, screening, washing of minerals but does not include any place at which any manufacturing process is carried on;*
- *Any place occupied by the owner of a pit and used for depositing refuse from it;*
- *Any line or siding serving a pit;*
- *A conveyor or aerial ropeway provided for the removal from a pit of minerals or refuse".*

M. F. Quirke and Sons have been engaged in extraction operations at Rangue, Killorglin, for almost fifty years. The pit began operations prior to the 1963 Planning Act, albeit it subsequently benefitted from Planning Permissions 233/89, 1890/96, 2548/97 and 1329/98. The extraction site at Rangue currently operates under planning PL 08.125729. For operations to continue at Rangue and Knocknaboola, future planning application comprises many separate but connected activities.

4.2 Pit Areas and General Layout

The development of the overall pit was progressive over the duration of several decades as described in Chapter 1 and each Phase is described in Table 2.1 overleaf and the current status of the relevant phase.

Table 4.1: General Areas of the Sand and Gravel Pit

Area	General Use	Area (ha)	Open Areas (ha)
Existing Aggregation Production factory	Aggregate processing; concrete making, block making, importing of raw materials from contiguous sites, R&D of aggregate products, garage works including metal fabrication, weighbridge, wheel washing and sales and distribution of processed aggregates.	18.5	18.5
Riordan's Sand and Gravel Pit	Transport of aggregate from Riordan's site to the factory opposite for processing. Activities at Riordan's site will cease in 2022 and the proposed Knocknaboola site will thus act as replacement.	11	11
Proposed sand and gravel Pit at Knocknaboola	To be used for extraction of sand and gravel over an area of 16.75 Ha	16.75	16.75

4.3 The Proposed Development

The proposed development continuation of use for existing factory site in the townland of Rangue and proposed sand and gravel pit extension on adjacent lands, in order to replace Riordan's sand and gravel Pit. The new proposed sand and gravel pit extension is situated in the townland of Knocknaboola. The proposal also involves construction of a temporary entrance from the Caragh Lake road to the Knocknaboola site to be used for a period of 12 months. Additionally, the construction of a tunnel/underpass is sought beneath the Caragh Lake Road (L-4021) is required to facilitate the transportation of aggregates from the Knocknaboola site to the factory site for further processing of aggregates, as well as manufacture and sale of concrete and concrete blocks.

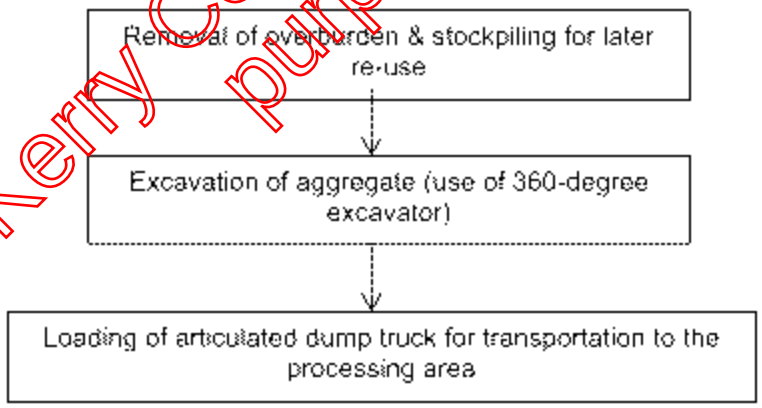
There will be no changes of production at the factory site and the layout of all plant and settling ponds will remain as they have over the duration of the present planning permission.

The output being sought in this new planning application is 100,000 cubic metres per annum, giving a daily extraction in the range of 600-800 tonnes per day. There will be no intensification of use, no foreseeable difference in the percolation of water through the settling ponds and no foreseeable difference in the emissions of noise or dust at the processing area. With this output per annum the lifetime of the new extension area is expected to be 20 years (16.3 years to exhaustion at full extraction).

There is, however, one alternative method of production in that it is proposed to sell a greater proportion of aggregates direct to customers, little altered from their raw state. Hence, the planning applications for a separate road entrance to the Knocknaboola site and for primary crushing, screening and grading to take place there.

Activities are described in the flow diagram below.

Flow Chart 2.1: Activities within the Proposed Pit Extension



4.3.1 Need for the Development

The proposed development includes the continued operation of the existing factory site at Rangue and the closure of one raw aggregate extraction site (Riordan's) and opening of another (Knocknaboola). This planning application is necessary because the old planning permissions are soon to expire and aggregate is near exhaustion at the Rangue/Riordan Pit site. The remaining small reserves and stockpiles of aggregates will be sold off from the Rangue site when the new Knocknaboola

site opens and subsequently the Rangue site will be restored in accordance with the original planning particulars as per the reinstatement plan granted under planning permission no. 00/3746.

Riordan's pit will cease in 2022, thus, the new extraction/pit site at Knocknaboola proposed is imperative and will virtually act as a replacement of Riordan's site, having a lifespan of 20 years once it is ready for use.
Employment at the site is a constant in the repair and maintenance of company plant and machinery. The company head offices are also located beside the garage and employment in these are also necessary. Temporary employment will further be required during the construction of the tunnel/underpass. Therefore, continuation of use and further sand and gravel pit extension is beneficial for continual employment in the Killorglin area.

Furthermore, MFQ is a prosperous company and has many clients, including; OPW, Bam Contractors, Moriarty, Eamon Costello, Liebherr and Rhatigan, to name a few. Thus, extraction operations must continue and progress past 2022.

4.4 Description of Extraction Activity

The proposed development includes the continued operation of the existing factory site at Rangue and the opening of a new extraction area in Knocknaboola. This section describes each site individually.

4.4.1 Factory site Description

The existing factory site is located off the Caragh Lake Road (L-4021) in the townland of Rangue, approximately 2.5km southwest of Killorglin. The Caragh Lake Road is to the south of the factory but heavy sand and gravel pit traffic enters from local road L-7504 which runs along its western boundary. This local road separates the factory site from the present aggregate extraction site and it is proposed to continue extraction there until the aggregates are exhausted or until the present planning permission (reference PL 08. 125728) expires – whichever is earliest.

The MFQ factory site occupies an area of 18.5 Ha, none of which is used for the extraction of raw aggregates, as little viable aggregates are to be found there. The area consists of naturally regenerated grass and woodland interspersed by various lagoons which attract diverse wildlife including breeding swan, duck and moorhen on the lagoons and various breeding songbirds on the scrubs and trees. These features are more comprehensively covered in the ecology section and they are mentioned here to give a perception of the nature of the site before describing its built environment details.

Raw aggregate is crushed, screened and washed at the site as soon as it is imported from the sand and gravel pit and stockpiles are built up for further use in the production process. Washed aggregates will be retained for use in the production of concrete and concrete blocks.

The blocks production process includes a large concrete apron for storage, drying and maturing of concrete blocks and is an integral part of the process. Once blocks have been adequately cured, they are stored onsite until taken by delivery trucks for distribution.

Contiguous with these activities on the factory site is a large garage which is capable of admitting 360-degree excavators, front end loaders, forklift trucks and road trucks. The company's Head Office is situated beside the garage and this is the administration hub for the entire company.

4.4.2 Processing of raw aggregate description in the factory site

An articulated dump truck transports raw aggregates to the factory site. The aggregate is then tipped onto a grading screen for separation, crushing and screening. Larger stones are separated from the smaller materials for later crushing into various commercially desirable stone sizes. The smaller aggregates are washed to remove the smallest components while the process is further adjusted to produce a specified type of concreting gravel. The washed and waste materials enter the lagoon system and are settled out in a system of ponds until nothing but clear water remains. These ponds are in a closed loop system.

This system of processing and pond use has been in use for decades including the entire duration of the present planning permission, PL 08.125728, and it is not intended to change the system in any way. The layout of all plant and settling ponds will remain as they have been over the duration of the present planning permission. The processed aggregates that have been produced to a concreting specification are then stockpiled for use in the manufacture of ready-mix concrete for concrete block manufacture.

It is worth noting that processed aggregates from the Rangue site is also transported for storage and sale in the Quirke Builders' Provider Yard at Deelis, Cahersiveen. This is a very important part of keeping employment steady within the company. Stockpiles are built up when demand is low and swiftly run down when demand exceeds supply.

4.4.5 Raw aggregate extraction and production in Knocknaboola

The extension lands at Knocknaboola equate to 24.5 Ha, albeit, only 16.75 Ha will be used for extraction. Overburden is quite shallow at Knocknaboola and it will be transported for the construction of berms at the site. Primary screening will take place on site and this partially processed aggregate will be sold directly to customers, mainly for trucking purposes. Mobile screening plant will be used during this first phase of development and it is this phase that will facilitate the construction of an underpass beneath the Caragh Lake Road.

The aggregate at Knocknaboola consists of sand and gravel and it will be quarried using a 360-degree excavator. As sand and gravel the pit moves into full production the major portion of the aggregate will be loaded into a dump truck, using a 360-degree excavator, and transported to the factory site via the tunnel/underpass for further washing, crushing and screening.

4.4.6 Overall extraction activity and HGV traffic at Rangue and Knocknaboola

When the Rangue factory site and aggregate production site were granted planning permissions in 2002, the situation with regard to Heavy Goods Vehicle traffic was quite different. Permission was granted to sand and gravel pit in one site, known as Riordan's site, and transport the aggregate across the local road, L-7504, to the factory site for processing. The HGV traffic count was much greater at this time due to the permitted operation of the John A Wood, once blocks have been adequately cured they are stored onsite until taken by delivery trucks for distribution.

4.4.7 Products Produced

The Sand and Gravel Pit can produce the following aggregate products. The type of product produced at any given time is dependent on local requirements:

- Pitch sand;
- Rock Armour;
- Chippings;

- Concrete;
- Crushed stone;
- Gravel;
- Hardcore;
- Road Making/Surfacing Materials;
- Sand, and,
- Stone.

4.5 Process Water Management

There are a number of settlement ponds within the existing processing site. The settlement ponds take the used wash water from the onsite aggregate washing plant. Suspended solids are then settled out by slowing the water flow through the lagoons. The fine silts and sands are removed from the ponds on a regular basis in order to maintain flows. There are no surface water discharges off-site from these lagoons. Some water percolates back into the ground but the majority is redirected back to the supply lagoon for reuse following removal of suspended solids by settlement.

4.5.1 Drainage Arrangements

The sand and gravel Pit is effectively a pit operated at a lower level compared to the surrounding lands. Therefore, it is ring drained to prevent surface water ingress from surrounding lands into it. The ring drains are located on the perimeter of the working areas and are essentially drainage ditches which eventually discharge into the surrounding agricultural drainage network and from there on to the nearest natural watercourses including the Douglas Stream to the east.

4.5.2 Wastewater Generation

A small volume of wastewater is generated on site from the welfare facilities present. This is treated in the two on-site wastewater treatment plants. Levels of wastewater are very low, due to the small number of personnel on site.

4.6 Electricity and Telecommunications

Electricity is supplied by public mains to the office units, to provide power for the IT and telecommunications. This power also powers the connections to the nearby weighbridge and lighting at the office units.

Telecommunication lines are present at the main office block, providing telephones and internet access.

4.7 Potable Water Supply

Potable water on site is supplied from the mains water supply.

4.8 Fuel Storage

Diesel fuel is stored on site within a 110% concrete bund.

4.9 Waste Generated

Wastes arising from site activities include soil and sub soil clearance, and the silts from the settlement ponds. Both of these wastes are stockpiled on site for future reuse in land rehabilitation works. All

aggregate extracted can be processed on site to create a commercial product. Low volumes of waste are generated within the site, primarily sourced from welfare facilities and plant maintenance. The wastes potentially generated within the Pit are tabulated below and itemised by European Waste Catalogue Codes (EWC).

Table 4.2: Wastes Generated at the Pit

Description	EWC Code	Hazardous/ Non-Hazardous	Source
Concrete	17 01 01	Non-Hazardous	Bund lining, on-going site activities, quality inspection failure.
Fluorescent tubes	20 01 21	Hazardous	Lighting from the site offices.
Plastic packaging	15 01 02	Non-Hazardous	On site materials, wastes, component packaging.
Mixed municipal waste	20 03 01	Non-Hazardous	Non-recyclable wastes arising from site.
Wood	20 01 38	Non-Hazardous	Wooden wastes from pallets etc.
PVC & HDPE	17 02 03	Non-Hazardous	Drainage piping.
Scrap Metal	17 04 05	Non-Hazardous	Scrap metal from site maintenance.
Waste fuels and oils	13 07 03	Hazardous	Waste oils from machinery, maintenance, spill residues etc.
Paper cardboard	15 01 01	Non-Hazardous	Cardboard packaging/office waste.

4.10 Access

The site is accessed via two entrances, both semi private roads off the N70, Ring of Kerry National Road to the north. The access road from the N70 to the site entrance is maintained by M.F.Q.
There is a southern entrance from the L-4021 and no HGV traffic shall use this entrance. There is also a western entrance from the L-7505, whereby HGV traffic can use.

The existing processing site is accessed via both the L-4021 and L-7505, depending on the vehicle type entering, and leads into the main production area and serves to access existing office buildings and processing plant.

The processing area is linked to the existing sand and gravel pit area (Riordan's Pit) in the western sections of the site via an underpass which runs under a local road which separates the western pit from the main processing area.

A temporary entrance will be constructed from the Caragh Lake road to the Knocknaboola extension site. This new, temporary entrance will be used only for 12 months during the construction of the underpass.

Routes within the Pit itself are hard-standing, produced from the movement of heavy vehicles across paths on a regular basis. These offer safe access from the weighbridge to the processing plant and out to the relevant extraction faces. Safe routes around settlement and drainage lagoons are designated by these tracks.

4.11 Welfare Facilities

Welfare facilities in the office building include a canteen, toilet, hand basin and shower.

4.12 Employees

Approximately 38 employees work permanently on site with the ability to engage extra road hauliers during times of peak demand.

4.13 Hours of Business

The sand and gravel pit's traditional and permitted hours of business have been from 7.00 am to 7.00 pm Monday to Friday and 7.00 am to 4.00 pm on Saturdays and it is closed on Sundays and Bank Holidays and closed for a fort-night at Christmas. In practice however, no employee works these hours since the recession hit the industry in 2008. The usual working hours are now from 8.00 am to 6.00 pm but customers demand earlier and later deliveries in which case empty trucks return to the pit after the other sand and gravel pit workers have gone home.

4.14 Environmental Management and Emissions

MFQ will operate an Environmental Management System (EMS) on site which will cover the following:

- Identification of key environmental impacts of the operational activities;
- The setting of objectives and targets and a programme of improvements;
- Regular monitoring of environmental performance including noise levels within and surrounding the facility, emissions to air from the odour treatment control system and site drainage;
- Regular auditing both by internal and external groups;
- Establishment of operational controls to prevent and minimise significant impacts;
- Regular reporting of environmental performance and production and submission of Annual Environmental Reports (AER) to the Local Authority / EPA as a requirement of the Waste Permit/Licence;
- Monitoring and control systems reviewed and amended;
- Environmental procedures including incident reporting, complaints, and emergency procedures established;
- Provision of environmental awareness training and,
- Operation of preventative maintenance programmes.

As part of the overall environmental management of the site, the facility will have a Community Liaison Officer to act as a formal point of contact and open communication between the company and residents and community groups on matters of environmental performance.

Chapter Five - Biodiversity

5.1 Introduction

This chapter of the EIAR provides an assessment of the likely significant effects in relation to a Planning Application for the continued operation of a 18.5Ha existing processing area at Rangue, Killorglin, Co. Kerry, herein referred to as the existing aggregate and production factory, and for a proposed sand and gravel pit of 16.75 Ha in the townlands of Rangue and Knocknaboola, Killorglin, Co. Kerry , herein referred to as the proposed extension, on biodiversity in the receiving environment. Full details of the proposed development can be found in EIAR Volume 1 Chapter 4 Description of Development.

This chapter describes the existing flora and fauna within and in the vicinity of the proposed development and the surrounding area. This chapter reviews the likely significant effects and proposes measures for the mitigation of these effects, where appropriate.

The potential impacts on biodiversity in this chapter should be read in conjunction with the other chapters of the EIAR including Chapter 4 Description of the Development, Chapter 6 Land (Soils, Geology and Hydrogeology), Chapter 7 Hydrology, Chapter 8 Noise and Vibration and Chapter 9 Air Quality & Odour.

5.1.1 Legislative Context

Flora and fauna in Ireland are protected at a national level by the Wildlife Act 1976, as amended, and the European Communities (Birds and Natural Habitats) Regulations 2011. They are also protected at a European level by the EU Habitats Directive (92/43/EEC) and the EU Birds Directive 2009/147/EC.

Under this legislation, sites of nature conservation importance are designated in order to legally protect faunal and floral species and important/vulnerable habitats. The relevant categories of designation are as follows:

- Special Areas of Conservation (SACs) are designated under the European Communities (Birds and Natural Habitats) Regulations 2011 to comply with the EU Habitats Directive (92/43/EEC);
- Special Protection Areas (SPAs) are designated under the EU Birds Directive (79/409/EEC) amended in 2009 as Directive 2009/147/EC; and
- Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) are listed under the Wildlife (Amendment) Act, 2000, as amended. A NHA is designated for its wildlife value and receives statutory protection. A list of pNHAs was published on a non-statutory basis in 1995, but these have not since been statutorily designated. Consultation with the NPWS is still required if any development is likely to impact on a pNHA.
- Relevant European Legislation
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (The Habitats Directive);
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (The Birds Directive);
- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (The Water Framework Directive);
- Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life (The Fish Directive (consolidated)).

Relevant Irish Legislation

- Wildlife Act 1976 as amended by Wildlife Act 1976 (Protection of Wild Animals) Regulations 1980, Wildlife (Amendment) Act 2000, Wildlife (Amendment) Act 2010, Wildlife (Amendment) Act 2012, European Communities (Wildlife Act, 1976) (Amendment) Regulations 2017 (The Wildlife Act);
- European Communities (Conservation of Wild Birds) Regulations 1985 (S.I. No. 291/1985) as amended by S.I. No. 31/1995 (The Wild Birds Regulations);
- European Communities (Natural Habitats) Regulations 1997 (S.I. No. 94/1997 as amended by S.I. No. 233/1998 and S.I. No 378/2005) (The Habitats Regulations);
- Fisheries (Consolidation) Act, 1959 (as amended) (The Fisheries Act);
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011) (The Habitats Regulations); and
- The Flora (Protection) Order 2015 (S.I. No. 356/2015).

5.2 Methodology

5.2.1 Guidance Used

This chapter of the EIAR follows the *Environmental Protection Agency's Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2017). It also takes account of the *Draft Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment* (Department of Environment, Community and Local Government, August 2018), *Chartered Institute of Ecology and Environmental Management Guidelines on Ecological Impact Assessment in the UK and Ireland, 2nd edition* (CIEEM 2016) and *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, Version 1.1* (CIEEM, 2019). Reference was also made to the following key documents where relevant:

- *Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)* (European Union, 2017);
- *Guidance on integrating climate change and biodiversity into environmental impact assessment* (EU Commission 2013);
- *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority 2009) *(for habitat assessment)*;
- *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011);
- *A Guide to Habitats in Ireland* (Fossitt, 2000)
- *Guidelines for the treatment of Badgers prior to the construction of National Road Schemes. National Roads Authority, Dublin* (National Roads Authority (NRA) 2005a);
- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* (NRA 2005b).
- *Guidelines for the treatment of bats during the construction of national road schemes (National Roads Authority* (NRA 2005c);
- *Guidelines for the protection and preservation of trees, hedgerows and scrub prior to, during and post construction of national road schemes*. (NRA 2006);
- *Guidelines for the treatment of Otters prior to the construction of National Road Schemes (National Roads Authority* (NRA 2008);
- *Bird Census Techniques* Bibby, C.J., Burgess, N.D., Hill, D.A. & Mustoe, S.H. (2000); and
- *Bird Monitoring Methods - a Manual of Techniques for Key UK Species*. Gilbert, G., Gibbons, D.W. & Evans, J. (1998).
- *AA Screening Report (Screening Stage 1) for drainage works at Rangue, Killorglin, Co. Kerry* (DixonBrosnan 2020)

5.2.2 Baseline Data Gathering

5.2.2.1 Desktop Study

A desktop study was carried out to collate the available information on the local ecological environment. The purpose of the desktop study was to identify features of ecological value occurring within the Proposed Development site and those occurring in proximity to it. A desktop review also allows the key ecological issues to be identified early in the assessment process and facilitates the planning of surveys. Sources of information utilised for this report include the following:

- National Parks and Wildlife Service (NPWS) - www.npws.ie;
- Environmental Protection Agency (EPA) – www.epa.ie;
- National Biodiversity Data Centre (NDBC) – www.biodiversityireland.ie;
- Bat Conservation Ireland - www.batconservationireland.org;
- Birdwatch Ireland - www.birdwatchireland.ie;
- National Biodiversity Action Plan 2017-2021 (NPWS 2017);
- Kerry County Council (2019) *Council Climate Change Adaptation Strategy 2019-2024;*
- Kerry County Council (2008) *Biodiversity Action Plans 2008-2012;* and
- Kerry County Council (2015) *County Development Plan 2015 – 2021.*

5.2.2.2 Field Surveys and Monitoring

This assessment is based on surveys at the Proposed Development site (Figure 1.1, Attachment 1: Figures). The Proposed Development comprises the continued processing aggregates at MFQ Rangue factory site (Planning reference PL 08.125729) and the opening of a new sand and gravel pit in contiguous land in the townland of Knocknaboola i.e. extension area. A range of ecology surveys was carried out at the proposed development site in between September 2020 and November 2021 to inform this EIAR.

Habitat Surveys

Habitats were mapped according to the classification scheme outlined in the Heritage Council publication *A Guide to Habitats in Ireland* (Fossitt, 2000) and following the guidelines contained *in Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011). Habitats were cross referenced with Habitats Directive Annex I habitats. Surveys were carried out on the 27th of September 2020, 11th of April, 8th of May and 22nd of June 2021. During these surveys the site was also surveyed for invasive species and rare floral and bryophyte species (Wyse *et al.,* 2016; Stace 2019 Lockhart, Hodgets and Holyoak 2012; Preston and Smith 1991).

Mammal Surveys

General mammal surveys were conducted in conjunction with habitat surveys on the 27th of September 2020, 11th of April, 8th of May, 22nd of June and 1st November 2021. These surveys focused in particular on Badger *Meles meles* and Otter *Lutra* and identifying potential foraging habitat for bats (NRA 2005a, NRA 2005b, NRA 2005c, NRA 2008).

Field signs of Badger are characteristic and sometimes quite obvious and include tufts of hair caught on barbed wire fences, conspicuous badger paths, footprints, small excavated pits or latrines in which droppings are deposited, scratch marks on trees, and snuffle holes, which are small scrapes where badgers have searched for insects and plant tubers.

The proposed development site was assessed for signs of Otter. Otter survey methodology followed guidance outlined in NRA (2008) and included searches for breeding or resting sites within 150m of the Proposed Development Site boundary. Evidence of Otter, including spraints, footprints, or feeding remains, was recorded where present.

Bat activity surveys were conducted within the proposed development site under suitable weather conditions on 5th of May, 13th of May and 6th of June 2021. Dusk activity surveys commenced at 15 minutes before sunset and ended a minimum of two hours after sunset (Collins 2016). The primary purpose of bat surveys was to assess usage of habitats, located within or in close proximity, to the site boundary. Activity surveys were also carried out to identify foraging and/or commuting routes across the site (i.e. hedgerows/treelines, stream etc) within the proposed development site boundary.

Bird Surveys

General breeding bird surveys were carried out on the 14th of April, 21st April, 8th of May and 22nd of June 2021. The breeding bird survey was based on the BTO Common Bird Census (CBC) methodology and Breeding Bird Survey (BBS) (Gilbert *et al.* 1998 and Bibby *et al.* 2000) which aims to capture a snapshot of breeding bird activity within the survey area. The survey area focused on habitats within the proposed development site boundary. The site was walked so that all habitats within 50m of all potential nesting features were surveyed. The ornithological surveyor slowly walked through the site, stopping at regular intervals to scan with binoculars and to listen for bird calls or song. Birds were identified by sight and song. All species seen or heard in the survey area and immediate environs were recorded including those in flight. Visits were made during favourable weather conditions.

All species encountered during the survey were mapped and coded using standard BTO species codes and activity recorded using the BTO codes for breeding evidence. In an effort to minimise potential disturbance, no attempts were made to locate nests as observed behaviours are generally sufficient to determine probable or confirmed breeding. The conservation status of birds was also recorded. Bird species listed in Annex I of the Birds Directive are considered a conservation priority. Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland (BOCCI). These are bird species suffering declines in population size. BirdWatch Ireland and the Royal Society for the Protection of Birds have identified and classified these species by the rate of decline into Red and Amber lists (Gilbert et al. 2021). Red List bird species are of high conservation concern and the Amber List species are of medium conservation concern. Green listed species are regularly occurring bird species whose conservation status is currently considered favourable.

Following sightings of Hen Harrier *Circus cyaneus* overflying the proposed extension area, additional focused surveys for Hen Harrier were carried out to determine if Hen Harrier were breeding within, or in proximity to, the proposed development site. The survey method involved a mixture of the Hen Harrier Breeding survey within the site (Gilbert *et al.* 1998) as well as vantage point surveys outside the site boundary to identify any Hen Harrier breeding sites nearby (SNH 2014). Three vantage were used to observe lands within and in the vicinity of the proposed development site for signs of Hen Harrier. In total 36 hours of vantage point surveys were carried out over the following dates; 14th of April, 21st April, 8th of May and 22nd of June 2021. This is paired back version of the SNH method used to record Hen Harrier activity at proposed windfarm sites.

Other surveys

During site visits any other species observed were also recorded. Particular attention was paid to rare invertebrate species e.g. Kerry Slug *Geomalacus maculosus* and Marsh Fritillary Marsh Fritillary *Euphydryas aurinia*.

Aquatic habitats were visually assessed for signs for fish and or aquatic macroinvertebrates.

5.2.3 Consultation

Consultation is a practice that is carried out to ensure that all relevant issues are addressed in the EIAR. The consultation process for the current facility involved the distribution of a formal Scoping Consultation Document to a number of consultees asking them for a written opinion on the proposed content of the EIAR. Further detail on consultation in included in Section 1.9 of the EIAR.

5.3 Study Area

5.3.1 Main Factory Site and Riordan's Pit (Existing Aggregate Production factory)

Michael F. Quirke and Sons (M.F.Q) operate a sand and gravel pit at Rangue, approximately 2.5km southwest of Killorglin, Co. Kerry (Figure 1.1, Attachment 1: Figure). The existing pit at Rangue is 29.5ha in size and includes the main processing site and Riordan's pit.

The main processing area, which currently processes aggregates, is located on the northern side of Caragh Lake Road. In this area, aggregates are washed and graded, and stockpiled for loading to trucks. Aggregates are also used in to produce concrete and mortar in an onsite batching plant, and to manufacture concrete blocks. The aggregates are extracted at the applicant's pit ('Riordan's site') to the immediate west. At the pit working face, aggregates are extracted by tracked excavator or loader, and transferred to the operations area using a dump truck. The transfer route passes under a local secondary road which separates Riordan's pit from the operations area. The secondary road meets Caragh Lake Road at a nearby T-junction. The pit began operations prior to the 1963 Planning Act, albeit it subsequently benefited from Planning Permissions 233/89, 1890/96, 2548/97 and 1329/98. The extraction site at Rangue currently operates under planning PL 08.125729.

5.3.2 Proposed sand and gravel Pit at Knockmaboola (Extension Area)

It is proposed to commence extraction of aggregates at a new site, on the southern side of Caragh Lake Road. At a new working face, aggregates will be extracted by excavator or loader, and transferred by dump truck to the existing operations area. On occasion, screening may be carried out at the working face using a mobile screener. Temporary stockpiles will arise around the screener. As required, a loader will be brought over from the main operations area and used to load screened aggregates into the dump truck or road-going trucks for export.

A portion of the screened aggregates will be exported directly offsite by truck via a proposed exit to the Caragh Lake Road. However, most aggregates will be transferred to the operations area using the dump truck. A new underpass will be constructed underneath Caragh Lake Road, linking the proposed extraction area to the existing processing area.

Extraction will be carried out over five phases shown in Figure 1. The phases will move in a generally southwest direction, over one bench. Bench height will be 6.5 m at the northeast corner, gradually increasing to 13.5 m towards the southwest as existing ground level rises. A large buffer, 80 m in width, will be retained around the northwest and southwest sides. The screener will only be imported to the extraction area from the end of phase 2.

Overburden will be removed at the start of each phase using up to two tracked excavators and up to two dump trucks. Overburden will be stockpiled in perimeter berms which will gradually extend southwest in tandem with each phase.

The proposed development will not result in any change in truck activity, and the number of truck movements will remain as at present. Thus, the proposed development merely represents the relocation of extraction from Riordan's pit to the new area, and the introduction of occasional

screening. Operations at Riordan's pit will cease prior to commencement of operations at the extension, and there will no further activity at the former. There will be no changes at the existing operations area, apart from the construction of the new haul route to the new extraction area. It is noted that trucks no longer enter or depart from the operations area via the southern access gate.

Construction works required at the outset will involve the creation of the Caragh Lake Road underpass, and the onsite haul roads at both ends of the underpass. Construction works will also involve removal of overburden over the phase 1 area, and the clearing of the crushing zone.

5.4 Receiving Environment

5.4.1 Designated Sites

Special Areas of Conservation (SACs) and candidate SACs are protected under the Habitats Directive 92/43/EEC and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Special Protection Areas (SPAs) are protected under the Birds Directive 2009/147/EC and European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Collectively, these sites are referred to as Natura 2000 sites or European sites. Natural Heritage Areas and proposed Natural Heritage Areas (NHAs/pNHAs) are national designations under the Wildlife Act 1976, as amended. A NHA/pNHA is designated for its wildlife value and receives statutory protection. A list of pNHAs was published on a non-statutory basis in 1995, but these have not since been statutorily proposed or designated. Consultation with the NPWS is still required if any development is likely to impact on a pNHA.

The proposed development area does not form part of any Natural Heritage Area (NHA) proposed Natural Heritage Area (pNHA), Special Protection Area (SPA), Nature Reserve, or National Park.

Natura 2000 Sites

In accordance with the European Commission Methodological Guidance (EC 2018), a list of Natura 2000 Sites that can be potentially affected by the proposed project has been compiled. All candidate SAC's (cSAC) and SPAs sites within the zone of influence of the proposed development have been identified, **Table 1** relevant Natura 2000 sites are shown in **Figure 5.1**.

Table 1. Designated sites and location relative to the proposed quarry extension

Site	Site Code	Distance (Closest Point)
SAC		
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC	000365	2.3km SW
Castlemaine Harbour SAC	000343	2.6km N.
Lough Yganavan and Lough Nambrackdarrig SAC	000370	3.6km NW.
Slieve Mish Mountains SAC	002185	9.5km N.
SPA		
Castlemaine Harbour SPA	004029	3.8km N.
Iveragh Peninsula SPA	004154	12.0km SSW.

Dingle Peninsula SPA	004153	13.0km NW.
Killarney National Park SPA	004038	14.3km SW.

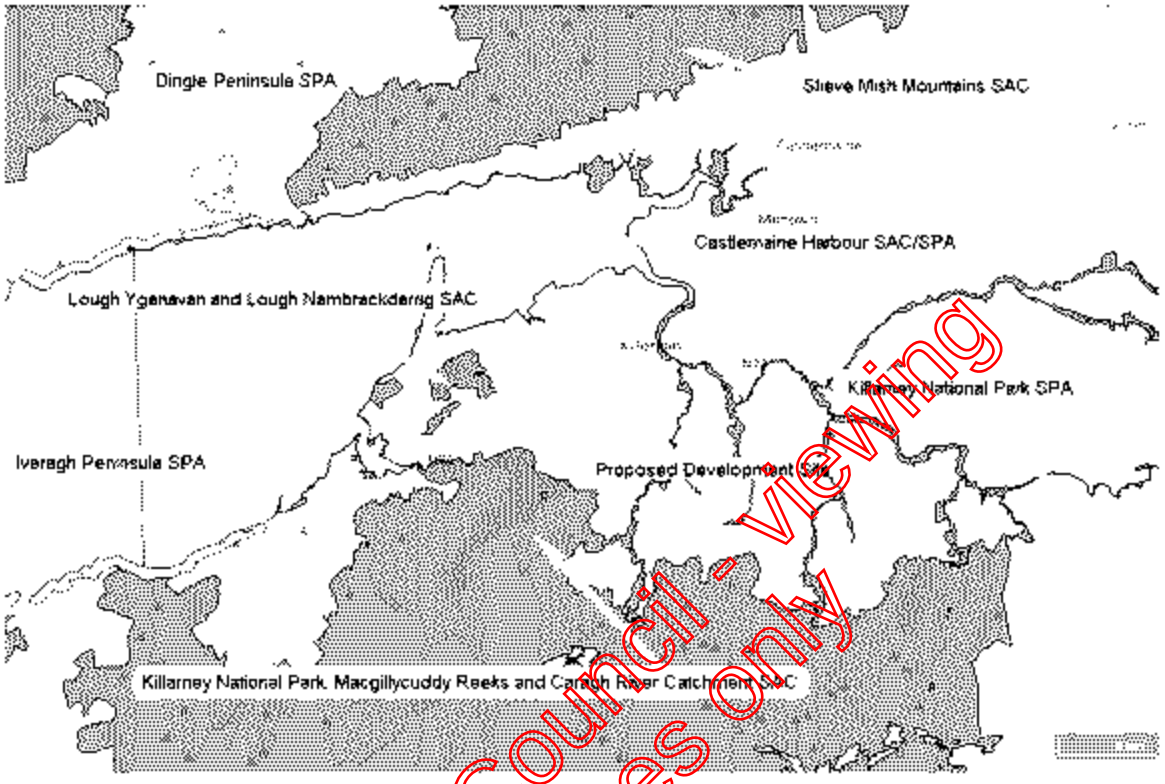


Figure 5.1. Designated sites within zone of influence of proposed quarry extension | Source: EPA Envision mapping https://gis.epa.ie/EPAMaps/) | not to scale

The site is potentially hydrologically connected to three Natura 2000 sites listed in **Table 1** i.e. Castlemaine Harbour SAC, Castlemaine Harbour SPA and the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

Castlemaine Harbour SAC is a large site located on the south-east corner of the Dingle Peninsula, Co. Kerry. It consists of the whole inner section of Dingle Bay, i.e. Castlemaine Harbour, the spits of Inch and White Strand/Rosbehy and a little of the coastline to the west. Castlemaine Harbour is of major ecological importance. It contains a range of coastal habitats of excellent quality, including many that are listed on Annex I of the E.U. Habitats Directive, and two which are listed with priority status (fixed dunes and alluvial forests). It also includes long stretches of river and stream which are excellent habitats for Salmon, Lamprey and Otter. Inch dunes are recognised as among the finest in the country, with particularly well-developed dune slacks.

Castlemaine Harbour SPA is one of the most important sites for wintering waterfowl in the south-west. It provides habitats for an excellent diversity of waterbirds, including divers and seaduck. Castlemaine Harbour SPA holds a Light-bellied Brent Goose population of international importance as well as populations of national importance of an additional sixteen species. Of particular note is that five species that occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Red-throated Diver, Great Northern Diver, Golden Plover, Bar-tailed Godwit and Chough. The site includes a Nature Reserve and two Wildfowl Sanctuaries.

Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC is the largest

terrestrial SAC site in Ireland and encompasses the mountains and lakes of the Iveragh Peninsula and the Paps range. The SAC is of great ecological importance. It includes the most extensive oak woods in the country, with some of the best bryophyte communities in Europe; Ireland's only sizable stand of Yew; excellent examples of blanket bog, alluvial woodland; good quality oligotrophic lakes, some of which support rare glacial relicts; unpolluted rivers with aquatic vegetation and rare invertebrates and fish; and several other annexed habitats.

Potential impacts on designated Natura 2000 sites (SAC/cSAC/SPA) are specifically addressed in an Natura Impact Statement (NIS) which has been submitted as part of this application (*Report in Support of Appropriate Assessment (AA) Screening and Natura Impact Statement (NIS) for continued operation and proposed extension to a sand and gravel pit at Rangue and Knockaboola, Co. Kerry* DixonBrosnan 2021). The conclusions of this NIS Report were as follows:

> *It has been objectively concluded following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted effects from the proposed development and with the implementation of the mitigation measures proposed, that the construction and operation of the proposed development will not adversely affect (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans or projects. There is no reasonable scientific doubt in relation to this conclusion. The competent authority will make the final determination in this regard.*

Nationally Protected Sites

Natural Heritage Areas (NHAs/pNHAs) are national designations under the Wildlife Act 1976, as amended. A Natural Heritage Area (NHA) is designated for its wildlife value and receives statutory protection. A list of proposed NHAs (pNHAs) was published on a non-statutory basis in 1995, but these have not since been statutorily proposed or designated.

The NHAs (pNHAs) located in the vicinity of the proposed development site are listed in **Table 2** and are shown in **Figure5.2**. The site is potentially hydrologically connected to the Castlemaine Harbour pNHA which is located approximately 3.9km northwest of the proposed development site. Given the distances from the proposed development site and the lack of hydrological connections, no impact pathway on any other NHA or pNHA has been identified.

Table 2. National Heritage Areas (NHA/pNHA) within 15km of proposed development site

Designated site	Distance from site of development (closest point)
Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment pNHA (site code 000365)	1.8km SW
Castlemaine Harbour pNHA (site code 000343)	3.9km NW
Lough Yganavan And Lough Nambrackdarrig pNHA (site code 000370)	3.9km NW

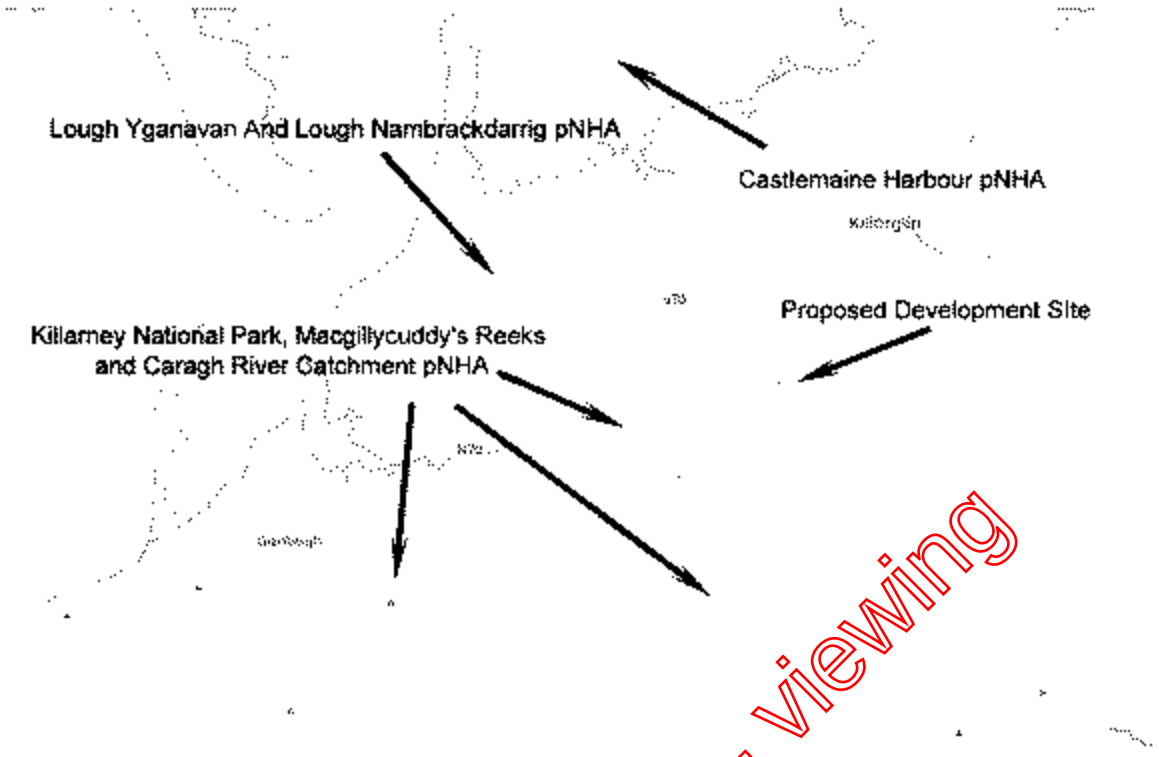


Figure5.2. Proposed Natural Heritage Sites in the vicinity of the proposed quarry extension | Source: EPA Envision mapping https://gis.epa.ie/EPAMaps/) | not to scale

Important Bird Areas – Castlemaine Harbour

Important Bird and Biodiversity Areas (IBAs) are sites selected as important for bird conservation because they regularly hold significant populations of one or more globally or regionally threatened, endemic or congregator bird species or highly representative bird assemblages. The European IBA programme aims to identify, monitor and protect key sites for birds all over the continent. It aims to ensure that the conservation value of IBAs in Europe (now numbering more than 5,000 sites or about 40% of all IBAs identified globally to date) is maintained, and where possible enhanced. The programme aims to guide the implementation of national conservation strategies, through the promotion and development of national protected-area programmes. Through their designation they aim to form a network of sites ensuring that migratory species find suitable breeding, stop-over and wintering places along their respective flyways.

The function of the Important Bird Area (IBA) Programme is to identify, protect and manage a network of sites that are important for the long-term viability of naturally occurring bird populations, across the geographical range of those bird species for which a site-based approach is appropriate. The development site lies approximately 4.8km south of the Castlemaine Harbour IBA (Site Code: IE074).

The site qualifies for designation under the following IBA Criteria (2000):

B1i - The site is known or thought to hold ≥ 1% of a flyway or other distinct population of a waterbird species.

C3 - The site is known to regularly hold at least 1% of a flyway population or of the EU population of a species threatened at the EU level (not listed on Annex 1 of The Birds Directive).

Table 3. Provides a summary of the Castlemaine Harbour IBA trigger species

Species	Current IUCN Red List Category	Season	Year(s) of estimate	Population estimate	IBA Criteria Triggered
Brent Goose Branta bernicla	LC	Winter	2002-2005	30-439 individuals	B1i, C3

Source: Birdlife International (September 2021)

Ramsar Sites

The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. A key commitment of Ramsar Contracting Parties is to identify and place suitable wetlands onto the List of Wetlands of International Importance. Castlemaine Harbour is listed as a Ramsar site, which is a non-statutory designation.

5.4.2 Habitats

Habitat mapping was carried out in line with the methodology outlined in the Heritage Council Publication, *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011). The terrestrial and aquatic habitats within the proposed development site were classified using the classification scheme outlined in the Heritage Council publication *A Guide to Habitats in Ireland* (Fossitt, 2000) and cross referenced with Annex I Habitats where required. The survey results are representative of the habitats within the application site and include the dominant and characteristic species of flora.

A current overview of habitats recorded within the site boundary is outlined in the habitat maps included in

Figure 5.3. Habitat recorded with proposed extension area

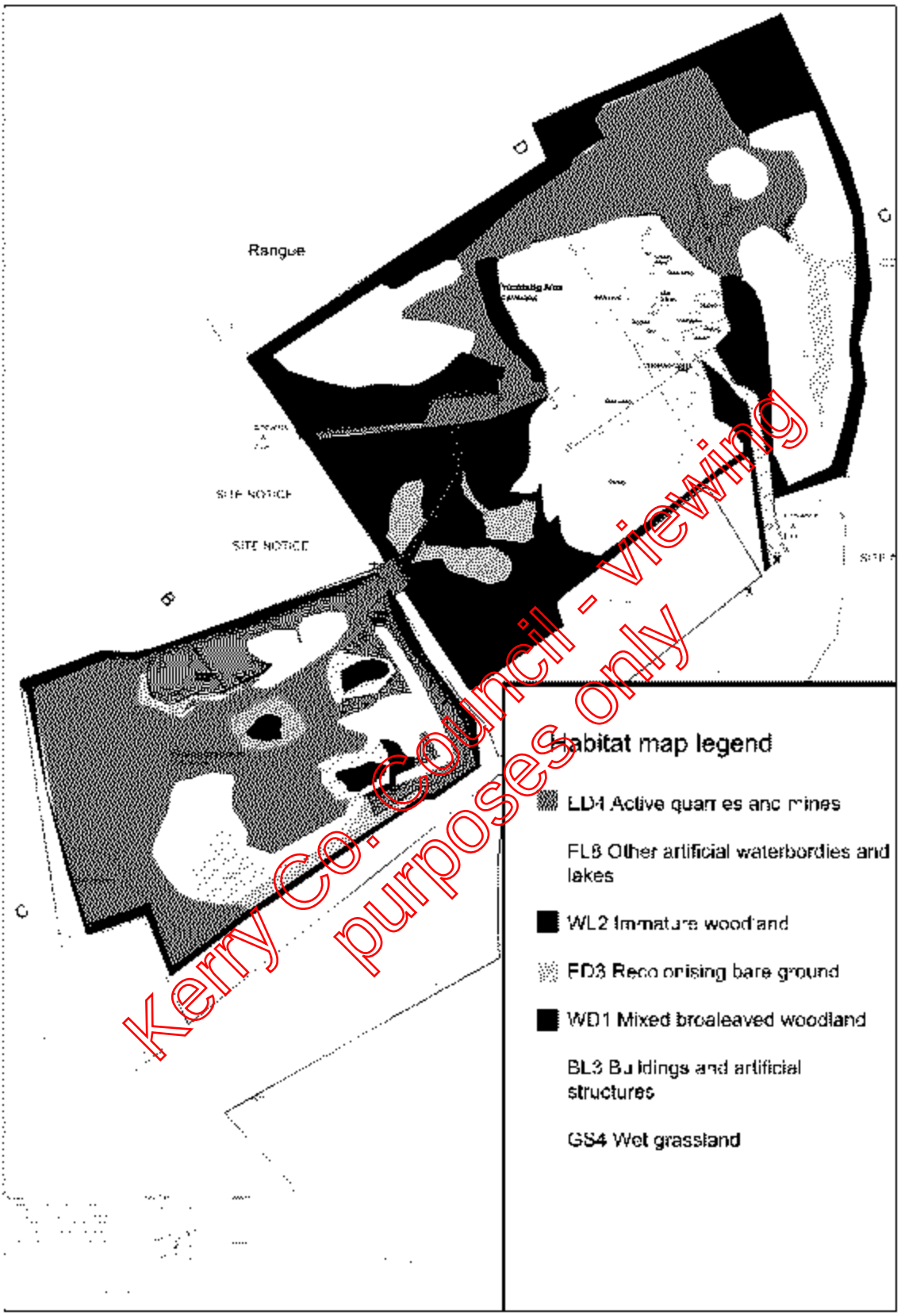


Figure 5.4. Habitats recorded within existing pit

Table 4. Habitats recorded within extension area and their relative value

Habitat	Habitat description	Habitat value (NRA 2009)
Drainage ditches FW4	The site has drainage ditches running north to northeast into the Glashacoomnafanida Stream on the eastern boundary of the proposed development site (See Figure 3). These drains drain the cutover bog and are of varying ages. Although some sections may dry up seasonally, the presence of aquatic vegetation indicates that some flow or standing water remains in the channels under these conditions. Species recorded within this habitat include Pond Bogweed *Potamogeton polygonifolius* and Lesser Bladderwort *Utricularia minor*. This habitat does not have links to Annex I habitats and is not a qualifying species for Natura 2000 sites within the zone of influence.	Local importance (lower value)
Eroding river FW1 (seasonal)	The Glashacoomnafanida Stream runs along the eastern boundary of the site. The gradient here is shallow and there are some areas of fine sediment deposition. This stream dries out seasonally but the well-defined channel persists throughout the year. During dry periods there may also be shallow pools of standing water. There are few vascular plants, however the liverworts *Pellia epiphylla*, *Nardia scalaris* and *Lepidozia reptans* were recorded. Further information on this habitat is provided in the Land, Soil, Geology and Hydrogeology Chapter 6 of this EIAR. FW1 has links to the Annex I habitat Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260) which is a qualifying habitat for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. The Glashacoomnafanida Stream dries up during periods of low rainfall and does not come within this habitat classification.	Local importance (lower value)
Improved agricultural grassland GA1 (outside redline boundary)	An area of grazed grassland, most of which has been reclaimed from wet heath habitat, is located to the northeast of the proposed development area on the eastern side of the Glashacoomnafanida Stream. This area has been reseeded but parts remain wet and dominated by Soft Rush *Juncus effusus*. Other common species recorded within this habitat include Perennial Rye Grass *Lolium perenne*, Vivpiporous Fescue *Festuca vivipara*, Sheep's Sorrel *Rumex acetosa* and Redshank *Persicaria maculosa* This habitat does not have links to Annex I habitats, and is not a qualifying species for Natura 2000 sites within the	Local importance (lower value)

	zone of influence.	
Wet grassland GS4 (outside redline boundary)	An area of wet grassland is located to the southeast of the site and has developed on an area that was previously cutover bog. This area is ungrazed and is developing pockets of scrub and immature woodland around the margins, particularly along its western boundary with the stream. Grass species recorded here include Crested Dogs Tail *Cynosurus cristatus*, Purple Moor Grass *Molina caerulea* and Yorkshire Fog *Holcus lanatus*. Broadleaved plants include Devil's Bit Scabious *Succisa pratensis*, Angelica sp. and Meadowsweet *Filipendula ulmaria*. Species associated bog habitats include Royal Fern *Osmunda regalis* with drier areas colonised by scrub including Bog Myrtle *Myrica gale* and Western Gorse *Ulex gallii*. This habitat has links to the Annex I habitat Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410) which is a qualifying habitat for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. However this area is not a significant example of this habitat type.	Local importance (higher value)
Wet heath HH3	There are three areas of this habitat within the landownership boundary but to the east of the proposed development and one larger area of this habitat within the proposed development area. The wet heath habitat within the proposed development boundary is characterised by Cross leaved Heath *Erica tetralix*, Ling *Calluna vulgaris*, and Purple Moor Grass. Other species include Deer Grass *Muhlenbergia rigens* with areas of Bog Myrtle and with Common Cotton Grass *Eriophorum angustifolium* and Bog Asphodel *Narthecium ossifragum* in wetter areas. Sphagnum moss species present including *Sphagnum papillosum* and *Sphagnum capillifolium*. Other species include *Cladonia portentosa*, *Racomitrium lanuginosum*, *Polytrichum commune* and *Atrichum undulatum*. This habitat corresponds to the Annex I habitat, 'northern Atlantic wet heaths with Erica tetralix (4010)' which is a qualifying habitat for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.	Local importance (Higher value)
Dense bracken HD1	Dense bracken *Pteridium* sp. has developed on isolated patches of dryer ground along the Glashacoomnafanida Stream on the eastern site boundary. This habitat does not have links to Annex I habitats and is not a qualifying species for Natura 2000 sites within the zone of influence.	Local importance (Lower value)

Lowland blanket bog PB3	A large area of this habitat (approx. 3.2ha) within the extension area forms part of a larger area of approximately 10ha of relatively intact blanket bog habitat on adjoining lands to the west. Peat depths are discussed in Chapter 6 of this EIAR. This area is ungrazed. The dominant species cover in this area is dwarf shrubs, including Ling and Cross Leaved Heath with localised Bog Myrtle. Black Bog Rush *Schoenus vulgaris* is also present. Broadleaved herbs include Marsh Lousewort *Pedicularis palustris* and Round Leaved Sundew *Drosera rotundifolia*. Scattered pools contain Bog Bean *Menyanthes trifoliata* and White Beaked Sedge *Rhynchospora alba*. Within this habitat there are pockets of the annexed, sub-habitat, 'depressions on peat substrates of the Rhynchosporion (7150) which is dominated by White Beaked Sedge. Blanket bogs that are still capable of peat formation correspond to the priority habitat, 'blanket bogs (* if active bog) (7130)'. The annexed habitat, 'depressions on peat substrates of the Rhynchosporion (7150)' occurs in pockets as a sub-habitat of blanket bog. 7130 and 7150 are qualifying habitats for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.	Nationally important
Cutover bog PB4	This includes areas of former wet heath and lowland blanket bog. Purple Moor Grass *Molinia caerulea* and Bog Myrtle are still present on more recently cut areas. Areas of cutover blanket bogs are characterised by mosaics of bare peat and revegetated areas including peat gullies and scattered pools with Water Lobelia *Rhynchospora alba* and White Beaked Sedge. Cotton Grass is abundant in wet areas. Intermediate areas between blanket bog and wet heath are colonized by Jointed Rush *Juncus articulatus* and Common Spike Rush *Eleocharis palustris*. Also present are Mat Grass *Nardus stricta*, Deer Grass, Star Sedge *Carex echinata*, Green Ribbed Sedge *Carex binervis*, Heath Rush *Juncus squarrosus* and Carnation Sedge *Carex panicea*. There are drier areas of ground within the cutover bog with Bell Heather and occasional Western Gorse. Within this habitat there are pockets of the annexed, sub-habitat, 'depressions on peat substrates of the Rhynchosporion (7150) which is dominated by White Beaked Sedge. 7150 is a qualifying habitats for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.	Local importance (Higher value)
Bog woodland WN7/Scrub WS1	This habitat has established along the eastern and northern site boundaries and along drainage ditches and	Local importance (Higher value)

	on scattered dry mounds in cutover bog. Trees are primarily immature or semi-mature and are dominated by Downy Birch *Betula pubescens* and Grey Willow *Salix spp.* Holly and Rowan are also present. Ground layer and understorey species include Bracken, Bramble, Purple Moor Grass, Royal Fern and Bog Myrtle. There are isolated patches of *Rhododendron ponticum.* Transitional scrub vegetation is located on the periphery of woodland/wet heath. Species include Gorse, Bramble and Grey Willow *Salix cinerea.* Bog woodland has links with Annex I priority habitat, '*bog woodland (91D0)'. This classification refers to woodland of intact raised bog, examples of this priority habitat are very rare in Ireland and this is not a significant example of this habitat type.	
Immature woodland WS2	Newly planted hardwood species i.e. Alder, Sessile Oak *Quercus petraea*, Scots Pine *Pinus sylvestris* and Sitka Spruce *Picea sitchensis* are located on or close to the northern boundary of the proposed development area. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence.	Local importance (Lower value)
Spoil and bare ground ED2	This habitat includes areas of disturbed ground (not associated with peat extraction) and track surfaces. It also includes linear excavations to the east of the proposed development area which were excavated under a previous planning application for a drainage ditch (See DixonBrosnan 2020). This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (Lower value)

Table 5. Habitats recorded within the existing pit

Habitat	Habitat Description	Habitat value (NRA 2009)
Mixed broadleaved/conifer woodland WD2	This has been primarily planted along the periphery of the existing quarry to provide a visual screen and to minimise potential impacts from dust. Species noted include Alder, Balsam Poplar *Populus balsamifera*, Silver Birch *Betula pendula* and Lodgepole Pine *Pinus contorta*. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within	Local importance (lower value)

	the zone of influence	
Immature Woodland WS2/Scrub WS1	This habitat has developed naturally on unused areas of the site which are not disturbed. Species noted include Grey Willow, Gorse, Downey Birch and common herbaceous species including Broad Leaved Willowherb *Epilobium montanum*, White Clover *Trifolium repens*, Self-Heal *Prunella vulgaris* and Coltsfoot *Tussilago farfara*. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (higher value)
Recolonising Bare ground ED3	This is a common habitat type which includes the periphery of yards and roads and which supports a wide variety of early secessional species. Generally these areas have been undisturbed for 1-2 years. Occurs on the periphery of wetland areas also. Species noted include Common Century *Centaurium erythraea*, Yellow Bartsia *Parentucellia viscosa*, Scarlet Pimpernel *Anagallis arvensis*, Broad Leaved Dock *Rumex obtusifolius* and Creeping Thistle *Cirsium arvense*. The uncommon plant Small Cudweed *Logfia minima* occurs within this habitat type. Small Cudweed also called Slender Cudweed (*Filago minima*) is included on the Flora Protection Order, 2015 (S.I. No. 356/2015). This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (lower value)
Other artificial lakes and ponds FL8	This includes lagoons which were created for surface water run-off from the quarry or have developed naturally. They have been colonised by a range of plants and provide habitats of local value. Species noted include Bulrush *Typha latifolia*., Water Plantain *Alisma plantago-aquatica* Water Horsetail *Equisetum fluviatile*, Purple Loosestrife *Lythrum salicaria* and Common Reed *Phragmites australis*. This habitat supports Mute Swan who breed within the site. Further information on this habitat is provided in the Land, Soil, Geology and Hydrogeology Chapter 6 of this EIAR. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (lower value)
Buildings and artificial	Low value habitat largely devoid of vegetation which	Local importance (lower

surfaces BL3	includes tracks, roads and yards. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	value)
Active quarries and mines ED4	Includes the active areas of extraction within the existing quarry. Noted that Sand Martin nest in areas which are less actively managed. *Gunnera glandulifera* was also recorded in this area. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (lower value)
Wet Grassland GS4	This habitat has developed on the periphery of a lagoon in the north eastern section of the site. Species noted include Purple Loosestrife, Angelica, Water Forget Me Not *Myosotis* sp. and Water Mint. *Mentha aquatica* This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (higher value)

and Figure 5.4 . Habitats recorded within the site boundary and their ecological value are detailed in **Error! Reference source not found.**. The ecological value of habitats has been defined using the c lassification scheme outlined in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA 2009) which is included in **Appendix 5.1** of this EIAR. It should be noted that the value of a habitat is site specific and will be partially related to the amount of that habitat in the surrounding landscape. Further information on peat depts which is of relevance in assessing peatland habitats is provided in Chapter 6 Land (Soils, Geology and Hydrogeology) (EIAR Volume 1). Site photographs are included in **Appendix 5.2**. A species list is included in **Appendix 5.3.**

- Habitats that are considered to be good examples of Annex I and Priority habitats are classed as being of International or National Importance.
- Semi-natural habitats with high biodiversity in a county context and that are vulnerable, are considered to be of County Importance.
- Habitats that are semi-natural, or locally important for wildlife, are considered to be of Local Importance (higher value) and
- Sites containing small areas of semi-natural habitat or which maintain connectivity between habitats are considered to be of Local Importance (lower value).

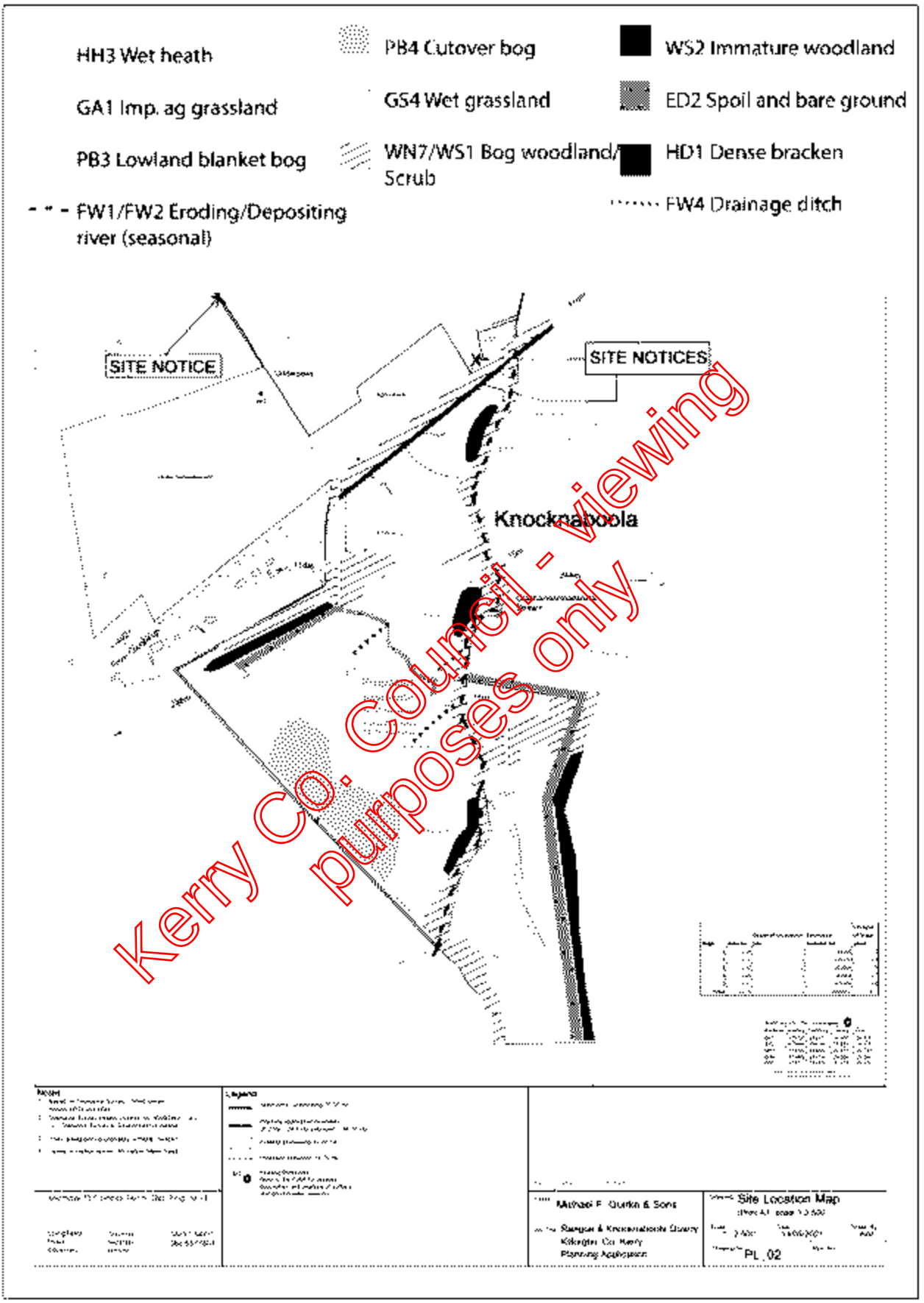


Figure 5.3. Habitat recorded with proposed extension area

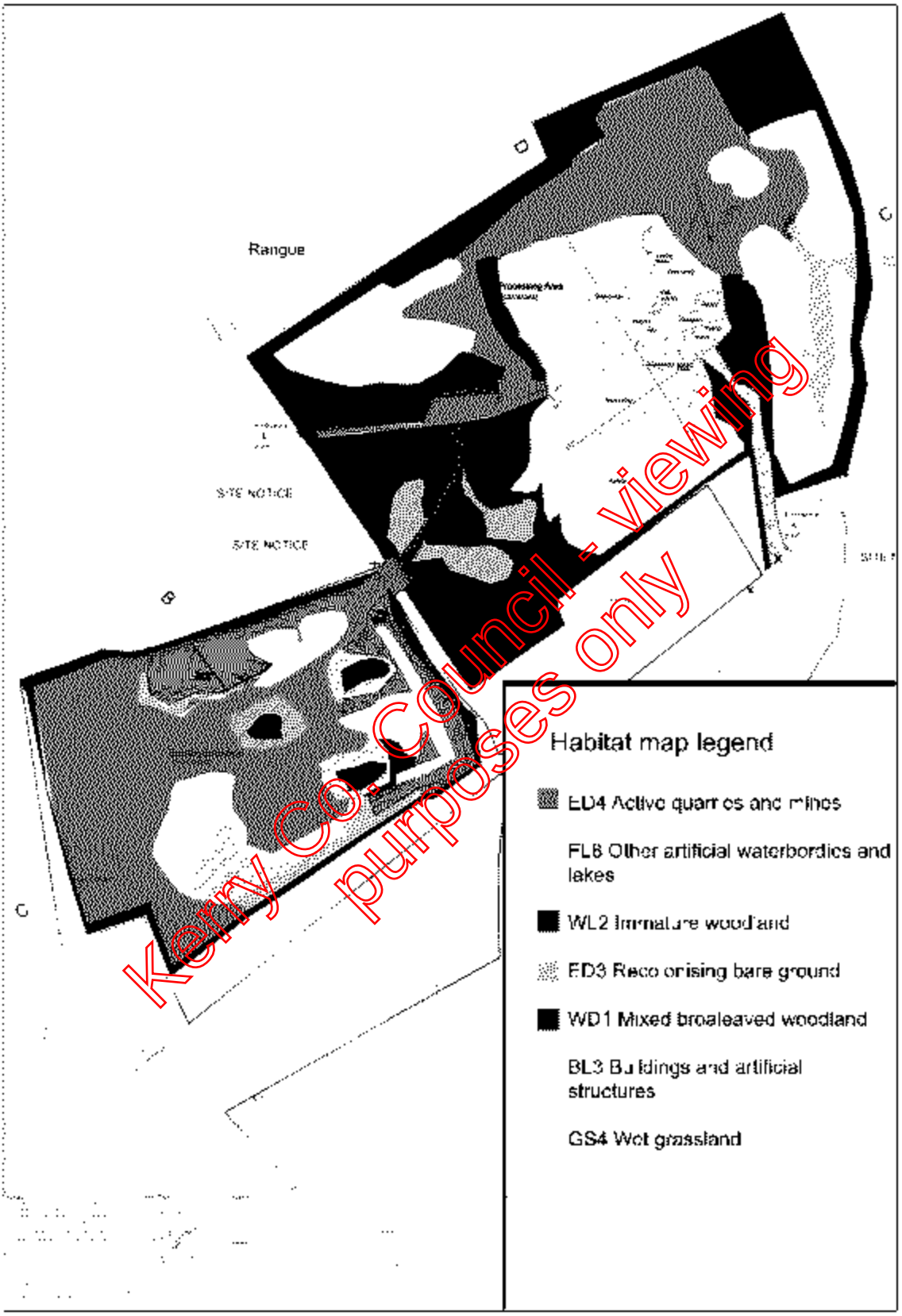


Figure 5.4. Habitats recorded within existing pit

Table 4. Habitats recorded within extension area and their relative value

Habitat	Habitat description	Habitat value (NRA 2009)
Drainage ditches FW4	The site has drainage ditches running north to northeast into the Glashacoomnafanida Stream on the eastern boundary of the proposed development site (See Figure 3). These drains drain the cutover bog and are of varying ages. Although some sections may dry up seasonally, the presence of aquatic vegetation indicates that some flow or standing water remains in the channels under these conditions. Species recorded within this habitat include Pond Bogweed *Potamogeton polygonifolius* and Lesser Bladderwort *Utricularia minor*. This habitat does not have links to Annex I habitats and is not a qualifying species for Natura 2000 sites within the zone of influence.	Local importance (lower value)
Eroding river FW1 (seasonal)	The Glashacoomnafanida Stream runs along the eastern boundary of the site. The gradient here is shallow and there are some areas of fine sediment deposition. This stream dries out seasonally but the well-defined channel persists throughout the year. During dry periods there may also be shallow pools of standing water. There are few vascular plants, however the liverworts *Pellia epiphylla*, *Nardia scalaris* and *Lepidozia reptans* were recorded. Further information on this habitat is provided in the Land, Soil, Geology and Hydrogeology Chapter 6 of this EIAR. FW1 has links to the Annex I habitat Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260) which is a qualifying habitat for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. The Glashacoomnafanida Stream dries up during periods of low rainfall and does not come within this habitat classification.	Local importance (lower value)
Improved agricultural grassland GA1 (outside redline boundary)	An area of grazed grassland, most of which has been reclaimed from wet heath habitat, is located to the northeast of the proposed development area on the eastern side of the Glashacoomnafanida Stream. This area has been reseeded but parts remain wet and dominated by Soft Rush *Juncus effusus*. Other common species recorded within this habitat include Perennial Rye Grass *Lolium perenne*, Vivpiporous Fescue *Festuca vivipara*, Sheep's Sorrel *Rumex acetosa* and Redshank *Persicaria maculosa* This habitat does not have links to Annex I habitats, and is not a qualifying species for Natura 2000 sites within the	Local importance (lower value)

	zone of influence.	
Wet grassland GS4 (outside redline boundary)	An area of wet grassland is located to the southeast of the site and has developed on an area that was previously cutover bog. This area is ungrazed and is developing pockets of scrub and immature woodland around the margins, particularly along its western boundary with the stream. Grass species recorded here include Crested Dogs Tail *Cynosurus cristatus*, Purple Moor Grass *Molina caerulea* and Yorkshire Fog *Holcus lanatus*. Broadleaved plants include Devil's Bit Scabious *Succisa pratensis*, Angelica sp. and Meadowsweet *Filipendula ulmaria*. Species associated bog habitats include Royal Fern *Osmunda regalis* with drier areas colonised by scrub including Bog Myrtle *Myrica gale* and Western Gorse *Ulex gallii*. This habitat has links to the Annex I habitat Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410) which is a qualifying habitat for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. However this area is not a significant example of this habitat type.	Local importance (higher value)
Wet heath HH3	There are three areas of this habitat within the landownership boundary but to the east of the proposed development and one larger area of this habitat within the proposed development area. The wet heath habitat within the proposed development boundary is characterised by Cross leaved Heath *Erica tetralix*, Ling *Calluna vulgaris*, and Purple Moor Grass. Other species include Deer Grass *Muhlenbergia rigens* with areas of Bog Myrtle and with Common Cotton Grass *Eriophorum angustifolium* and Bog Asphodel *Narthecium ossifragum* in wetter areas. Sphagnum moss species present including *Sphagnum papillosum* and *Sphagnum capillifolium*. Other species include *Cladonia portentosa*, *Racomitrium lanuginosum*, *Polytrichum commune* and *Atrichum undulatum*. This habitat corresponds to the Annex I habitat, 'northern Atlantic wet heaths with Erica tetralix (4010)' which is a qualifying habitat for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.	Local importance (Higher value)
Dense bracken HD1	Dense bracken *Pteridium* sp. has developed on isolated patches of dryer ground along the Glashacoomnafanida Stream on the eastern site boundary. This habitat does not have links to Annex I habitats and is not a qualifying species for Natura 2000 sites within the zone of influence.	Local importance (Lower value)

Lowland blanket bog PB3	A large area of this habitat (approx. 3.2ha) within the extension area forms part of a larger area of approximately 10ha of relatively intact blanket bog habitat on adjoining lands to the west. Peat depths are discussed in Chapter 6 of this EIAR. This area is ungrazed. The dominant species cover in this area is dwarf shrubs, including Ling and Cross Leaved Heath with localised Bog Myrtle. Black Bog Rush *Schoenus vulgaris* is also present. Broadleaved herbs include Marsh Lousewort *Pedicularis palustris* and Round Leaved Sundew *Drosera rotundifolia*. Scattered pools contain Bog Bean *Menyanthes trifoliata* and White Beaked Sedge *Rhynchospora alba*. Within this habitat there are pockets of the annexed, sub-habitat, 'depressions on peat substrates of the Rhynchosporion (7150) which is dominated by White Beaked Sedge. Blanket bogs that are still capable of peat formation correspond to the priority habitat, 'blanket bogs (* if active bog) (7130)'. The annexed habitat, 'depressions on peat substrates of the Rhynchosporion (7150)' occurs in pockets as a sub-habitat of blanket bog. 7130 and 7150 are qualifying habitats for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.	Nationally important
Cutover bog PB4	This includes areas of former wet heath and lowland blanket bog. Purple Moor Grass *Molinia caerulea* and Bog Myrtle are still present on more recently cut areas. Areas of cutover blanket bogs are characterised by mosaics of bare peat and revegetated areas including peat gullies and scattered pools with Water Lobelia *Rhynchospora alba* and White Beaked Sedge. Cotton Grass is abundant in wet areas. Intermediate areas between blanket bog and wet heath are colonized by Jointed Rush *Juncus articulatus* and Common Spike Rush *Eleocharis palustris*. Also present are Mat Grass *Nardus stricta*, Deer Grass, Star Sedge *Carex echinata*, Green Ribbed Sedge *Carex binervis*, Heath Rush *Juncus squarrosus* and Carnation Sedge *Carex panicea*. There are drier areas of ground within the cutover bog with Bell Heather and occasional Western Gorse. Within this habitat there are pockets of the annexed, sub-habitat, 'depressions on peat substrates of the Rhynchosporion (7150) which is dominated by White Beaked Sedge. 7150 is a qualifying habitats for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.	Local importance (Higher value)
Bog woodland WN7/Scrub WS1	This habitat has established along the eastern and northern site boundaries and along drainage ditches and	Local importance (Higher value)

	on scattered dry mounds in cutover bog. Trees are primarily immature or semi-mature and are dominated by Downy Birch *Betula pubescens* and Grey Willow *Salix spp.* Holly and Rowan are also present. Ground layer and understorey species include Bracken, Bramble, Purple Moor Grass, Royal Fern and Bog Myrtle. There are isolated patches of *Rhododendron ponticum.* Transitional scrub vegetation is located on the periphery of woodland/wet heath. Species include Gorse, Bramble and Grey Willow *Salix cinerea.* Bog woodland has links with Annex I priority habitat, '*bog woodland (91D0)'. This classification refers to woodland of intact raised bog, examples of this priority habitat are very rare in Ireland and this is not a significant example of this habitat type.	
Immature woodland WS2	Newly planted hardwood species i.e. Alder, Sessile Oak *Quercus petraea*, Scots Pine *Pinus sylvestris* and Sitka Spruce *Picea sitchensis* are located on or close to the northern boundary of the proposed development area. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence.	Local importance (Lower value)
Spoil and bare ground ED2	This habitat includes areas of disturbed ground (not associated with peat extraction) and track surfaces. It also includes linear excavations to the east of the proposed development area which were excavated under a previous planning application for a drainage ditch (See DixonBrosnan 2020). This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (Lower value)

Table 5. Habitats recorded within the existing pit

Habitat	Habitat Description	Habitat value (NRA 2009)
Mixed broadleaved/conifer woodland WD2	This has been primarily planted along the periphery of the existing quarry to provide a visual screen and to minimise potential impacts from dust. Species noted include Alder, Balsam Poplar *Populus balsamifera*, Silver Birch *Betula pendula* and Lodgepole Pine *Pinus contorta*. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within	Local importance (lower value)

	the zone of influence	
Immature Woodland WS2/Scrub WS1	This habitat has developed naturally on unused areas of the site which are not disturbed. Species noted include Grey Willow, Gorse, Downey Birch and common herbaceous species including Broad Leaved Willowherb *Epilobium montanum*, White Clover *Trifolium repens*, Self-Heal *Prunella vulgaris* and Coltsfoot *Tussilago farfara*. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (higher value)
Recolonising Bare ground ED3	This is a common habitat type which includes the periphery of yards and roads and which supports a wide variety of early secessional species. Generally these areas have been undisturbed for 1-2 years. Occurs on the periphery of wetland areas also. Species noted include Common Century *Centaurium erythraea*, Yellow Bartsia *Parentucellia viscosa*, Scarlet Pimpernel *Anagallis arvensis*, Broad Leaved Dock *Rumex obtusifolius* and Creeping Thistle *Cirsium arvense*. The uncommon plant Small Cudweed *Logfia minima* occurs within this habitat type. Small Cudweed also called Slender Cudweed (*Filago minima*) is included on the Flora Protection Order, 2015 (S.I. No. 356/2015). This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (lower value)
Other artificial lakes and ponds FL8	This includes lagoons which were created for surface water run-off from the quarry or have developed naturally. They have been colonised by a range of plants and provide habitats of local value. Species noted include Bulrush *Typha latifolia*., Water Plantain *Alisma plantago-aquatica* Water Horsetail *Equisetum fluviatile*, Purple Loosestrife *Lythrum salicaria* and Common Reed *Phragmites australis*. This habitat supports Mute Swan who breed within the site. Further information on this habitat is provided in the Land, Soil, Geology and Hydrogeology Chapter 6 of this EIAR. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (lower value)
Buildings and artificial	Low value habitat largely devoid of vegetation which	Local importance (lower

surfaces BL3	includes tracks, roads and yards. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	value)
Active quarries and mines ED4	Includes the active areas of extraction within the existing quarry. Noted that Sand Martin nest in areas which are less actively managed. *Gunnera glandulifera* was also recorded in this area. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (lower value)
Wet Grassland GS4	This habitat has developed on the periphery of a lagoon in the north eastern section of the site. Species noted include Purple Loosestrife, Angelica, Water Forget Me Not *Myosotis* sp. and Water Mint. *Mentha aquatica* This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence	Local importance (higher value)

5.4.3 Flora

The site of the proposed development lies within Ordnance Survey National Grid 10km square V79 (hectad). The National Biodiversity Data Centre (NBDC) online database provides data on the distribution of mammals, birds, and invertebrates within the 10km grid squares. Some 365 flowering plants are listed by the NBDC as present in the hectad V79. **Table 6** lists threatened flowering plant species and their designations within V79.

A number of notable bryophyte species were recorded and these are discussed in **Section 6.4.7** below. The National Parks and Wildlife Service (NPWS) rare plant database lists three protected plant species within V79 i.e. Slender Naiad *Najas flexilis*, Irish Lady's-tresses *Spiranthes romanzoffiana* and Sea Pea *Lathyrus japonicus*. All three species are protected by the Flora Protection Order 2015 (S.I. No. 356 of 2015). Slender Naiad is also listed under Annex II of the Habitats Directive (Directive 92/43/EEC) and is a qualifying interest for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. These species were not recorded during site surveys of the proposed extension area or the existing pit.

Small Cudweed also called Slender Cudweed (*Filago minima*) is included on the Floral Protection Order, 2015 (S.I. No. 356/2015) and was recorded within the existing quarry. Small Cudweed is classed as near threatened in the Red Data book list of vascular plants 2016. This species is usually a summer annual which germinates from a seed, grows, flowers, produces seed and then dies within a single year. It is noted that this species is also present at Quirkes operational extraction area at Ballahacommane, Killarney, Co. Kerry. Viable populations of this species are expected to persist within the existing extraction area when it is operational and levels of disturbance are relatively high. However specific mitigation measures will be required as part of a reinstatement plan to ensure that

viable populations remain is situ once the existing extraction area is not longer operational.

Table 6. NBDC listed flowering and endangered flowering plants for grid square V79

Grid Square	Flowering plant Species	Latin Name	Designations
V79	Cornflower	*Centaurea cyanus*	Threatened Species: Regionally Extinct
V79	Irish Lady's-tresses	*Spiranthes romanzoffiana*	Threatened Species: Vulnerable
V79	Sea Pea	*Lathyrus japonicus*	Threatened Species: Data deficient
V79	Slender Naiad	*Najas flexilis*	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Threatened Species: Vulnerable

Source NBDC database 07/10/2021

5.4.4 Mammals

Bats

In Ireland, nine species of bat are currently known to be resident with the residency of the tenth recorded species yet to be proven. These are classified into two Families: the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats). The Lesser Horseshoe Bat *Rhinolophus hipposideros* is the only representative of the former Family in Ireland. All the other Irish bat species are of the latter Family and these include three pipistrelle species: common *Pipistrellus*, soprano *Pipistrellus pygmaeus and* Nathusius' *Pipistrellus nathusii*, four *Myotids: Natterer's Myotis nattereri, Daubenton's Myotis daubentonii*, whiskered *Myotis mystacinus, Brandt's Myotis brandtii*, the brown long-eared *Plecotus auritus* and Leisler's *Nyctalus leisleri bats*.

Whiskered and Natterer's bats are listed as 'Threatened in Ireland', while the other species are listed as 'Internationally Important' in the Irish Red Data Book 2: Vertebrates (Whilde, 1993). The population status of both Whiskered and Natterer's bats was considered 'indeterminate' because of the small numbers known of each, a few hundred and approximately a thousand respectively. Ireland is considered to be an international stronghold for Leisler's bat, whose global status is described as being at 'low risk, near threatened' (LR; nt) by the IUCN (Hutson *et al.*, 2001).

Near threatened status is applied to those taxa that are close to being listed as vulnerable (facing a high risk of extinction in the wild in the medium-term future on the basis of a range of criteria defined by the IUCN). The Irish population of the Lesser Horseshoe Bat is estimated at 14,000 individuals and is considered of International Importance because it has declined dramatically and become extinct in many other parts of Europe. Data collected shows that the species increased significantly between from the early 1990's to present.

A review of existing bat records within a 10km radius of the study site (sourced from NBDC Database) showed that the Irish bat species listed in **Lesser Horseshoe** Bat is the only species of bat listed on Annex II of the Habitats Directive (Directive 92/43/EEC) and is a qualifying species for the Killarney

National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

Table 7 have been recorded. It is noted that other species which have not been included within this database are also likely to occur. Lesser Horseshoe Bat is the only species of bat listed on Annex II of the Habitats Directive (Directive 92/43/EEC) and is a qualifying species for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

Table 7. Bat species recorded within grid square V79

Common name	Scientific name	Presence
Lesser Noctule	*Nyctalus leisleri*	Absent
Pipistrelle	*Pipistrellus sensu lato*	Present
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Absent
Daubenton's Bat	*Myotis daubentonii*	Present
Natterer's Bat	*Myotis nattereri*	Absent
Brown Long-eared Bat	*Plecotus auritus*	Present
Whiskered Bat	*Myotis mystacinus*	Absent
Lesser Horseshoe	*Rhinolophus hipposideros*	Present
Nathusius's Pipistrelle	*Pipistrellus nathusii*	Absent

Source: NBDC 07/10/21

All bat species are protected under the Wildlife Acts (1976 & 2000) which make it an offence to wilfully interfere with or destroy the breeding or resting place of all species; however, the Acts permit limited exemptions for certain kinds of development. All species of bats in Ireland are listed in Schedule 5 of the 1976 Act and are therefore subject to the provisions of Section 23 which make it an offence to:

- Intentionally kill, injure or take a bat
- Possess or control any live or dead specimen or anything derived from a bat
- Wilfully interfere with any structure or place used for breeding or resting by a bat
- Wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose.

All bats are listed on Annex IV of the EU Habitats Directive. The domestic legislation that implements this Directive gives strict protection to individual bats and their breeding and resting places. It should also be noted that any works interfering with bats and especially their roosts, including for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

Furthermore, on 21st September 2011, the Irish Government published the European Communities (Birds and Natural Habitats) Regulations 2011 which include the protection of the Irish bat fauna and

further outline derogation licensing requirements. **Table 8** summarises the protection given to bats by national and international legislation and conventions.

Table 8. Legislative protection for bats in Ireland

Legislation/Convention	Relevance to Irish bats
Irish Wildlife Act (1976) & Irish Wildlife (Amendment) Act 2000.	It is an offence to wilfully interfere with or destroy the breeding or resting place of bats, (with some exemptions for certain kinds of construction development). Provides for the creation of NHAs.
EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Directive 92/43/EEC), commonly known as the 'Habitats Directive	Lists all the vesper bats in Annex IV as in need of strict protection and also encourages Member States to conserve landscape features such as river corridors, field boundaries, ponds and woodlands. It also requests that Member States establish a system to monitor the incidental capture and killing of the animals listed in Annex IV. The Lesser Horseshoe Bat is further listed in Annex II of the EU Habitats Directive The level of protection offered to Lesser Horseshoe Bats effectively means that areas important for this species are designated as Special Areas of Conservation.
The Convention on the Conservation of European Wildlife and Natural Habitats, commonly known as the 'Berne Convention'.	It obliges states to protect and conserve animals and their habitats, especially those listed as endangered or vulnerable. Also obliges parties to promote national policies for the conservation of wild fauna and natural habitats
The Convention on the Conservation of Migratory Species of Wild Animals, commonly known as the 'Bonn Convention'	This led to the European Bats Agreement (EUROBATS), which lists a wide range of objectives, including promoting research programmes relating to the conservation and management of bats, promoting bat conservation and public awareness of bats, and identifying and protecting important feeding areas of bats from damage and disturbance.

Evidence of bat activity associated with potential roost sites includes bat droppings, urine staining, feeding remains and dead/alive bats. Indicators that potential roost locations and access points are likely to be inactive include the presence of cobwebs and general detritus within the apertures. Bats generally make use of large mature trees that contain natural holes, cracks/splits in major limbs, loose bark, hollows/cavities, dense epicormic growth (bats may roost within it) and bird and bat boxes. The importance of trees to bats varies with species, season and foraging behaviour. Evidence indicating bat presence, includes dark stains running below holes or cracks, bat droppings, odours, or scratch

marks.

Bats also often use features such as hedgerows, treelines, woodland edges and waterways as commuting pathways between roosts and foraging areas. Sheltering vegetation, such as treelines and woodland, not only acts as cover from potential predators and the weather, but also provides structure for acoustic orientation and navigation. Sheltered areas also allow insects to gather and therefore support bat forging.

Night-time bat emergence surveys (using a Batbox Duet and Echo Meter Touch Bat Detector) and transect surveys as well as daytime building surveys and were carried out within the extension area on 8th of May 13th of May and 6th of June 2021.

The closest NBDC record for Lesser Horseshoe Bat is located approximately 1.1km southwest of the site (an individual recorded on 01/08/2002). DixonBrosnan carried out a preliminary ecological assessment of an area of farmland to the west of the proposed development site for a separate planning application in 2014. A small colony of Lesser Horseshoe Bat was recorded in a derelict cottage approximately 1.5km northwest of the proposed development site (**Figure 5.5**). Subsequently a further bat survey was carried out at the cottage by Conor Kelleher on October 9, 2016. Mr. Kelleher concluded the following:

"…. building is not being used as a breeding site by Lesser Horseshoe Bats as a maternity colony was not present during the site visit, instead, the structure is currently being used as an occasional summer roost and as a transitional roosting site by a small number of Lesser Horseshoe Bats in the spring and autumn seasons and, possibly, as a hibernation site during the winter months".

There are no buildings within the extension area and the trees within the site, which are immature and semi-mature, do not provide features i.e. cracks and crevices, to support roosting bats. The buildings within the existing pit are of modern construction and do not provide potential roosting sites for bats. The trees within the existing site do not provide potential roosting site for bats. The lands within the proposed extension area and existing pit boundary are considered of low suitability as potential bat roosts (Potential Roost Feature (PRF)) under the guidelines set out in '*Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd end)*' (Collins 2016).

Bats spend much of the winter in torpor at hibernation sites although they will rouse on warmer nights to drink, forage and expel waste products. Bats can change hibercula depending on weather conditions. In general winter roosting sites have a constant temperature and high humidity (Collins, 2016) and are often in basements or underground cellars. The buildings within the Proposed Development site and in immediate proximity to it, are of modern construction There are no cellars or underground structures within the proposed extension area or existing pit. Therefore, no potential winter roosting habitat for bats will be affected.

Boundary habitats along the northern and eastern boundaries of the proposed extension area, which are the more sheltered areas of the site, were surveyed. No bats were recorded on the 8th of May. Twenty Soprano Pipistrelle were recorded on the 13th of May. These bats appeared to arrive from an area to north of the site. They began foraging over the boundary habitats on the northern and eastern boundary before moving to forage over the cutover bog at the centre of the site. A similar foraging pattern was observed on the 6th of June, however higher numbers of Soprano Pipistrelle i.e. approximately 30 bats, were recorded during this survey.

Overall, the site is Local importance (Higher value) for Soprano Pipistrelle. No roosting sites were recorded. It is also noted that no Myotis bats were recorded during site surveys.

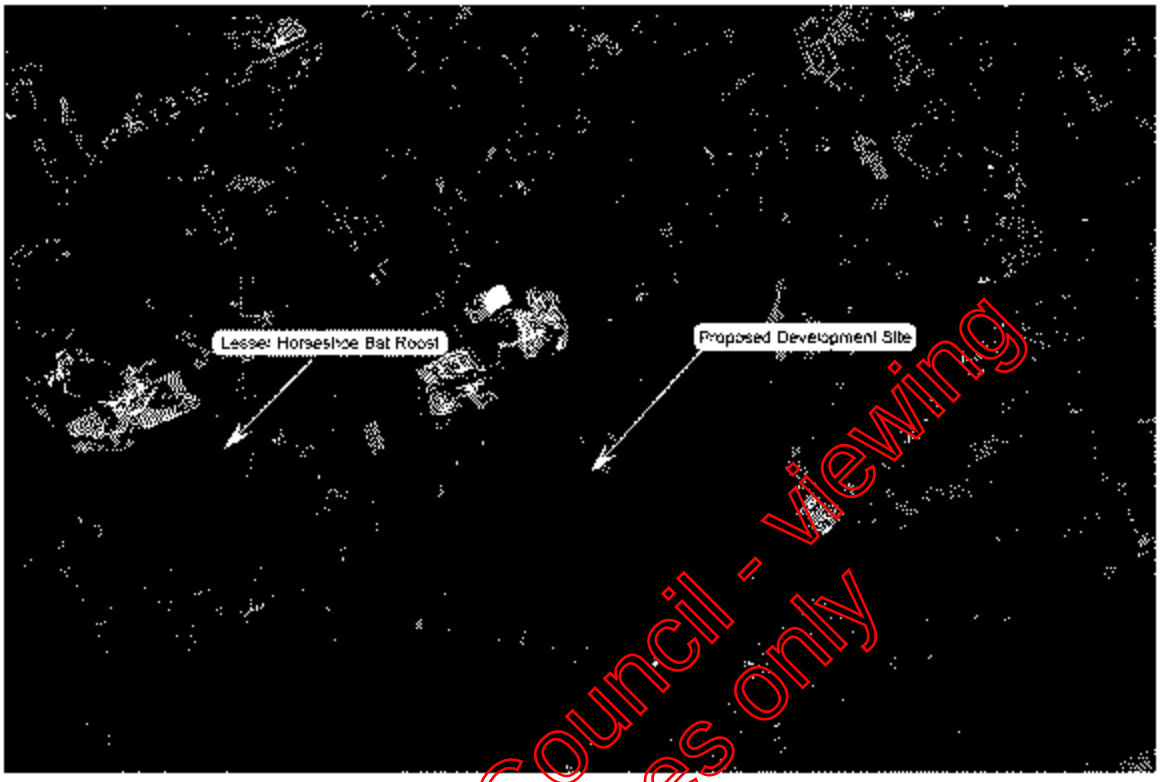


Figure 5.5. Location of derelict cottage with Lesser Horseshoe Bat colony in the vicinity of the proposed development site (approximate extension area boundary)

Otter

Otters, along with their breeding and resting places are protected under the provisions of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act, 2000. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Direct which is transposed into Irish law in the European Communities (Natural Habitats) Regulations (S.I 94 of 1997), as amended. Otters are also listed as requiring strict protection in Appendix II of the Berne Convention on the Conservation of European Wildlife and Natural Habitats and are included in the Convention on International Trade of Endangered species (CITES).

Although rare in parts of Europe they are widely distributed in the Irish countryside in both marine and freshwater habitats. Otters are solitary and nocturnal and as such are rarely seen. Thus, surveys for Otters rely on detecting signs of their presence. These include spraints (faeces), anal gland secretions, paths, slides, footprints and remains of prey items. Spraints are of particular value as they are used as territorial markers and are often found on prominent locations such as grass tussocks, stream junctions and under bridges. In addition, they are relatively straightforward to identify.

Otters occasionally dig out their own burrows but generally they make use of existing cavities as resting placing or for breeding sites. Suitable locations include eroded riverbanks, under trees along rivers, under fallen trees, within rock piles or in dry drainage pipes or culverts etc. If ground conditions are

suitable the holt may consist of a complex tunnel and chamber system. Otters often lie out above ground especially within reed beds where depressions in the vegetation called "couches" are formed. (NRA 2008). Generally, holts or resting areas can be located by detecting signs such as spraints or tracks.

In contrast natal holts which are used by breeding females can be extremely difficult to locate. They are often located a considerable distance from any aquatic habitats and Otters may also use habitats adjoining small streams with minimal or no fish populations. In addition, natal holts are usually carefully hidden and without obvious sprainting sites. Otters do not have a well-defined breeding season.

It is noted that Otters are largely nocturnal, particularly in areas subject to high levels of disturbance as evidenced by the presence of Otters in the centre of Cork and Limerick City. Thus, Otters are able to adapt to increased noise and activity levels; however, breeding holts are generally located in areas where disturbance is lower.

A review of existing records showed that Otter or signs of Otter have been recorded on 14 occasions within tetrad V79, the most recent being in July 2014. Otter is known to occur within the Laune sub-catchment and Castlemaine Harbour as well as within Caragh Lake, located 3.5km southwest of the proposed development site. The closest NBDC Otter record is from a stream below Lough Nafanida approximately 1.4km south-southwest of the proposed extension area.

In Ireland, the territory of female otters is approximately up to 7.5 ± 1.5km in length and the territory of male otters 13.2 ± 5.3km (O'Neill *et al.* 2008). Otters do occur within the catchment and therefore there is the potential for Otter to move through or feed within the local streams connected to the site. However, no signs of Otter were noted during site surveys. It is noted that the Glashacoomnafanida Stream, which runs along the eastern boundary of the site dries up periodically and therefore does not support permanent fish populations where it adjoins the site. Otter may forage within the lagoons within the existing quarry and may hunt for frogs within the peatland habitats within the proposed extension area.

Other Mammals

Fifteen other species of terrestrial mammal have been recorded within grid square V79. Eight of which are protected under Wildlife Act 1976 (as amended); namely Badger *Meles*, Pygmy Shrew *Sorex minutus*, Red Squirrel *Sciurus vulgaris*, Pine Marten *Martes*, Red Deer *Cervus nippon*, Irish Stoat *Mustela erminea hibernica*, Irish Hare *Lepus timidus* and Hedgehog *Erinaceus europaeus*.

Badger

Badgers and their setts are protected under the provisions of the Wildlife Act 1976, as amended, and it is an offence to intentionally, knowingly or unknowingly kill or injure a protected species, or to wilfully interfere with or destroy the breeding site or resting place of a protected wild animal. Badger setts are formed by a complex group of interlinked tunnels, and therefore works in proximity to setts can potentially cause damage a protected species.

Badgers are known to occur within the wider landscape with 58 records of Badger in V79 (NBDC). Field signs are characteristic and sometimes quite obvious and include tufts of hair caught on barbed wire fences, conspicuous badger paths, footprints, small excavated pits or latrines in which droppings are deposited, scratch marks on trees, and snuffle holes, which are small scrapes where Badgers have searched for insects and plant tubers. Badger will generally not build setts in bog/wetland habitat however, they could potentially forage in these areas. No signs of Badger was recorded during site survey and given the habitat onsite are unlikely to occur. The existing pit and proposed extension area

are of negligible potential value for Badger.

Hedgehog

Hedgehogs are protected under the provisions of the Wildlife Act 1976 and are also listed on Appendix III of the Berne Convention and can be found throughout Ireland, with male Hedgehogs having an annual range of around 56 hectares. A number of factors are thought to influence the distribution of Hedgehogs in a habitat, with nest sites, food availability and the presence of predators believed to be major contributory factors. Generally, Hedgehogs prefer edge habitat and pasture but in recent years have begun to colonize urban areas. Hedgehog could use habitats on the margins of the existing pit and proposed extension area e.g. scrub. However no signs of Hedgehog were recorded and given the habitats onsite this site is of low potential value for Hedgehog.

Red Squirrel

Red Squirrel in also listed on Appendix III of the Berne Convention can be found throughout Ireland. Red Squirrels feed mainly on tree seeds, although they can utilise fungi, fruit and buds as they become available in the woodland. They are found in all types of habitat but typically are in higher densities in mature mixed broadleaved forests. They can also survive in monoculture coniferous woodland. Red Squirrel is known to occur in the wider area around the proposed extension area with four records in V79 (NBDC records). No woodland habitat of significant value for this species was recorded within existing pit and proposed extension area are. The site is of negligible potential value for Red Squirrel.

Red Deer

Red Deer are the largest land mammal found on the island of Ireland. Populations of Red Deer are found in the west, northwest, east and southwest regions of Ireland, with smaller populations found scattered throughout Northern Ireland and certain parts of the midlands. One sighting of Red Deer has been recorded in V79 and it is not likely to occur within or in the immediate vicinity of the proposed development site. No signs of deer were recorded during the site survey. The habitats within the existing pit and proposed extension area do not provide valuable for this species and the site is of low potential value for Red Deer.

Irish Stoat

Irish Stoat is one of the species protected under regulations (Protection of Wild Animals) in 1980 which enabled Ireland to comply with the provisions of the Bern Convention of European Wildlife and Natural Habitats, which was ratified by Ireland in April 1982. Irish stoats occur in most habitats with sufficient cover, including urban areas. Irish Stoat has been recorded on one occasion in V79 (July 2013). Due to the habitats recorded within the existing pit and proposed extension area and surrounding landscape, Stoat may occur. However, the open and/or disturbed nature of the site means it is of low potential value for Stoat.

Pine Marten

Pine Martin is also listed Annex V of the EU Habitats Directive 1992 and Appendix III of the Bern Convention 1979, are habitat specialists, requiring forest or scrub habitat to exist in an area. Pine Marten has been recorded on one occasion in V79 (December 2012).There is no valuable habitat for this species within the existing pit or proposed extension area and overall the site of negligible potential value for Pine Marten.

Irish hare

Irish Hare is one of three lagomorphs found on the Island of Ireland and the only native lagomorph. It is listed on Appendix III of the Berne Convention, Annex V(a) of the EC Habitats Directive (92/43/EEC) and as an internationally important species in the Irish Red Data Book. The Irish hare is adaptable and lives in a wide variety of habitats. It typically reaches its highest densities on farmland, particularly

where there is a mix of grassland and arable fields along with hedgerows and other cover. Hares have been recorded on six occasions within V79 (NBDC). There are no suitable foraging habitat for Irish Hare within the existing pit and this is of negligible value for this species. Irish Hare were recorded on several occasions, foraging at the proposed extension area during the 2021 site surveys. The proposed extension area is of potential local value (higher importance) for Irish Hare.

Pygmy Shrew

Pygmy Shrew is protected under the provisions of the Wildlife Act 1976, as amended and is common throughout mainland Ireland and prefers habitats such as hedgerows and grasslands; they have also been found utilizing stone walls. Due to the habitats present within the proposed extension area and existing pit it is possible that Pygmy Shrew is present, however none were recorded onsite. The proposed extension area and existing pit are of potential local value (lower importance) for Pygmy Shrew.

5.4.5 Amphibians and Reptiles

Amphibians

The NBDC lists three species of amphibians within V79, Common Frog *Rana temporaria*, Natterjack Toad *Epidalea calamita* and Smooth Newt *Lissotriton vulgaris*.

The Natterjack Toad is the rarest of the three Irish amphibian species and is restricted to Kerry. This amphibian breeds in warm, shallow pools on sand dunes and sandy heaths. The Natterjack Toad is listed under Annex IV of the EU Habitats Directive and the Wildlife Act of 1976 (as amended). It is listed as endangered species. Few records of the species exist within V79, the most recent being from December 1971.

Common Frog is listed in Annex V of the EU Habitats Directive and is protected under the Wildlife Acts. Common Frog was recorded on several occasions within the proposed extension area. Common Frog may also use the artificial waterbodies within the existing pit and were recorded within the proposed extension area. No signs of Common Frog were recorded within the existing pit during site surveys.

Smooth Newt is the only member of the Urodela (the tailed amphibians) found in Ireland. While commonly encountered near water bodies, adult newts are actually terrestrial, only returning to water bodies to breed. They tend to prefer habitats that offer protection from desiccation, such as long grass, woodland and scrubland. Newts will over-winter in refugia such as woodpiles and rotting logs, which offer them some protection from the elements. No newt were recorded during site surveys, however the settlement ponds within the existing pit could potentially provide habitat for smooth newt.

The site of local potentially of local value (higher importance) for Common Frog and potentially of local value (higher importance) Smooth Newt.

Reptiles

Common Lizard *Zootoca vivipara* been recorded within grid square V79 on two occasions, the most recent in August 2018 (NBDC records), Common Lizard is protected under the Wildlife Act. is Ireland's only native terrestrial reptile and is so protected under the Wildlife Act. Unlike the vast majority of reptiles, it has been found that the Common Lizard often frequents damp habitats, as the humidity has a beneficial effect on growth rate and activity. The species is tolerant, to a degree, of habitat disturbance (it may even use artificial habitats, e.g. railway embankments, hedgerows, and gardens.

Common Lizard was recorded within the proposed extension area on the 8th of May 2021. The site is of Local importance lower value) for Common Lizard. No signs of Common Lizard were recorded within the existing pit.

5.4.6 Birds

The NDBC online data base lists 139 species of bird recorded within grid square V79. Of these species, a number are listed under Annex I of the Birds Directive i.e. Arctic Tern *Sterna paradisaea*, Bar-tailed Godwit *Limosa lapponica*, Black-throated Diver *Gavia arctica*, Kingfisher *Alcedo atthis*, Dunlin *Calidris alpine*, Golden Plover *Pluvialis apricaria*, Great Northern Diver *Gavia immer*, Hen Harrier *Circus cyaneus*, Little Egret *Egretta garzetta*, Merlin *Falco columbarius*, Peregrine Falcon *Falco peregrinus*, Chough *Pyrrhocorax pyrrhocorax*, Red-throated Diver *Gavia stellate* and Whooper Swan *Cygnus*.

Breeding bird surveys were carried out at the proposed extension area and existing pit in 14th of April, 21st April and 22nd of May 2021. Two red list species were recorded and seven amber list species were recorded.

A number of breeding birds of conservation concern recorded during the site surveys as listed in

Table 9. A total of 15 bird species were recorded during breeding bird surveys. Common Green List species e.g. Blackbird *Turdus merula*, Robin *Erithacus rubecula* Wren *Troglodytes* and Great tit *Parus major* were recorded primarily along the proposed development site boundary and within the existing quarry. Mute Swan *Cygnus olor*, Moorhen *Galligo chloropus* and Mallard *Anas platyrhynchos* use the sedimentation ponds within the existing pit.

Several Amber and Red List species were recorded at the proposed extension area. One red list species i.e. Meadow Pipit *Anthus pratensis* was recorded breeding at the proposed extension area. The red list species Snipe *Gallinago gallinago* was recorded within the proposed extension area during winter surveys (27th September 2020), however no signs of this species were recorded during breeding bird surveys. Three Amber List species were recorded i.e Skylark *Alauda arvensis*, Willow warbler *Phylloscopus trochilus* and Swallow *Hirundo rustica* at the proposed extension area. A number of the species recorded during site surveys i.e. Skylark, Snipe and Meadow Pipit are under threat due to intensification of agricultural practices as they rely on less intensively managed agricultural grassland. The wet grassland and bog/heath habitats within the proposed development site provide valuable habitat for these species. As noted above Snipe were not recorded during the breeding bird surveys. However, they could potentially breed in wet grassland habitats within the proposed development site. Snipe have recently been moved from Amber List to the Red List for species of conservation concern due to a significant drop in their breeding numbers.

One Annex I species, Hen Harrier, was recorded during site surveys. This species was recorded overflying the site for two site visits i.e. 14th April and 21st of April 2021. This included a sighting of a single ringtail (14th April) and two birds (sex and age not confirmed) (21st April). Following these sightings, vantage point surveys were conducted from three vantage points surrounding the proposed extension area site to determine if Hen Harrier were breeding on or in the vicinity (**Figure 5.6**). No further sightings of Hen Harrier were made during the subsequent vantage point surveys. It was therefore concluded that while the proposed extension area was within the foraging range of Hen Harrier, the site was not being used as a nesting site. Hen Harrier are likely to forage on Skylark and Meadow Pipit which breed within the proposed development site. It is noted that although the NBDC has records of Hen Harrier within V79, these are roving records during the winter months. There are no records of breeding Hen Harrier in the vicinity of the proposed development site and the closest Hen Harrier SPA is the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA which is located approximately 28km northeast of the site. Ruddock *et al.* (2016), recorded no breeding pairs within West Kerry during the 2015 national Hen Harrier survey.

There are a number of Red List and Amber List species breeding and foraging within the site. Overall, the Site is of Local Importance (Higher value) for birds of conservation concern and Local importance (Higher value) for other breeding birds. Although Hen Harrier do not breed at the site, given the foraging habitat present at the site, it has been classified as Local importance (Higher value) for this

Annex I species.

Table 9. Birds of Conservation Concern Recorded during Site Surveys

Species		Breeding Status	Potential number of territories within site boundary	Conservation Status: Annex I of Birds Directive or Red/Amber List*
Blackbird	*Turdus merula*	Possible	3	
Blackcap	*Sylvia atricapilla*	Possible	2+	
Cuckoo	*Cuculus canorus*	Possible	Na (one bird recorded)	
Dunnock	*Prunella modularis*	Possible	2	
Goldcrest	*Regulus*	Possible	1	Amber
Goldfinch	*Spinus tristis*	Possible	1	
Hen Harrier	*Circus cyaneus*	Non breeding	Overflying	Annex I; Amber List
Hooded Crow	*Corvus cornix*	Non breeding	Overflying	
Mallard	*Anas platyrhynchos*	Possible	1	Amber List
Meadow pipit	*Anthus pratensis*	Possible	Several	Red List
Moorhen	*Gallinula chloropus*	Possible	1	
Mute Swan	*Cygnus olor*	Possible	1	Amber List
Robin	*Erithacus rubecula*	Possible	3	
Skylark	*Alauda arvensis*	Confirmed	3	Amber List
Snipe	*Gallinago*	Non breeding (winter)	1	Red list
Stonechat	*Saxicola rubicola*	Possible	1	
Swallow	*Hirundo rustica*	Confirmed	2	Amber List
Willow warbler	*Phylloscopus trochilus*	Probable	10+	Amber List
Wren	*Troglodytes*	Possible	3	

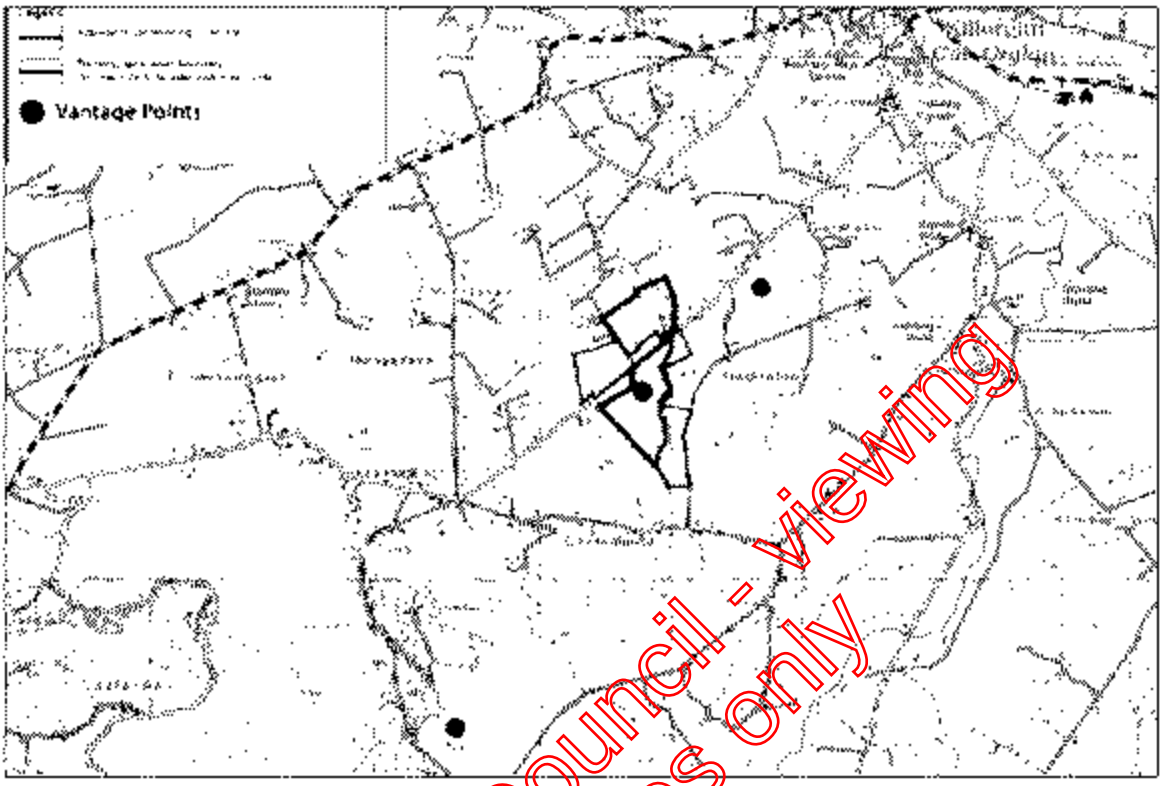


Figure 5.6. Hen Harrier Survey Vantage Points

5.4.7 Other Species

NBDC did not return any records for any protected, rare or notable species of invertebrates within 2km of the proposed development site (V79R and V79L). The wet grassland within the proposed development site is ungrazed and Devil's Bit Scabious *Succisa pratensis,* which is the main food source for this species, was recorded within the proposed extension area. However, no Marsh Fritillary were recorded during site surveys. Marsh Fritillary is protected under the EU Habitats Directive [92/43/EEC] and is a qualifying interest for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

Butterfly species recorded within the extension area were Holly Blue *Celastrina argiolus*, Ringlet *Aphantopus hyperantus*, Meadow Brown *Maniola jurtina*, Speckled Wood *Pararge aegeria*, Peacock *Aglais io*, Small Tortoiseshell *Aglais urticae*, Small White *Pieris rapae* and Greened Veined *White Pieris napi*. It is noted that no butterfly species are legally protected in the Republic of Ireland under the Wildlife Act, 1976 or the Wildlife (Amendment) Act, 2000.

Kerry Slug is a protected species throughout its range of southwest Ireland and the north of the Iberian Peninsula. Within Ireland it is protected under the Wildlife Act, 1976 (as amended), and is also protected under Annex II and Annex IV of EU Habitats Directive [Council Directive 92/43/EEC] and seven Special Areas of Conservation (SACs) have been designated for its protection in Ireland, including the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

In West Cork and Kerry, Kerry Slug occurs in three general habitat types. These are deciduous woodland (usually *Quercus* dominated), blanket bog or unimproved oligotrophic open moor and lake

shores (NPWS 2010; Platts & Speight 1988). Within these habitats, the species tends only be present if there is outcropping of Devonian Old Red Sandstone (NPWS 2010), humid conditions and lichen, liverwort and/or mosses for the species to shelter in and feed on (Platts & Speight 1988). The degree to which this species would utilise the proposed extension area would depend to a large degree on the amount of exposed bedrock available for feeding. An assessment of the habitats on site indicates that there is very little bedrock within the cutover bog/wet heath habitat and this area is not of value for this species. No Kerry Slug were recorded. A range of other relatively common invertebrates utilise cutover bog/wet heath and grassland/scrub habitats. The habitat value for Kerry Slug within the proposed extension area are not of significant value for Kerry Slug due to the paucity of rocky outcrops which would provide suitable feeding areas for this species.

The Glashacoomnafanida Stream which flows along the eastern boundary of the extension area flows directly into Castlemaine Harbour approximately 5.2km downstream of the proposed development site. In very dry weather it is reported that the Glashacoomnafanida Stream dries up. An assessment included in Chapter 6, section 6.4 (EIAR Volume 1) indicates that water from the base of the stream sinks into the underlying permeable strata downstream of the proposed development site. Given the seasonal natures of flows in this section of the river/stream, the Glashacoomnafanida Stream near the proposed development site has limited fish potential, although downstream of the proposed development site where flows are more persistent there is likely to be more valuable fish habitat.

As noted in **Section 0** a number of bryophyte species were recorded within the proposed extension area. The sphagnum moss species recorded were *Sphagnum papillosum* and *Sphagnum capillifolium*. Other species include *Cladonia portentosa*, *Racomitrium lanuginosum*, *Polytrichum commune* and *Atrichum undulatum*. It is noted that no notable bryophyte species were recorded at the existing pit.

The lichen species *Cladonia portentosa*, commonly known as Reindeer Moss, is protected under Annex V of the Habitats Directive. There is no current, published, IUCN Red Data List for Irish lichen species. While the conservation status of individual lichen species in Ireland cannot be inferred from their status in Wales or England, the results of recent assessments within those jurisdictions are provided here for information. In both the 2012 Conservation Evaluation of British Lichens and Lichenicolous Fungi, and the 2010 Lichen Red Data List for Wales *Cladonia portentosa* is listed as Least Concern. In the Article 17 Habitats Directive reporting for the period 2007-2012 no current threats were listed for this species. In that reporting period the named Cladonia species of the Habitats Directive occurring in Ireland were given an 'Overall Assessment of Conservation Status' of 'Inadequate' due to ongoing pressures on the habitats where they occur.

All Sphagnum species are protected under Annex V of the Habitats Directive. Guidelines on reporting for the Habitats Directive indicate that these species are required to be reported on as a group, unless a member state is of the opinion that individual species within the group may require special attention. In Ireland all Sphagnum species are classified as IUCN Least Concern. In the Article 17 Habitats Directive reporting for the period 2007-2012 no current threats were listed for these species. In that reporting period the named Sphagnum species of the Habitats Directive occurring in Ireland were given an 'Overall Assessment of Conservation Status' of 'Inadequate' due to the poor conservation status of the peatland habitats within which the majority of Sphagnum species occur.

5.4.8 Invasive Species

The Birds and Natural Habitats Regulations 2011 (SI 477 of 2011), Section 49(2) prohibits the introduction and dispersal of species listed in the Third Schedule, which includes Japanese Knotweed (*Fallopia japonica*), as follows: "any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow [....] shall be guilty of an offence."

A survey for invasive species was carried out in conjunction with habitat surveys and any observations of invasive species made during other surveys were recorded. The non-native third schedule species Rhododendron (*Rhododendron ponticum)* was recorded within bog woodland WN7/Scrub WS1 habitat within the proposed extension area. Giant Rhubarb (*Gunnera glandulifera*) was also recorded in a scattered distribution within the existing pit. Both species is listed are Third Schedule species under SI 477 of 2011. These species has been shown to have an adverse impact on landscape quality and native biodiversity or infrastructure.

5.5 Assessment Methodology

5.5.1 Valuation of ecological receptors

Annex III of the amended Directive 2014/52/EU requires that the EIAR should assess:

- The magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected)
- The nature of the impact
- The transboundary nature of the impact
- The intensity and complexity of the impact
- The probability of the impact
- The expected onset, duration, frequency and reversibility of the impact
- The cumulation of the impact with the impacts of other existing and/or approved projects and
- The possibility of effectively reducing the impact

Potential effects of the construction, operational and decommissioning phases of Proposed

Development on biodiversity include:

- Potential Effects on Habitats
- Potential Effects on Mammals
- Potential Effects on Birds
- Potential Effects on Other Species
- Potential Effects on Amphibians and Reptiles
- Potential Effects from Non-native Invasive Species
- Potential Effects of Decommissioning

5.5.2 Magnitude of impacts

When describing changes/activities and impacts on ecosystem structure and function, important elements to consider include positive/negative, extent, magnitude, duration, frequency and timing, and reversibility.

Section 3.7 of the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'*, (EPA 2017) provides standard definitions which have been used to classify the effects in respect of ecology. This classification scheme is outlined below in **Table 10**.

Table 10. EPA Impact Classification

Impact Characteristic	Term	Description
	Positive	A change which improves the quality of the environment.
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting

		error.
Quality	Negative	A change which reduces the quality of the environment.
Significance	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	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging trends.
	Significant	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	An effect which obliterates sensitive characteristics.
Duration and Frequency	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 lasting one to seven years.
	Medium-term	Effects lasting seven to fifteen years.
	Long-term	Effects lasting fifteen to sixty years.
	Permanent	Effects lasting over sixty years.
	Reversible Effects	Effects that can be undone.
	Frequency	Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost.
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents.
	'Worst Case'	The effects arising from a development in the case where mitigation measures substantially fail.

5.5.3 Significance of impacts

According to the EPA (2017), significance of effects is usually understood to mean the importance of the outcome of the effects and is determined by a combination of objective (scientific) and subjective (social) concerns.

The EPA further notes that:

"While guidelines and standards help ensure consistency, the professional judgement of competent experts plays a role in the determination of significance. These experts may place different emphases on the factors involved. As this can lead to differences of opinion, the EIAR sets out the basis of these judgements so that the varying degrees of significance attributed to different factors can be understood".

With this in mind, the geographic frame of reference applied to determining impact significance by the NRA (2009) in Ireland and CIEEM (2019) in Ireland and the UK, has been adopted in this report in tandem with the EPA's qualitative significance criteria. **Table 11** compares the qualitative versus geographic approaches to determining the significance of effects.

Table 11.Equating the Definitions of Significance of Effects Using a Geographic vs. Qualitative Scale of Reference

Geographic Scale of Significance **(NRA, 2009; CIEEM, 2019)**	**Qualitative Scale of Significance of Effects** **(EPA 2017)**
Negligible or Local Importance (Lower Value). No significant effects predicted to significant ecological features.	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.
Local Importance (Higher Value), County, National, Regional, or International.	Slight / Moderate / Significant / Very Significant / Profound i.e. effects can be slight, moderate, significant, very significant, or profound at Local scale, subject to the proportion of the local population/habitat area affected.

The geographic frame of reference can be a good fit to assessments of biodiversity impacts because it allows clear judgements to be made about the scale of significance, with reference to published estimates for the population size of a given species at county, national and / or international scales or areas of habitats at such scales.

The proportion of a known feature impacted at county scale (i.e., 1% of the known or estimated population in a given county) is measurably different from that impacted at national scale (i.e., 1 % of the known or estimated national population).

A non-geographic qualitative approach can be a poor fit to assessments of biodiversity, since the definitions provided for the different qualitative terms do not relate to measurable units of space such as a county or national boundary. For instance, a significant effect is defined by the EPA as "an effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment

without affecting its sensitivities", whilst a very significant effect is that which "by its character, magnitude, duration or intensity significantly.

5.5.4 Summary of Valuation of Significant Ecology Features

As per the impact assessment methodology outlined in **Section 0**, significant ecological features are considered to be those valued at Local Importance (Higher Value) or higher as per NRA (2009) and CIEEM (2019) definitions. **Table 12** summarises all significant ecological features identified within the Zone of Influence of potentially significant impacts.

It is noted that impacts on Castlemaine Harbour SAC and Castlemaine Harbour SPA and the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC are discussed in the NIS which accompanies this application.

Table 12. Summary Valuation of Significant Ecological Features and Identification of Features Scoped Out From the EIAR

Feature		Highest Value within Zone of Influence	At risk of significant impact	Scoped into ecology assessment
Designated sites	Castlemaine Harbour SAC	International	Yes	Yes
	Castlemaine Harbour SPA	International	Yes	Yes
	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC	International	Yes	Yes
	Castlemaine Harbour pNHA	National	Yes	Yes
	Other National Sites	National	No	No
Habitats within proposed extension area	Drainage ditches FW4	Local importance (Lower value)	Yes	Yes
	Eroding river FW1/Depositing river	Local importance (Lower value)	Yes	Yes
	Improved agricultural grassland GA1	Local importance (Lower value)	Yes	Yes
	Wet grassland GS4	Local importance (Higher value)	Yes	Yes
	Wet heath HH3	Local importance (Higher value)	Yes	Yes
	Dense bracken HD1	Local importance (Lower value)	Yes	Yes
	Lowland blanket bog PB3	Nationally important	Yes	Yes
	Cutover bog PB4	Local importance (Higher value)	Yes	Yes
	Bog woodland WN7/Scrub WS1	Local importance (Higher	Yes	Yes

		value)		
	Immature woodland WS2	Local importance (Lower value)	Yes	Yes
	Spoil and bare ground ED2	Local importance (Lower value)	Yes	Yes
Habitats within existing pit	Mixed broadleaved/conifer woodland WD2	Local importance (Lower value)	Yes	Yes
	Immature Woodland WS2/Scrub WS1	Local importance (Higher value)	Yes	Yes
	Recolonising Bare ground ED3	Local importance (Lower value)	Yes	Yes
	Other artificial lakes and ponds FL8	Local importance (Lower value)	Yes	Yes
	Buildings and artificial surfaces BL3	Local importance (Lower value)	Yes	Yes
	Active quarries and mines ED4	Local importance (Lower value)	Yes	Yes
	Wet Grassland GS4	Local importance (Higher value)	Yes	Yes
Flora	Sphagnum mosses	Local importance (Higher value)	Yes	Yes
Mammals	Bats (Soprano Pipistrelle)	Local importance (Higher Value)	Yes	Yes
	Otter	Local importance (Lower Value)	Yes	Yes
	Badger , Hedgehog, Red Squirrel, Red Deer, Irish Stoat, Pine Marten, Pygmy Shrew	Negligible	No	No
	Irish Hare	Local importance (Higher value)	Yes	Yes
Amphibians	Common Frog	Local importance (Higher Value)	Yes	Yes
Reptiles	Common Lizard	Local importance (Lower Value)	Yes	Yes
Birds	Hen Harrier (Annex I species)	Local importance (Higher Value)	No	Yes
	Meadow Pipit, Skylark, Snipe, Willow Warbler, Swallow (BOCCI)	Local importance (Higher Value)	Yes	Yes
	Other breeding birds (Several)	Local importance (Higher Value)	Yes	Yes
Aquatic	Fish species	Local importance (Higher	Yes	Yes

species		Value)		
Other species	Invertebrates	Local importance (Higher Value)	Yes	Yes

5.6 Impacts on the Proposed Development

The proposed works require the removal of peat, overburden and aggregates from the proposed extension at Knocknaboola i.e. Construction phase (**Section 0**). The operational phase of the application will include and the continued use of the existing pit at Rangue for processing of aggregate as well as the production of aggregate within the proposed extension site at Knockaboola (**Section 0**).

5.6.1 Construction Phase – Extension Area

In the absence of mitigation measures, construction phase impacts have the potential to remove a range of habitats and disturb or displace protected species for the duration of construction. Significant potential impacts on biodiversity include habitat loss, noise and visual disturbance (including lighting) of protected fauna species, and the potential for suspended solids or other contaminants to be carried into local watercourses.

Habitats

The proposed site layout is shown on Figure 1. The majority of habitats and flora in this area will be removed during the construction phase. Potential impacts on habitats, are included in **Table 13**. It should be noted that the value of a habitat is site specific and will be partially related to the amount of that habitat in the surrounding landscape. The classification scheme, used in **Table 10** and **Table 11** for the value of habitats and the impacts on them, is detailed in the NRA publication *Guidelines for assessment of ecological impacts of National Road Schemes* (**Appendix 5.1**). Predicted impacts on habitats within the proposed extension area the absence of mitigation are detailed in **Table 13**. Impacts on habitats within the existing pit are detailed in **Table 14**.

These species were recorded within Wet Heath HH3 and will be removed from the extension area during construction phase of the proposed development. In the absence of mitigation, wind-blown dust could potentially impact on sensitive habitats adjoining the site.

Table 13. Impacts on Habitats within the Proposed Extension Area in the absence of mitigation

Habitat	Ecological value	Impact
Drainage ditches FW4	Local importance (Lower value)	Most of this habitat will be removed as part of the proposed development. Negative, slight, long-term at local level.
Eroding river FW1/Depositing river FW2	Local importance (Lower value)	There will be no direct impacts on this habitat. Indirect impacts are discussed in **Section 0** No impact
Improved agricultural grassland GA1	Local importance (Lower value)	This habitat will be removed as part of the proposed development. Negative, not significant, long-term at local level.

Habitat	Ecological value	Impact
Wet grassland GS4	Local importance (Higher value)	Most of this habitat will be removed as part of the proposed development. Negative, slight, long-term at local level.
Wet heath HH3	Local importance (Higher value)	Most of this habitat will be removed as part of the proposed development. Negative, slight, long-term at local level.
Dense bracken HD1	Local importance (Lower value)	Most of this habitat will be removed as part of the proposed development. Negative, not significant, long-term at local level.
Lowland blanket bog PB3	Nationally important	Approximately 10% of this habitat will be removed as part of the proposed development. The remainder of this habitat will be retained as part of preserved area of habitat within the landholding (See **Figure x**). Negative, moderate, long-term at a local level and not significant at a national level
Cutover bog PB4	Local importance (Higher value)	Most of this habitat will be removed as part of the proposed development. An area of this habitat will be retained as part of preserved area of habitat within the landholding. Negative, slight, long-term at local level.
Bog woodland WN7/Scrub WS1	Local importance (Higher value)	Most of this habitat will be removed as part of the proposed development. An area of this habitat will be retained as part of preserved area of habitat within the landholding . Negative, slight, long-term at local level.
Immature woodland WS2	Local importance (Lower value)	Most of this habitat will be removed as part of the proposed development. An area of this habitat will be retained will be retained as part of preserved area of habitat within the landholding. Negative, not significant, long-term at local level.
Spoil and bare ground ED2	Local importance (Lower value)	Most of this habitat will be removed as part of the proposed development. Negative, not significant, long-term at local level.

Table 14. Impacts on habitats within existing pit in the absence of mitigation

Habitat	Habitat value (NRA 2009)	
Mixed broadleaved/conifer woodland WD2	Local importance (lower value)	This habitat will be maintained. These were previously planted as part of a reinstatement and landscaping programme. No impact.
Immature Woodland WS2/Scrub WS1	Local importance (higher value)	This habitat will be maintained as part of the restoration plan for the Riordan's site. Positive, slight, long-term at a local level. This habitat will be removed within the factory site. Negative, slight, long-term
Recolonising Bare ground ED3	Local importance (lower value)	This habitat will be maintained as part of the restoration plan for the Riordan's site. Positive, slight, long-term at a local level. This habitat will be removed within the factory site. Negative, not significant, long-term
Other artificial lakes and ponds FL8	Local importance (lower value)	Parts of this habitat will be maintained as part of the restoration plan for the Riordan's site. Positive, slight, long-term at a local level. This habitat will be maintained for surface water management within the factory site. Neutral impact.
Buildings and artificial surfaces BL3	Local importance (lower value)	This habitat will be maintained within the factory site. Neutral impact.
Active quarries and mines ED4	Local importance (lower value)	This habitat will be maintained within the factory site. Neutral impact.
Wet Grassland GS4	Local importance (higher value)	This habitat will be maintained for surface water management within the factory site. Neutral impact.

Invasive Species

The non-native third schedule species Rhododendron was recorded within bog woodland WN7/Scrub WS1 habitat within the proposed extension area. Giant Rhubarb was also recorded in a scattered distribution at the existing pit. These species are listed is a Third Schedule species under SI 477 of 2011. These species have been shown to have an adverse impact on landscape quality and native biodiversity or infrastructure.

Under the right ecological condition, Rhododendron can become highly invasive and once

Rhododendron has invaded an area, few native plants survive. Within the Killarney National Park this species causes severe ecological issues. Rhododendron can regenerate via seeds, suckers or rootlets. It forms extensive dense thickets which cast a very deep shade, leading in woodland to loss of ground flora, epiphytic bryophytes and lichens, modifying the fauna and preventing regeneration of trees. In addition to the effect of shade, it may produce biochemicals which can affect other plants, inhibiting the germination or seedling establishment of other species. There is also evidence for the prevention of mycorrhizal development in the roots of seedlings of competing plant species. R. ponticum is identified as a serious threat to upland oakwood. It is also identified as a threat for several lower plants and fungi including *Acrobolbus wilsonii, Arthothelium macounii* and *Lejeunea mandonii.*

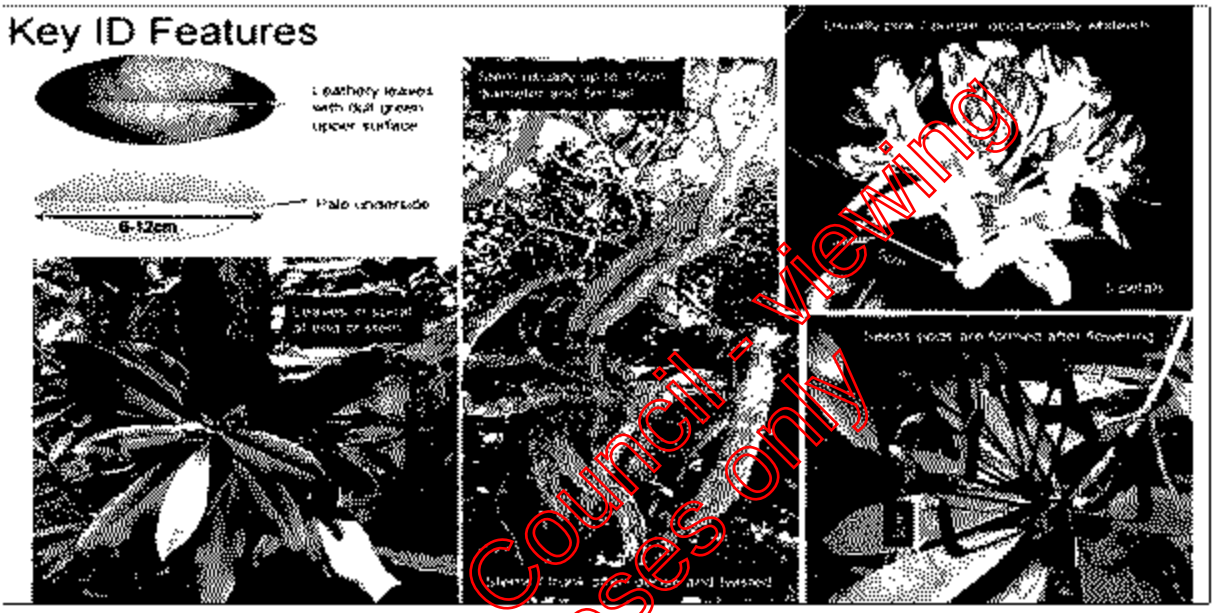


Figure 7. Key Features of Rhododendron

Giant Rhubarb is a large perennial plant that is an introduced species that has become invasive in the west of Ireland. It can grow up to 2 m tall with leaves of up to 2 m in diameter. It is a rhizatomous plant with the rhizomes of mature plants can be up to 1.5-2 m long growing above ground. It is deciduous with the leaves dying off in autumn (October) leaving the large brown rhizomes exposed. Growth starts in early spring (March), prior to the emergence of native species. It can reproduce by both sexual (seed) and asexual (vegetative) means. Inflorescence development occurs early in the spring, with the fruits maturing in late summer/early autumn. Large numbers (up to 250 000 seeds per mature plant) of drupe like, red or orange seeds are produced. Small fragments of the rhizome have the potential to establish new plants. The characteristics of this species is shown **in Figure 8**.

Giant Rhubarb threatens indigenous biodiversity. Once established, it can quickly develop large and dense colonies and due to its wide leaf span, it can have a dramatic impact on the local biodiversity by light exclusion and halt natural succession. On rivers it causes erosion to banks, exposing them to fast running water after die-back in winter. Giant Rhubarb growth may also lead to the blockage of drainage channels and increase risk of flooding. The plant is shade tolerant so it may colonise in a variety of landscapes e.g. grassland, waterways, roadsides, quarries, bog, heath, coastal cliffs and especially old former agricultural fields.

The likely vectors of spread for Giant Rhubarb are waterways, birds, and by anthropogenic activities such as the clearing of ditches, road building, and movement of soils for housing development. As Giant Rhubarb is found to thrive in quarries it can easily spread into new areas through the transport of aggregates. The majority of the seeds are dispersed near the parent plant, but some may be

transported along waterways or are possibly eaten by birds, which can further aid seed dispersal. Giant Rhubarb can also regenerate from root fragments, leaf cuttings and rhizomes. Once a small fragment of rhizome becomes established, it can extend by 15cm a year.

Figure 8. Key Features of Giant Rhubarb

Mammals

Bats

No buildings are present within the proposed extension area and buildings within the existing quarry are not of value for roosting bats. No trees with significant potential to support bats were recorded within the proposed extension area boundary. While direct impacts to bat roosting sites will be avoided, the removal of vegetation and bog habitat will result in a reduction in foraging resources within the site. Linear features along the site boundary as well as bog habitats at the centre of the site have moderate suitability as foraging/commuting areas, to link roost sites to foraging areas and facilitate the dispersal of bats into the wider landscape. Large numbers of Soprano Pipistrelle were recorded foraging within the extension area. During construction most of these habitats will be removed. In the absence of mitigation, the construction phase of the proposed development will result in the long-term loss of moderate value bat foraging and commuting habitat. However, given the availability of similar habitat in the immediate vicinity, there is unlikely to be any fragmentation impacts or loss of connectivity within the wider landscape.

Noise and lighting during construction has the potential to significantly impact on foraging habitats of Soprano Pipistrelle. Construction works within the extension area will be confined to daytime hours and therefore disturbance from lighting will be minimal. Bat foraging in adjacent habitats may also be disrupted by increase disturbance and lighting. Lighting deters some bat species, in particular Myotis species, from foraging. No Myotis species were recorded within the site. Pipistrelle species appear to be more tolerant of light and disturbance (Speakman 1991; Stones et al. 2009; Haffner 1986).

Overall, the loss of semi-natural habitat and increased lighting and disturbance during construction and operation will reduce the feeding area available for bats. The impact on foraging bats will be negative, moderate and medium term at a local geographic level.

Otter

No signs of Otter were recorded within 150m of the proposed extension area or the existing site. There is no evidence of Otter usage on the Glashacoomnafanida Stream adjacent to the site, (or onsite drainage ditches) and given its limited size and seasonal flows of this watercourse is unlikely to be a critical foraging resource for Otter. Construction works in the extension area could potentially indirectly affect fish stocks downstream via impacts on water quality. However, it is noted that this stream adjacent to the proposed extension area has limited potential for fish as it is dry during the summer months. It is not a significant source of prey for Otter. Potential impacts on surface water and fish species is discussed in further detail in **Section 0**. Common Frog were recorded within the proposed extension area, and may provide prey for Otter. While frogs use the proposed extension area, it is noted that wet grassland and wet heath habitats are locally common and common Frog are likely to continue to use alternative habitats in the vicinity of the proposed development site. However, Common Frog are unlikely to use the proposed extension area in significant numbers following habitat removal.

During the construction phase noise levels will increase. No blasting is required. However it is noted that there are no holts in the vicinity of the proposed development site and no potential for significant vibration impacts to breeding habitat. It is noted that construction works will primarily take place during daytime hours which will avoid the largely nocturnal foraging habits of Otter. While there may be some short-term displacement of Otter, increased noise and disturbance during the construction phase is unlikely to significantly impact on Otter due to their ability to move away from and/or adapt to short-term disturbance.

Overall, it is expected that effects on Otter will be negative, not significant and temporary at a local geographic level in the absence of mitigation.

Other mammals

The only other protected mammal species (Wildlife Act 1976 (as amended)) which was recorded within the proposed development site was Irish Hare. The habitats to be affected are common and there is no evidence to indicate that the proposed development site is of particular value for these species in the context of the surrounding countryside. Effects on these Irish Hare during construction due to loss of habitat, increased noise and disturbance and lighting are predicted to be negative, not significant and temporary at a local geographic level in the absence of mitigation.

Amphibians and Reptiles

Amphibians

Moderate numbers of Common Frog are likely to utilise wet grassland and wet heath habitat within the proposed development site. Construction works could lead to habitat loss and in the absence of mitigation, direct mortality or injury during vegetation clearance will occur. The impact on this species during construction will be negative, moderate and long-term at a local geographic level.

Reptiles

Common Lizard was recorded within the extension area on one occasion. In the absence of mitigation, construction works will lead to habitat loss and could result in direct mortality or injury during vegetation clearance. The impact on this species during construction will be negative, slight and long-term at a local geographic level.

Birds

The most significant impacts on breeding birds will be direct impacts during the construction phase through habitat loss, fragmentation and modification. Most of the bog, heath, scrub, woodland and grassland within the extension area will be lost during the construction phase. This will result in loss of connectivity with the wider environment, as well as loss of habitat for birds.

During the construction phase it is expected that there will be indirect impacts with considerable disturbance of the site. This is likely to displace foraging and breeding birds from the extension area. During construction works, noise levels will fall off quickly outside the site boundary even during peak construction works. Although the habitats within the site are valuable, they are common in the immediate vicinity of the site. Given the mobile nature of birds, and given that similar habitats occur in the immediate vicinity, the impact from disturbance will be moderate during the construction phase at a local level.

Several territories of breeding birds of conservation concern including the Red List species i.e. Meadow Pipit and Snipe, as well as Amber List species Skylark and Willow Warbler will be removed during the construction phase. While displaced birds are likely to use alternative grassland/bog/heath habitats in the vicinity, intensification of agriculture and the loss of suitable grassland and heath habitats is a significant threat to these species. In the absence of mitigation, potential impacts include disturbance and injury to eggs, young and nests, and long-term loss of potential nesting sites and foraging habitat. However, as noted in **Table 13**, most of the lowland blanket bog habitat and some cutover bog within the proposed extension area will be retained as part of the preservation area. This will maintain potential foraging and breeding habitat for several species including Skylark, Meadow Pipit and Snipe. While there will be a reduction in foraging/nesting habitat for breeding birds of conservation as a result of construction works, the retention of areas of potentially valuable habitat for local bird populations means overall the impact on breeding birds of conservation concern is likely to be negative, slight and long-term at a local level.

The Annex I species Hen Harrier could also potentially forage within the proposed extension area. No signs of breeding activity within or in the immediate vicinity of the proposed extension area was recorded. The closest Hen Harrier SPA is the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, which is located approximately 28km northeast of the site. Breeding Hen Harriers in Ireland have been reported to travel over 11km from an active nest, via GPS tracking (Irwin *et al.* 2012), and males in Scotland have been observed travelling up to 9km from nests (Arroyo *et al.* 2014). However, typical foraging ranges are reported to be much smaller and the intensity with which suitable foraging areas are used declines with distance from the nest or roost site to which individuals return (Arroyo *et al.* 2014). While the proposed extension area is likely to form part of the foraging territory of Hen Harrier, given the large size of Hen Harrier foraging territory the loss of this habitat is not likely to have a significant impact on Hen Harrier. Hen Harrier are likely to continue to forage within the retained bog habitat at the proposed extension area. On the basis of short-term disturbance and loss of a relatively small area of foraging habitat, the impact on Hen Harriers, which forage within but breed outside the site, is likely to be negative, not significant and short-term at a local level.

Several territories of many common Green List bird species (Blackbird, Robin, Wren etc) will be removed. In the absence of mitigation, potential impacts include disturbance and injury to eggs, young and nests, and long-term loss of potential nesting sites and foraging habitat. The impact on Green List bird species will be negative, imperceptible, and long-term at a local level.

Other Species

Terrestrial invertebrates

The habitats to be affected support common species of invertebrates and there is no evidence to

indicate that the proposed development areas are of particular value for other species in the context of the surrounding countryside. No significant effects on other species have been identified.

Aquatic species (downstream)

In the absence of appropriate design and mitigation, high levels of silt in surface water run-off from the active quarry could theoretically impact on fish species in the Glashacoomnafanida Stream (and downstream within the Keal Stream) and Castlemaine Harbour SAC/SPA. It is noted that additional information on potential impacts on water quality is provided in Chapter 6 (EIAR Volume 1). If of sufficient severity, adult fish could theoretically be affected by increased silt levels as gills may become damaged by exposure to elevated suspended solids levels. Excessive siltation can cause eggs and fry to be smothered. If of sufficient severity, aquatic invertebrates may be smothered by excessive deposits of silt from suspended solids. In areas of stony substrate, silt deposits may result in a change in the macro-invertebrate species composition, favouring less diverse assemblages and impacting on sensitive species. Aquatic plant communities may also be affected by increased siltation. Submerged plants may be stunted and photosynthesis may be reduced. Inadvertent spillages of hydrocarbons during operation could introduce toxic chemicals into the aquatic environment via surface water run-off or groundwater contamination and have a direct toxicological impact on habitats and fauna.

It will continue to be necessary to pump groundwater and surface water from the southern pond at the Rangue site in order to control the water table level in the winter, and intermittently during rainfall events in the summer, and to provide water for concrete production. There is a high risk that a pollution incident could impact the pond before being pumped off site and impacting the Glashacoomnafanida Stream. This is a significant, likely and temporary impact. To date, no reported pollution of the Glashacoomnafanida stream has taken place, and there has been no reported impact on the downgradient SAC. Discharge of water from the site is subject to the conditions of discharge licence W61.

The removal of peat, the low permeability iron pan, and subsoil during the construction phase of the proposed extension at Knocknaboola will expose the underlying and (usually) more permeable sand and gravel subsoil. This will result in increased percolation of effective rainfall to groundwater, in turn reducing runoff from the site to the Glashacoomnafanida Stream. Quarrying from the proposed extension will remove less than 1% of the land area contributing rainfall runoff to the Glashacoomnafanida Stream and the downstream. Water budget calculations (Appendix 7.3) indicate that the impact of this will be an imperceptible, neutral and permanent impact on the Castlemaine Harbour SAC.

Removal of peat and upper subsoil layers on more elevated areas of the proposed extension site will expose subsoil to erosion and is likely to lead to an increase in sediment laden runoff reaching surface water during the construction phase of the proposed extension. Disturbance of the peat cover on this site could lead to water with high suspended peat content entering the surface drainage network. In the absence of mitigation, peat entering the watercourse could have a negative, significant and long-term effect on local water quality and aquatic receptors downstream.

The construction of the proposed extension will not increase flood risk downstream of the quarry as no removal of aggregate will take place below the water table, and no pumping of groundwater to the surface drainage network will take place from the proposed extension area.

5.6.2 Operational Phase – Extension Area

The proposed development would be operational 0700 and 1900 Monday to Saturday inclusive. In the absence of mitigation measures, significant operation phase impacts could include light spill onto retained vegetation/valuable habitats within and outside the site boundary used for feeding or breeding by protected species. Disturbance to protected species could occur from noise or vibration

associated with traffic and human use of the operational site. It is noted that the proposed development is highly unlikely to give rise to perceptible groundborne vibration, and vibration is not typically associated with sand and gravel quarries.

Habitat loss within the proposed extension area has been considered above in **Section 0,** as the majority of habitats will be removed during the construction phase. Habitats within the existing aggregation production factory and Riordan's Sand and Gravel Pit are considered below as their management forms part of the operational/reinstatement phases at the Quirke's site. It is noted that extraction will cease at the Riordan's Quarry site in 2022.

Habitats

Riordan's Quarry is exhausted and its planning permission ceases by 2022. Restoration and landscaping at this site has been ongoing within the extraction area and this will continue after permission ceases. This site, which is 11ha in area, will be restored with a mix of native trees, shrub and grassland habitat which will provide nesting and foraging habitat for birds, as well as foraging habitat for bats and other mammals and invertebrates. Aquatic habitat within this area will also be retained. This currently provides foraging habitat for Mute Swan, Mallard and Moorhen. Once activity ceases within the existing quarry, the habitat suitability for Small Cudweed is likely to deteriorate. A specific management plan for this species will therefore be incorporated into the final restoration plan based on the prevailing conditions at time of closure.

In the absence of mitigation, wind-blown dust could potentially impact have a negative, slight and short term impact on sensitive habitats adjoining the site.

Mammals

Bats

Increased activity and human presence, noise and artificial lighting may impact and disturb or displace bats during the operational phase of the proposed development, including light spill onto previously unlit habitats. Within the proposed extension area, where habitats have been removed, bats are unlikely to forage during operation. However, bats may continue to forage within retained areas of blanket bog and cutover bog along the western boundary of the extension area.

Lighting deters some bat species, in particular Myotis species, from foraging. No Myotis species were recorded within the site. Pipistrelle species, which were recorded foraging at the site, appear to be more tolerant to light and disturbance (Speakman 1991; Stones *et al.* 2009; Haffner 1986).

Extraction operations will be conducted during daytime, therefore lighting requirements during the operational phase will be minimal and largely confined to security lighting. While some lighting may be required during the daytime winter months, this will not impact on bats as they hibernate during this period. Bats are likely to continue to forage in dark areas on the margins of the site, although in smaller numbers that previously.

No significant operational lighting will be required and during operation the impacts on bats is predicted to be negative, slight and long-term.

Otter

Increased activity and human presence, noise and artificial lighting may impact and disturb or displace Otter during the operational phase of the proposed development, including light spill onto previously unlit boundary habitats. Badly designed lighting could displace Otter from nearby habitats and create a barrier to connectively in the wider area.

During the operational phase noise levels will increase. Noise modelling for the operational phase predicts that even at the closest receptors, will be lower than the 55dB (Refer to **Chapter 8 Noise and vibration (EIAR Volume 1)**. It is noted that construction works will primarily take place during daytime hours which will avoid the largely nocturnal foraging habits of Otter. Therefore, noise levels outside the site boundary will not significantly impact on Otter. Lighting of the site during operation will be minimal and will not impact significantly on any Otter using the site.

Overall, it is expected that effects on Otter will be negative, not significant and long-term at a local geographic level in the absence of mitigation.

Other Mammals

Increased activity and human presence, noise, fencing and additional lighting may disturb or displace other mammal species such Irish Hare from favoured foraging habitats during the operational phases of the proposed development. However, given the availability of similar habitat in the vicinity and the mobile nature of these species, potential impacts on other mammals during operation are predicted to be negative, slight and long-term at a local level.

Amphibians and Reptiles

Amphibians

Wet grassland and wet heath habitat, where Common Frog has been recorded, will absent from the extension area during operation. In the absence of mitigation there will be no suitable habitat for Common Frog within the site. However, it is noted that these habitats are locally common and frogs

are likely to use alternative habitat in the absence of mitigation. The impact on this species will be negative, slight and long-term at a local geographic level.

It is noted that settlement ponds at the existing pit will be retained within the factory site and these may provide potential habitat for Smooth Newt and Common Frog. This habitat will be retained.

Reptiles

Heath habitat, where Common Lizard was recorded, will absent from the site during operation. In the absence of mitigation habitats for Common Lizard within the site will be limited. However, it is noted that these Common Lizard will use a range of habitats including woodland and heath and are likely to use alternative habitat in the absence of mitigation. The impact on this species will be negative, slight and long-term at a local geographic level.

Birds

Following habitat removal during construction a number of Red List species i.e. Meadow Pipit and Snipe, as well as Amber List species i.e. Skylark and Willow Warbler will be displaced from parts of the proposed extension area. It is noted there is currently no grassland habitat suitable for these species within the existing pit. There will also be a loss of habitat for common bird species which use the extension area, as scrub and bog woodland habitats will be absent from most of the site during operation. However, grassland birds in particular, as well as foraging Hen Harrier are likely to continue to use the habitat preservation area to the west of the proposed extension area during the operational phase.

Visible human presence in previously undisturbed areas and increased noise and lighting may prevent birds from nesting or foraging in retained habitats within or adjacent to the site. In areas where nesting habitat is retained within the site e.g. boundary woodland and scrub, operational lighting may impact on breeding birds. During operation lighting will largely be confined to daytime hours and no significant ongoing disturbance to habitats within or on the edge of the proposed extension area is predicted to occur.

The impact on birds of conservation concern which breed within the site is likely to be negative, slight and long-term at a local level due to disturbance and/or displacement of bird species including Meadow Pipit, Skylark, Swallow and Willow Warbler.

The impact on birds of conservation concern which forage within but breed outside the site is likely to be negative, not significant and long-term at a local level due to disturbance and/or displacement i.e. Hen Harrier.

The impact on common bird species is likely to be negative, slight and long-term at a local level due disturbance and/or displacement.

Other species

A number of potential impacts on surface water during operation were considered in Chapter 6 of this EIAR. During extraction the reduction in surface water drainage to the Glashacoomnafanida stream (as water will be diverted to the pit void) will not have a significant impact on flows within the stream or on local groundwater flows.

Given all surface drainage from the proposed extraction area within the extension site will be directed into the pit void, and there will be no risk that sediment laden runoff will discharge to the Glashacoomnafanida Stream. This is a positive, slight and long term impact on local water quality. Therefore during operation the potential impact of surface water runoff on aquatic receptors downstream will not be significant.

No significant impacts on other species during the operational phase have been identified.

5.6.3 Decommissioning Phase

Implementation of the quarry restoration plan during decommissioning will ultimately allow the site to be returned to a condition whereby there will be a negligible/imperceptible residual impact on the surrounding environment. It is expected that it would be a condition of the planning permission for the proposed development that a closure and residuals management plan, including a detailed decommissioning plan, be submitted to the local authority for their approval.

Decommissioning activities will include, as a minimum:

All wastes at the facility at time of closure will be collected and recycled or disposed of by an authorised waste contractor, as appropriate;

- Utilities will be drained of all potential pollutants such as lubricating oils or sealed to prevent leakage if being moved offsite or recused elsewhere;
- All raw materials, oils, fuels, etc. onsite at the time of closure will be returned to the supplier, or collected and recycled or disposed of by an authorised waste contractor, as appropriate,
- All buildings and equipment will be decontaminated, decommissioned and demolished in accordance with a phased demolition plan, and either sold for reuse or recycled, or disposed of by an authorised waste contractor, as appropriate. In general, specialist equipment, pipelines and storage tanks will be sold for reuse, where possible, or disposed of offsite;
- Roadways to be broken up and removed and security fences dismantled;
- All hazardous and non-hazardous process substances to be removed;
- All roads and hardstanding areas to be removed and recycled or disposed of by an authorised waste contractor, as appropriate;
- Landscaped will be reinstated in accordance with a landscape reinstatement plan; and
- On completion of safe decommissioning of equipment, the potable water, fire water and electrical power supplies could be disconnected, and removed or abandoned in place.
- When operations have ceased, and assuming confirmation from the monitoring programme that all emissions have ceased, it is expected that there would be no requirement for long-term aftercare management at the Proposed Development site.

A restoration plan for the quarry and proposed extension area will be prepared prior to decommissioning. Successful reinstatement programme will include as much naturally colonising vegetation as possible, as such vegetation (a) allows a head start, (b) reflects the native flora and (c) provides local flora and fauna banks to enhance ecological value.

Allowing the quarry to develop native vegetation, via natural colonisation from species in the surrounding landscape, will allow a diverse range of species and habitat to develop. This is in turn will support a range of fauna included invertebrates, birds and mammals. An updated and detailed management plan will be prepared prior to closure.

The applicant will clearly define the management responsibility for the site restoration work. The supervising ecologist will draw up a management plan for the aftercare of the site following closure.

Once activity ceases within the existing quarry, the habitat suitability for Small Cudweed is likely to

deteriorate. A specific management plan for this species will therefore be incorporated into the final restoration plan based on the prevailing conditions at time of closure.

A survey for invasive species and in particular Rhododendron and Giant Rhubarb will be carried out prior to closure and a site-specific invasive management plan will be prepared and implemented if required.

Sand martin nests within the existing quarry and vertical sandy faces will be identified by the supervising ecologist which are suitable for nesting. These faces will be preserved.

During decommissioning, measures would be undertaken by the Applicant to ensure that there would be no significant, negative environmental effects during the decommissioning phase. The decommissioning plan would incorporate measures to satisfy all regulatory requirements and to achieve targeted environmental goals. The decommissioning measures would have to be implemented to the satisfaction of the local authority/EPA. As the site of the proposed development is generally of relatively low habitat and species value, the impact of decommissioning will be temporary and not significant following the implementation of standard mitigation measures.

5.6.4 Do-Nothing Scenario Impact

Most of the habitats within the existing pit have been significantly modified from the natural state by human activity. Some encroachment of scrub and bracken is occurring in areas that are being recolonised by vegetation and in areas that have been left unmanaged. The general pattern of succession from scrub with patches of grassland to woodland would be expected to continue. If sufficient time elapsed without development, the unused areas of the site would be expected to develop a covering of woodland with a mix of native and introduced species. If left untreated, Rhododendron and Giant Rhubarb will continue to spread at a slow but cumulative rate.

Areas of natural habitat i.e. Cutover bog and Wet heath are present at the site and these will remain largely intact in the absence of development. In the absence of development, it is expected that the small areas which are currently managed for agriculture (pasture) would remain under the same management regime. No significant changes to the boundary habitats are likely to occur.

5.7 Mitigation

5.7.1 Construction phase Mitigation

The mitigation measures have been drawn up in line with current best practice. It is clear that the mitigation measures are designed to achieve a lowering or reducing of the risk of impact to acceptable levels. The likely success of the proposed mitigation measures is high, either in their current form or as they will be adapted on-site to achieve the desired result.

Whilst the proposed methods of mitigation may be amended and supplemented, the risk that the mitigation measures will not function effectively in preventing significant ecological impacts is low. The following mitigation measures will be implemented during the construction phase.

Habitats

A berm will be maintained along the eastern boundary adjacent to Glashacoomnafanida Stream and a silt fence will be provided between this berm and the stream.

To prevent incidental damage by machinery or by the deposition of spoil during the site clearance stage, any habitats earmarked for retention will be clearly marked in a manner visible to machinery operators.

Overburden will only be stripped as required to minimise the amount of bare soil at any given time. This reduces the risk of air blown dust impacting on vegetation, reduces the potential or elevated silt levels in surface water run-off and maintains semi-natural habitats in place as long as possible. Where possible stripping of overburden will take place during dry weather.

During the construction phase of the proposed extension, shallow peat, where present, will be excavated and largely removed from the excavation area of the site and stored for reuse during quarry restoration. The impact on soils is considered to be of a temporary nature as they are stored for re-use directly within the worked out areas as a fundamental part of the proposed rehabilitation.

Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped, as appropriate, once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary. Any new planting for landscape purposes will be predominantly of native species.

Riordan's Quarry is exhausted and its planning permission ceases by 2022. Restoration and landscaping at this site has been ongoing within the extraction area and this will continue until and after permission ceases. This site, which is 11ha in area, will be restored with a mix of native trees, shrub and grassland habitat which will provide nesting and foraging habitat for birds, as well as foraging habitat for bats and other mammals and invertebrates. Aquatic habitat within this area will also be retained. This currently provides foraging habitat for Mute Swan, Mallard and Moorhen. A detailed management plan will be developed to protect Small Cudweed where it occurs within the site.

Invasive Species

To prevent Rhododendron, Giant Rhubarb or other invasive species being spread around the site or being inadvertently being brought into the site, the contractor will be required to inspect vehicles before using them on site. Herbicides will only be used in line with manufacturers recommendations and shall take into account the need to avoid impacts on aquatic receptors or adjoining habitats.

A survey for invasive species will be carried out prior to the commencement of works. This is to confirm the extent of infestations as identified by invasive species surveys to date, and to determine whether any new infestations have established in the intervening period.

Prior notification will be given to all contractors that parts of the site are contaminated with Rhododendron and Giant Rhubarb and that they must adhere to this protocol to avoid the spread of the plant within and more importantly, outside of the works area. This includes any site investigation works in advance of commencement of excavation works.

All stands of Rhododendron and Giant Rhubarb will be clearly delineated with hazard tape in a manner visible to machine operators prior to the commencement of works.

Appropriate signage will be put in place to deter any entrance by people or machinery into the areas within which the Rhododendron and Giant Rhubarb is growing.

Only vehicles required for the works within the contaminated works area should be brought on site and the number of visits minimised as much as practicable. Vehicle movements within this area should be kept a minimum. A specialised wash down area will be created for machinery and footwear. All machinery and equipment (including footwear) should be power washed prior to leaving the contaminated works area within this wash down area. They should also be visually checked for clods of soil, bits of vegetation etc. and particular care is required with tracked machinery. This wash down area will be located in close proximity to existing stands and the wash down area will be included in the post-works treatment programme for Rhododendron.

If and where contaminated soil or heaps of high-risk invasive species (i.e. Rhododendron/ Giant Rhubarb) are to be stockpiled, the area will be clearly marked out on site. These areas will not be within 20m of any watercourse or flood zone.

Post development any Amber Listed invasive species remaining on the site will be treated via a standard herbicide programme.

The following mitigation measures will be implemented to prevent the spread of Rhododendron during the construction phase.

Management of Rhododendron

The eradication of Rhododendron from an infested habitat can only be carried out effectively by understanding the ecology of the species and by strategically planning the clearance work. In order to rid a habitat of Rhododendron, a number of steps should be followed, including cutting all standing Rhododendron and killing the stumps by uprooting or herbicide treatment. All habitats cleared of Rhododendron must be regularly and systematically re-visited to remove any seedlings that have germinated and become established. Appropriate guidelines are provided in *The Control of Rhododendron in Native Woodlands (Native Woodland Scheme Information Note No. 3)* and Higgins, G.T. (2008) *Rhododendron ponticum: A guide to management on nature conservation sites. Irish Wildlife Manuals, No. 33.*

Cutting and removal

The first operation in clearing Rhododendron is the cutting of individual stems with hand or chainsaws. Stems will be cut as close to the ground as possible. The cut material will be removed from the area to allow for effective follow-up work. If the terrain and layout of the woodland are suitable, the material can be used to build a "dead hedge" around the area as a barrier to exclude grazing animals. Burning under the supervision of personnel with fire experience is another option. Rhododendron material can be burnt green immediately after being cut. Fires should be carefully located so as not to damage any trees or other vegetation close by, and old tyres or diesel should not be used. If burning is not an immediate option, the cut material can be piled neatly outside the treated area, allowing them to be dismantled easily to facilitate burning at a later stage (ideally 1-2 years later).

Where burning is envisaged, contact will be made with the Local Authority to obtain permission. Flailing is another method of Rhododendron clearance. This involves the flailing of the thickets down to ground level, using a mechanical flail head mounted on a tracked machine. Although not suitable on all sites, especially those that are steeply sloping or very wet, it is a very effective as it mulches the material upon contact.

Killing Rhododendron

Some method of killing must be used as Rhododendron invariably grows back vigorously when cut. The following approaches can be considered:

Digging out

Digging the stumps out of the ground is an effective way of killing Rhododendron. Its effectiveness is maximized by removing all viable roots. Digging out can be carried out manually or, if the terrain allows, by machine (e.g. a tractor and chain). To prevent regrowth, as much soil as possible should be knocked off the root system, and the stumps should be turned upside down to expose the roots to the air and to allow the rain to wash off any remaining soil. Stumps that are dug out should be burnt along with the cut material.

This method avoids any use of herbicides. However, the impact to tree root systems and the potential for soil compaction and disturbance caused by the use of machinery in certain habitats means that this option will only be implemented under ecological supervision to minimise inadvertent disturbance of habitats.

Direct stump treatment

Rhododendron kill can be achieved by direct stump treatment, whereby freshly cut stumps are painted or spot sprayed with a herbicide solution. Ideally this should be carried out when rain is not imminent, to avoid the solution from being washed off. Stems are cut as close to the ground as possible, and the fresh stump surfaces treated with herbicide immediately, i.e. within minutes. A vegetable dye is used to clearly identify which stumps

have been treated. Painting of stumps with glyphosate solutions (25-100%) was found to be 100% effective when carried out between May and March at an experimental site in Scotland (Tabbush and Williamson, 1987). This method is regarded as being most effective outside the time of spring sap flow. The following are herbicides (including application rates, methods and timing) used in the control of Rhododendron by stump treatment (after Willoughby and Dewar (1995)).

- Glyphosate: Apply 'Roundup' in a 20% solution in water to all freshly cut stump surfaces using one of the following: a knapsack sprayer at low pressure; a forestry spot gun fitted with a solid stream nozzle; a cleaning saw fitted with a suitable spray attachment; or a paint brush. Best results can be obtained during the period October to February.

- Tryclopyr: Apply 'Garlon 4' in an 8% solution in water using one of the following: a knapsack sprayer at low pressure; a forestry spot gun fitted with a solid stream nozzle; a cleaning saw fitted with a suitable spray attachment; or a paint brush. Apply at any time between cutting and the appearance of new growth.

- Ammonium sulphamate: Apply as a 40% solution between April and September. Optimum control resulting from treatments applied between June and September. Surfactant additives are not appropriate for stump application. It is important to ensure that all cut surfaces are treated. In Ireland, trials in Killarney using stump treatment resulted in extremely successful kill rates among a range of plant sizes throughout all months of the year. Chemical concentrations from 10% to 20% have been used effectively and further trials are ongoing.

A major advantage of stump treatment is that all initial clearance work can be carried out in a single sweep. Also, as the application of the herbicide is carried out with a handheld applicator, spray drift is avoided and the impact to the surrounding non-target area is minimal. In addition, small volumes of herbicide are used. Although stump treatments can result in total kill, regrowth from the cut stumps can occur. This regrowth is usually slow and stunted. Carefully timed foliar application of herbicide to the regrowth will subsequently achieve full kill.

Spraying of regrowth and large seedlings

Stumps and large seedlings (less than 1.5 m in height) can be effectively killed by spraying the regrowth with a suitable herbicide. Success is dependent on the plants being dry at the time of herbicide application and remaining dry for a sufficient time thereafter to allow the herbicide to be absorbed into the plant (at least 6 hours, preferably longer). The addition of a surfactant (e.g. Mixture B) can increase the rate of herbicide absorption and reduce the amount of 'dry-time' required after foliar herbicide application. Surfactants are often more environmentally damaging than the herbicides themselves and must be used with great care, especially adjacent to aquatic habitats. Spraying should be carried out in near windless conditions, to maximise herbicide contact and absorbance of the chemical into the plant. Conversely, spraying in windy conditions should be avoided at all costs, as this will lead to herbicide drift, resulting in 'collateral damage' which will kill nearby native flora, including herbaceous species and young regenerating trees. This delays the establishment of a ground cover and facilitates further Rhododendron establishment.

It is important to ensure at all times that chemical solutions do not enter watercourses, as this can have a severe impact on the aquatic habitat and on aquatic life. At all times, adhere to best practice regarding safety and environmental protection, as set out in the manufacturer's guidelines, Ward (1998), and the Forest Service Forestry and Water Quality Guidelines and Forest Protection Guidelines. As spraying is not 100% effective, some plants may require two or more applications before they are killed. Since cut stumps generally produce multiple shoots of regrowth, delaying the spraying for more than three years after the initial stump cutting can actually result in the infestation becoming even more severe. At this stage, the regrowth is likely to be too tall to be sprayed effectively, forming dense impenetrable thickets. Regrowth is also likely to flower more vigorously than naturally regenerated Rhododendron.

Stem injection

Stem injection, using the 'drill and drop' method (Edwards, 2006), can be used for the control of established Rhododendron bushes, where access to the main stem is possible and where the stem is large enough for a hole to be drilled into it. One of the main advantages of this technique is that it facilitates the controlled application of herbicide to target plants, thereby reducing damage to other flora adjacent to treated bushes. It is a

particularly useful method on difficult, sloping terrain, where other methods may be impractical.

A handheld cordless drill with several re-chargeable batteries and a spot gun are the only tools required. A 25% solution of glyphosate (i.e. 1:3 mix with water) is recommended. No additives are required. Applications during March, April and October have been successful in giving complete control of target bushes. Treated bushes can be left standing on site to rot. However, bear in mind that standing, dead Rhododendron may persist for 10 to 15 years, is unsightly and can inhibit access to the woodland for management operations. Therefore, it may be better to cut and remove the treated bushes at a later date.

The effectiveness of control should be assessed initially every 12 months following the treatment. The main steps involved in stem injection are as follows.

1. Stems to be treated should be greater than 3 cm in diameter. In order to maximise the potential of killing the entire plant, choose a position on the stem as close to the main root system as possible, and at least below the lowest fork.

2. Drill as vertically as possible into the stem to create a hole that will hold the herbicide solution. The drill bit used should be 11-16 mm in diameter, depending on the stem diameter. There is no upper limit to the size of stem that can be treated.

3. Apply the herbicide to the hole immediately after drilling. The recommended amount is 2ml of herbicide solution per stem. Do not allow the herbicide to overflow from the hole. The use of a forestry spot gun with a calibrated 10ml chamber is recommended, as this allows for the accurate application of a calibrated 2ml of herbicide per hole.

4. It is recommended that each plant be marked immediately after treatment, to track progress. Treated plants can be marked with a spray of coloured paint or by attaching coloured biodegradable tape.

5. Applications can be made in light rain, provided that rainwater is not running down the stem into the application hole and washing the herbicide solution out into the surrounding area.

6. Bush death should occur between 9 and 21 months, depending on application date and bush size.

Outline methodology Rhododendron

1. The exact treatment details will be outlined in a detailed management plant prepared by the treatment contractor and supervising ecologist will be finalized prior to the commencement of treatment. The following principles/guidelines will be implemented.

2. The entire site and adjacent area will be surveyed and the level of infestation assessed and mapped prior to the commencement of treatment works.

3. The age, condition and any previous treatments of all stands will be noted and mapped.

4. Areas to be treated will be prioritized. However, the objective is complete removal within the applicant's landholding.

5. A Rhododendron Management Plan will be prepared by the contractor with input from the supervising ecologist. The plan will encompass the entire site and include projections over a suitable timeframe. All work to be carried out in the area should be mapped and clearly dated and detailed in an accompanying schedule, along with a timeframe for follow-up work.

6. Treatment options will follow the following guideline methods:

- Young plants - single stemmed, typically < 10 years old & up to 1m tall
- These plants will be cut off as close to the ground as possible (with secateurs or pruning saw) and the stem treated with herbicide.
- Plants may be pulled by hand, if necessary, loosening the adjacent soil with a mattock or pick axe.

- Foliage will be treated with herbicide.

Isolated plants, typically >10 years old

- The plant may be cut down to the stump, as low to the ground as possible and the stump treated with herbicide.
- If access to the base of the main stems is possible, stem application of herbicide may be used.
- If low growing enough (usually less than 1.5m) foliage may be sprayed with herbicide.
- The plant may be cut to the ground/low stump and regrowth later treated with herbicide.
- The plants may be cut to c. 40cm above ground, each stem broken off from the root and the root treated with herbicide (New method under trial, see p. 28).
- If chemical treatments are not an option, the only alternative method of killing to rootstock is stump extraction. This may be done manually (using a mattock) or mechanically.

Mature stands of dense Rhododendron

- The plant may be cut down to the stump, as low to the ground as possible and the stump may be treated with herbicide.
- If access to the base of the main stems is possible, stem application of herbicide may be used.
- The plant may be cut to the ground/low stump and regrowth later (after c. 18 months) treated with herbicide.
- The plant may be cut to the ground/low stump and regrowth later knocked off and the stump collar treated with herbicide.
- If chemical treatments are not an option, the only alternative method of killing the rootstock is stump extraction. This may be done manually (using a mattock) or mechanically, but the use of heavy machinery on nature conservation sites is often inadvisable.

7. In all sites, follow-up work will be necessary to ensure that any small plants or seedlings which were either missed on the previous visit or have entered the site subsequently from adjacent seed sources, are removed before they reach the flowering age (10-12 years). Ideally remove them when they are c. 0.5 m tall. At this stage, they are more easily seen, and any young seedlings likely to die naturally through desiccation will have done so. The systematic checking for reinfestation is necessary if the area is to be maintained free of seed-producing Rhododendron. Also, reinfestation brought about by poor follow-up will negate the considerable time and cost invested in the initial clearance.

8. The use of track mounted machinery can offer a relatively fast approach to Rhododendron clearance by this method. A fork or bucket can extract either entire standing plants or stumps. This method is not suitable where vehicular access to a site is very difficult, where very steep slopes require clearance and where terrain (e.g. boulders) hinders the movement of machinery around the clearance site. In addition, the disturbance caused by heavy machinery to soil and to tree roots requires consideration and there is also potential for damage to standing trees, although a good operator can often avoid this. Extraction of the rootstock by this method gives good kill, although some regrowth from root fragments may require further treatment. Given that the applicant has access to suitable machinery this is preferred option on areas within the proposed extension area. How usage of this method on areas within the landholding outside the proposed extension area need to be carefully evaluated based on up to date survey results to ensure inadvertent damage of adjacent habitats is minimized.

9. The treatment programme will be carried out by a suitably qualified person who has experience of treating invasive species and will be carried out in line with the herbicide manufacturer's instructions. Site hygiene protocols to prevent spread of this species will be specified by the management plan and will be strictly enforced.

Management of Giant Rhubarb

G. tinctoria is an introduced species that has become invasive in the west of Ireland. Although the exact date of its introduction to Ireland is unknown, Preager first recorded it in the wild in Ireland in 1939 on Achill Island. Pollen analysis suggests that it could have been present on Achill Island for 70-100 years (Hickey and Osborne 1998). This species is currently considered invasive on the west of Ireland. It is not yet invasive in other areas of the country due possibly to climatic and environmental conditions. Of particular concern are impacts associated with peat bog and waterside vegetation as large dense colonies can rapidly dominate and displace important native species. Methods for control are outlined in Armstrong, C., Osborne, B., Kelly, J. and Maguire, C.M. 2009. Giant Rhubarb (Gunnera tinctoria) Invasive Species Action Plan. Prepared for NIEA and NPWS as part of Invasive Species Ireland.

Treatment options

Mechanical control

Due to the size of *G. tinctoria* and its potential to reproduce from small fragments, physical removal has largely been over-looked as a possible means of control. There is the added problem of the disposal of the material removed. However, it should not be dismissed as a potential means of control. Physical removal using spades is clearly a viable option for small plants, or where a small number of plants are present, plant material missed in the first removal can be monitored and subsequently removed. With the appropriate machinery and manpower large areas could be cleared quickly.

When physical removal is used on a large scale it will leave a "blank canvas" and this must be accounted for during the planning stages, as the area may become susceptible to reinvasion by G. tinctoria or a variety of other unwanted species. It may be necessary to implement a restoration protocol for the cleared site after physical removal. Managers should be aware of and compliant with relevant waste legislation.

Chemical control

Chemical control can be effective in treating large areas and is generally considered efficient and cost effective (Motooka et al., 2002, Carlile 2006). The major drawback of using chemicals is the impacts they can have on the environment, affecting not only the target species but other species in the neighbouring area.

Methods and timing of application

The timing of herbicide application is an important factor for any successful control measures. Plants treated early in the growing season (March-May) had little impact in preventing the growth of G. tinctoria. Initially plants showed evidence of leaf necrosis, but soon new healthy leaves were produced and grew to the same proportions as untreated plants. Plants treated at the end of the growing season (Aug-Sept) showed no re-growth after one year, but after two years re-growth was observed. Despite no leaf or flower growth the rhizomes do remain in the ground. The presence of a viable rhizome indicates a potential for regrowth and subsequent reapplications of herbicide will be required. Spraying is generally carried out using a backpack sprayer and all leaves are thoroughly sprayed until the point of "run-off", using the manufacturers recommended concentrations. Spraying must be carried out on still, cool, dry days. Rainfall soon after application may wash the herbicide off the leaves, a common feature of the climatic conditions in this area and reapplication would be necessary.

Protective clothing and a mask must be used at all times when handling herbicides. The cut and paint method involves cutting the petiole (the leaf stalk) at the base and immediately applying the herbicide on to the cut surface using a brush or sponge.

This has been the method of choice in large monostands on Achill, due to the size of the plants effective spraying using a backpack sprayer would prove difficult and potentially dangerous to the persons carrying out the spraying. Large stands of G. tinctoria can be very difficult to access, and by cutting the petioles it clears the area and allows further access into the sites. This method is also cost-effective as small quantities of herbicide are involved. Injection of herbicides involves using a drill to make small wells in the rhizome that are then filled with herbicide. Several wells should be made along the rhizome as translocation can be slow and the herbicide may only penetrate small sections of the rhizome. This method is more labour intensive, but the effects on the neighbouring environment are minimised.

Outline methodology Giant Rhubarb

1. A pre-treatment survey will be carried out to establish accurate baseline distribution.

2. It is noted that this species is not as problematic as Rhododendron or Japanese knotweed and is limited to one location at present. Nonetheless the objective is removal within the landholding.

3. Given it its limited distribution and the applicants access to farm machinery mechanical removal with deep burial is considered the preferred option.

4. Gunnera has a rhizome which can easily be broken into pieces that have the potential to re-sprout. Care must be taken not to leave any fragments behind.

5 Monitoring will be carried out as specified in final invasive species management plant to ensure that any regrowth is recorded and removed.

Water Quality

A range of mitigation have been specified to protect surface water and groundwater quality during the construction phase. Mitigation measures in relation to water quality and preventing impact on aquatic habitats are specified in **Chapter 6 Land (Soils, Geology and Hydrogeology (EIAR Volume 1).**

Noise

Mitigation measures in relation to noise are addressed in **Chapter 8 Noise and Vibration (EIAR Volume 1).** Mitigation measures shall be implemented to reduce impacts related to construction noise and vibration.

Dust

Mitigation measures to control dust emissions during construction are included in **Chapter 9 Air Quality and Odour (EIAR Volume 1).**

Birds

The Wildlife Act 1976, as amended, provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land, or any such growing in any hedge or ditch from the 1st of March to the 31st of August. Exceptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Nonetheless, it is recommended that vegetation be removed outside of the breeding season. No disturbance of sand martin nesting colonies will occur.
Retention of the native treelines, hedgerows and woodland along the site boundaries will reduce the loss of breeding and nesting habitat for birds. NRA guidelines on the protection of trees and hedges prior to and during construction should be followed (NRA, 2006b).

Bats

The first aim of the developer should be to entirely avoid or minimise the potential impact of a proposed development on bats and their breeding and resting places. During the initial site clearance, general mitigation measures for bats will follow the National Road Authority's *'Guidelines for the Treatment of Bats during the Construction of National Road Schemes'* NRA (2005) and *'Bat Mitigation Guidelines for Ireland: Irish Wildlife Manuals, No. 25'* (Kelleher, C. & Marnell, F. (2006)). These documents outline the requirements that should be met in the pre-construction (site clearance) stage to minimise negative impacts on roosting bats, or prevent avoidable impacts resulting from significant alterations to the immediate landscape. The developer should take all reasonable steps to ensure works do not harm individuals by altering working methods or timing to avoid bats, if necessary.
No bat roosts were recorded within the proposed extension area. As part of this project, in its current

form, the following mitigation measures are proposed as a precautionary measure:

- Felling of mature trees as identified by the supervising ecologist will be undertaken in autumn (September-November) or spring (April-May) to avoid the destruction of maternity roosts and hibernating sites. Young bats are unable to escape injury because they cannot fly. Equally, hibernating bats may not arouse sufficiently to avoid fatal injuries.
- Felled trees should not be mulched immediately. Such trees should be left lying several hours and preferably overnight before any further sawing or mulching. This would allow any bats within the tree to emerge and avoid accidental death. A bat ecologist will be on-hand during felling operations to inspect felled trees for bats. If bats are seen or heard in a tree that has been felled, work should cease and the local National Parks & Wildlife Service Conservation Ranger should be contacted for advice.
- Bat roosting sites can change depending on a variety of factors and therefore the presence of bats should never be ruled out completely.
- Retain mature to semi-mature trees in external boundaries where possible and resist 'tidying up' dead wood and spilt limbs on tree specimens.
- Protect treelines and shrubs to be retained during works.
- Felling of trees with no potential for roosting bats (features such as tree holes, crevices, loose bark, spilt limbs and dead wood are absent) does not require a bat specialist to be present.
- If bats are recorded by the bat ecologist within any vegetation or structure on site i.e. trees, or walls to be removed or impacted on, no works will proceed without a relevant derogation licence from the National Parks and Wildlife Service.

The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained are set out in Circular Letter NPWS 2/07 "Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

Common Frog

A visual search of the wet grassland, wet heath habitat and drainage ditches to be removed will be carried out in the days prior to commencement of works and any frogs will be removed to alternative wet grassland habitat elsewhere within the landholding. This will be carried out under licence from the NPWS and under supervision of the ECoW.

5.7.2 Operational Phase Mitigation

Mitigation measures are required during the operational phase of the proposed quarry extension to reduce and possibly eliminate the impacts on the soils, geology, hydrology and hydrogeology.

A quarry restoration plan has been prepared for the existing quarry and the proposed extension. Restoration of the proposed extension will be completed in a phased and progressive basis. Phase 1 of the proposed excavation will be restored as phase 2 of the proposed excavation will take place.

A mineral soil berm will be constructed surrounding the entire extension at Knocknaboola. The mineral soil berm along the southwestern boundary will be constructed to retain the upgradient wetlands. An upgradient interceptor drain will allow runoff from the upgradient peat lands discharge to the Glashacoomnafanida stream.

Full details of these measures are included in **Chapter 6 Land (Soils, Geology and Hydrogeology (EIAR Volume 1).**

During the operational phase the site environmental management system will address management of potentially contaminating materials such as fuel, lubricating oils, solvent, etc. and ensure such material is appropriately controlled, in accordance with regulatory requirements and industry best practice.

Operational activity will be confined to daytime hours. No signification lighting will be required during the operational phase.

The principal mitigation measures required for the development in relation to noise concern selection of equipment, sound containment, and acoustic attenuators, in order to achieve the required limits. The predicted noise levels, as outlined in **Chapter 8 Noise and Vibration** are considered to be readily technically achievable using standard methods. No specific mitigation measures have been identified during the operational phase, apart from the erection of 3 m berms around the site perimeter, and the introduction of screening only from the end of phase 2 onwards.

The current noise monitoring programme will be continued and will be modified to take into account the cessation of Riordan's pit activity, and the commencement of extraction at the extension. This will ensure compliance with criteria set out in conditions attached to planning permission. Further details are included in **Chapter 8 Noise and Vibration (EIAR Volume 1)**.

Mitigation measures to control dust emissions during construction are included in **Chapter 9 Air Quality and Odour.**

Once extraction activity comes to an end the restoration process will facilitate natural recolonisation.

5.9 Difficulties Encountered in Compiling Information

Extensive survey work was carried at the proposed development site using a range of standard methodologies. However, there were difficulties in mapping faunal territory and other species in third party lands outside the control of the Applicant. It can be difficult to determine territory size of wildlife populations particularly where they may include multiple landholdings. Therefore, in this case a conservative approach was adopted in determining impact.

5.10 Residual Impacts

5.10.1 Habitats

The mitigation measures have been drawn up in line with current best practice. It is clear that the mitigation measures are designed to achieve a lowering or reducing of the risk of impact to acceptable levels. The likely success of the proposed mitigation measures is high, either in their current form or as they will be adapted on-site to achieve the desired result. Whilst the proposed methods of mitigation may be amended and supplemented, the risk that the mitigation measures will not function effectively in preventing significant ecological impacts is low.

In respect of terrestrial habitats, the development will result in the net loss of heath, grassland and bog habitats as well as the loss of common boundary habitats. Wet heath habitat, which has links to the Annex I habitat 'northern Atlantic wet heaths with Erica tetralix (4010)' and has been classified as high local importance will be removed. This habitat supports a number of Annex V bryophyte species and these are unlikely to persist within the proposed development area following habitat removal. It is noted that these species are common constituents of bog and heath habitat in Ireland. The impact of this will be negative, slight and long-term at a local level.

An area of Lowland blanket bog (approximately 3.0ha in area), classified as of national importance, will be retained within the landholding. A smaller area of this habitat (approximately 0.3ha) will be

removed. Blanket bogs that are still capable of peat formation correspond to the priority habitat, 'blanket bogs (*if active bog) (7130)'. The annexed habitat, 'depressions on peat substrates of the Rhynchosporion (7150)' occurs in pockets as a sub-habitat of blanket bog. 7130 and 7150 are qualifying habitats for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. This habitat will largely be retained at the site. A mineral soil berm will be constructed along the southwestern boundary to retain the upgradient wetlands. Negative, moderate, long-term at a local level and not significant at a national level No significant impact from the spread of invasive species is predicted to occur following the implementation of mitigation measures.

There will be no direct loss of aquatic habitats and sedimentation ponds within the existing pit, which are known to provide habitat for aquatic birds and may provide habitat for newts, will be maintained.

5.10.2 Mammals

No bat roosting habitat will be impacted. There will be a nett loss of bat and foraging habitat, with the removal of cutover bog and heath habitats, and the impact will be negative, slight and long-term.

Irish Hare were recorded at the site. The impact on Irish hare will be negative, slight and long term at a local level dur to habitat loss and disturbance.

There will be no significant long-term impact on other mammal species i.e. Otter, Badger is predicted to occur.

5.10.3 Birds

There will be a loss of bog woodland habitat bordering the Glashacoomnafanida Stream as well as smaller pockets of bog woodland habitat within the extension area. This will lead to a loss of nesting habitat for bird species included a notable number the Amber List species Willow Warbler nesting along the stream.

Sedimentation ponds within the existing pit, which are known to provide habitat for aquatic birds and may provide habitat for newts, will be maintained.

The loss of heath and cutover bog will reduce the habitat available to grassland bird species within the site. However, the retention of an area of blanket bog and the restoration of Riordans's Quarry to include areas of semi-natural grassland, will mitigate in part against this habitat loss. The residual impact on birds will be negative, imperceptible to slight and long-term.

5.10.4 Designated sites

Detailed mitigation measures have been specified to minimise impacts on surface water quality and aquatic ecology downstream of the site. Any impacts on water quality will be localised and temporary and will not have a significant impact on aquatic ecology. As no significant impacts on water quality are predicted to occur and subsequently there will be no impact on Natura 2000 sites/NHAs/pNHAs downstream of the proposed development site. A NIS submitted with this application concluded the following:

> *It has been objectively concluded following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted effects from the proposed development and with the implementation of the mitigation measures proposed, that the construction and operation of the proposed development will not adversely affect (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans or projects. There is no reasonable scientific doubt in relation to this conclusion. The competent authority will make the final determination in this regard.*

5.10.5 Other species

Detailed mitigation measures have been specified to minimise impacts on surface water quality and aquatic ecology downstream of the site. Any impacts on water quality will be localised and temporary and will not have a significant impact on aquatic ecology. A 15 buffer zone and earth berm to be installed between proposed extension and Glashacoomnafanida Stream. A silt fence will be installed between the soil berm and the Glashacoomnafanida Stream. Topography means accidental discharge/breakout of silt laden waters is not possible from site. The impacts on aquatic fish and invertebrates as a result of the proposed development will be negative, not significant and long term.

5.11 Cumulative Impacts

There are three quarries located in the vicinity of the works area. Two are under the ownership of M.F. Quirke. Extractive sites that discharge process water into a watercourse require a discharge licence under Section 4 of the Local Government (Water Pollution) Act 1977. Uncontrolled discharges of polluting matter to such media are an offence under the Act's Section 3. Predicted impacts to surface water and groundwater following mitigation are not significant to slight and neutral (See **Chapter 6 Land (Soils, Geology and Hydrogeology (EIAR Volume 1)**. Therefore no cumulative impacts on water quality will occur and subsequently there will be no cumulative impact to aquatic receptors.

Cumulative impacts on fauna chiefly relate to increased noise and activity levels and potential impacts on water quality. The loss of the proposed extension area will increase the active area of the quarry and thus noise levels and levels of visual disturbance will increase. Noise levels are likely to fall off quickly outside the site boundary. The increase in noise and disturbance will occur in a context where there is already an existing quarry and fauna will have habituated to existing levels of noise and disturbance. In this context no significant cumulative impact from noise and disturbance has been identified.

5.12 Summary

The impacts on the ecological environment as a result of the proposed development are summarised as follows:

- Natural and semi-natural habitats within the extension area will be removed. Overall there will be a net loss of habitats at the site including wet heath and blanket bog which have links to Annex I habitat.
- No significant potential roosting habitat for bats was recorded in buildings or trees within the site. One species of foraging and commuting bat, Soprano Pipistrelle was identified using the extension area. No light sensitive Myotis species were recorded. Works will be carried out during daylight hours and there will be no lighting disturbance to bats.
- Irish Hare was recorded on a number of occasions and there will be a nett loss of habitat for this species. No other protected mammal species were recorded at the site.
- The site currently includes moderate value habitat for breeding birds, including a number of birds of conservation concern. Overall there will be a nett loss of grassland, heath, bog and bog woodland habitat which provide nesting and foraging habitat for birds.
- Common Frog was recorded in wet grassland habitat at the site. Mitigation measures including removal of this species under licence have been outlined to avoid direct mortality impacts to Common Frog. No rare invertebrate species were recorded at the site.
- The project has been designed to minimise potential impacts on local watercourses. No significant impact on the aquatic ecology of the Glashacoomnafanida Stream.
- The proposed development site is not located within any SAC, SPA, NHA or pNHA. However the site is potentially hydrologically connected to three Natura 2000 sites and one pNHA, namely the Castlemaine Harbour SAC, Castlemaine Harbour SPA and the Killarney National

Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and the Castlemaine Harbour pNHA. Following mitigation, there will be no adverse impacts on designated sites. Appropriate mitigation has been specified to minimise potential impacts and the proposed development will not adversely affect (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans or projects. No significant impacts on the Castlemaine Harbour pNHA will occur.

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Chapter Six Land, Soil, Geology and Hydrogeology

6.1 Introduction

Parkmore Environmental Services Ltd (PES) was engaged by M.F. Quirke & Sons, to prepare an Environmental Impact Assessment Report (EIAR) on the soils, geology, hydrology and hydrogeology receiving environment in relation to a Planning Application for the continued operation of a 18.51 Ha existing quarry processing area at Rangue, Killorglin, Co. Kerry, and for a planned extension to that quarry of 16.75 Ha in the townlands of Rangue and Knocknaboola, Killorglin, Co. Kerry. The objectives of the assessment include:

- Produce a baseline study of the existing water environment (soils, geology, surface hydrology and groundwater hydrogeology) in the planning application area of the site;
- An assessment of the impact of quarrying activities within the planning application area will have, and is continuing to have on soils, geology, surface water and ground water;
- Identify likely positive and negative impacts of the proposed development on soils, geology, surface and groundwater, during construction and/or operational phases of the project, and,
- A recommendation of measures to reduce or eliminate potential impacts (where necessary).

This section of the EIAR was prepared by Parkmore Environmental Services Ltd. The project team consists of Richard Langford, BA Geology, MSc Applied Hydrogeology, PGeo, EurGeol.

6.1.1 Legislative Context

The EU sets out mandatory requirements for Environmental Impact Assessments under the EIA Directive 85/337/EEC (as amended by Directive 97/11/EC). The Directive identifies that certain project types, described under Annex I, will always have significant environmental effects due to their nature and size. These projects are required to undergo an EIAR in every Member State. For projects listed under Annex II, the EIA Directive gives Member States discretion to decide the limits of projects requiring an EIAR. In Ireland, mandatory thresholds have been set for projects that would otherwise fall under Annex II, which are described in Schedule 5 of The Planning and Development Regulations 2001 as amended. These thresholds are based on project characteristics including size and location. Projects within these thresholds, such as the proposed quarry extension at Rangue and Knocknaboola, are always subject to an EIAR. In some circumstances, projects considered below the thresholds set under Schedule 5 Part 2 may still be considered by the Planning Authority to have significant effects on the environment, such as in cases where the projects are in a location of particular environmental sensitivity and may also be subject to an EIAR. These sub-threshold projects are reviewed by the Planning Authority on a case-by-case basis. The principal piece of legislation under which an EIAR may be undertaken for various developments is The Planning and Development Act 2000, as amended. Further regulations are explained in The Planning and Development (Environmental Impact Assessment) Regulations 2001-2018.

The assessment is carried out in accordance with the follow legislation:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1995, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001), S.I. No.30 of 2000 the Planning and Development Act, 2000 and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/373/EEC and subsequent Amendments, on the assessment of the effects of certain public and private projects on the environment;

- S.I. No. 600 of 2001 Planning and Development Regulations, 2001;

- S.I. No. 94 of 1997 European Communities (Natural Habitats) Regulations, resulting from EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);

- S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;

- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009 and SI No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC). Since 2000 water management in the EU has been directed by the Water Framework Directive (WDF). The key objectives of the WFD are that all water bodies in member states achieve (or retain) at least 'good' status by 2015. Water bodies comprise both surface and groundwater bodies, and the achievement of 'good' status for these depends also on the achievement of 'good' status by dependent ecosystems. Phases of characterisation, risk assessment, monitoring and the design of programme of measures to achieve the objectives of the WFD have either been completed or are ongoing. In 2015 it will fully replace a number of existing water related directives, which are successively being repealed, while implementation of other Directives (such as the Habitats Directive 92/43/EEC) will form part of the achievement of implementation of the objectives of the WFD;

- S.I. No. 41 of 1999 Protection of Groundwater Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);

- S.I. No. 249 of 1989 Quality of Surface Water Intended for Abstraction (Drinking Water), resulting from EU Directive 75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (repealed by 2000/60/EC in 2007);

- S.I. No. 439 of 2000 Quality of Water intended for Human Consumption Regulations and S.I. No. 278 of 2007 European Communities (Drinking Water No. 2) Regulations, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and WFD 2000/60/EC (the Water Framework Directive);

- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations; and,

- S.I No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010.

6.2 Methodology

6.2.1 Guidance Used

The hydrology and hydrogeology section of the EIS is carried out in accordance with guidance contained in the following:

- Environmental Protection Agency (Draft, 2017): Guidelines on the information to be contained in Environmental Impact Assessment Reports;

- Environmental Protection Agency (Draft, 2015): Advise Notes on Current Practice (in the preparation on Environmental Impact Statements);
- Environmental Protection Agency (2002): Guidelines on the Information to be Contained in Environmental Impact Statements;
- Institute of Geologists Ireland (2013) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Section 177F of the Planning and Development Act, 2000 (as amended); and,
- Section 261A of the Planning and Development Act, 2000 (as amended) and related provisions - Supplementary Guidelines for Planning Authorities (DELG, 2012).
- "Control of Water Pollution from Construction sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001);
- "Oils storage guidelines. Best Practice Guide" (Enterprise Ireland, BPGCS005).

6.2.2 Baseline Data Collection

6.2.2.1 Desktop Study

A desk study of the site and the surrounding area was completed as part of this study. This involved collecting all relevant hydrological, hydrogeological and meteorological data for the area. This included consultation with the following:

- Catchments.ie Map Viewer (www.catchments.ie);
- CFRAM Preliminary Flood Risk Assessment Mapping & OPW's Indicative Flood Maps (www.floodinfo.ie);
- Contribution to an EIS, Soils (Geology) and Water, for a Sand and Gravel Pit Operation, at Rangue, Killorglin, Co. Kerry by Eugene Daly and Associates (EDA, 2000).
- EIS for Proposed Sand and Gravel Quarry at Rangue, Killorglin, Co. Kerry by E G Pettit & Co., 2000.
- Environmental Protection Agency database (www.epa.ie);
- Environmental Protection Agency / Teagasc 1:50,000 scale soils and subsoils maps and associated documentation;
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Geological Survey of Ireland borehole / depth to bedrock data from Exploration and Mining Division Minerals open file data and geotechnical databases (www.gsi.ie);
- Geological Survey of Ireland – Laune Muckross Groundwater Body Initial Characterisation Report - Draft (2004);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Topographical survey and drawings prepared by Michael O'Connor.

7.2.2.2 Field Surveys and Monitoring

A preliminary site walkover investigation was completed by PES on the 5th March 2021, where the drainage network was walked and mapped; surface water flow data was obtained from upstream and downstream of the proposed quarry extension, the depth to water in a number of groundwater wells was recorded, and 4

groundwater wells were instrumented with groundwater level loggers. Field data collection continued until the 13th October 2021.

6.2.3 Assessment Methodology

6.2.4 Impact Assessment

- Baseline hydrology and hydrogeology site characteristics of the receiving environment are derived from the desk study information, and site-specific data gather as part of this investigation;
- Potential hazards arising from the development are identified;
- Receptors in the receiving environment to which these hazards may represent a risk are identified in the course of the study area characterisation;
- The potential impact on receptors are identified, in terms of quality, significance, duration and type;
- Measures to mitigate potential impacts on given receptors from the proposed development are identified;
- Residual impacts are stated.

In addition to the above methodology the sensitivity of the water environment receptors were assessed on completion of the desk study and baseline study. Levels of sensitivity which are defined in Table 13.1 are then used to assess the potential effect that the proposed development may have on them.

6.2.5 Significance of Impacts

The statutory criteria (EPA, Draft 2017 and EPA, Draft 2015) for the assessment of impacts require that likely impacts are described with respect to their extent, magnitude, complexity, probability, duration, frequency, reversibility and trans-frontier nature (if applicable). Two impact characteristics proximity and probability are described for each impact and these are defined in Table 1. Impact significance is defined in Table 2.

Table 15: Receptor Sensitivity Criteria (Adapted from www.sepa.org.uk)

Sensitivity of Receptor	
Not sensitive	Receptor is of low environmental importance (e.g. surface water quality classified by EPA as A3 waters or seriously polluted, fish sporadically present or restricted). Heavily engineered or artificially modified and may dry up during summer months. Environmental equilibrium is stable and is resilient to changes which are considerably greater than natural fluctuations, without detriment to its present character. No abstractions for public or private water supplies. GSI groundwater vulnerability "Low" – "Medium" classification and "Poor" aquifer importance.
Sensitive	Receptor is of medium environmental importance or of regional value. Surface water quality classified by EPA as A2. Salmonid species may be present and may be locally important for fisheries. Abstractions for private water supplies. Environmental equilibrium copes well with all natural fluctuations but cannot absorb some changes greater than this without altering part of its present character. GSI groundwater vulnerability "High" classification and "Locally" important aquifer.
Very sensitive	Receptor of high environmental importance or of national or international value i.e. NHA or SAC. Surface water quality classified by EPA as A1 and salmonid spawning grounds present. Abstractions for public drinking water supply. GSI groundwater vulnerability "Extreme" classification and "Regionally" important aquifer.

Table 16: Impact Characteristics

Impact Characteristic	Degree/ Nature	Description
Proximity	Direct	An impact which occurs within the area of the proposed project, as a direct result of the proposed project.
	Indirect	An impact which is caused by the interaction of effects, or by off-site developments.
Probability	Low	A low likelihood of occurrence of the impact.
	Medium	A medium likelihood of occurrence of the impact.
	High	A high likelihood of occurrence of the impact.

Table 17: Impact/Effect Significance

Significance	Description
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 alters most of a sensitive aspect of the environment.
Profound Effects	An effect which obliterates sensitive characteristics

6.3 Study Area

The proposed development consists of the continued operation of a 18.51 Ha existing sand and gravel processing area at Rangue, Killorglin, Co. Kerry and for a planned extension to that sand and gravel pit of 16.75 Ha in the townlands of Rangue and Knocknaboola, Killorglin, Co. Kerry.

The existing Rangue processing area is located c. 2.7km southwest of Killorglin (ITM: 475803, 594112).
The proposed extension to the Rangue processing area is located in the townlands of Rangue and Knocknaboola (ITM: 475955, 593596) and is located south of the Killorglin to Glannagilliagh third class road, to the south and southeast of the existing processing area. It is proposed to link the existing pit to the proposed extension via an underpass and haul road beneath the Glannagilliagh road.

The existing quarry is accessed via two entrances; one entrance leads directly onto the Killorglin to Glannagilliagh road to the south, the second entrance is accessed by a third class road to the southwest of the existing pit. The proposed extension will be accessed via the same entrances. All aggregate processing will continue to take place in the existing Rangue pit site. Offices, welfare facilities (toilets), fuel and chemical stores will remain on the existing Rangue pit site. There will be no re-fuelling of plant and machinery on the proposed extension site – all refuelling will take place in the existing sand pit.

The existing pit at Rangue comprises an area of c. 18.51 hectares and occupies some relatively low lying ground to the north of the foot hills of Macgillycuddy's Reeks. The pre-development site had an elevation of between c. 37m AOD in the southwest, to c. 22m AOD in the northeast, but has been worked down to c. 17m AOD. The majority of sand and gravel, which is economically viable to access and process, has already been extracted from the existing pit. General elevation now ranges from c. 17m to 17.5m AOD in the central portion of the pit, to 22mAOD at the stream on the north-eastern boundary, to 30m AOD on the southwestern boundary.

The existing Rangue processing area is almost rectangular in shape and is located between two northwest to southeast trending morainic ridges. The Range processing area is bound by a minor road to the southwest, a

field and the Glannagilliagh road to the southeast, a small stream called the Glashacoomnafanida stream to the east, agricultural grass land to the north and northeast, and a Roadstone gravel pit to the northwest. Riordan's pit, which is also operated by M.F. Quirke and Sons has been almost exhausted of its unsaturated sand and gravel resources, is located to the west of the Rangue processing area, the opposite side of the minor road which forms the western boundary of the Rangue processing area. A second sand and gravel pit, owned by Roadstone but no longer in operation as all reserves have been exhausted, is located adjacent to and north of Riordan's pit.

The Range processing site was formerly part of a relatively large wet boggy area between two ridges. Most of the site has been excavated to a level close to the permanent water table. The deepest part of the excavation appears to be in the north-western portion of the pit. A large clear water pond occupies this area, where reinstatement works are underway.

The proposed extension is located on a land-bank of 24.5 Ha, is almost triangular in shape and is bound by the Glashacoomnafanida stream, which flows from south the north along the eastern boundary of the proposed extension, by the Glannagilliagh road and 8 residential dwelling houses along the north-western boundary, and by cutaway bog to the southwest.

It is proposed to use 16.75 Ha of the proposed extension lands for the extraction of sand and gravel aggregate. The remaining 7.82 Ha will be used to provide a buffer between residential dwellings (no dwelling will be located within 100m of the proposed quarry extraction area); a buffer between the Glashacoomnafanida stream (no extraction of aggregate will take place within 15m of the stream), and to provide for a wildlife refuge to the southwest.

The majority of the proposed extension area is underlain by shallow cutaway peat bog. The vast majority of the site is underlain by peat depths of less than 0.25m. There are areas of the site where there is no peat cover, particularly on the elevated hillock on the south-eastern part of the proposed extension. The deepest portions of bog is present on the southern portion of the site, where a maximum depth of 6.1m of peat was recorded (this area is not within the proposed extraction area). The site (and bog) is heavily drained, with numerous shallow drains discharging to the Glashacoomnafanida stream, along the eastern boundary of the site.

The topography of the site is gently undulating, with an overall topographic gradient to the northeast. The elevation of the proposed extension ranges between 41m AOD at the peak of a small hillock in the southwestern part of the site, to 27m AOD at the north-eastern corner of the site. The elevation of land along the southwestern boundary ranges between 38 and 39m AOD.

There is a large operational sandpit and associated works located at Muingaphuca c. 1.5km west of the existing Rangue pit. This is also operated by M.F. Quirke and Sons.

6.4 Receiving Environment

The receiving environment comprises the existing soils, subsoils, geological, hydrogeological and hydrological environment in which the proposed development will take place. The findings of the soils, geology, hydrology and hydrogeology baseline study are summarized in Table 9.

6.4.1 Site Description

The existing pit at Rangue has been operated as a quarry by the current owners for the past 40 years. It is in a rural setting approximately 2.7km southwest of Killorglin, Co. Kerry. The existing pit covers an area of 18.51 Ha. Almost all of the available aggregate has been extracted from the pit at Rangue. The pit is to be retained as a quarry processing facility, to process aggregate extracted from the proposed extension at Rangue and Knocknaboola. The existing pit is bound by a minor road to the southwest, a field, dwelling house and the Glannagilliagh road to the southeast, a small stream called the Glashacoomnafanida stream to the east,

agricultural grass land to the north and northeast, and a Roadstone gravel pit to the northwest. Riordan's pit, which is also operated by M.F. Quirke and Sons has been almost exhausted of its unsaturated sand and gravel resources, is located to the west of the Rangue processing area, and on the opposite side of the minor road which forms the western boundary of the Rangue processing area. A second sand and gravel pit, operated by Roadstone Ltd (Formerly John A. Woods), is located adjacent to and north of Riordan's pit.

The proposed extension to the Rangue Pit is on a 24.5 hectare site, comprised principally of cutaway bog. It is located in the townlands of Rangue and Knocknaboola (for the purposes of this report the proposed extension will be referred to as being in the townland of Knocknaboola). The proposed extension is approximately triangular in shape and is bound by the Glashacoomnafanida stream, which flows from south the north along the eastern boundary of the proposed extension, by the Glannagilliagh road and 8 residential dwelling houses along the north-western boundary, and by cutaway bog to the southwest. The residential dwellings are served by a mains water supply. There is no mains sewerage in the area, each of the dwellings discharges sewage effluent to ground.

A location map showing the location of the existing pit, the proposed extension, and the local surface water drainage network is presented in Figure 1.

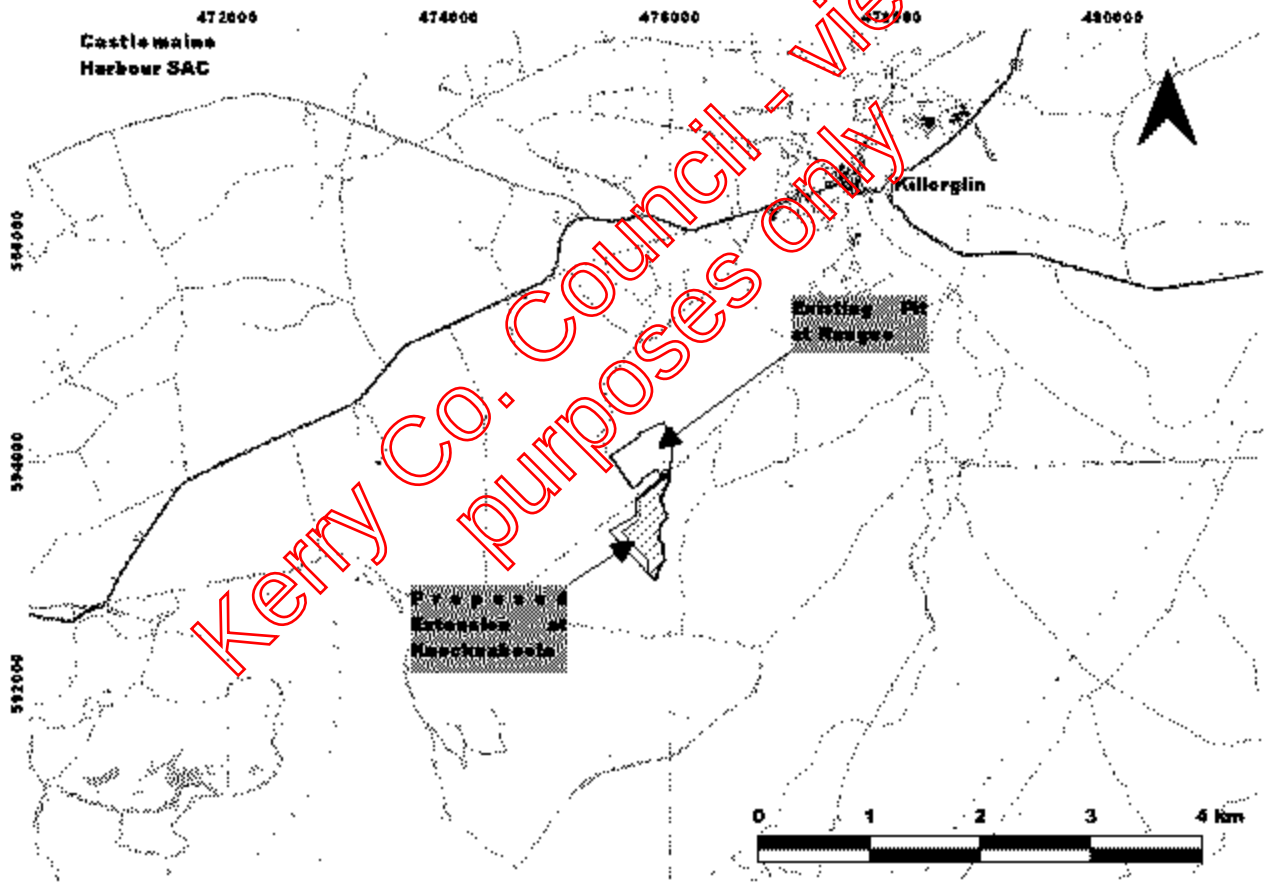


Figure 9: Site Location

6.4.2 Aggregate Processing

Gravel and fines are extracted from a number of steep working faces within the Riordan's pit with a variety of excavators and front loaders. Following extraction of the sand and gravel deposits, the aggregates are processed using a screener and washer. This is located on the floor of the Range Pit, to the northeast of the office and

workshop buildings. The screening is a processing flow which sorts the aggregate into various size ranges. The pre-screening occurs first in the screening process, where the aggregate in the hopper is dry screened to separate the finer materials from the larger (greater than 75mm) materials. The finer material (less than 75mm) moves along the conveyor belt to the washing area. The washer washes the aggregate to ensure standards and specifications are met and removes clay, silt, twigs etc. 600 to 800 tonnes of aggregate is processed per day. The screen sizes used in the sorter determine the end product. The aggregate sizes produced are 10 mm – 20 mm, 6 mm – 10 mm and 4mm to 6mm. The larger aggregates (stones) (i.e. greater than 20 mm) are crushed and re-processed through the washer/screener.

After aggregate processing the material is stockpiled relevant to size. The material is stockpiled on north-eastern pit floor, not covered and away from lagoons.

The crusher unit onsite is used when needed and dictated via the market

A readymix concrete plant and block making facility are also located within the pit at Rangue. A number of derivative products are produced at these works.

The sand and gravel resources at the main pit in Rangue are exhausted. It is proposed to retain the aggregate processing and production facilities at Rangue and import the raw material from the proposed nearby extension pit at Rangue and Knocknaboola.

Approximately 90 cubic meters of water per hour is used for washing the aggregate over an 8 hour period.

A significant amount of water is used for washing the raw aggregate to remove fines, in the production of readymix concrete and blocks and for dust suppression. The fines are segregated from the processed aggregate and stock piled. Some of the fines are sold (this is a low value product), with the majority used for reinstatement of the worked areas of the quarry.

There is an elaborate, interconnected water system in the Rangue Pit. There are two large ponds within the confines of the pit.

The lowest pond is located in the southern portion of the pit (Plate 1). The southern pond water level is sustained by a combination of surface water runoff and upward seepage of groundwater through the base of the pond during the winter. During the summer it appears the pond is perched above the groundwater table. Water used in the concrete batching plant is pumped from this pond to a header tank at the batching plant. The header tank operates on a float switch; when the tank is full, water is diverted to the small pond beside the southern entrance road, before discharging off site. Water is also pumped offsite from the southern pond, when the water table comes closest to the pit floor.

Plate 1: View of southern pond with Rangue blockyard in background

After processing, sediment laden water discharges to a series of elongate settlement lagoons, linked in series, in the western portion of the site. Water drains from one lagoon to another, before being re-circulated to the sand washing plant. The fines that settle out in these lagoons are regularly removed and allowed to dry before disposal in the worked areas of the pit.

Water is intermittently pumped from the southern pond to a small pond/drain beside and west of the southern entrance road. This drain is part of a surface drain that has been constructed around the southern boundary of the site. The pumped water flows underneath the entrance road and discharges to the Glashacoomnafanida stream at the south-eastern corner of the site. There are two abstraction pumps in the southern pond, a high yielding pump which discharges directly to the small pond beside the southern entrance gate; and, a lower yielding pump, which pumps to the header tank at the concrete batching plant, and subsequently to the small pond beside the southern entrance gate; both pumps cannot be used at the same time. Flow gauging completed on the 17th May indicates between 0.009 and 0.036 m3/hour discharges to the Glashacoomnafanida stream when the pumps are active. A trade effluent discharge licence (Licence No. W61) from Kerry County Council covers the discharge from the pond to the adjoining stream.

A large pond is located in the north-western portion of the quarry (Plate 2). Water from this pond is pumped to the sand washing plant. This pond receives surface runoff from the pit floor, including from the northern block yard and the sand washing area, and acts as a settlement pond for the northern portion of the pit. The water level in this pond is close to the groundwater level. This pond is under active re-instatement by backfilling with low permeability fines, which have little economic value.

Plate 2: View of north-western pond which is undergoing active re-instatement.

A settlement pond, which was present in the north-eastern corner of the pit, has been reinstated using low permeability fines, which have little economic value. Surface water falling on the site via precipitation percolates to ground or flows into either the north-western or southern ponds.

Figure 10: Site Layout Map indicating location of water supply and sand washing infrastructure

6.4.2 Climatic Conditions

Met Eireann records show that the average annual rainfall for the period 1981-2010 in the area is of the order 1,439 mm/year (Dooks, Glenbeigh). This rainfall station is located c. 7.5 km west southwest of the sand pit.

Table 18: Monthly Rainfall Data from Muckross House

Monthly Rainfall, Dooks, Glenbeigh (Station 4705)

Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
30 year average 1981 - 2010	155.2	112.8	116.1	85.2	88.8	80.1	85.6	99.3	107.1	158.4	154.0	156.4	1439.0
2020	100.3	187.4	76.4	30.5	65	80.1	184.7	142.7	68.5	172.1	158.1	167.2	1442
% of 30 Year Average	65.7	166.1	65.8	46.4	73.2	100.0	215.8	143.7	64.0	102.2	96.4	100.5	100.0
2021	115.4	134.6	58.7	25.2	112.8	25.2	53.6	89.1	121.8				
% of 30 Year Average	68.9	119.3	50.6	29.6	127.0	31.5	62.6	89.7	113.7				

*In the absence of available data from Dooks, rainfall from Valencia Observatory has been used for July, August and September 2021

Average potential evapotranspiration data from Valentia Observatory, a coastal station located c. 35 km southwest of the sandpit, for the period 1981 to 2010 is of the order of 518.9 mm/year. PE data from Valentia is used as it is not available for Dooks. Assuming actual evapotranspiration is 95% of potential evapotranspiration give an AE of 493 mm/year. Using these figures gives an average annual effective rainfall of c. 946 mm/year. (A literature review of average annual evapotranspiration of 30% of annual precipitation for the region of the site gives effective rainfall of 1007 mm/year, which is very similar. (Mills, G, 2000)).

Effective rainfall is divided between recharge to groundwater and runoff to surface water. Given the hydrogeological setting of the quarry (moderate to low permeability subsoil (compacted silty clayey sand/gravel) overlain by peat, the potential recharge to the overburden is estimated to be as low as 4% (GSI Recharge Maps).

This indicates that up to 38 mm/year is available to recharge the underlying sands and gravels, and subsequently the underlying karstified limestone aquifer, with more than 908 mm/year available as runoff to surface water.

6.4.3 Topography, Physical Features and Landuse

The existing pit at Rangue comprises an area of c. 18.51 hectares and occupies some relatively low lying ground to the north of the foot hills of Macgillycuddy's Reeks, and to the south of Castlemaine Harbour. The pre-development site had an elevation of between c. 37m AOD in the southwest, to c. 22m AOD in the northeast, but has been worked down to c. 17m AOD. The majority of sand and gravel, which is economically viable to access and process, has already been extracted from the existing pit. General elevation now ranges from c. 17m to 17.5m AOD in the central portion of the pit, to 22mAOD at the stream on the north-eastern boundary, to 30m AOD on the southwestern boundary. Please refer to cross section reports which accompany the planning application.

The existing Rangue pit is almost rectangular in shape and is located between two northwest to southeast trending morainic ridges. The pit is approximately 530m long x 330m wide.

The landscape of the pit is characterised by quarrying activity, and includes stockpiles of aggregate, ponds, settlement lagoons, and quarry processing infrastructure such as access roads, crushing grading and screening infrastructure, block yards, readymix concrete batching plant, carpark area, work shop, reception and office buildings. The deepest parts of the pit, which are located in the northwest and the southwest, have been worked down close to the permanent winter water table. Large clear water ponds occupy the deepest parts of the pit. These areas are under active re-instatement by backfilling with silt and fine aggregate with little

economic value. Part of the western portion of the pit is covered in low woodland. The central part of the pit contains block manufacturing and storage yards, the reception office and workshop area. Two double bunded fuel tanks (one for green diesel and one for white diesel) are located beside the workshop at the dedicated refuelling area, which is bunded with concrete walls (Plate 3). A hydrocarbon interceptor will be installed and located to the southeast of the garage. All garage and car park runoff will be intercepted and diverted to the hydrocarbon interceptor. The eastern portion of the pit contains the sand washing plant and a series of settlement lagoons.

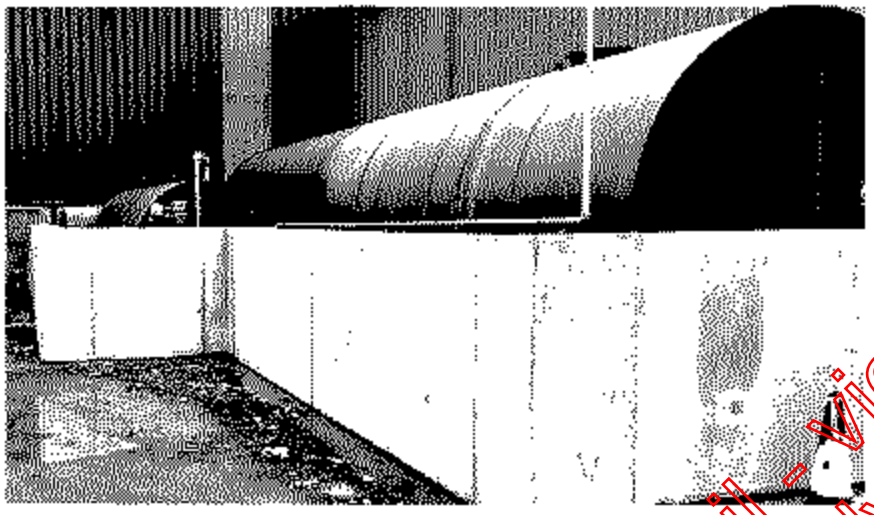


Plate 3: Double Bunded Fuel Tanks, bunded with concrete walls

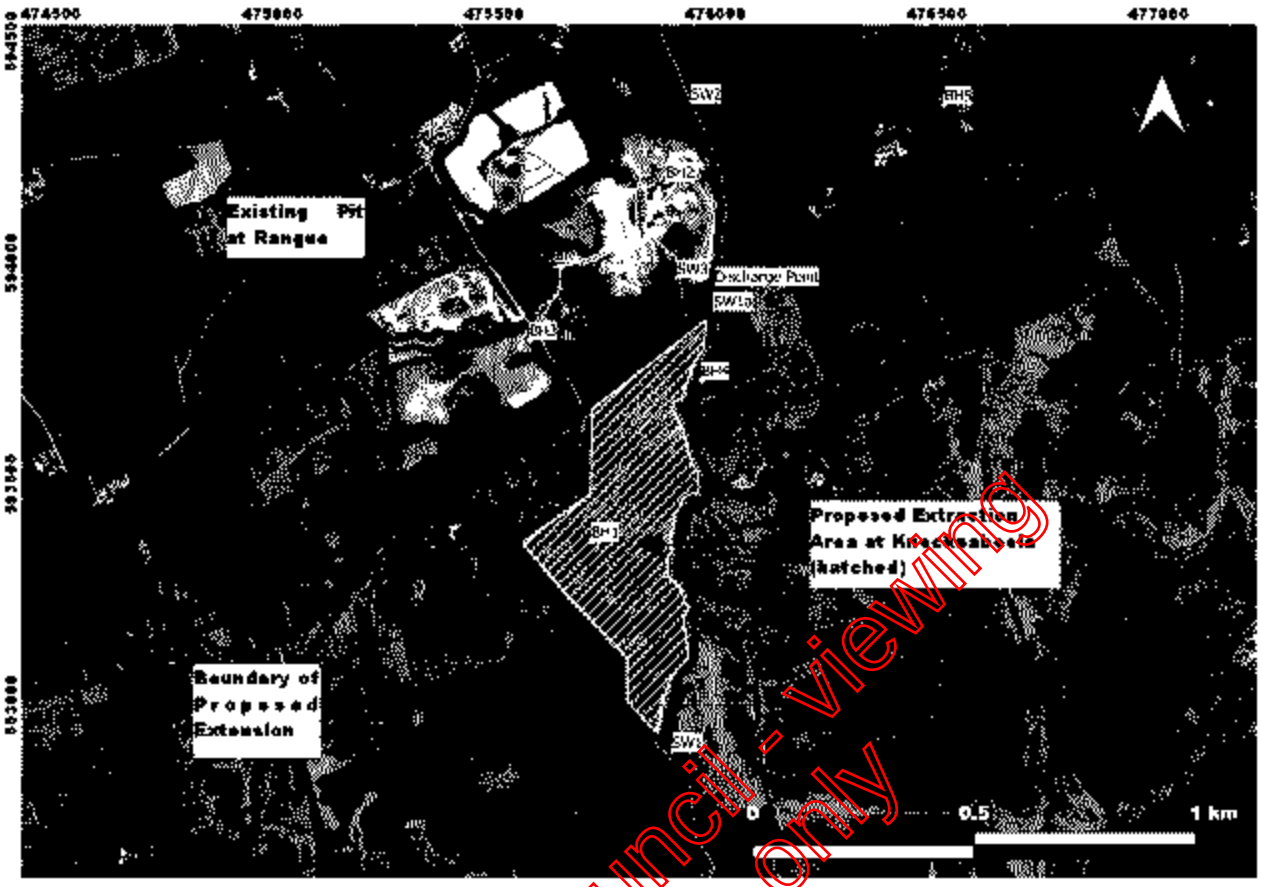


Figure 11: Proposed Extension

The proposed extension to the Rangue Pit is located in the townlands of Rangue and Knocknaboola (ITM: 475955, 593596) and is located southeast of the Glannagilliagh road, approximately 47m southeast of the existing pit at its closest. The proposed extension comprises a landbank of 24.5 hectares, of which 16.75 hectares will be actively quarried (Figure 3).
The majority of the proposed extension area is underlain by shallow cutaway peat bog. Small scale peat harvesting takes place from the deeper parts of the bog along the southwestern site boundary (this area is not within the proposed extraction area). The site (and bog) is heavily drained, with numerous shallow drains discharging to the Glashacoomnafanida stream, which flows in a northerly direction along the eastern boundary of the site (Plate 3).

A review of the Ordnance Survey of Ireland Discovery Series Sheet 78 indicates that the topography of the area is dominated by an elevated ridgeline to the southwest, where ground elevations reach a peak of 205m AOD approximately 1.88km to the southwest, and 194m AOD approximately 1.57km to the south southwest of the proposed extension (Figure 1). The topography falls steeply from these peaks to the north and northeast for about 1km, where the ground elevation reaches 50m AOD. The public road from Coomnafanida to Glannagilliagh roughly follows the 50m AOD contour line. The topography falls much more gently from the 50m AOD contour through the proposed extension and to the northeast. The topography of the proposed extension site is gently undulating, with an overall gently topographic gradient towards the River Laune which is at an elevation of between 10m and 0m AOD, and is located approximately 3km to the northeast of the proposed extension. The elevation of the proposed extension ranges between 41m AOD at the peak of a small hillock in the southwestern part of the site, to 27m AOD at the north-eastern corner of the site. The elevation of land along the southwestern boundary ranges between 38 and 39m AOD. The average gradient across the proposed extension is 1m in 55m, which is considered relatively flat.

Plate 4: View of drainage channel on proposed extension at Knocknabiota

Planning permission was granted to M.F. Quirke and Sons to extract sand and gravel from an adjacent pit at Riordan's in 2002 (KCC Planning Reference 00/3746 ABP Ref No. PL08.125729). Riordan's pit, which comprises approximately 11.75 Ha and is located southwest of the pit at Rangue, is almost completely exhausted and is due to undergo re-instatement. There are existing pits located west of and adjacent to the pit at Rangue and northwest of and adjacent to the pit at Rangue which were operated by Roadstone Ltd. These pits comprise approximate areas of 4.62 Ha and 7.27 Ha respectively and are no longer in operation.

Peat land is present south and east of the proposed extension. The land north of the proposed extension appears to consist of well drained agricultural grazing land. There are a number of farmyards locally, and approximately 8 dwelling houses located approximately 100m from the north-western boundary of the proposed extension, between the proposed extension and the existing pit at Riordan's. There is one dwelling house located at the south-eastern entrance to the main pit at Rangue. All houses are connected to the mains water supply. There is no mains sewerage, and all houses discharge sewage effluent to ground.
There is a large operational sandpit and associated works located at Muingaphuca c. 1.5km west of the existing Rangue pit. This is also operated by M.F. Quirke and Sons.

The existing quarry is accessed via two entrances; one entrance leads directly onto the Killorglin to Glannagilliagh road to the south, the second entrance is accessed by a third class road to the southwest of the existing pit. These entrances will be retained for the proposed extension. All aggregate processing will continue to take place in the existing Rangue Pit.

6.4.4 Soils and Subsoils

The soils in the general area are classified as Rolling Lowland Soils[1] and consist mainly of low level (Atlantic Type) blanket peat. These are often quite thick soils that have low permeability and therefore are poorly drained. The soils do benefit from land drainage.

All of the soil and much of the subsoil from the Rangue sandpit has been removed due to extensive quarrying. According to GSI Soil Maps, the proposed extension is underlain by peat. According to the IFS soil description, it is comprised of cutaway/cutover peat. A soils map is presented in Figure 4.

[1] Soil Associations of Ireland and Their Potential Uses, Gardiner and Radford, 1980.

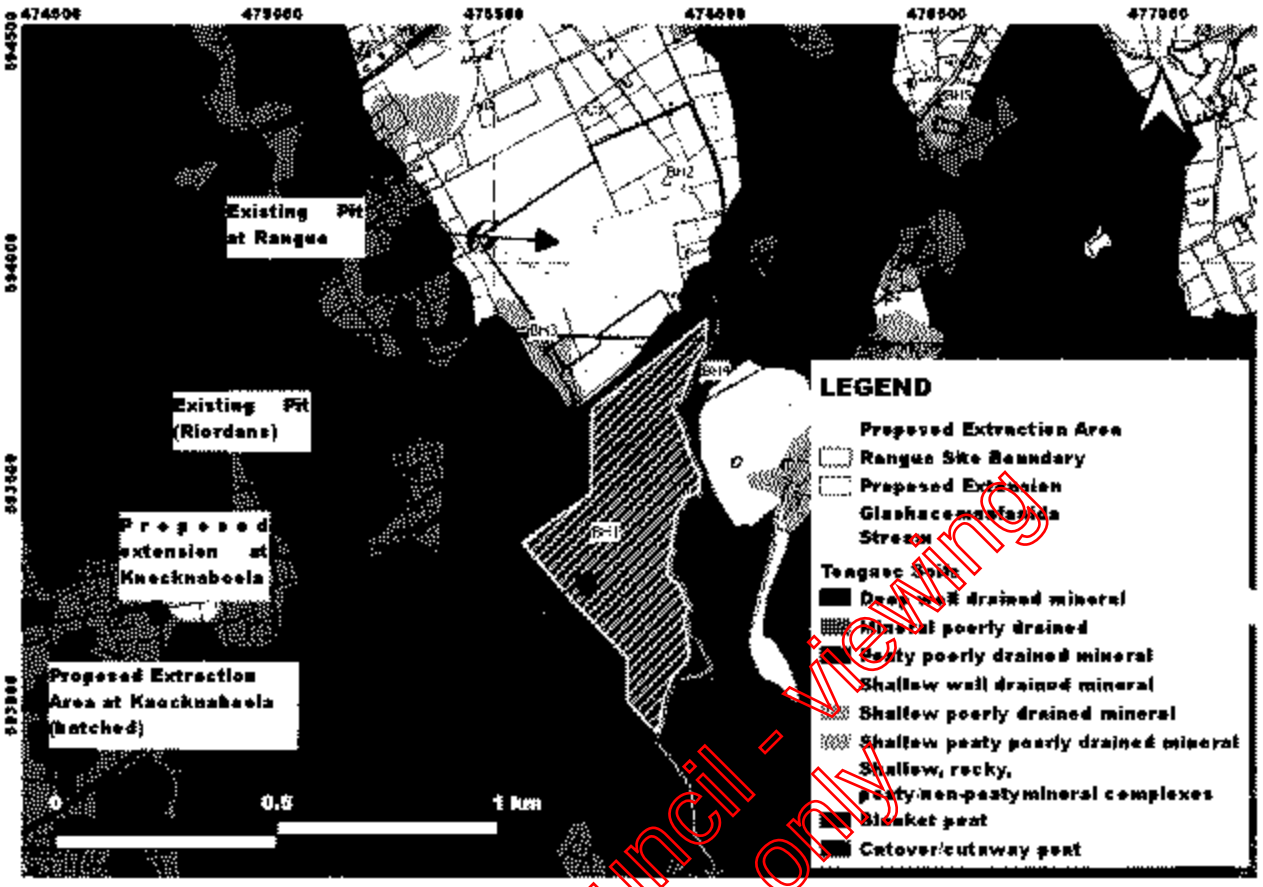


Figure 12: Soils Map (Source: GSI)

There are very significant Quaternary overburden (or subsoil) deposits in this region. Killorglin was located at the junction of two ice flows; one from the west, and the other one from the east. The enormous amounts of rock that were eroded from the mountains (Devonian rocks) by the ice sheets were deposited close to the margins of these ice sheets (Pracht, 1997). These sediments can be very thick in the Killorglin and Rangue areas. The sediments on the lowland are generally interbedded tills (boulder clays) and gravels.
A review of the GSI's database of boreholes indicates that 29.5m of Quaternary deposits (described as drift) overlying limestone bedrock was encountered in a County Council borehole (53.3m deep) at the junction of the minor road at Tooreennaslingaun (townland west of Rangue) and the N70 about 3km west of the pit at Rangue. Another borehole, drilled on the southwest shores of Lake Caragh, about 3.5km south of the proposed extension indicates a depth to bedrock of 91.4m. Boreholes drilled at either side of the bridge over the Laune Estuary in Killorglin encountered bedrock at between 26m and 33.5m.

It is reported that the depth to bedrock in the area of the existing and proposed development sites is approximately 30 metres (EDA, 2000). Site specific borehole drilling was completed to depths of 8.5m below the floor of the Rangue pit, and 17.5m below ground level at the proposed extension. Bedrock was not encountered in any of the site investigation boreholes.

The subsoil sediments generally consist of interbedded tills (boulder clay) and sands and gravels. Owing to the chaotic type of deposition by ice sheets, very rapid vertical and horizontal variations in lithology can be expected in this type of deposit.

In the Rangue area the Quaternary deposits take the form of moraines (i.e. the ridges east and west of the main pit and the proposed extension at Rangue). The main pit at Rangue is excavated into a mapped glaciofluvial

terrace. The proposed extension incorporates a portion of a mapped moraine which lies to the west of the main pit at Rangue.

The Quaternary deposits which are quite thick do have some groundwater potential. Owing to the predominance of till in the overall deposit, and the rapid changes in lithology, they have not been classified as an aquifer by the GSI. A subsoil map is presented in Figure 5.

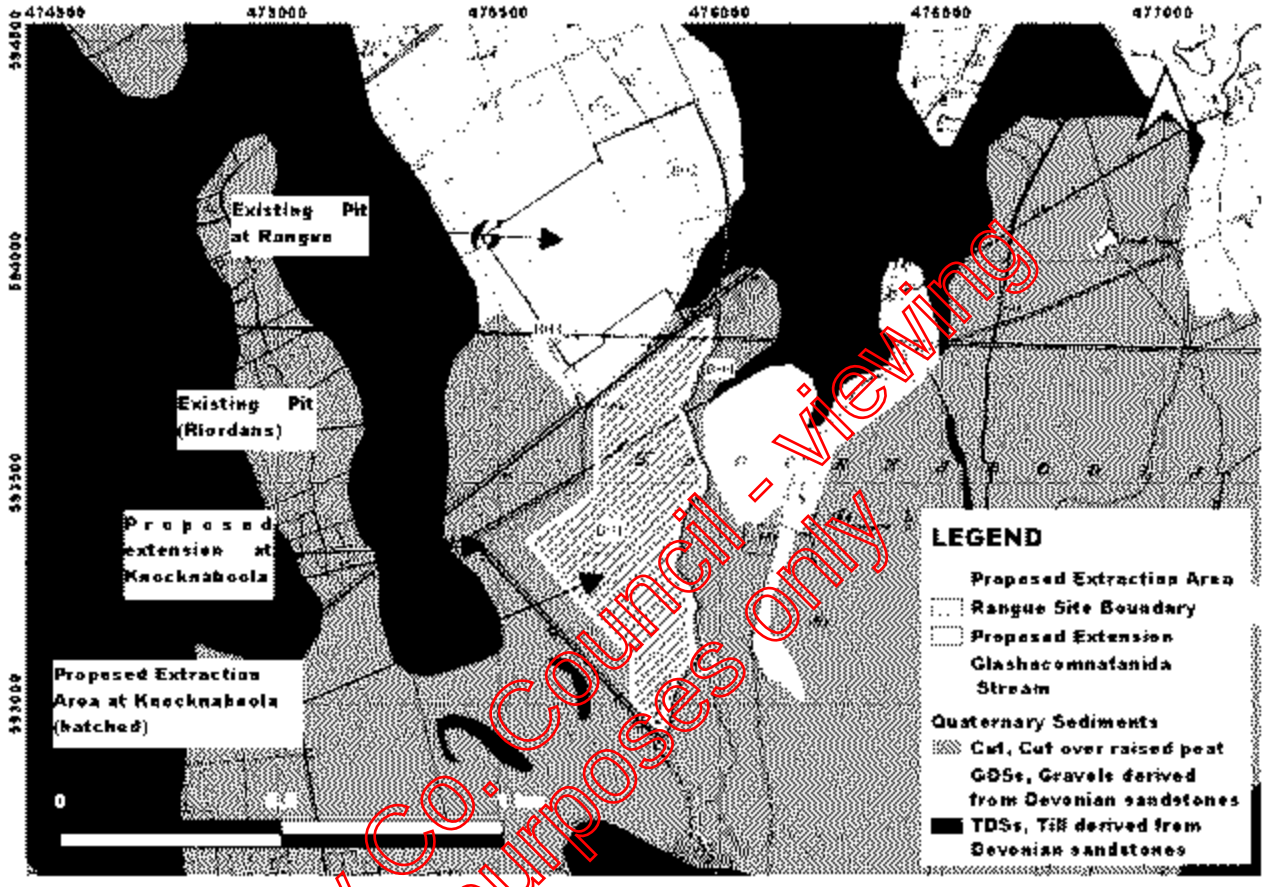


Figure 13: Subsoils Map (Source: GSI)

A wide variety of sand and gravel over burden has been exposed in a recent drain excavated to the east of the proposed extension at Knocknaboola. In places, the upper sand and gravel layers contain lots of fines, an iron pan and are well cemented resulting in a low permeability sand and gravel horizon. Elsewhere, more permeable sand and gravel is present close to the ground surface.

A review of the quaternary deposits exposed in the Rangue sandpit by Eugene Daly and Associates in 2000 also indicated the presence of a wide variety of materials present. According to Daly, two visually significantly different types of till are evident in this pit. The lower unit which occurs at depth over the eastern part of the pit comes closer (3 to 4m) to the surface at the western end of the pit. It contains relatively small pebbles and a high proportion of fine mainly silt material. The fines (less than 25mm) content of the lower unit is about 75%. The pit has been worked down to this unit. The upper unit contains a high proportion of large pebble and cobble grade material with a low fines content.

Borehole BH2 was drilled in the east central part of the Rangue pit in 2000. The borehole collared into the lower unit of the pit section which is described as a dense, silty gravelly sand. Here, this unit is 6m thick. This unit is underlain by at least 2.5m of dense sandy gravel.

This variety of materials (from fine silty sand to cobbles) indicates the complexity of the depositional environment. The majority of the economically valuable sand and gravel deposits from the Rangue pit have almost been exhausted, with mainly silt/clay rich lenses remaining.

6.4.4.1 Peat Depth Survey

A peat depth survey was completed on the 16th April 2021. The aim of the survey was to establish the depth of peat overlying the mineral soil at the proposed extension site at Knocknaboola. Peat depths were probed at an approximate 50m grid spacing across the proposed extension site. A ranging rod was pushed through the peat until refusal at 129 separate locations. It is assumed that refusal indicates the base of the peat.

The vast majority of the site is underlain by peat depths of less than 0.3m. There are areas of the site where there is no peat cover, particularly on the elevated hillock on the south-eastern part of the proposed extension. The thickest depth of peat is present on the southern portion of the site, where a maximum depth of 6.1m of peat was recorded (this area is not within the proposed extraction area). The site (and bog to the south) is heavily drained, with numerous shallow drains discharging to the Glashasoonnafanida stream, along the eastern boundary of the site.

A histogram displaying the frequency of peat depths encountered is presented in Figure 6 and clearly displays that almost half of depth probes are less than 0.3m deep. Peat depth contours are presented in Figure 7.

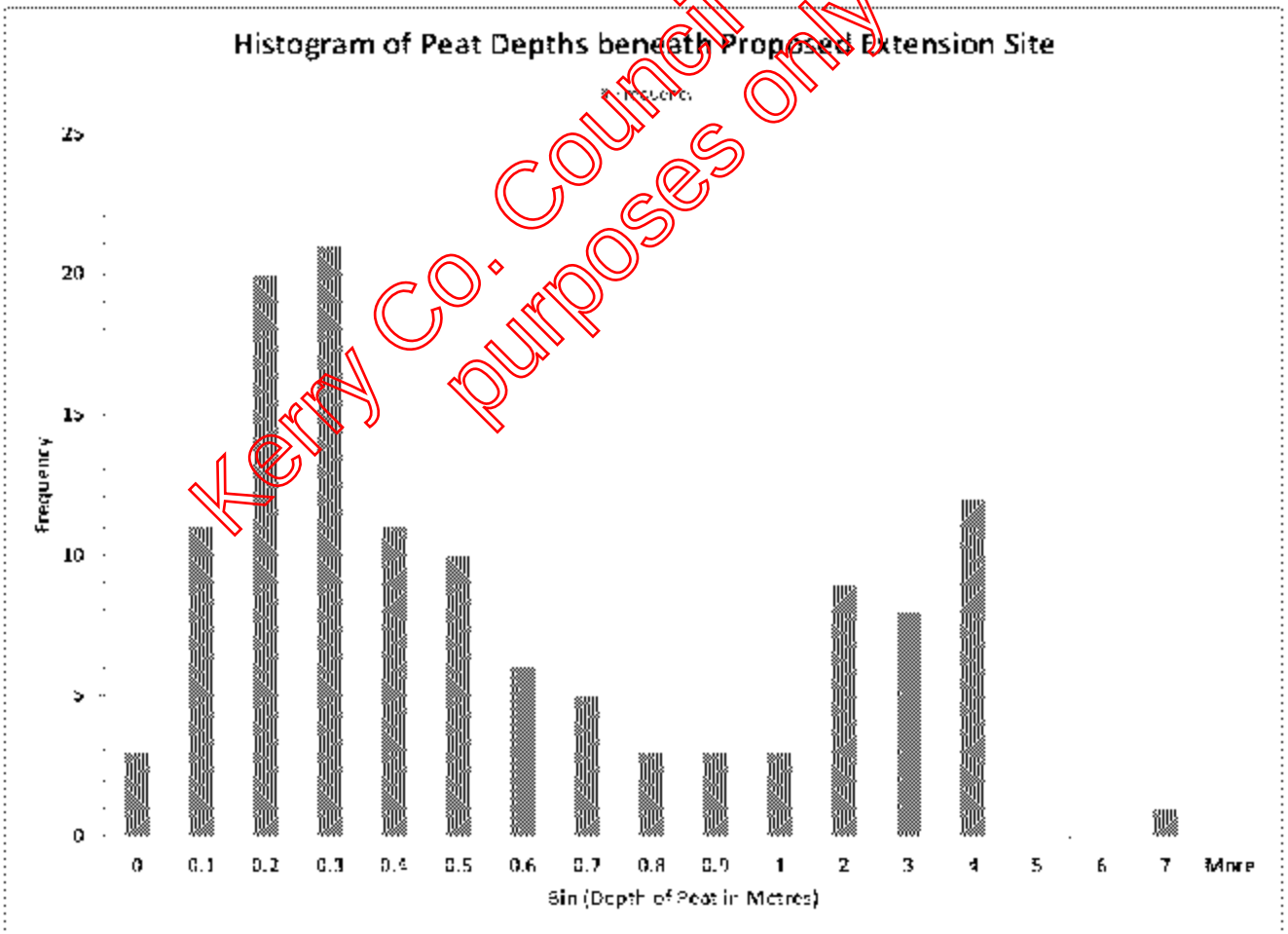


Figure 14: Histogram of probed peat depth beneath the proposed extension at Knocknaboola

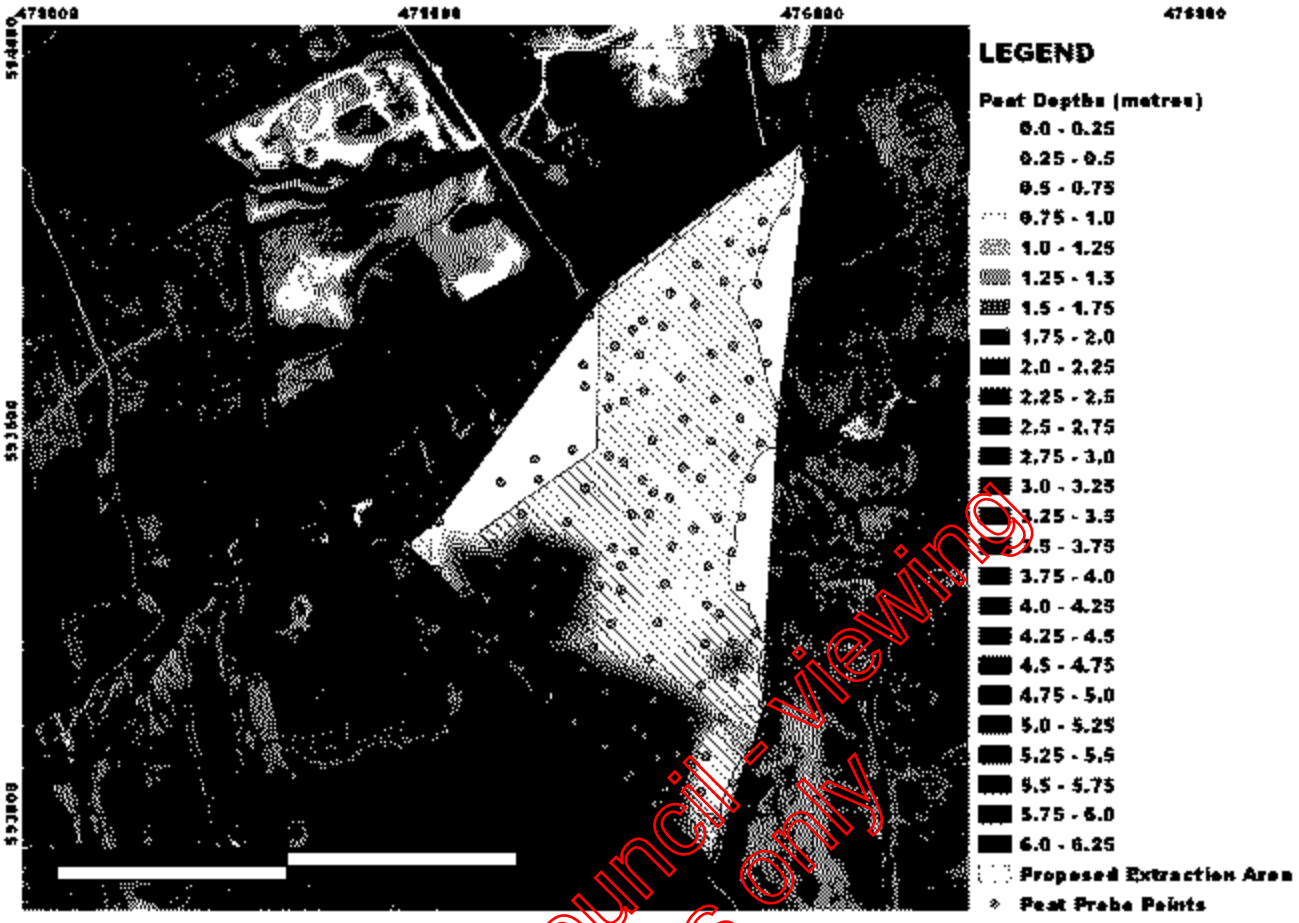


Figure 15: Peat Depth Contours beneath proposed extension

6.4.4.2 Trial Pit Investigation

Five no. trial pits were excavated on the proposed extension site at Knocknaboola to maximum proven depths of between 2.7m BGL (TH103) to 3.8m BGL (TH101) on the 17th June 2021. Trial pit locations were chosen to give a good spatial indication of subsoil conditions beneath the proposed extension at Knocknaboola. The trial pit returns were logged by a hydrogeologist. The quaternary deposits exposed during trial pitting show a wide variety of materials present. They range from silty clayey fine SAND, to clayey sandy GRAVEL, to coarse SAND and GRAVEL beds. The upper sand and gravel horizons tend to be well cemented. These upper layers have a low permeability, and include a low permeability iron pan, and it is this low permeability which allows a perched water table to develop above the sand and gravel deposits and provided the conditions for peat development to occur. An iron pan was observed in TH102 to TH105 at depths of between 0.7m to 1.2m BGL (TH104) to 1.5m to 1.6m BGL (TH102). Beneath the iron pan, the sediments tend to be free draining and water percolated freely to ground. Perched groundwater was noted seeping into TH101 from 3.4m BGL; and shallow water seepage from above the iron pan into Trial Holes 102 to 105 was noted. Trial hole logs are presented in Appendix 7.1. Trial pit locations are presented in Figure 8.

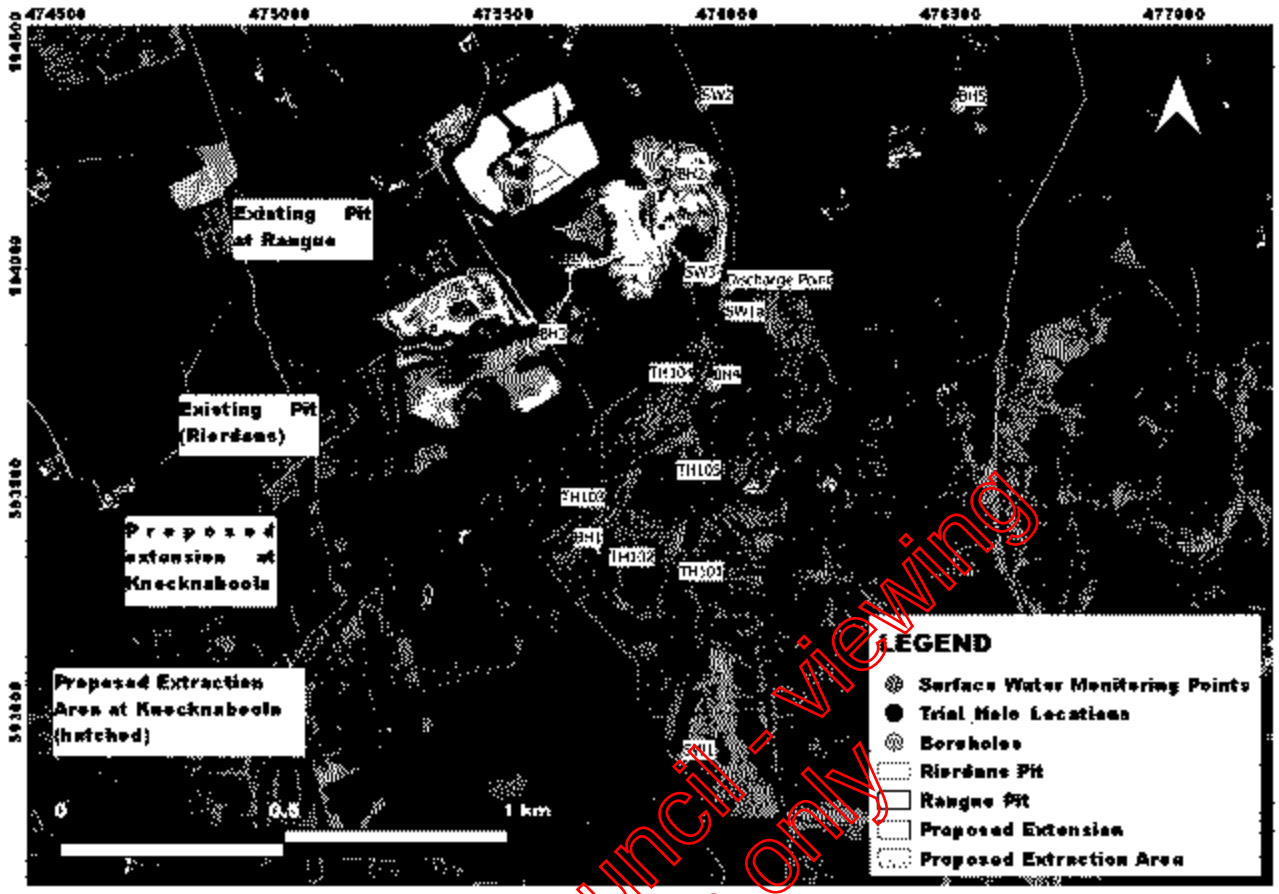


Figure 16: Trial Pit, Borehole and Surface Water Monitoring Locations

6.4.4.3 Borehole Drilling

Two boreholes were drilled on the Knocknaboola site by Hilliard Ltd drillers in July 2019. Both boreholes were completed as monitoring wells. A review of the drillers log indicates that Borehole 4 (BH4 – named hole 1 on the drillers log), which is located east and across the Glashacoomnafanida stream from the proposed extension at Knocknaboola, was drilled to a depth of 17.0m BGL. According to the driller's log, gravel boulders were encountered to a depth of 9m BGL, overlying sand and gravel to 13m BGL, overlying sand to 16m BGL, overlying sandy gravel to 17m BGL. Groundwater was reportedly encountered from 13m BGL. The monitoring well was completed with slotted 2" pipe from 17.5m to 13.5m, and plain pipe from 13.5m to ground level. The groundwater level was encountered at depths of between 9.05m and 10.8m below ground level between March and June 2021.

A review of the drillers log indicates that borehole 1 (BH1 – named hole 2 on the drillers log), which is located in the centre of the proposed extension at Knocknaboola, was drilled to a depth of 17.5m BGL. According to the driller's log, boulders gravel and sand were encountered to a depth of 1m BGL, overlying sandy gravel to 17.5m BGL. Groundwater was reportedly encountered from 15m BGL. The monitoring well was completed with slotted 2" pipe from 17.5m to 13.5m, and plain pipe from 13.5m to ground level. The groundwater level was encountered at depths of between 12.87m and 13.19m below ground level between March and June 2021.
Previously, borehole drilling and testing was carried out under the supervision of Eugene Daly and Associates in July and August 2000. Borehole 2 was drilled in the east central part of the Rangue pit, to a depth of 8.5m below the floor of the pit. The borehole collared into a dense, silty gravelly sand (EDA, 2000). Bedrock was not encountered.

Borehole 3 was drilled just inside the eastern boundary of the Riordan's site. The borehole encountered dense very silty very sandy, fine to medium gravel with cobbles and boulders to 8m BGL, overlying gravels with a proportion of fine sand to 18m BGL, overlying sandy clay with gravel between 18m and 19.1m. Bedrock was not encountered.

The 2019 driller's logs and available logs from 2000 are presented in Appendix 7.2. Borehole locations are presented in Figure 16.

6.4.5 Bedrock Geology

The Geological Survey of Ireland (GSI) Sheet 20, Geology of Dingle (Pracht, 1996), shows that the Rangue and Knocknaboola sites are underlain by limestones of Lower Carboniferous age. Owing to the absence of rock outcrop in the area, the limestones are taken as one undifferentiated unit called the Dinantian Limestones. Devonian rocks (sandstones, conglomerates and slates) outcrop in the higher ground about 1.5km to the south of the Rangue site. There are also Namurian (Upper Carboniferous) shales in a couple of outcrops at Laharan over 2km to the north of the site.

Bedrock is overlain by extensive sand and gravel overburden deposits reportedly up to 30m thick in the vicinity of the pit at Rangue (EDA, 2002).

Few bedrock structures are mapped in this area, which is probably related to the poor exposure, and lack of variation in the rock lithology. The rocks have been folded by the Variscan Orogeny into a series of east west trending anticlines and synclines, with associated systems of faults and joints which created some pathways for groundwater movement (GSI, 2004). According to Sheet 20, much of the bedrock is dipping to the south at between 35 and 70 degrees.

The mapped bedrock geology of the site area from the GSI is presented in Figure 8.

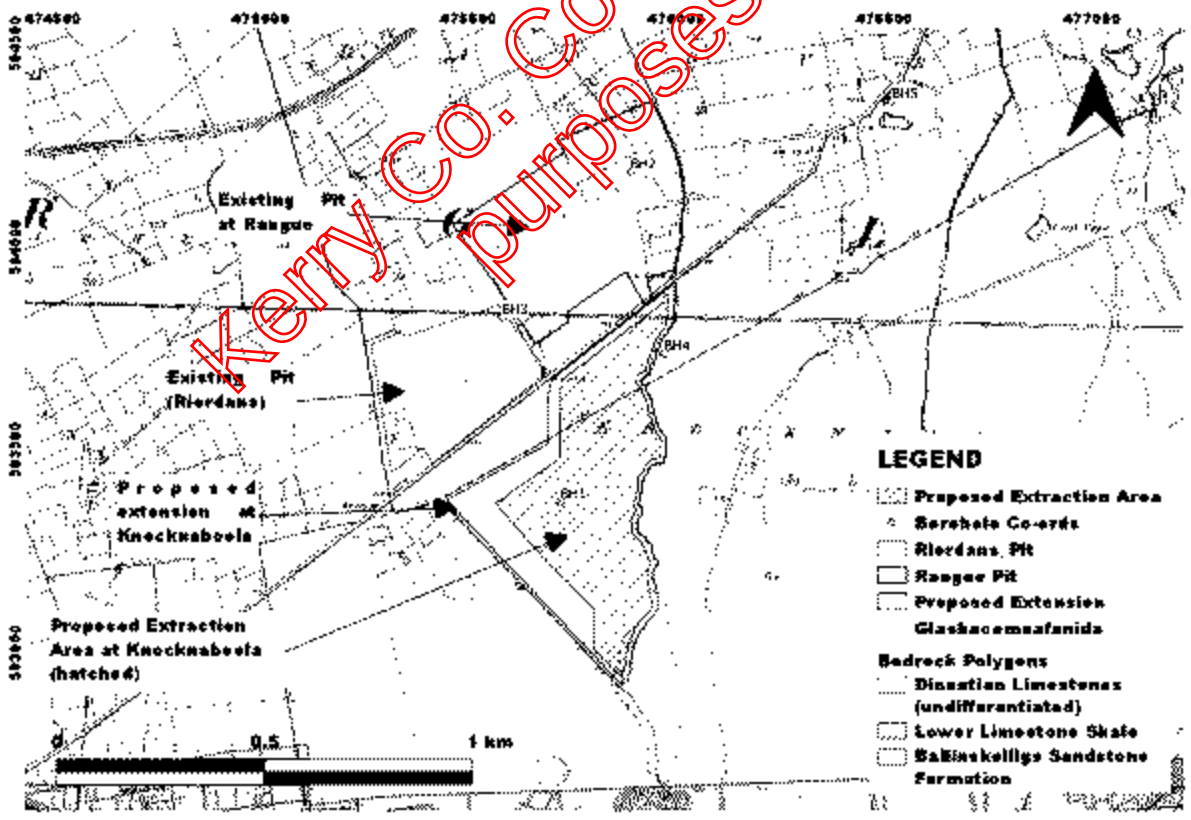


Figure 17: Bedrock Geology Map (Source: GSI)

6.4.6 Groundwater Vulnerability

The GSI has developed a groundwater vulnerability classification for Ireland. The groundwater vulnerability at a particular point can be determined based on the natural geological and hydrogeological characteristics at that point. The vulnerability therefore depends on the nature of subsoils (permeability), the type of recharge (point or diffuse) and the thickness of the unsaturated zone (depth to groundwater).

The vulnerability of the bedrock aquifer underlying the majority of the existing sandpit is rated as "High". A high vulnerability rating indicates the presence of greater than 3 metres of high permeability subsoil overlying the bedrock aquifer; or between 3 and 10m of moderate permeability material overlying the bedrock aquifer; or, between 3 and 5m of low permeability material overlying the bedrock aquifer.

The vulnerability of the bedrock aquifer underlying the proposed extension is rated as "Moderate". A moderate vulnerability rating indicates the presence of greater than 10 metres of moderate permeability subsoil overlying the bedrock aquifer; or between 5 and 10m of low permeability material overlying the bedrock aquifer.

Five no. trial pits excavated on the site of the proposed extension at Knocknaboola confirm the presence of at least 3.8m of sand and gravel overburden beneath the site. Borehole drilling, completed during a 2019 site investigation at the proposed extension, reportedly encountered up to 27.5m of sands and gravels, with no bedrock encountered. The depth to water in that borehole ranges between 13.61 and 13.93m BGL, (21.37m AOD to 21.0m AOD) and represents the groundwater level in the quaternary sediments, indicating a "high" groundwater vulnerability rating for the proposed extension.

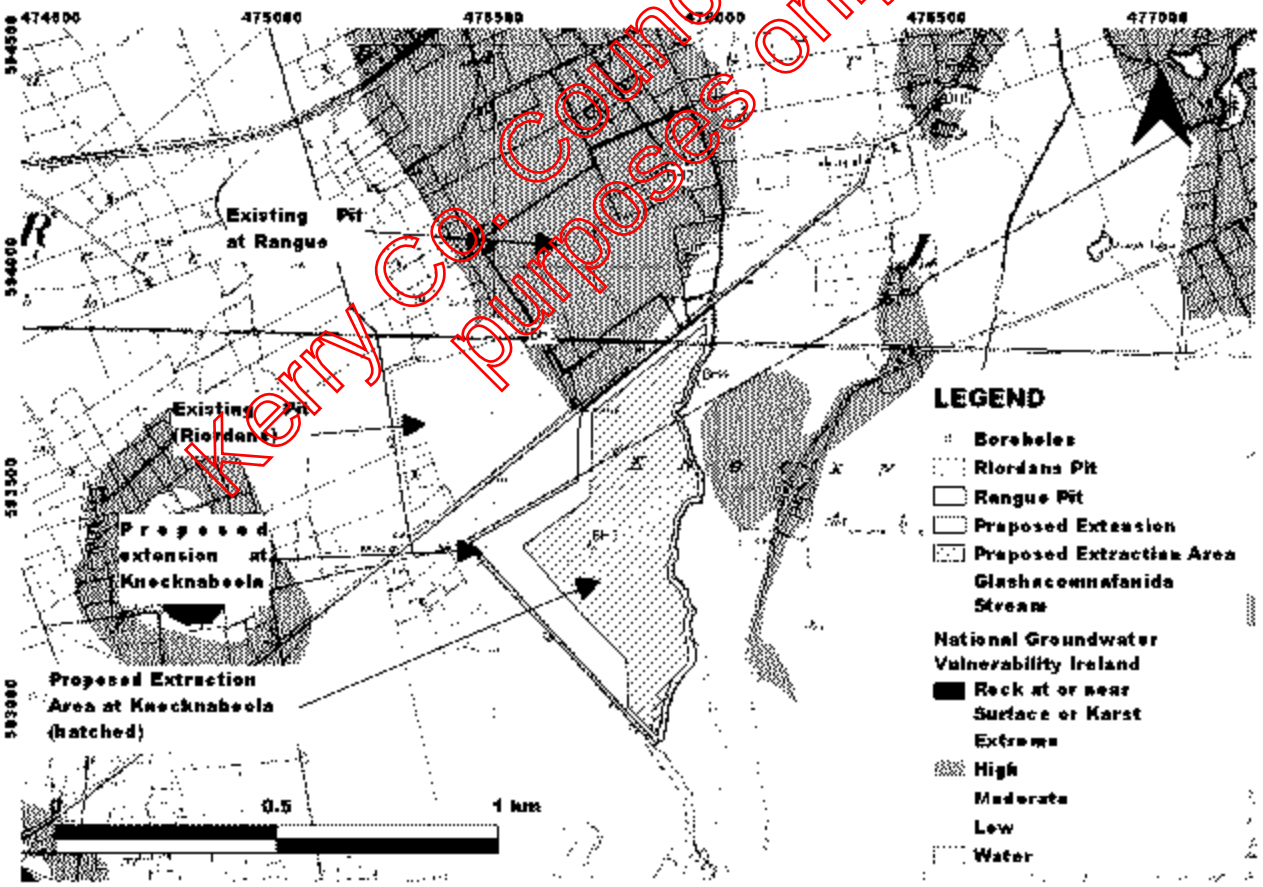


Figure 18: Groundwater Vulnerability Map (Source: www.gsi.ie)

6.4.7 Hydrogeology

There are essentially two potential aquifers beneath the existing site at Rangue, and, the proposed extension, at Rangue and Knocknaboola:

- A potential aquifer within the underlying bedrock (classified as a regionally important karstified aquifer by the GSI) and;

- A potential aquifer within the overlying quaternary sand and gravel deposits (not classified as an aquifer by the GSI).

Bedrock:

The Geological Survey of Ireland (GSI) Sheet 20, Geology of Dingle (Pracht, 1996), shows that the Rangue and Knocknaboola sites are underlain by limestones of Lower Carboniferous age. Owing to the thick overburden cover, which results in an absence of rock outcrop in the area, the limestones are taken as one undifferentiated unit called the Dinantian Limestones. This bedrock is classified by the Geological Survey of Ireland (GSI) as being a Regionally Important Aquifer (Rkc). This indicates possible well yields of greater than 400 m^3/day from bedrock.

According to the GSI, it is expected that a yet unmapped succession of Dinantian Lower Impure Limestones, Dinantian Pure Unbedded Limestones and Dinantian Upper Impure Limestones, similar to which occurs in the east of the groundwater body and in the Castlemaine Groundwater Body, occurs within this area. The Pure Unbedded Limestones are considered to be the dominant lithology (GSI, 2004).

Pure unbedded limestones in this region are generally highly productive. The rocks generally contain numerous faults and joints which have been enlarged by karstification. In this GWB there are some surface karst features east of Lough Leane and along the shores of the lake. Transmissivity in the pure unbedded limestone can range up to a few thousand m^2/d. Pumping tests in the same rock type in the Cloyne GWB gave a range of transmissivity of 200 to over 2000 m^2/day. Groundwater gradients are generally low (0.001 to 0.005). Some variations in the hydrogeological properties observed within the pure unbedded limestone have been observed in the adjoining Castlemaine GWB to the north, due to some variation in the permeability of the different rock units (GSI, 2004).

Steeper hydraulic gradients are expected where impure limestones occur. In the impure limestones, transmissivities will be lower; generally in the range 5-20 m^2/day but may be higher where karstification has occurred (GSI, 2004).

Within the existing pit, and beneath the proposed extension, quaternary deposits are present and the depth to bedrock is deep (bedrock was not encountered during drilling beneath the existing pit, where BH2 was advanced to 8m below the floor of the pit, or beneath the proposed extension to a proven depth of 17m below existing ground level). Therefore there will be no impact on the underlying bedrock aquifer from quarrying activities at Rangue or Knocknaboola.

Quaternary Deposits:

The bedrock is overlain by extensive areas of sand and gravel. These deposits have not yet proven to be very productive and the heterogeneity of these deposits means that their ability to act as aquifers is limited (GSI, 2004).

In the Killorglin area, overlying sand and gravel quaternary deposits that are in continuity with the underlying limestone provides additional storage to the bedrock aquifer. According to the GSI, data on the hydrogeological properties of these deposits, which are a mixture of glacial moraines and out-wash gravels, is limited. No high yielding boreholes are recorded. The water level fluctuation in two wells monitored near Killorglin is very small which may be attributed to the high storativity in the deep sand/gravel deposits. The moraines have a high clay

content and subsequently lower permeability and so do not yield large quantities of water. They can also contain massive boulders which make well drilling difficult. The cleaner outwash gravels have higher sand and gravel content and are more likely to bear water.

According to the GSI, in the west of the groundwater body, an iron pan has developed over sand and gravel deposits, resulting in a perched water table and the development of blanket peat over sand and gravel deposits (GSI, 2004). The iron pan was encountered during trial pitting on the proposed extension site in June 2021. Previous work completed by Eugene Daly and Associates in August 2000 found that very rapid variations occur in the lithology in the Rangue area. These findings have been backed up by the trial pit investigation completed as part of this report in June 2021 (section 7.4.2.2). The same applies to the permeability of the quaternary (subsoil) deposits.

The response of the water level (i.e. rise above the top of the unit) in BH2 when drilling penetrated the lower sandy gravel layer indicates that the groundwater in the sandy gravel unit is being confined by the overlying silty gravelly sand which therefore has a low permeability (EDA, 2000).

In the Rangue pit, both the units above and below the silty gravelly sandy have a lower fines content. Therefore, the permeability of these units will be at least moderate. The rising head test in borehole BH2 gave a value for the permeability of the lower unit of 1.32×10^{-5} m/s. A similar value was reportedly obtained for the strata straddling the water table in the borehole at Riordan's site (BH3). These permeability values are typical of 'dirty' gravels (EDA, 2000).

Rising head tests completed in the newly drilled boreholes BH1 and BH4 on and close to the proposed extension indicate the underlying sand and gravel permeability values in the range of 3.81×10^{-4} m/s (BH1) to 1.15×10^{-3} m/s (BH4). These are typical of permeability values expected in unconsolidated clean sands and gravels. Permeability test calculations are presented in Appendix 7.3.

The permanent water table during the summer of 2000 was 16 to 17m below ground level in the area of the Rangue and Riordan's pits (similar levels were encountered in 2021). There were perched water tables above the permanent water table in this area. The reduced water levels show a reduction in water table elevation of 4.19m from the southwest (Riordan's site) to the northeast (BH 5). This indicates that groundwater flow is to the northeast, towards the River Laune. However, in the immediate area of the Rangue pit groundwater will flow towards the pond in the pit due to pumping (EDA, 2000).

It is likely that continuity in the subsoil deposits as a whole will be relatively low owing to the type of deposit. The results of drilling show that the streams in the area are all perched above the permanent water table. Observations of the streams at low flow and the pond discharge indicate that some stream flow is being lost to the water table and is therefore recharging the underlying groundwater body (EDA, 2000).

Two boreholes were drilled at Knocknaboola in 2019. A review of the driller's logs, and the trial pit returns, confirms there is a shallow perched water table above an iron pan, and a deeper water table within the underlying sands and gravels at the Knocknaboola site. The groundwater levels were measured at 12.87m to 13.19m below ground level beneath the proposed extension at Knocknaboola (BH1).

There is no evidence of large springs or abstraction wells immediately upgradient or downgradient of the sandpit or proposed extension.

6.4.7.1 Water Framework Directive

Under the Water Framework Directive, different geological formations have been grouped into similar 'rock unit groups' of similar hydrogeological characteristics. Large areas of these rock unit groups have been defined as 'groundwater bodies', the management unit for groundwater for the purposes of the Water Framework

Directive. The overall status of each groundwater body has been assessed as either 'Good' or 'Poor' as part of the Water Framework Directive Implementation work in Ireland.

The existing and proposed site is located within the Laune Muckross Groundwater Body (GWB). The Laune Muckross Groundwater Body has been assessed as having 'Good' status but is considered to be 'at risk' of failing to achieve the objectives of the Water Framework Directive (i.e. maintain good status by 2027). It appears that the main pressure identified is industrial, and relates to a licenced industrial facility (P0018-01) which is located 2km west of the existing pit at Rangue.

Limestone bedrock within the Laune Muckross GWB have no intergranular permeability. Groundwater flow occurs in the many faults and joints, enlarged by karstification. Based on data from the similar Castlemaine GWB to the north it is likely that at least part of the groundwater flow may be through enlarged conduits within the limestone, however overall groundwater flow is generally thought to be diffuse rather than focussed due to the high frequency fractures and jointing (GSI, 2004).

Groundwater flow is complicated in the west of the groundwater body (including at Rangue and Knocknaboola) where the bedrock aquifer is overlain by deep sand and gravel deposits which are in turn overlain by blanket peat over an iron pan. A shallow perched water table has been encountered in the overlying peat. Beneath the peat, water levels in the sands and gravels can be quite deep (10 to 20m below ground level). In general, groundwater is unconfined in this GWB. Groundwater gradients are expected to be relatively flat in the sand and gravel and in the pure unbedded limestones (GSI, 2004)

The regional groundwater flow direction is anticipated to be downslope to the northeast, towards the River Laune, which serves as the primary line of discharge. The highly permeable aquifer supports a regional scale flow system. Groundwater flow paths can be several kilometres long, but may be significantly shorted in areas where the water table is very close to the surface.

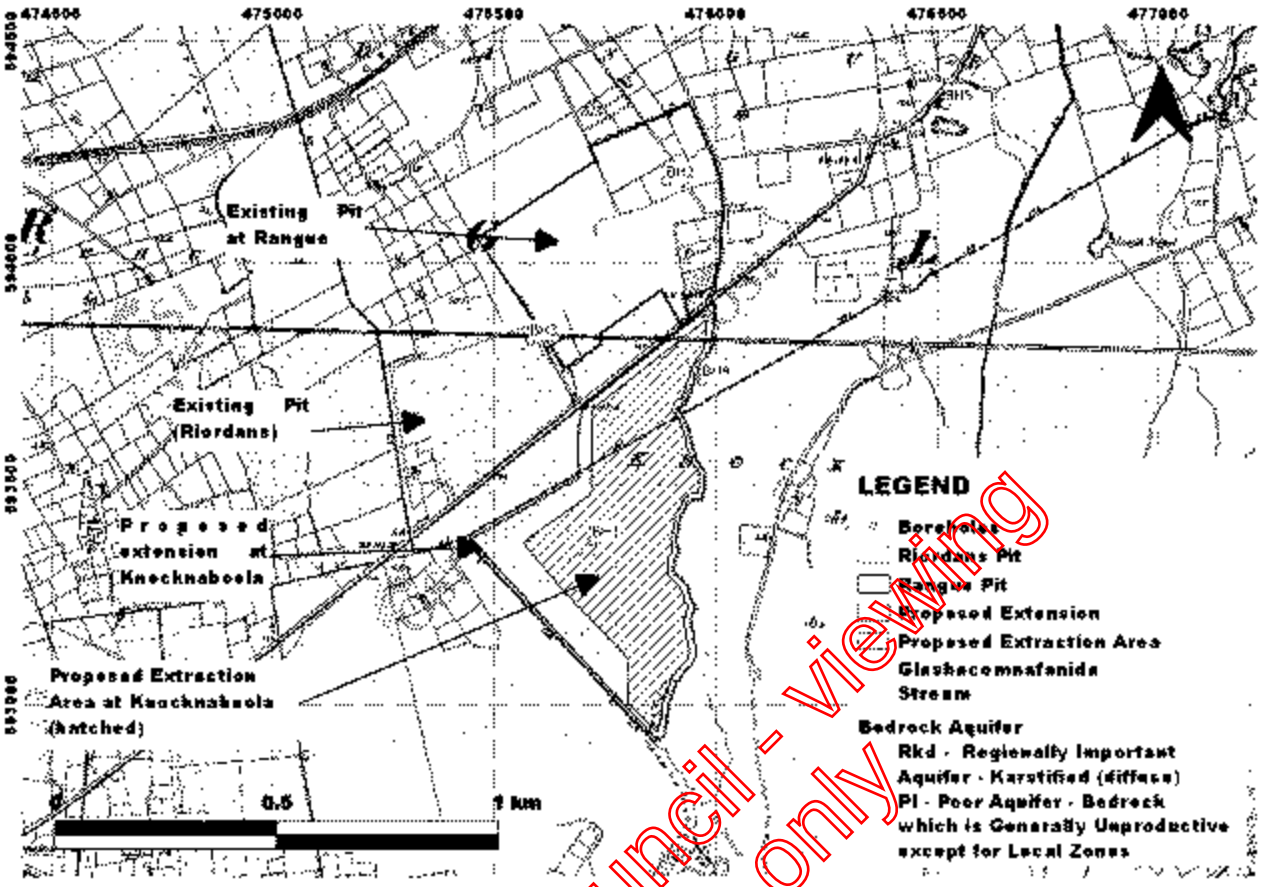


Figure 19: Bedrock Aquifer Map
(Source: www.gsi.ie)

6.4.9 Groundwater Recharge Mechanisms

Diffuse recharge occurs over most of the groundwater body as precipitation percolates through subsoil or areas of outcropping rock. There will also be runoff from surrounding uplands.

An iron pan has developed above the sand and gravel deposits beneath the proposed extension. This has resulted in a perched water table and the development of blanket peat over the sand and gravel deposits. This iron pan restricts the downward percolation of rainfall recharge.

Where morainic sand and gravel deposits occur with high clay content they may also restrict percolation of recharge to the underlying aquifer. Moranic sand and gravel deposits are mapped to the east and west of the proposed extension at Knocknaboola.

The GSI has estimated a recharge co-efficient of 4% for the site of the proposed extension at Knocknaboola. This indicates that up to 94% of effective rainfall on the site will runoff to the Glashacoomanfanida stream.
The GSI has applied a recharge co-efficient of 42.5% for the main pit at Rangue. This indicates that 57.5% of effective rainfall will runoff to the ponds at the site, before being pumped off site via the licenced discharge point.

The water budget for the site is investigated in detail in Appendix 7.4. The water budget indicates that approximately 202,017 m^3/annum is available to runoff to the ponds or percolate to ground at Rangue (c. 553 m^3/day) in its current state; and that c. 6,307 m^3/annum (16.8m^3/day) percolates to groundwater beneath the proposed extension at Knocknaboola.

6.4.10 Discharge of Domestic Wastewater to Ground

Sewage wastewater effluent generated from the toilets and canteen located beside the offices at the Rangue site discharges to a septic tank and soak pit located along the southwestern boundary of the site. The hydraulic population equivalence of the quarry is 3.5, and the organic P.E. is 6. Therefore, a Tier 1 assessment, completed in accordance with the EPA (2011) Guidance on the Authorisation of Discharges to Ground is required (i.e. a site suitability assessment).

A site characterisation assessment was carried out to investigate the suitability to treat and dispose of sewage wastewater generated from the toilet and welfare facilities on site, to ground. The site suitability assessment found that the site is suitable for the installation of a tertiary treatment system, constructed and installed incompliance with the EPA CoP, 2021. The existing wastewater treatment and disposal system is not installed in compliance with the EPA Code of Practice, Wastewater Treatment and Disposal Systems serving Single Houses, 2021 and will need to be replaced. The site characterisation report is presented in Appendix 7.5.

6.4.11 Dewatering and Groundwater Discharge

No extraction of aggregate will take place beneath the water table at the proposed extension at Knocknaboola; therefore no dewatering will be required on that site.

It will continue to be necessary to pump groundwater from the southern pond at the Rangue site in order to control the water table level in the winter, and intermittently during rainfall events in the summer, and to provide water for concrete production. The volume of abstraction is relatively small, and the associated drawdown will not extend much beyond the boundaries of the pit.

Discharge of water from the site is subject to the conditions of discharge licence W61 and is presented in Appendix 7.6.

6.4.12 Groundwater Wells

Neither the existing quarry, nor the proposed extension is located within the source protection zone of contribution or a source protection zone of any public water supply well.
The site and surrounds are served by mains water. There are no known domestic groundwater abstraction wells within the vicinity of the site.

The nearest known abstraction well is located at the Roadstone quarry the north of the Rangue pit. It is presumed that this well was used to supply process water though no information was available. The borehole is approximately 250m from the southern pond in the Rangue pit. This quarry is no longer in use as economically exploitable sand and gravel has been removed from the pit.

A review of the GSI online web mapping site indicates the nearest mapped groundwater well is located at the junction of the minor road at Tooreennaslingaun (townland west of Rangue) and the N70 about 3km west of the pit at Rangue.

6.4.13 Groundwater Hydrochemistry

A number of groundwater quality samples have been obtained from the site; 4 groundwater samples were obtained on the 16th June 2021, in accordance with PES groundwater sampling protocol, and sent to an accredited laboratory for analysis for a range of parameters as part of this baseline assessment. Groundwater samples were obtained from BH1 (Knocknaboola), BH2 (Rangue), BH3 (Riordan's Pit) and BH4 (Knocknaboola). The results of analysis were compared to previous groundwater analysis from boreholes BH2 and BH3 completed in 2000, and to the EU Environmental Objectives (Groundwater) Regulations (S.I. No. 9 of 2010) and the Drinking Water Standards (S.I. 122 of 2014). The results of analysis are presented in graphical format in

Figure 11 and in numerical format in Table 5, and the laboratory analytical certificates are presented in Appendix 7.7. Groundwater sampling logs are presented in Appendix 7.8.

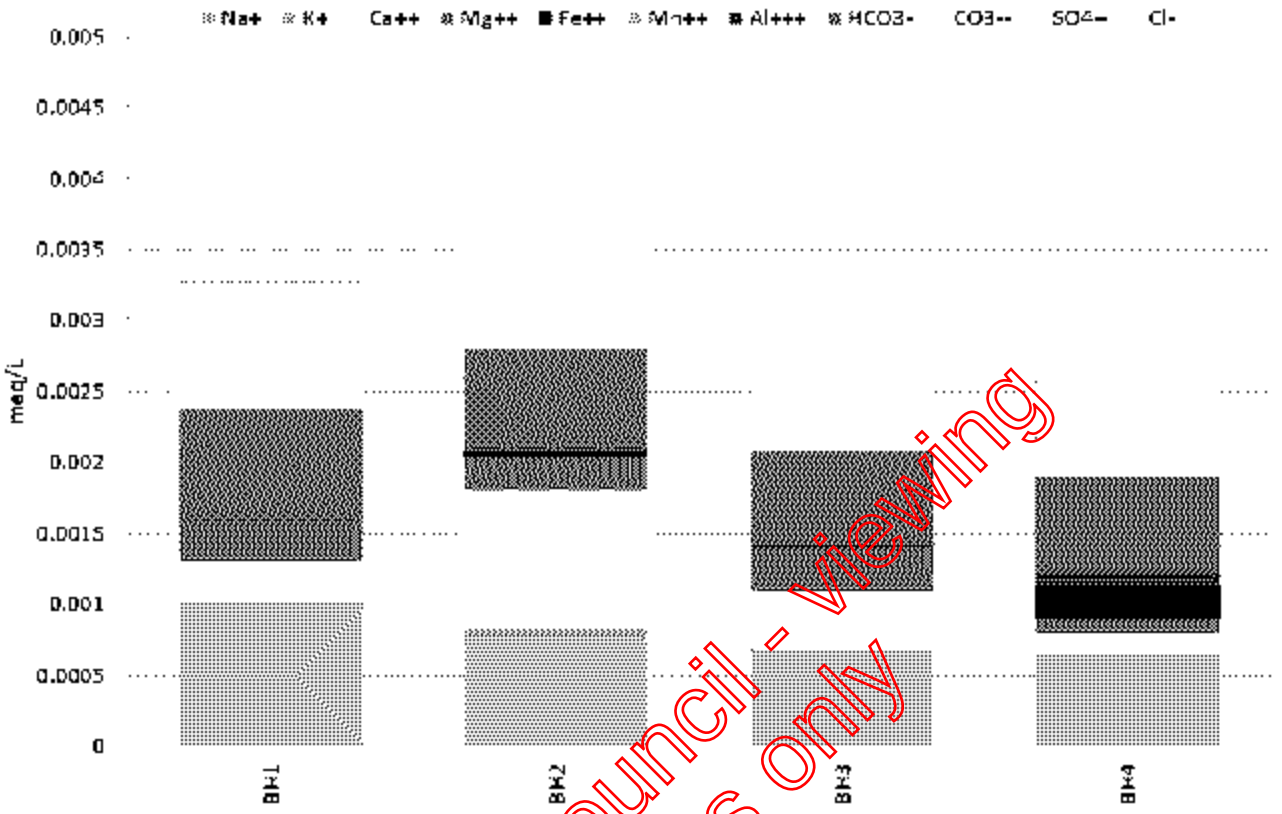


Figure 20: Hydro-chemical Bar Plot of Water Samples from Quirkes Quarry, Rangue

The results of analysis confirms that the hydrochemistry of groundwater from BH's 1, 3 and 4 is dominated by the sodium and chloride and bicarbonate ions, and that groundwater is soft (BH1, 3 and 4) to moderately hard (BH2), ranging between 18 mg/l $CaCo_3$ in BH4 to 68 mg/l $CaCo_3$ in BH2's 2000 sample. Groundwater in BH2, in the main pit at Rangue is dominated by the sodium, chloride and bicarbonate irons, as well as calcium ions. A piper plot of groundwater results indicates the groundwater in the area is dominated by sodium chloride type water (Appendix 7.9).

All groundwater samples, show low levels of mineralisation, indicating young groundwater with a short residence time in the overburden aquifer (Figure 11). This is typical of groundwater with short flow pathways. Overall, water quality is good. Nitrate and ammonia levels are low in all the groundwater samples. All the analysis indicates good water quality with little evidence of human activity. Groundwater in BH2 has an elevated pH level compared with the other samples, and the sample collected in 2000. Its chemistry shows more calcium present than in other groundwater samples. It is likely that the elevated calcium is a naturally occurring phenomenon, given the groundwater samples collected in 2000 and 2021 show the presence of moderately hard groundwater at this location, compared with soft groundwater sampled from the other boreholes, and the underlying bedrock aquifer consists of calcium rich limestone bedrock.

Table 19: Groundwater Analytical Results

PARAMETER	UNITS	BH1	BH2	BH2	BH3	BH3	BH4	Drinking Water Standards S.I. No. 122 of 2014	Fit Environmental Objectives (GW) S.I. No. 9 of 2010
Date Sampled		17/06/2021	17/06/2021	02/08/2000	17/06/2021	02/08/2000	17/06/2021		
Sampled By		PES	PES	EDA	PES	EDA	PES		
Field Parameters									
pH	pH Units	5.89	9.26	5.1	5.32	6.7	5.8		
Electrical Conductivity	uS/cm @ 25degC	186	219	279	172	162	142	60	37.5
Temperature	°C	11.5	11.7	-	11.4	-	11.2		
MICROBIOLOGICAL									
Escherishia coli (E.coli)	mpn/100ml	<1			<1		<1	0	
Total Coliforms	mpn/100ml	<1	-	-	<1	-	<1	0	
CHEMICAL PARAMETERS									
Hardness	mg/l CaCO3	28	60	64	34	48	40		
Cadmium	µg/l	<0.45	-	-	<0.45	-	<0.45	5	
Chromium	µg/l	<1			<1		2	50	37.5
Lead	µg/l	<1	-	-	<1	-	<1	10	18.75
Nickel	µg/l	<1	-	-	<1	-	<1	20	15
Arsenic	µg/l	<1	-	-	<1		3	10	7.5
Nitrate as NO3	mg/l NO3	6.46	<0.8	<0.09	<1.1	3	<1.1	50	37.5
INDICATOR PARAMETERS									
Aluminium	µg/l	28	-	-	92	-	-	200	150
Sodium	mg/l	22.9	32.6	45	16.5	20	14.6	200	150
Magnesium	mg/l	3.3	2.03	-	3.0	-	1.2		
Calcium	mg/l	8.7	19.4		8		2.8		
Ammonium NH4	mg/l NH4	<0.02	0.16	-	<0.02	-	0.16	0.3	0.085 - 0.175
Chloride	mg/l Cl	28	39.4	42.5	27.3	28.4	26.8	250	24 187.5
Potassium	mg/l K	<1	3.41	3.5	<1	2.7	<1	-	
Sulphate	mg/l SO4--	8.2	<20		8.6	-	5	250	187.5
Colour	Hazen units	<5	0		<5	-	<5	Acceptable to consumers and no abnormal change	
Conductivity	uS/cm @ 25degC	186	194	279	154	162	126	2,500	600 - 1875
pH	-	6.1	9.62	5.1	6.6		6.3	6.5 - 9.5	
Total Iron	µg/l	8	1420	570	27	<100	6849	200	
Total Manganese	µg/l	3.15	70.3	420	<1	630	279.84	50	
Alkalinity	mg/l CaCO3	40.5	57.8	60	33.5	36	34		
Total Organic Carbon (TOC)		1.9	4.58	<5	1.3	<5	1.9	No abnormal change	
Other Metals									
Barium	µg/l	34	-	-	5	-	28		
Strontium	µg/l	20	-	-	17	-	14		
Zinc	µg/l	<8	-	-	<8	-	<8		
Other									
Total Phosphorus	mg/l P	3.04	-	-	<0.04	-	3.11		
BOD	mg/l	<1	11	-	<1	-	1.3		
Hydrocarbons	µg/l		<10						

"-" indicates not analysed

- 7.4.14 Groundwater Levels and Flows

Groundwater levels varied between 13.61m and 14.51m below ground level in BH1 at the site of the proposed extension in Knocknaboola during the study period of March 2021 to October 2021. This equates to between 20.42m and 21.37m AOD.

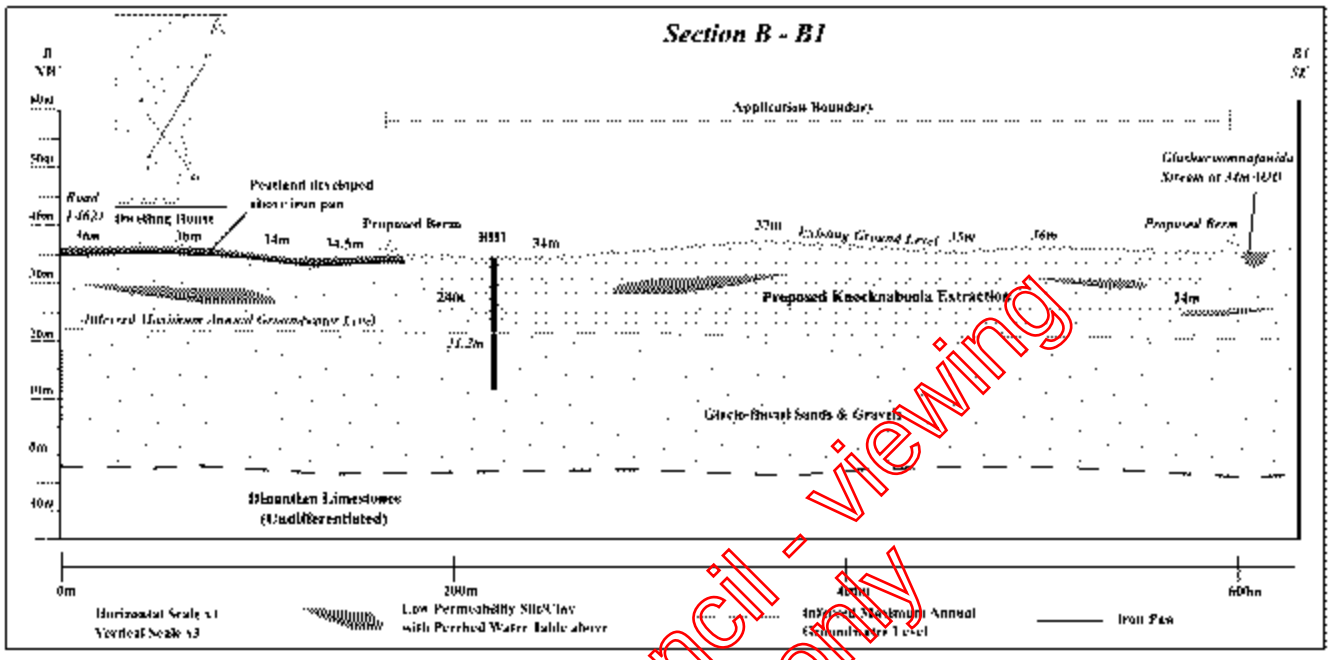
Excavation from the pit in Rangue is close to the water table, with the southern pond having been excavated below the winter water table.

The regional groundwater flow direction is anticipated to be from elevated ground to the south of the existing pit towards the River Laune to the northeast. This was confirmed by interrogation of groundwater level data collected during the study period (Appendix 7.10). Groundwater contours were prepared using groundwater level data recorded during the water level monitoring on the 13th October 2021. The inferred groundwater contours and groundwater flow direction are presented in **Figure 21**.

Figure 21: Inferred Groundwater Contours and Groundwater Flow Direction

6.4.19 Conceptual Site Model

A hydrogeological conceptual model of the site is presented in Figure 16 and Figure **23** and is based on the section line A-A1 and B-B1.



The site and surrounds are underlain by an estimated 30m of sand and gravel subsoil overburden overlying limestone bedrock. A shallow iron pan has developed over sand and gravel deposits, at a depth between 0.7m and 1.6m BGL, resulting in a perched water table and the development of blanket peat over sand and gravel. Peat depths across the majority of the proposed extension are less than 0.3m. The GSI estimates that up to 96% of effective rainfall will runoff the blanket peat to the surface drainage network. Beneath the iron pan, subsoil deposits tend to be more permeable.

The subsoil sediments generally consist of interbedded tills (boulder clay) and sands and gravels. Owing to the chaotic type of deposition by ice sheets, very rapid vertical and horizontal variations in lithology and permeability's can be expected in this type of deposit. There is a proven depth of 17.0m of sand and gravel subsoil beneath the proposed extension at Knocknaboola (BH1). The groundwater level varied between 12.87m and 13.19m in BH1, and 9.05m and 10.2m in BH4 during the study period of March 2021 July 2021. This indicates the surface drainage network is perched at least 9m above the groundwater table in the vicinity of the existing pit at Range and the site of the proposed extension at Knocknaboola. Observations of the Glashacoomnafanida stream indicate is it loosing water to ground where it crossed permeable sand and gravel strata.

As removal of peat and low permeability deposits above the iron pan progress, the majority of effective rainfall will percolate to ground rather than runoff to the surface drainage network beneath the proposed extension site.

The existing pit at Rangue has been worked down to c. 17m BGL. The floor of the pit is close to the maximum winter groundwater table. Therefore, the effective rainfall on the existing pit will either percolate to groundwater or runoff to a number of ponds that cover the floor of the pit. The water level in the pit is controlled by pumping from the southern pond, to the Glashacoomnafanida stream under licence (Discharge Licence W61).

Figure 22: Conceptual Site Model (Section Line A-A)

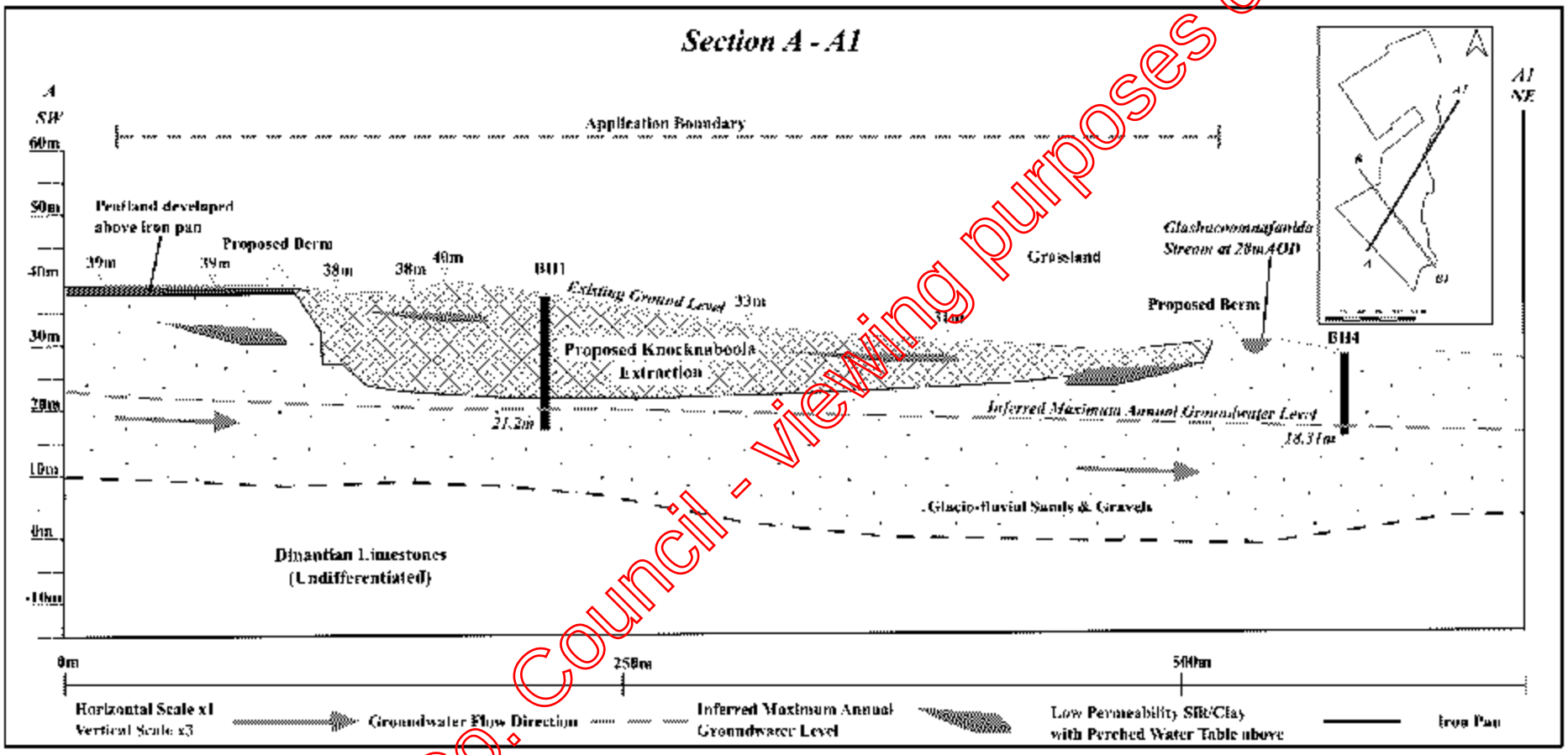
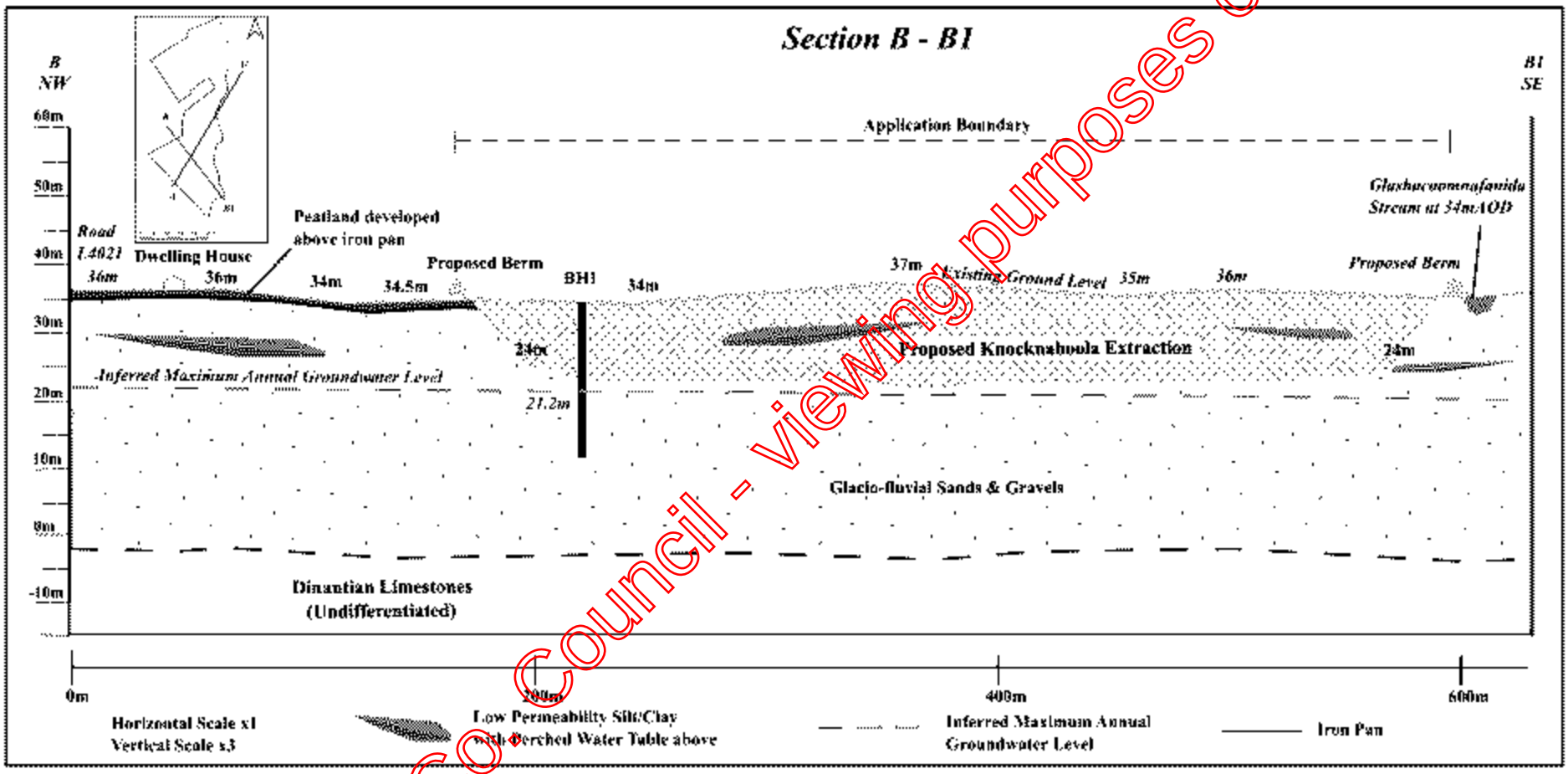


Figure 23: Conceptual Site Model (Section Line A-A)



6.4.20 Geological Heritage Sites

The site does not encompass any listed geological heritage sites. The closest geological heritage site is at Tullig Beg (IGH 16), which is located c. 2.6km northwest of the site.

6.4.21 Designated Sites

In the Republic of Ireland designated sites include proposed National Heritage Areas (pNHAs), National Heritage Areas (NHAs), Special Areas of Conservation (SAC) and Special Protection Areas (SPAs). Neither the existing quarry at Rangue not the proposed extension at Knocknaboola is located within or adjacent to any designated site.

There is one designated site within 5km of the proposed development site, namely the Castlemaine Harbour Special Area of Conservation (SAC) and Proposed National Heritage Area (pNHA) (site code 000365) which is located approximately 2.1km west and upgradient of the existing pit at its closest to the site. This area is designated an SAC based on the presence of 19 habitats or species which are listed on Annex I/II/IV of the EU Habitat's directive.

Castlemaine Harbour is also designated a Special Protection Area (site code 004029) under the E.U. Birds Directive. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland and Waterbirds.

The existing pit and the proposed extension are connected hydrologically to Castlemaine Harbour SAC, pNHA and SPA via the Glashacoomnafanida stream which eventually discharges to the Harbour c. 3.8km north northwest of the pit at Rangue.

A designated site location map is presented in Figure 12. Site synopses are presented in Appendix 7.13.

6.4.22 Site Baseline Summary

The site baseline summary is presented in Table 9.

Table 20: Summary of Soils, Geology, Hydrology and Hydrogeology Baseline Findings

Attribute	Description
Site Characteristics	Existing sand/gravel quarry at Rangue. Sand and gravel resource completely exhausted. Sand and gravel resource almost completed exhausted at adjacent Riordan's Pit. The Rangue pit is to be retained as a quarry processing facility, to process aggregate extracted from the proposed extension at Rangue and Knocknaboola. Proposed extension at Rangue and Knocknaboola comprises a greenfield site, located adjacent to the existing and operational sand/gravel quarry.
Topography	The topography of the area is gently undulating, with an overall topographic gradient to the northeast, towards the River Laune.
Landuse	24.5 Hectares covered in thin layer of blanket or cut away bog. Active peat harvesting takes place along southern boundary where peat is thickest. Peat depth less than 0.3m across the majority of the site. The existing pit at Rangue comprises 20.2 Hectares and is to be retained as a quarry processing facility, to process aggregate extracted from the proposed extension at Rangue and Knocknaboola.
Soil Type	All of the soil and much of the subsoil from the Rangue sandpit has been removed due to extensive quarrying. According to GSI Soil Maps the proposed extension is underlain by cut away blanket peat.
Subsoil Type	Trial pitting and borehole drilling confirms the presence of sands and gravels derived from Devonian sandstones beneath the proposed extension.
Depth of quaternary deposits	Trial Pitting confirms depth to bedrock is greater than 3.8m below ground level at proposed extension. Borehole drilling on proposed extension indicates that 17.0m of sand and gravel are present, and the depth to ground water varies between 12.87m and 13.19m below ground level in BH1, beneath the proposed extension. It is estimated that up to 20m of overburden is present above the bedrock in the vicinity of the Rangue site (EDA, 2000).
Bedrock Geology	The Geological Survey of Ireland (GSI) Sheet 20, Geology of Dingle (Pracht, 1996), shows that the Rangue and Knocknaboola sites are underlain by limestones of Lower Carboniferous age. Owing to the absence of rock outcrop in the area, the limestones are taken as one undifferentiated unit called the Dinantian Limestones.
Vulnerability Rating	The vulnerability of the bedrock aquifer underlying the majority of the existing sandpit is rated as "High". The vulnerability of the bedrock aquifer underlying the proposed extension is rated as "Moderate".
Hydrogeology and Groundwater Flow	There are essentially two potential aquifers beneath the existing site at Rangue, and, the proposed extension at, Rangue and Knocknaboola: i. A potential aquifer within the underlying bedrock (classified as a regionally important karstified aquifer by the GSI) and; ii. A potential aquifer within the overlying quaternary sand and gravel deposits (not classified as an aquifer by the GSI due to the heterogeneity of the deposits). Groundwater contours confirm the groundwater flow direction is to the northeast, towards the River Laune.
Groundwater Wells	Neither the existing quarry, nor the proposed extension is located within the source protection zone of contribution or a source protection zone of any

	public water supply well or group water scheme well. No domestic or agricultural groundwater supply wells were noted within the immediate vicinity of the site.
Groundwater Quality	Groundwater quality has been intermittently monitored at this site, and indicates good quality, with little impact on water quality from anthropogenic activities.
Designated Sites	Two within 5km of the site: i. Castlemaine Harbour Special Area of Conservation (SAC) and Proposed National Heritage Area (pNHA) (site code 000365) which is within 3.8km west downgradient of the site; and ii. Castlemaine Harbour Special Protected Area (SPA) (Site Code 004029) is within 3.8 km of the site Both sites are connected hydraulically to the existing quarry and proposed extension, and the impact on the sites is considered in detail in the Soils, Geology, Hydrology and Hydrogeology chapter of the EIAR.

6.4.22 Geological Receptor Importance

Given the nature of the quarrying industry (i.e. extraction of raw material from ground), the primary risk to soil and subsoil at the site is the extraction of both from the site.

Secondary to risks are from hydrocarbon spillage during operation of the quarry, and leakage to ground from sewage wastewater discharge at the site. These are common potential impacts to all construction sites (such as road works and industrial sites).

Land beneath the proposed extension is considered as having low importance given it is generally poorly drained with a thin covering of peat. Soil beneath the proposed extension is considered as having low importance given its poorly drained peat nature and relatively shallow depths, overlying poorly drained strata. Subsoil beneath the site is considered as having low to moderate importance given its relative abundance locally, the sand and gravel is not classified as an aquifer by the GSI and the resource quality means it requires washing/processing following extraction from the pit. The bedrock geology is considered as having low importance beneath the site given it will not be accessed or impacted by the proposed development.

Land beneath the existing pit is considered of low importance given it is unsuitable for agriculture after 40 years of extraction, however it continues to provide suitable habitats for flora and fauna as restoration of the site continues. Soil beneath the existing pit is considered as having low importance given the lack thereof across much of the site. Subsoil beneath the site is considered as having low to moderate importance given its relative abundance locally, the sand and gravel is not classified as an aquifer by the GSI and the resource quality means it requires washing/processing following extraction from the pit. The bedrock geology is considered as having low importance beneath the site given it will not be accessed or impacted by the proposed development. The importance of the land, soil and geological environment is summarised in Table 10.

Table 21: Estimation of the Importance of Land, Soil and Geological Environment

Attribute	Location	Importance	Reason
Land	Extension	Low	Poorly drained degraded peat land. Peat depths of less than 0.3m across the majority of the site. Active peat harvesting takes place along the southern boundary of the site where peat depths are greatest.

	Existing Pit	Low	Land unsuitable for agriculture after 40+ years of quarrying. Restoration of quarry to maintain habitat for wildlife.
Soil	Extension	Low	Poorly drained degraded peat overlying low permeability strata.
	Existing Pit	Low	There is no remaining soil cover on the site as has been removed by quarrying at the site
Subsoil (Quaternary Deposits)	Extension	Low to Moderate	Sand and gravel beneath proposed extension is not classified as an aquifer by GSI; It comprises a small proportion of the available resource in the locality; & Sand and gravel is medium to high grade quality which will require washing.
	Existing Pit	Low	Majority of economically available and accessible resource has been removed
Bedrock Geology	Extension	Low	Depth to bedrock is greater than 30m below ground level and will not be accessed or impacted by proposed sand and gravel pit.
	Existing Pit	Low	Depth to bedrock is greater than 10m below the floor of the quarry and will not be accessed or impacted by continued operation at Rangue.

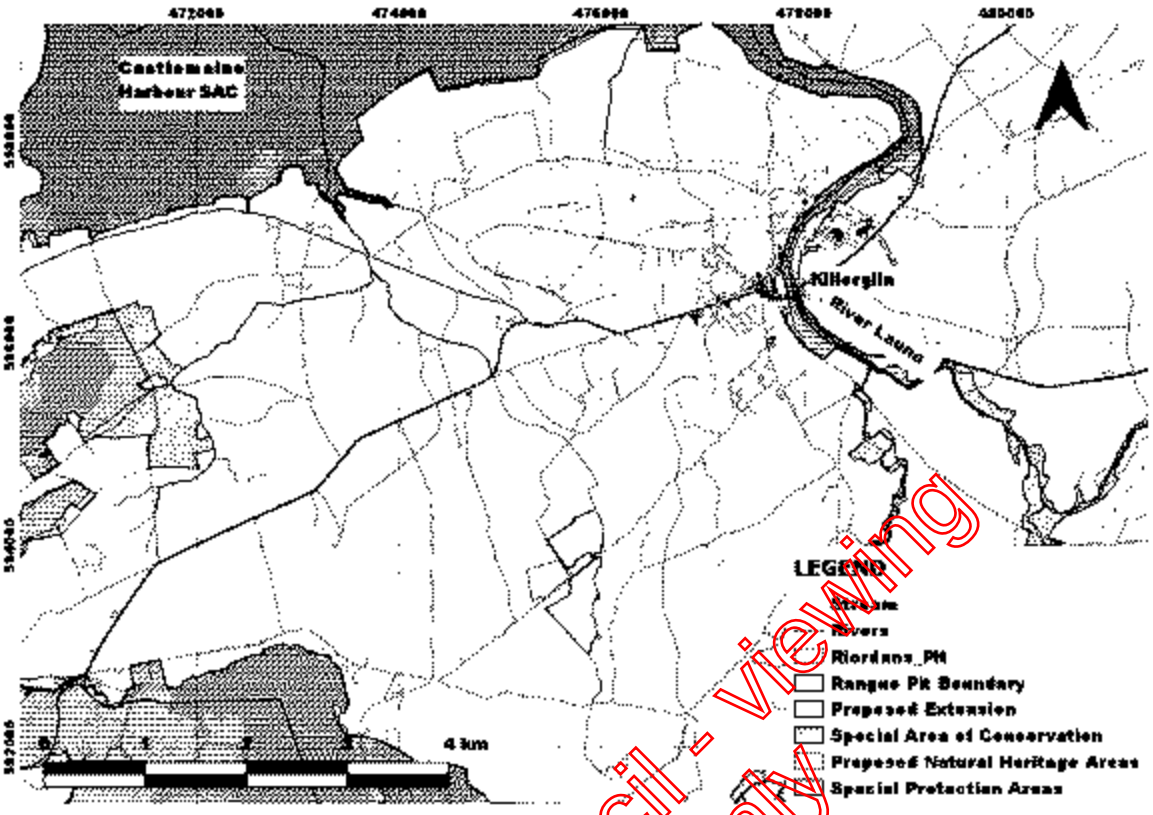


Figure 24: Designated Site Location Map (Source NPWS)

6.4.23 Groundwater Receptor Sensitivity and Importance

The site itself is not located within any designated areas (refer to Figure 24). However, there are two designated water dependent sites within 5km of the site.

Given the presence of permeable subsoils beneath the site (and beneath the low permeability iron pan layer), the presence of a regionally important bedrock aquifer, and a sensitive downgradient SAC, the site has been categorised as a Type C Hydrogeological environment (IGI, 2013).

As no quarrying will take place below the groundwater table, there is no requirement to lower the groundwater table, and no discharge to surface water is proposed from the proposed extension. No abstraction from surface water is proposed. Therefore, the risk of impacting the surface water drainage network from quarrying at the proposed extension is low.

It will continue to be necessary to pump groundwater from the southern pond at the Rangue site to the adjacent Glashacoomnafanida stream in order to control the water table level in the winter, and intermittently during rainfall events in the summer, and to provide water for concrete production. Discharge of water from the site is subject to the conditions of discharge licence W61. Therefore, the risk of impacting the surface drainage network from the continued quarry processing at Rangue is high.

The primary risk to water from any quarrying site would be from hydrocarbon/chemical spillage and/or leakages within excavations, discharge of sediment laden water and/or hydrocarbon impacted water to the surface drainage network and from domestic wastewater discharge from the onsite wastewater treatment and disposal system.

Based on criteria set out in Table 1, groundwater at the site can be classed as very sensitive because the underlying Dinantian limestone bedrock is classified as a Regionally Important Karstified Aquifer (Rkd). There is groundwater within the sand and gravel overburden which can be classified as sensitive. This is not classified as an aquifer by the GSI and is therefore considered of low importance, and there are no known potable abstractions from the overburden deposits down gradient of the site. Contamination of groundwater within the underlying sand and gravel overburden could occur as a result of leakage of hydrocarbons from the plant and machinery on the site, and refuelling of plant and machinery. To date, there has been no reported contamination event on site. Notwithstanding this, there is a high risk that groundwater will be impacted as a result of quarrying activities on the existing site and the proposed extension.

In terms of non-designated surface water bodies that are hydraulically connected to the site (*i.e.* Glashacoomnafanida Stream) it is the assessment approach that all surface waters, regardless of whether they have 'poor' or 'good' status, should be treated the same in terms of the level of protection and mitigation measures employed, *i.e.* there should be no negative change in WFD status at all. For the purpose of the impact assessment all surface waters in hydraulic connectivity with the site are considered to have a very high importance and are very sensitive. The Glashacoomnafanida Stream is part of the Douglas_010 waterbody, which has no assigned status under the Water Framework Directive. The main significant pressure identified on the waterbody is from agricultural, industry and extractive industry processes, such as quarrying at the site, and other quarries in the area. Approximately 3.8 km downstream of the site, the Glashacoomnafanida stream discharges to the Castlemaine Harbour SAC. This area is classified as a SAC based on the presence of 19 no. habitat and/or species which are listed on Annex I/II/IVI of the EU Habitats directive and is considered to have a very high importance and is very sensitive.

The proposed extension is currently covered in highly drained and degraded cutaway blanket peat. Peat depths across the majority of the site are less than 0.3m. Active peat harvesting takes place along the southern boundary of the site, where peat depths are greatest (a maximum depth of 6.1m was recorded along the southern boundary of the site). Quarrying from beneath the proposed extension, is likely to alter the local hydrological regime. Land use change will reduce the rainfall runoff rates from the proposed extension and increase the proportion of rainfall percolating to groundwater. Given the hydrogeological setting of the existing site and proposed extension (moderate vulnerability, overlain by peat), where 4% of effective rainfall is expected to percolate to groundwater prior to the proposed development, this reduction in rainfall runoff from a relatively small catchment area (16.75 hectares equates to less than 1% out of a catchment area of 20.35km^2) will not significantly impact the downgradient SAC. Indeed, any increase in groundwater storage will result in an increase in baseflow to downgradient surface water bodies in hydraulic connection with the underlying aquifer, such as the River Laune which form part of the same SAC. A summary of receptor sensitivity and importance is presented in Table 11.

Mitigation measures associated with the proposed development should ensure that the underlying groundwater will continue to be of a high quality and will therefore not impact on the quality of downgradient surface water bodies, where it provides groundwater baseflow.

Table 22: Summary Table of Receptor Sensitivity and Importance

Item	Description	Sensitivity	Importance	Risk
Bedrock Aquifer	Regionally important aquifer. No known potable abstraction wells within 1km downgradient of the site.	Very Sensitive	High	Low
Sand and Gravel Aquifer	Not classified as an aquifer by GSI. No downgradient potable abstraction wells	Sensitive	Low	High
Surface Water	Glashacoomnafanida Stream connects the site hydraulically to downgradient Castlemaine Harbour SAC	Very Sensitive	Very Important	High

6.5 Impacts of the Development

The proposed works require the removal of peat, overburden and aggregates from the proposed extension at Knocknaboola; and the continued use of the main pit at Rangue for processing of aggregate. The potential impacts on the soils, geology and hydrogeology of the site are assessed below. A summary of all impacts is presented in Table 23.

An impact assessment was undertaken under the following considerations:

- **Quality of Effects:** The magnitude of each impact was considered from positive to negative
- **Significance of Effects:** The significance of each impact was considered as having either an imperceptible, not significant, slight, moderate, significant, very significant or profound effect.
- **Extent and Context:** A description of whether the extent, duration or frequency will conform or contrast with the established baseline conditions.
- **Probability of Effects:** Whether an impact was likely or not
- **Duration and Frequency of Effects:** The duration of each impact was considered to be momentary, brief, temporary, short term, medium term, long term, permanent, or reversible. The frequency describes how often the event will occur.

6.5.1 Construction Phase

During the construction period peat (topsoil) and subsoil will be stripped and heaped on site to enable extraction of sand and gravel aggregate from the site. Restoration of exhausted portions of the existing pit will continue to take place.

6.5.1.1 Impact on Soils and Geology

During the construction phase of the proposed extension, shallow peat, where present, will be excavated and largely removed from the excavation area of the site and stored for reuse during quarry restoration. The impact on soils is considered to be of a temporary nature as they are stored for re-use directly within the worked out areas as a fundamental part of the proposed rehabilitation.

The majority of the proposed extension area is underlain by shallow cutaway peat bog. Small scale peat harvesting takes place from the deeper parts of the bog along the southwestern site boundary (this area is not within the proposed extraction area). The land is not productive agricultural land. The impact on land is considered to be a long term, negative and a not significant effect as the shallow peat land is already heavily degraded, peat depths are shallow over the majority of the proposed excavation area, the deeper portions of peat are located along the southern boundary and will be retained. The effect of removal of 16.75 Hectares of highly degraded shallow cut away bog from the existing peat lands is considered not significant in the wider blanket peat landscape.

Removal of peat will expose the subsoil to erosion and will result in a reduction in elevation of the ground surface and could lead to an increase in sedimentation of surface and groundwater. This is considered a short term, negative, slight effect and unlikely.

Site works could destabilise upgradient peat lands and cause a peat slide. This is considered negative, very significant, unlikely and permanent effect.

Potential contamination of the underlying soil and geology (direct impact) resulting from leakage of fuel and lubrication oils from machinery on site. This is considered a short term, negative, moderate and likely effect (before mitigation).

Given the proven depth of overburden beneath the existing pit at Rangue and the proposed extension at Knocknaboola, there will be no impact on the underlying bedrock geology.

6.5.1.3 Impact on Groundwater

Removal of peat and subsoil from the proposed extension site will increase the groundwater vulnerability at the site. This is a negative, slight, and long term impact.

Removal of topsoil and subsoil from the proposed extension will increase potential recharge at that location and will possibly lead to an increase in sediment laden waters percolating to ground. This is a negative, slight, and long term impact.

Removal of the original soil cover will reduce water loss to transpiration. This is a neutral, slight, and long term impact.

There is potential for groundwater pollution to occur during the construction phase. Potential polluting activities include accidental fuel spillages during refuelling of plant/vehicles including staff vehicles parked at the site, and leaks from plant/vehicles percolating to groundwater. This is a negative, moderate, and short-term impact.

6.5.2 Operational Phase

During the operational period, impacts and effects listed during the construction phase will continue to apply. In addition, the following potential impacts could occur.

6.5.2.1 Impact on Soils and Geology

By its nature, quarrying of the underlying sand and gravel deposits will involve permanent removal of an identified aggregate resource. This has resulted, and will result, in a permanent, negative, significant effect on the sand and gravel resource.

Temporary removal of peat and subsoil within the perimeter of the proposed quarry extension will be a direct impact of the proposed quarry extension which is considered a temporary effect.

Extraction and processing of aggregate will involve the permanent removal 1,630,400m^3 of sand and gravel from the proposed extension over the next 20 years. Processing of sand and gravel will result in low value silt and clay bi-product. Some of this will be sold, but the majority will be re-used on site during ongoing restoration of the existing pit at Rangue, Riordan's, and proposed restoration of the extension at Knocknaboola.

Potential contamination of the underlying soil and geology (direct impact) resulting from leakage of fuel and lubrication oils from machinery on site. This is considered a temporary, negative, slight and likely effect.

Given the proven depth of overburden beneath the existing pit at Rangue and the proposed extension at Knocknaboola, there will be no impact on the underlying bedrock geology.

The development will not have an indirect impact on the geological aspects of the environment outside the quarry extraction area. Soils on adjoining lands will not be directly or indirectly impacted as a resulting from development of the proposed site.

6.5.2.3 Impact on Groundwater

Deeper extraction of sand and gravel aggregate will reduce the depth of the unsaturated zone, increasing the vulnerability of the underlying groundwater aquifer within the quaternary sediments to a pollution incident. This is a negative, slight, and long term impact.

Groundwater storage within the unsaturated zone will be slightly reduced with continued extraction of aggregate from within the proposed extension. The loss of storage is insignificant, as extraction of aggregate will not take place within 1m of the water table. This is a negative, imperceptible, and long term impact.

Discharge of domestic wastewater effluent to groundwater already takes place from a septic tank and soak pit on the main pit at Rangue, and likely enriches the underlying groundwater with nitrate and phosphorus. This is a negative, slight, and long term impact.

Restoration of parts of the main pit at Rangue and Riordan's is proposed using silt and clay material which has no economic re-sale value. This will be sourced from bi-product generated at the linatex sand washing facility.

Abstraction and discharge offsite of surface water and groundwater from the southern pond in order to control the water level beneath the main pit at Rangue will continue under licence. Continued abstraction could, but is unlikely to, result in depletion of the underlying groundwater resource. This is a negative, not significant, and medium term impact.

6.5.3 Cumulative Impacts

Discharge of groundwater and surface water, pumped from the southern pond at the Rangue site to the Glashacoomnafanida stream, could impact on the stream and the downgradient SAC. This has not happened to date, and a discharge licence has been in place since 1989. Given water has to be pumped from the pit floor, there is no risk of an accidental discharge (breakout) from the site to surface water.

The main risk to the catchment is from pumped discharge of water from the main pit at Rangue, and hydrocarbon contamination from the End of Life Vehicle Facility at Rangue.

6.5.3 Decommissioning Phase

Implementation of the quarry restoration plan during decommissioning will ultimately allow the site to be returned to a condition whereby there will be a negligible/imperceptible residual impact on the surrounding environment.

6.5.4 Do Nothing Scenario

Aggregate from Riordan's pit continues to be processed at the main pit in Rangue until it is completely exhausted. Then the existing pit at Rangue is decommissioned and the quarry restoration plan is implemented. Please refer to Chapter 3.

Table 23: Summary of Effects on Soils, Geology and Hydrogeology

Impact: Soils & Geology	Probability	Nature of Impact Pre-Mitigation	Mitigation Measures	Nature of Impact Post Mitigation
Sedimentation of surface and groundwater due to erosion of exposed topsoil and subsoil	Unlikely	Significant, Negative, Long-Term	No discharge to surface water will occur from the site. A soil berm will be constructed along the boundary of the proposed extension at Rangue and Knocknaboola. A silt fence must be installed between the Glashacoomnafanida Stream and the berm. The combination of these two mitigation measures will prevent silt laden runoff from entering the Glashacoomnafanida Stream and migrating off site. The overburden from the proposed extension will only be stripped as required in order to limit the length of time the soil is exposed and reduce the risk of erosion and subsequent siltation of runoff. Detailed mitigation measures to protect surface and groundwater are outlined section 7.6.	Imperceptible, Neutral, Short-Term
Accidental spillages or leakages of fuel and lubrication oils from machinery	Likely	Slight, Negative, Short Term	To prevent contamination of the ground, hazardous materials (oils, fuels, chemicals etc) should be used and stored in an appropriate manner and in accordance with professional guidelines such as for example "Control of Water Pollution from Construction sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001), and "Oils storage guidelines. Best Practice Guide" (Enterprise Ireland, BPGCS005). Storage and refuelling areas should be designed to be sufficiently impermeable to prevent the infiltration of any spillage, leakage or runoff into the ground. Spillage kits and action plans for their use should be available throughout the works. Re-fuelling of vehicles must take place in a designated, properly bunded area on the site. An Incident spillage plan shall be prepared to provide guidance on response to emergency situations, such as the accidental spillage of oil, fuel, raw material or hazardous material as a result of leakage from, or failure of, any of the above or below ground storage tanks, or resulting from an accident involving vehicles transporting material to and from the site. Drains and interceptor traps on site to be regularly cleaned and maintained as per manufacturers spec.	Slight, Neutral, Short term

Direct Impacts: Groundwater	Nature of Impact Pre-Mitigation	Mitigation Measures	Nature of Impact Post Mitigation
Potential Lowering of water Level beneath Rangue Pit from pumping from the southern pond	Slight, Negative, Unlikely, Long Term	Groundwater and surface water from the existing southern pond is pumped off site intermittently to control the water level in the southern pond. Groundwater level monitoring indicates impact of pumping is localised. Implementation of the quarry restoration plan will ultimately allow the site to be returned to a condition whereby there will be a negligible residual impact on the underlying aquifer.	Imperceptible, Neutral, Unlikely, Long term
Increased groundwater vulnerability	Moderate, Negative, Long term	Removal of topsoil, subsoil and aggregate from the site will increase the groundwater vulnerability at the site. Phased development of the proposed extension, and continual re-instatement of the existing site will minimise the risk to groundwater. No excavation of aggregate to take place within 1m of the groundwater table beneath the proposed extension at Rangue and Knocknaboola.	Slight, Negative, Likely, Long term
Increased potential recharge to groundwater	Slight, Neutral, Likely, Long term	The impact of increased recharge will be minimal as there is plenty of storage available in the underlying sand and gravel aquifer, and a minimum of 1m of unsaturated overburden will remain between the base of the proposed extension, and the underlying water table.	Imperceptible, Neutral, Likely, Permanent
Discharge of sediment laden water to groundwater	Slight, Negative, Unlikely, Long term	Use of wet cyclone system to remove majority of fines from aggregate. Installation of silt traps along drainage network. No excavation within 1m of water table to allow sediment to filter from runoff. No downgradient abstractions from sand and gravel aquifer. No impact on underlying bedrock aquifer (c. 30 m below base of quarry).	Imperceptible, Neutral, Unlikely, Long term
Discharge of Septic Effluent to Groundwater	Slight, Negative, Likely, Long term	The existing septic tank and soak pit is to be replaced by a wastewater treatment and disposal system installed in compliance with the EPA Code of Practice, Wastewater Treatment Systems serving Single Houses, 2021, and Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels, EPA 1999.	Not significant, Positive, Likely, Long term
Accidental spillages or leakages of fuel and lubrication oils	Moderate, Negative, Unlikely, Short-Term	As per mitigation measures outlined for surface water above and in section 7.6	Not Significant, Negative, Unlikely, Short-Term

Direct Impacts: Groundwater	Nature of Impact Pre-Mitigation	Mitigation Measures	Nature of Impact Post Mitigation
Potential Lowering of water Level beneath Rangue Pit from pumping from the southern pond	Slight, Negative, Unlikely, Long Term	Groundwater and surface water from the existing southern pond is pumped off site intermittently to control the water level in the southern pond. Groundwater level monitoring indicates impact of pumping is localised. Implementation of the quarry restoration plan will ultimately allow the site to be returned to a condition whereby there will be a negligible residual impact on the underlying aquifer.	Imperceptible, Neutral, Unlikely, Long term
Increased groundwater vulnerability	Moderate, Negative, Long term	Removal of topsoil, subsoil and aggregate from the site will increase the groundwater vulnerability at the site. Phased development of the proposed extension, and continual re-instatement of the existing site will minimise the risk to groundwater. No excavation of aggregate to take place within 1m of the groundwater table beneath the proposed extension at Rangue and Knocknaboola.	Slight, Negative, Likely, Long term
Increased potential recharge to groundwater	Slight, Neutral, Likely, Long term	The impact of increased recharge will be minimal as there is plenty of storage available in the underlying sand and gravel aquifer, and a minimum of 1m of unsaturated overburden will remain between the base of the proposed extension, and the underlying water table.	Imperceptible, Neutral, Likely, Permanent
from machinery and plant.			

Indirect Impacts: Groundwater	Nature of Impact Pre-Mitigation	Mitigation Measures	Nature of Impact Post Mitigation
Reduced baseflow to Glashacoomnafanida Stream from Perched Water	Imperceptible, Neutral, Likely, Long Term	Perched water will now discharge to deep groundwater rather than surface water. This will result in an imperceptible reduction in base flow to surface water in the vicinity of the site. A small reduction in Baseflow to the Glashacoomnafanida Stream is offset by a small increase in base flow to surface water downgradient of the site (i.e. River Laune and Castlemaine Harbour SAC).	Imperceptible, Neutral, Likely, Long Term
Increased Baseflow to River Laune and Castlemaine Harbour (Part of SAC)	Imperceptible, Neutral, Likely, Long Term	The potential increase in baseflow is considered negligible, given the scale of the quarry compared to the groundwater catchment. Implementation of the quarry restoration plan will ultimately allow the site to be returned to a condition whereby there will be a negligible residual impact on the underlying aquifer and downstream surface water receptors.	Imperceptible, Neutral, Likely, long-term

6.6 Mitigation

6.6.1 Soils and Geology

Mitigation measures are required during the operational phase of the proposed quarry extension to reduce and possibly eliminate the impacts on the soils, geology, hydrology and hydrogeology outlined above.

A quarry restoration plan has been prepared for the existing quarry and the proposed extension. Restoration of the proposed extension will be completed in a phased and progressive basis. Phase 1 of the proposed excavation will be restored as phase 2 of the proposed excavation will take place.

A mineral soil berm will be constructed surrounding the entire extension at Knocknaboola. The mineral soil berm along the southwestern boundary will be constructed to retain the upgradient wetlands. An upgradient interceptor drain will allow runoff from the upgradient peat lands discharge to the Glashacoomnafanida stream.

Existing drainage, which flows in a southwest to northeast direction, along the western boundary of the extension will be maintained, above the proposed underpass access tunnel. Silt traps will be constructed within the drainage channel to allow suspended solids to settle before surface water discharges to the Glashacoomnafanida stream. The proposed soil berm, drainage works along the southern boundary of the proposed extension, and the low topographic gradient means there is a low risk of any peat slide occurring.

Consideration has been given to soil and subsoil management. Peat and subsoil stripped to obtain access to the sand and gravel resource will either be utilised directly for construction of peripheral screening berms, for progressive restoration, or placed in temporary overburden storage areas for use in future restoration. The storage areas will be vegetated as soon as is possible, to reduce both visual impact and erosion.

The beneficial re-use of material excavated at the site will avoid the unnecessary disposal of spoil in landfill. Peat and overburden stripped from the site will be re-used to reinstate areas of the existing quarry which are no longer in use, as well as in the construction of earthen screen berms.

The overburden from the proposed extension will only be stripped as required in order to limit the length of time the soil is exposed and reduce the risk of erosion and subsequent siltation of runoff.

Where possible, land will be stripped in dry weather to reduce nutrient loss and reduce the generation of silt runoff. Soils will not be moved in unusually dry and windy weather conditions.

Measures will be taken to minimize the sediment generation during storage of soils. Soils will not be stockpiled at elevated locations on the site but transported to lower elevations within the existing pit at Rangue.

All temporary storage mounds will have slope angles not greater than 1:1.5 and will be revegetated as quickly as possible to avoid soil erosion by air and water.

As the quarry is being worked, other areas will be reinstated in order to reduce surface runoff and prevent generation of suspended solids.

The quarrying of sands and gravels to produce aggregates will involve the excavation and removal of the quaternary deposits within the designated extraction area. Whilst the material cannot be replaced, the extraction of these deposits will offer an opportunity for future geological study of these quaternary deposits that may lead to a better understanding of past geological processes on a local and a regional scale.

To prevent contamination of the ground beneath the existing pit at Rangue, hazardous materials (oils, fuels, chemicals etc) should be used and stored in an appropriate manner and in accordance with professional guidelines such as for example "Control of Water Pollution from Construction sites, Guidance for Consultants

and Contractors" (CIRIA 532, 2001), and "Oils storage guidelines. Best Practice Guide" (Enterprise Ireland, BPGCS005). Storage and refuelling areas should be designed to be sufficiently impermeable to prevent the infiltration of any spillage, leakage or runoff into the ground. Spillage kits and action plans for their use should be available throughout the works.

An incident spillage plan shall be prepared to provide guidance on response to emergency situations, such as the accidental spillage of oil, fuel, raw or hazardous material(s) as a result of leakage from, or refuelling of, plant and machinery on the subject site, or resulting from an accident involving vehicles transporting material(s) to and from the site.

No fuels or hydrocarbons to be stored on the proposed extension site. The only potential pollution activity within the proposed extension will be the refuelling of plant and machinery using tanker trucks. Re-fuelling of vehicles must take place in a designated, properly bunded area on the neighbouring, Rangue site.

The final land restoration scheme will allow the site to be returned to a condition whereby there will be negligible residual impact on the surrounding environment following the removal of sand and gravel from the proposed extension.

6.6.2 Hydrogeology

Mitigation measures are required during the construction and operation phases to reduce and possibly eliminate the impacts on the hydrology and hydrogeology outlined above. Mitigation measures are listed below:

- The beneficial re-use of material excavated at the site will avoid the unnecessary disposal of soil in landfill. Peat and overburden stripped from the site will be re-used to reinstate areas of the existing quarry which are no longer in use, as well as in the construction of earthen screen berms.
- The overburden from the proposed extension will only be stripped as required in order to limit the length of time the soil is exposed and reduce the risk of erosion and subsequent siltation of runoff.
- Where possible, land will be stripped in dry weather to reduce nutrient loss, sustain soil condition and reduce the generation of silt runoff.
- Measures will be taken to minimize the sediment generation during storage of soils. Soils will not be stockpiles at elevated locations on the site but transported to lower elevations within the existing pit at Rangue.
- A buffer of zone of 15 metres will be maintained between the proposed excavation and the Glashacoomnafanida steam. The combination of the buffer zone and the berm will minimize the potential seepage of water from the stream into the pit and subsequently to deep groundwater.
- Runoff from the access roadway, and existing roads, to be directed towards silt traps, prior to discharging to the floor of the proposed sandpit at Knocknaboola. This will minimize the risk of silt laden runoff from migrating offsite.
- No excavation of aggregate is to occur within 1m of the groundwater table (i.e. no excavation to take place below 22.5m AOD to the south of the proposed extension, or below 20.5mAOD in the south). This will minimize the risk to groundwater quality from accidental spillages of contaminants at the base of the excavation, and allowing suspended solids filter out of percolating waters.
- No site facilities (offices, toilets etc.) to be located on the proposed extension; all facilities will continue to operate at the pre-existing Rangue sandpit;
- No storage of fuel, lubrication oils, or chemicals on the proposed extension site. These materials will be stored at the existing Rangue sandpit oil storage facilities.
- To prevent contamination of surface or ground waters, hazardous materials on the Rangue sandpit (oils, fuels, chemicals etc.) should be used and stored in an appropriate manner and in accordance with professional guidelines such as for example "Control of Water Pollution from Construction sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001), and "Oils storage guidelines. Best Practice Guide" (Enterprise Ireland, BPGCS005). All quarrying works will be completed in line with

the recommendations of this publication and this will serve to mitigate against any pollution occurring;

- An incident spillage plan shall be prepared to provide guidance on response to emergency situations, such as the accidental spillage of oil, fuel, as a result of leakage from plant or machinery, or resulting from an accident involving vehicles transporting material(s) to and from the subject site.
- Emergency Scenario: An emergency spill plan will be drawn up for the site, taking account of environmental considerations.

Oil Storage/Refuelling:

- Site compounds, parking and plant storage areas will comprise concrete hard standing. Any spillages/leaks will be directed through an oil/water interceptor thereby reducing avoiding direct discharge to groundwater or surface water.
- Storage and refuelling areas should be designed to be sufficiently impermeable to prevent the infiltration of any spillage, leakage or runoff into the ground. Spillage kits and action plans for their use should be available throughout the works.
- All oil stored on site for quarry vehicles will be kept in a locked and bunded area and the drainage or overflow from the bund will be directed to an oil/water interceptor.
- Generators, pumps and similar plant will be placed on drip trays to prevent contamination by oil.
- All site vehicles and plant used will be refuelled in a properly bunded area. Drainage from this area will be directed to an oil/water interceptor.
- All temporary fuel tanks will also be located in a suitably bunded area and all tanks will be double skinned. In addition, oil adsorbent materials will be kept on site in close proximity to any fuel storage tanks or bowsers during site construction and operations works.
- The oil/water interceptor will be monitored on a regular basis to ensure it is working correctly.
- All deliveries to onsite oil storage tanks will be supervised.
- Records will be kept of delivery dates and volumes.
- Oil tank bunds will have a capacity of tank volume plus 10 percent at a minimum.
- Steel tanks will be protected from corrosion.
- Waste oil will be stored in a bunded facility and will be collected regularly for disposal by a licenced contractor. All waste oil quantities disposed of will be recorded and certs of disposal retained on file.
- A procedure will be drawn up which will be adhered to during refuelling of onsite vehicles. This will include the following:
- Fuel will be delivered to plant on site by dedicated tanker or in a delivery bowser dedicated to that purpose.
- In the case of a bowser, the driver or supervising foreman will check the delivery bowser daily for leakage.
- The driver will be issued with, and will carry at all times, absorbent sheets and granules to collect any spillages that may accidently occur.
- Where the nozzle of a fuel pump cannot be placed into the tank of a machine then a funnel will be used.
- Refuelling will take place in a designated, properly bunded area only.
- Every piece of equipment associated with the storage of fuel on site will be designed and installed to recognized British Standards codes.
- All valves should be of steel construction and the open and close positions should be clearly marked.
- Rainwater will be removed from bunds which will incorporate a sump to facilitate this.
- Publications such as PPG – Above Ground Storage Tanks will be used as Guidance in addition to the above.

6.7 Difficulties Encountered in Compiling Information

No difficulties encountered in compiling this information.

6.8 Residual Impacts

Implementation of mitigation measures during the operation phase, along with good site management and quarrying practices should eliminate any machinery and fuel oil related significant and/or permanent direct and indirect impacts on the receiving environment.

Removal of 16.75 Hectares of shallow degraded peat land is not significant in the wider blanket peat landscape.

Quarrying of the underlying sand and gravel deposits will involve permanent removal of an identified aggregate resource. Removal of sand, gravel and rock from the site will have a positive impact for the construction industry. No other significant effects on the geological environment have been identified.

6.8.1 Construction

The stripping of topsoil and subsoil from the site during the construction phase will increase the vulnerability of the underlying aquifer to contamination; and reduce potential runoff from the site while increasing percolation of effective rainfall to deep groundwater.

Implementation of mitigation measures during the construction phase, along with good site management and construction practices will minimise any significant impact(s) on the soils, geology, surface water or groundwater environment. The residual impact significance is generally imperceptible once mitigation measures outlined have been deployed. The significance of post mitigation impacts are presented in Table 23.

6.8.2 Operation

Extraction of sand and gravel aggregate from beneath the proposed extension will increase the vulnerability of the underlying aquifer to contamination; will result in the permanent discharge of perched water to deep groundwater; slightly reduce runoff to, and baseflow to, the perched drainage network near the site; and increase the volume of recharge to groundwater. Reduced baseflow and runoff to the local drainage network will be offset by a potentially slightly increased baseflow to surface water bodies hydraulically downgradient of the site. In summary, the operation of the proposed development will result in a number of slight insignificant alterations to the hydraulic regime in vicinity of the quarry.

As above, implementation of mitigation measures during the operation phase, along with good site management and construction practices will minimise any potential significant impact(s) on the soils, geology, surface water or groundwater environment. The residual impact significance is generally imperceptible once mitigation measures outlined have been deployed.

6.8.3 Restoration

Implementation of the quarry restoration plan will ultimately allow the site to be returned to a condition whereby there will be a negligible/imperceptible residual impact on the surrounding environment.

6.9 Monitoring

A designated person within the quarry team will have overall responsibility for ensuring that the excavation is carried out in such a way as to minimize possible pollution of soils and geology. This person will also have the responsibility of monitoring the performance of any pollution control measures adopted.

6.10 References

Included at beginning of chapter.

Chapter Seven — Water (Hydrology)

7.1 Introduction

Parkmore Environmental Services Ltd (PES) was engaged by M.F. Quirke & Sons, to prepare an Environmental Impact Assessment Report (EIAR) on the hydrology receiving environment in relation to a Planning Application for the continued operation of a 18.51 Ha existing quarry processing area at Rangue, Killorglin, Co. Kerry, and for a planned extension to that quarry of 16.75 Ha in the townlands of Rangue and Knocknaboola, Killorglin, Co. Kerry. The objectives of the assessment include:

- Produce a baseline study of the existing water environment (soils, geology, surface hydrology and groundwater hydrogeology) in the planning application area of the site;
- An assessment of the impact of quarrying activities within the planning application area will have, and is continuing to have on soils, geology, surface water and ground water;
- Identify likely positive and negative impacts of the proposed development on soils, geology, surface and groundwater, during construction and/or operational phases of the project, and,
- A recommendation of measures to reduce or eliminate potential impacts (where necessary).

This section of the EIAR was prepared by Parkmore Environmental Services Ltd. The project team consists of:

Richard Langford, BA Geology, MSc Applied Hydrogeology, PGeo, EurGeol

7.1 Methodology

7.2.1 Guidance Used

The hydrology and hydrogeology section of the EIS is carried out in accordance with guidance contained in the following:

- Environmental Protection Agency (Draft, 2017): Guidelines on the information to be contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (Draft, 2015): Advise Notes on Current Practice (in the preparation on Environmental Impact Statements);
- Environmental Protection Agency (2002): Guidelines on the Information to be Contained in Environmental Impact Statements;
- Institute of Geologists Ireland (2013) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Section 177F of the Planning and Development Act, 2000 (as amended); and,
- Section 261A of the Planning and Development Act, 2000 (as amended) and related provisions - Supplementary Guidelines for Planning Authorities (DELG, 2012).

- "Control of Water Pollution from Construction sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001);
- "Oils storage guidelines. Best Practice Guide" (Enterprise Ireland, BPGCS005).

7.2.2 Baseline Data Collection

7.2.2.1 Desktop Study

A desk study of the site and the surrounding area was completed as part of this study. This involved collecting all relevant hydrological, hydrogeological and meteorological data for the area. This included consultation with the following:

- Catchments.ie Map Viewer (www.catchments.ie);
- CFRAM Preliminary Flood Risk Assessment Mapping & OPW's Indicative Flood Maps (www.floodinfo.ie);
- Contribution to an EIS, Soils (Geology) and Water, for a Sand and Gravel Pit Operation, at Rangue, Killorglin, Co. Kerry by Eugene Daly and Associates (EDA, 2000).
- EIS for Proposed Sand and Gravel Quarry at Rangue, Killorglin, Co. Kerry by E G Pettit & Co., 2000.
- Environmental Protection Agency database (www.epa.ie);
- Environmental Protection Agency / Teagasc 1:50,000 scale soils and subsoils maps and associated documentation;
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Geological Survey of Ireland borehole / depth to bedrock data from Exploration and Mining Division Minerals open file data and geotechnical databases (www.gsi.ie);
- Geological Survey of Ireland – Laune Muckross Groundwater Body Initial Characterisation Report - Draft (2004);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Topographical survey and drawings prepared by Michael O'Connor.

7.2.2.2 Field Surveys and Monitoring

A preliminary site walkover investigation was completed by PES on the 5th March 2021, where the drainage network was walked and mapped; surface water flow data was obtained from upstream and downstream of the proposed quarry extension, the depth to water in a number of groundwater wells was recorded, and 4 groundwater wells were instrumented with groundwater level loggers. Field data collection continued until the 13th October 2021.

7.2.3 Assessment Methodology

7.2.3.1 Impact Assessment

- Baseline hydrology and hydrogeology site characteristics of the receiving environment are derived from the desk study information, and site-specific data gather as part of this investigation;
- Potential hazards arising from the development are identified;
- Receptors in the receiving environment to which these hazards may represent a risk are identified in the course of the study area characterisation;
- The potential impact on receptors are identified, in terms of quality, significance, duration and type;
- Measures to mitigate potential impacts on given receptors from the proposed development are identified;
- Residual impacts are stated.

In addition to the above methodology the sensitivity of the water environment receptors were assessed on completion of the desk study and baseline study. Levels of sensitivity which are defined in Table 13.1 are then used to assess the potential effect that the proposed development may have on them.

7.2.3.2 Significance of Impacts

The statutory criteria (EPA, Draft 2017 and EPA, Draft 2015) for the assessment of impacts require that likely impacts are described with respect to their extent, magnitude, complexity, probability, duration, frequency, reversibility and trans-frontier nature (if applicable). Two impact characteristics proximity and probability are described for each impact and these are defined in Table 1. Impact significance is defined in Table 2.

7.3 Study Area

The proposed development consists of the continued operation of a 18.51 Ha existing sand and gravel processing area at Rangue, Killorglin, Co. Kerry and for a planned extension to that sand and gravel pit of 16.75 Ha in the townlands of Rangue and Knocknaboola, Killorglin, Co. Kerry.

The existing Rangue processing area is located c. 2.7km southwest of Killorglin (ITM: 475803, 594112).
The proposed extension to the Rangue processing area is located in the townlands of Rangue and Knocknaboola (ITM: 475955, 593596) and is located south of the Killorglin to Glannagilliagh third class road, to the south and southeast of the existing processing area. It is proposed to link the existing pit to the proposed extension via an underpass and haul road beneath the Glannagilliagh road.

7.3.1 Regional Hydrology

The regional hydrology is dominated by both the River Laune, which is located c. 3.1km north-east and downgradient of the proposed extension at Knocknaboola, and Castlemaine Harbour, which is located c. 3.8km north north-west and downgradient of the existing pit at Rangue. Both the River Laune and Castlemaine Harbour are part of the Castlemaine Harbour Special Area of Conservation (SAC) (site code 000343).

The River Laune, which is the principal river draining into Castlemaine Harbour, meanders its way from Lough Leane, which is located 14.3km east south-east of the proposed extension and immediately southwest of Killarney, through Beaufort and Killorglin, before flowing into Castlemaine Harbour c. 2.5km north of Killorglin.

There is no direct connection between the existing sandpit at Rangue and the proposed extension at Knocknaboola and the River Laune.

There are two small streams adjoining or adjacent to the existing sandpit at Rangue and the proposed extension at Knocknaboola. They all flow in a northerly direction and flow into Castlemaine Harbour c. 3.8km northwest of the pit at Rangue. They are:

- The Upper Keal Stream that rises c. 530m southwest of the south-western boundary of Riordan's extension. This stream joins the Feighahuthig stream at the N70, c. 3.26km northwest of the pit at Rangue. The catchment area of this stream is c. 2.25km^2. This stream is a 200 to the southwest and upgradient of Riordan's site, which is not within the catchment of this Upper Keal stream. Therefore, the continued operation of the Rangue pit, and the proposed extension at Knocknaboola will have no impact on this stream. This stream will not be considered further in this report.

- The Glashacoomnafanida (Feighahuthig) stream rises at Lough Nafanida, at an elevation of approximately 100m AOD, c. 2.14km south of the entrance to the Rangue pit. It flows northwards along the eastern boundary of the proposed extension at Knocknaboola and the eastern boundary of the

Rangue pit. The elevation of the stream bed along the boundary of the proposed extension and the Rangue pit ranges between c. 37m AOD in the south to c. 20m AOD in the north. A review of historical maps indicates that the channel of this stream once disappeared into a small oval shaped marshy area about 400m north of the Rangue site before re-emerging about 250m further north. The Glashacoomnafanida stream is called the Feighahuthig stream downstream of this marshy area.

This stream becomes the Keal stream when it receives the discharge from the Upper Keal stream at the N70, c. 3.26km northwest of the Rangue pit. The catchment area to the N70 is c. 4.5km^2.

- A third small stream, called the Knocknaboola stream in this report, rises 500m south of Lough Nafanida, at an elevation of c. 100m AOD. This stream is located c. 1.5km east of, and in a separate topographic catchment to the proposed extension at Knocknaboola, and is not considered further in this report.

A map presenting the regional hydrology is presented in **Figure 25**.

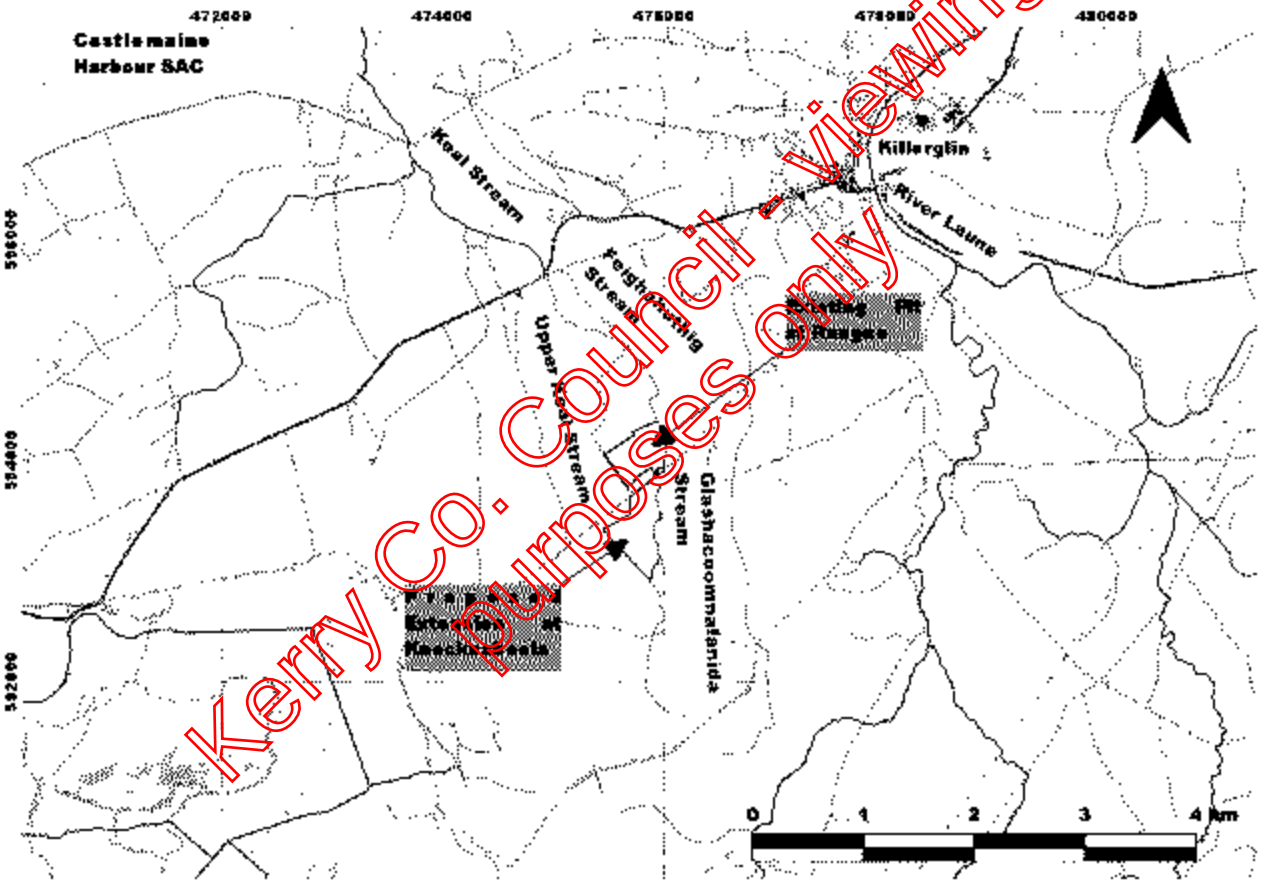


Figure 25: Regional Hydrology
(Source: Bing Maps)

The groundwater table is up to 9.05m below the ground-level in BH4, located 16m east of the Glashacoomnafanida stream and the proposed extension at Knocknaboola. Therefore, all of the streams/drainage ditches are perched and are likely to be losing (and where perched water tables exist, gaining) varying amounts of water to ground as the stream flows across permeable overburden. The local hydrology is dominated by the Glashacoomnafanida stream.

A shallow drainage ditch runs along the southern boundary of the Rangue sandpit. This man-made drain was installed to intercept surface water runoff from the neighbouring lands to the south. No flow has been observed in this drain during site visits undertaken as part of this investigation, except for pumped water from the floor of the pit at Rangue. The pumped water flows underneath the entrance road and discharges to the Glashacoomnafanida stream at the south-eastern corner of the site.
A shallow drainage ditch was also excavated along the northern boundary of the Rangue sandpit. This drain has been installed to intercept surface water runoff from the neighbouring lands to the north.
The proposed quarry extension at Knocknaboola is heavily drained, with numerous shallow drains discharging to the Glashacoomnafanida stream, which flows in a northerly direction along the eastern boundary of the site.
A local hydrology map is presented in **Figure 26**.

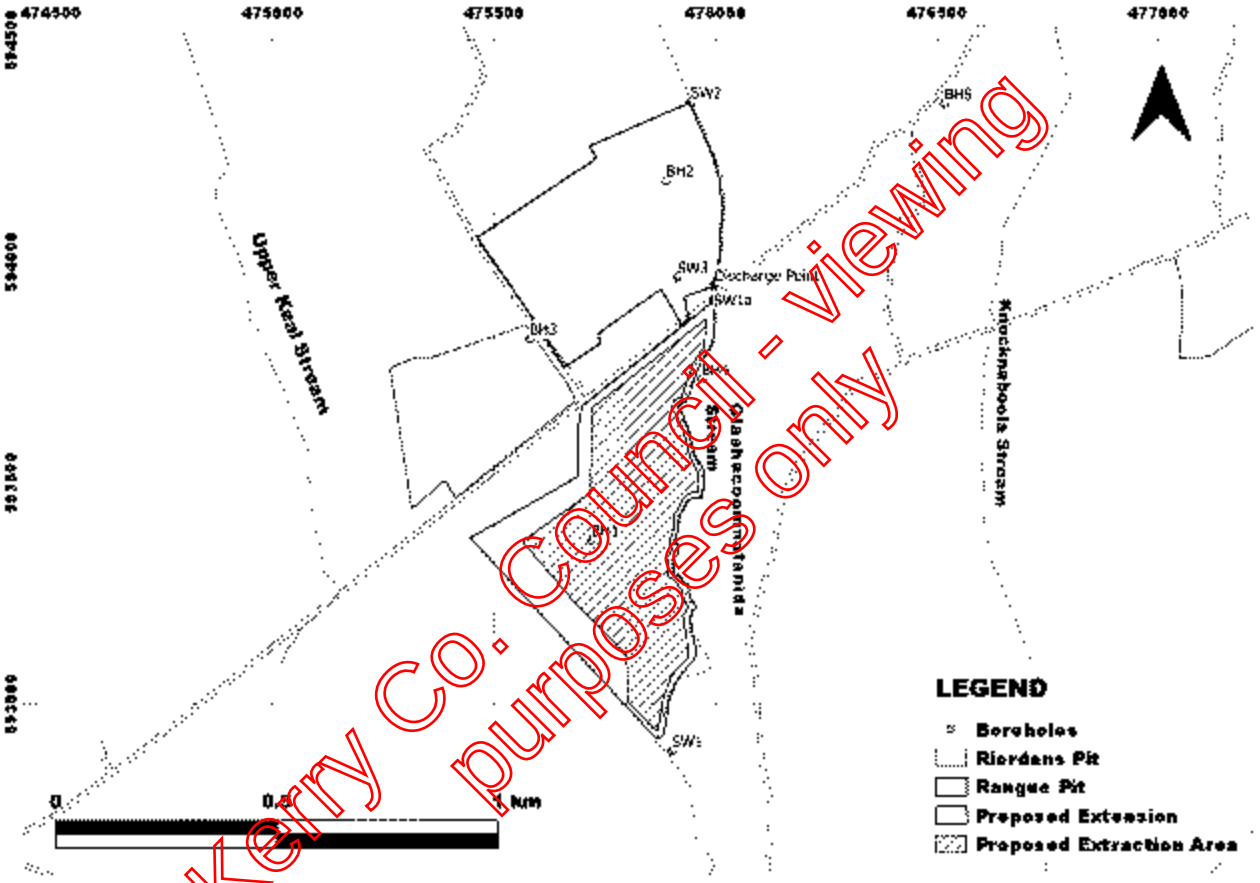


Figure 26: Local Hydrology

7.4.15 Local Hydrology - Flows

Site specific flow measurements were recorded in the Glashacoomnafanida Stream upstream of the proposed extension and downstream of the existing discharge point at Rangue in March, April, May and July 2021.
Upstream of the proposed extension, the flow varied from less than 1 litre/second on the 24th July 2021 to 9 litres/second on the 17th May 2021. The flow was previously recorded in early August 2000 at between 2 and 3 litres per second (EDA, 2000).

Downstream of the discharge point along the eastern boundary of the Rangue pit, the flow varied between 2 litres/second on the 16th April 2021 and 59 litres/second on the 17th May 2021. The increase in flow between the upstream and downstream measurement points is as a result of runoff from the lands at Knocknaboola;

however the high discharge measured at the downstream location on the 17th May is a result of discharge of water from the pit at Rangue.

The low flows measured in April and July 2021, both gauged after extended dry periods, are likely to be less than the 95% (flow which is equalled or exceeded 95% of the time). The low flows encountered after extended dry periods indicate there is no baseflow entering the stream, and discharge in the stream is driven by rainfall runoff, which is expected given the stream is perched more than 9m above the underlying overburden water level.

In very dry weather it is reported that the Glashacoomnafanida stream dries up. This was not observed during the monitoring period in 2021. However, 700m downstream of the Rangue pit, where the Feighahuthig stream (called the Glashacoomnafanida stream as it passed the Rangue pit) flows beneath the L7504, no flow was noted on the 24th July 2021 and only standing water was visible in parts of the stream bed. This indicates that water from the base of the stream sinks into the underlying permeable strata between the quarry site and the bridge.

A summary of surface water flow measurements is presented in Table 6: Summary of Stream Flows Measured between March and July 2021. Flow measurement details are presented in Appendix 7.11.

Table 23: Summary of Stream Flows Measured between March and July 2021

Glashacoomnafanida Stream Flow Measurements		
	SW1	SW2
	Upstream of Extension	Downstream of Discharge Point
Date	Litres/Second	Litres/Second
05/03/2021	0.0033	0.008
16/04/2021	0.0019	0.002
17/05/2021	0.0089	0.059
24/07/2021	0.0008	0.005

7.4.16 Local Hydrology – Water Framework Directive and Quality

Under the Water Framework Directive (Directive 2000/60/EC) all surface water catchments have been characterised and assigned an overall status based principally on chemical and ecological status. The status of river water bodies can range from Bad-Poor-Moderate-Good-High. The objective of the Water Framework Directive is to restore poor quality water bodies to at least 'Good' status and prevent deterioration of 'Good' status water bodies, by 2027.

Ireland has been divided into 46 large catchments, 583 sub-catchments and 4829 smaller water bodies. The existing sandpit and proposed extension both lie within the catchment to the Douglas_010 waterbody (the Glashacoomnafanida stream), which is part of the Laune_SC_030 sub-catchment of the Laune-Maine-Dingle catchment (hydrometric area 22). They all form part of the South Western River Basin District.

A review of the Catchments.ie website indicates that the Douglas_010 waterbody status is under review (it has no assigned ecological status, and no record of water chemistry is available from the catchments.ie site; hence no status has been assigned). The risk of the Douglas_010 waterbody not meeting the requirements of the WFD is unassigned. The main significant pressure identified on the waterbody is from agricultural, industry and extractive industry processes.

The Douglas_010 waterbody discharges into Castlemaine Harbour c. 3.8km northwest and downstream of the existing pit at Rangue. Castlemaine Harbour is assigned an overall 'Good' status and is considered "not at risk" under the 3rd cycle of the Water Framework Directive. The objective for the SWB is to protect the 'Good' status condition.

A summary of the WFD status and objectives is presented in Table 7.

Table 24: Summary of WFD status and objectives

Water Body Management Unit	Chemical Surface Water Status	Overall Ecological Status	Overall Status	Overall Risk Result	Overall Objective
Glashacoomnafanida Stream (Douglas_010 Waterbody)	Not Assigned	Not Assigned	Not Assigned	Review	Review
Castlemaine Harbour IE_SW_230_0200	Good	Good	Good	Not at Risk	Protect

No surface water quality data has been collected from the Glashacoomnafanida stream as part of the WFD monitoring. Surface water grab samples were collected from 3 locations as part of this site investigation, namely:

- SW1, upgradient of the proposed extension at Knocknaboola;
- SW2, downstream of the discharge point at Rangue; and
- SW3, the quarry discharge at Rangue

The results of analysis are presented in Table 8. Sampling locations from this investigation, and from prior site investigations, are presented in **Figure 16**. Sampling Logs are presented in Appendix 7.12. Monitoring results are compared with a number of standards as listed below:

- Limits set out in the *EPA Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals)* under surface water;
- Limits set out in European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009) for the purposes of assessing the status of surface waters in Ireland; and;
- Limits set out in European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 (S.I. No. 294 of 1989).

Table 25: Surface Water Quality Results

PARAMETER	UNITS	SW1	SW1	SW1a	SW2	SW2	SW2	SW3	SW3	EPA ELVs for Extractive Industry	S.I. 272 Environmental Objectives (SW) Regulations 2009	S.I. 294 EC (Quality of Surface Water Intended for the Abstraction for Drinking Water Regulations) 1989	
Location		Upstream		Upstream of Rengue	Downstream			Discharge					
Grid Reference (ITM)		479902, 593885		479868, 593914	479544, 594383			479898, 593985					
Date		16/04/2021	14/05/2021	1/8/2013	16/04/2021	14/05/2021	01/03/2000	14/05/2021	01/08/2009				
Sampled By		PES	PES	EDA	PES	PES	EOA	PES	EDA			A1 Waters	A2 Waters
Physico-Chemical Parameters													
pH	pH Units	5.4	6.9	5.9	6.1	7.20	6.20	7.30	6.90	6-9	6.5 < pH < 9 (Soft Water)	5.5-8.5	5.5-9
Electrical Conductivity	µS/cm	93	82	92.5	90	150	113	210	273	-	-	-	-
Temperature	°C	11	12.7	-	9.7	12.8	-	13.7	-	-	Not greater than 1.5°C rise outside mixing zone	25	25
CHEMICAL PARAMETERS													
Ammonia	mg/l N	<0.02	<0.02	0.3	0.12	<0.03	0.13	<0.03	0.33		High Status ≤0.040 (mean) or ≤0.090 (95%ile) Good Status ≤0.065 (mean) or ≤0.140 (95%ile)	0.2	1
Nitrate as N	mg/l N	<0.25	<0.25	0.03	<0.25	<0.25	0.17	<0.25	0.32	11*	-	11*	11*
Nitrite as N	mg/l	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	-		0.03**	
Ortho-Phosphate (MRP)	mg/l P	<0.01	<0.01	-	0.02	<0.01	-	<0.01	-	-	High Status ≤0.025 (mean) or ≤0.045 (95%ile) Good Status ≤0.035 (mean) or ≤0.075 (95%ile)	-	-
Total Phosphorus	mg/l P	<0.01	<0.01	<0.02	0.05	<0.01	<0.02	<0.01	<0.02	-	-		-
Suspended Solids	mg/l	<1	<1	4	6	<1	5	<1	3.5	35		50	
BOD	mg/l	-	1.3	3.8	-	2.2	1.3	1.0	1.7	25	High Status ≤1.3 (mean) or ≤2.2 (95%ile) Good Status ≤1.5 (mean) or ≤2.6 (95%ile)	5	5
Chloride	mg/l	27.7	23.2	30	26.3	29.0	[illegible]	30	30	-	-	250	250
Total Nitrogen	mg/l	0.5	0.5	-	0.7	<0.5		<0.5		-	-	1	2
Potassium	mg/l	-	-	2.7	-	-	3.1	-	3.3	-	-	-	-
Iron	mg/l	-	-	0.14	-	-	0.05	-	0.18	-	-	0.2	2
Total Organic Carbon	mg/l	4.9	7.4		10.3	6.5		3.3		-	-	-	-
Manganese	mg/l	-	-	0.03	-	-	0.02	-	0.03	-	-	0.05	0.3
Hydrocarbons													
Hydrocarbons	µg/l	<10	<10	-	<10	<10	-	<10	-	1000	-	-	-

* 50mg/l NO3 limit value converted to N.
Legend
PES = Parkmore Environmental Services Ltd
µS/cm = microsiemens per centimetre
mg/l = milligrams per litre
/ = No analysis or Environmental Objective

Parkmore Environmental Services Ltd.
Kilcoogrill
Shanagolden,
Co. Limerick.

Surface water quality in the Glashacoomnafanida stream along the eastern boundary of the proposed extension and further downstream along the eastern boundary of the pit at Rangue is excellent. The chemical analysis indicates this surface water body is at "High Status" under the Water Framework Directive, with both Ammonia, Orthophosphate and Biological Oxygen Demand (BOD) levels within less than the limits required by S.I. 272 2009. All parameters monitored were within the EPA Emission Limit Values (ELVs) for the Extraction Industry, and the Quality of Surface Water intended for the Abstraction of Drinking Water Regulations.

Surface water quality in the discharge water is also excellent. The total suspended solids (TSS) content of the discharge water was 3.5 mg/l, which is within the ELV of 35 mg/l for quarries, and the discharge licence limit of 30 mg/l.

During high flows it is expected that the total suspended solids concentration of the stream will increase given the stream crosses a catchment underlain by sand and gravel overburden, and erosion and deposition are characteristics of an upland river environment.

The results of this analysis compare favourably with results from previous analysis, indicating no deterioration of surface water quality as a result of ongoing quarrying activities at the Rangue pit.

7.4.17 Surface Water Abstraction

There are no recorded surface water abstractions from the Glashacoomnafanida stream as indicated by the EPA 2009 abstraction register[2]. The nearest surface water abstraction for drinking water is at Killorglin, approximately 2.9 km northeast of the existing pit at Rangue. There is no direct hydrological link between the pit and this surface water abstraction.

No water is abstracted from the Glashacoomnafanida stream for use at the site. Drinking water, and water for toilets, is taken from a mains supply. Water from the southern pond is used on site for processing the aggregate and dust suppression.

7.4.18 Flooding

OPW's indicative river and coastal flood map was consulted to identify those areas as being at risk of flooding. No areas within the site boundary were identified. The Past Flood Event maps were consulted and no past flood event has been logged downstream of the existing pit or the proposed extension.

The CFRAM River Flood Extents maps were consulted. The CFRAM Flood Maps are predictive flood maps showing areas predicted to be inundated during a theoretical or 'design' flood event with an estimated probability of occurrence, rather than information for actual floods that have occurred in the past, which is presented, where available on the 'past' flood maps. According to the CFRAM Flood maps there is no mapped risk of flooding downstream during low, medium or high probability flood events (i.e during 1:1000 year, 1:100 year or 1:10 year flood events).

National Indicative Fluvial Mapping indicates the extent of a fluvial indicative 100 and fluvial extreme 1000 year flood events (flood events with an annual exceedance probability of 1% or high risk, and 0.1% or moderate risk, respectively). According to the National Indicative Fluvial Mapping, the downstream stream channel known as the Keal stream, from c. 1.45km downgradient of the pit at Rangue until it reaches Castlemaine Harbour, is at risk of flooding during a 1 in 100 year and 1 in a 1000 year rainfall event. The mapped flood extents encompass low lying agricultural lands. As already stated, no past flood event has been logged on the floodinfo.ie website.

[2] www.floodinfo.ie

The water level at the quarry floor has been controlled by pumping under licence to the Glashacoomnafanida stream since at least 1989 (Discharge Licence W61). All excavation of material at the proposed extension site will take place above the water table; therefore, there will be no increase in discharge rate off site. Therefore, the continued operation of the pit at Rangue will not increase the flood risk downstream of the site; while the development of the proposed extension will divert existing runoff to ground, therefore slightly reducing the volume of water.

Table 9: Summary of Hydrology Baseline findings Site Baseline summary

Attribute	Description
Hydrology	The regional hydrology is dominated by both the River Laune, which is located c. 3.1km north-east and downgradient of the proposed extension at Knocknaboola; and Castlemaine Harbour, which is located c. 3.8km north north-west and downgradient of the existing pit at Rangue. There are two small streams adjoining or adjacent to the existing sandpit at Rangue and the proposed extension at Knocknaboola. They all flow in a northerly direction and flow into Castlemaine Harbour c. 3.8km northwest of the pit at Rangue; they are the upper Keal stream and the Glashacoomnafanida stream. The nearest surface water body is the Glashacoomnafanida stream which flows along the eastern boundary of the existing pit and the proposed extension. This stream reportedly dries up during extended dry periods. This was not observed during the monitoring period adjacent to the site, but 700m downstream of the Rangue pit, where the Feighahuthig stream (called the Glashacoomnafanida stream as it passed the Rangue pit) flows beneath the L7504, no flow was noted on the 24th July 2021 and only standing water was visible in parts of the stream bed. This indicates that water from the base of the stream sinks into the underlying permeable strata between the quarry site and the bridge. The surface drainage network is perched at least 9m above the underlying groundwater table. Surface water quality upstream and downstream of the existing pit and the proposed extension is excellent. The Past Flood Event maps were consulted and no past flood event has been logged downstream of the existing pit or the proposed extension. No extraction of aggregate will take place beneath the water table at the proposed extension at Knocknaboola; therefore no dewatering will be required on that site. It will continue to be necessary to pump groundwater/surface water from the southern pond at the Rangue site in order to control the water table level at that site. Discharge of water from the site is subject to the conditions of discharge licence W61. The existing septic tank and soak pit system is not in compliance with the current or previous guidelines and will need to be replaced. The site is suitable for the installation of a secondary treatment system and polishing filter installed in compliance with the EPA Code of Practice, 2021.
Surface Water Quality	Surface water quality upstream and downstream of the existing pit and the proposed extension is excellent.
Flooding	The Past Flood Event maps were consulted and no past flood event has been logged downstream of the existing pit or the proposed extension.

Licenced Discharge to Surface Water	No extraction of aggregate will take place beneath the water table at the proposed extension at Knocknaboola; therefore no dewatering will be required on that site. It will continue to be necessary to pump groundwater/surface water from the southern pond at the Rangue site in order to control the water table level at that site. Discharge of water from the site is subject to the conditions of discharge licence W61.
Wastewater Treatment	The existing septic tank and soak pit system is not in compliance with the current or previous guidelines and will need to be replaced. The site is suitable for the installation of a secondary treatment system and polishing filter installed in compliance with the EPA Code of Practice, 2021.

Impacts of the Development

The proposed works require the removal of peat, overburden and aggregates from the proposed extension at Knocknaboola; and the continued use of the main pit at Rangue for processing of aggregate. The potential impacts on the hydrology of the site are assessed below. A summary of all impacts is presented in **Table 23**.

An impact assessment was undertaken under the following considerations:

- **Quality of Effects:** The magnitude of each impact was considered from positive to negative
- **Significance of Effects:** The significance of each impact was considered as having either an imperceptible, not significant, slight, moderate, significant, very significant or profound effect.
- **Extent and Context:** A description of whether the extent, duration or frequency will conform or contrast with the established baseline conditions.
- **Probability of Effects:** Whether an impact was likely or not
- **Duration and Frequency of Effects:** The duration of each impact was considered to be momentary, brief, temporary, short term, medium term, long term, permanent, or reversible. The frequency describes how often the event will occur.

7.5.1 Construction Phase

During the construction period peat (topsoil) and subsoil will be stripped and heaped on site to enable extraction of sand and gravel aggregate from the site. Restoration of exhausted portions of the existing pit will continue to take place.

7.5.1.2 Impact on Surface Water

The existing quarry and the proposed extension are located within the surface water catchment of the Keal stream (Douglas_010_Waterbody). The Glashacoomnafanida stream hydraulically connects the existing quarry, and the proposed extension, to the Keal stream and the downgradient SAC. There is a moderate risk that a pollution incident on the site could impact on the downgradient SAC given that it is in hydraulic connection with the site, via the Glashacoomnafanida stream, and the SAC is located approximately 3.8 km downstream of the site.

It will continue to be necessary to pump water from the southern pond at the Rangue site in order to control the water table level in the winter, and intermittently during rainfall events in the summer, and to provide water for concrete production. There is a high risk that a pollution incident could impact the pond before being pumped off site and impacting the Glashacoomnafanida stream. This is a significant, likely and temporary impact. To date, no reported pollution of the Glashacoomnafanida stream has taken place. Discharge of water from the site is subject to the conditions of discharge licence W61. Furthermore, there is a risk that such an incident could impact the downstream SAC. Given that the SAC is located approximately 3.8 km downstream of the site, and taking account of the dilution available in the stream and the estuarine environment, the risk to the SAC is considered to be moderate, and the impact to be slight, likely and temporary.

The removal of the temporary (winter) perched water table at the Rangue sandpit site as a consequence of the existing excavation has likely resulted in a small decrease in the winter flow of the adjoining stream. The small reduction in winter flow will be compensated by likely increased baseflow downgradient of the sandpit. This is an imperceptible, neutral, and permanent impact.

The removal of peat, the low permeability iron pan, and subsoil during the construction phase of the proposed extension at Knocknaboola will expose the underlying and (usually) more permeable sand and gravel subsoil. This will result in increased percolation of effective rainfall to groundwater, in turn reducing runoff from the site to the Glashacoomnafanida stream. Quarrying from the proposed extension will remove less than 1% of the land area contributing rainfall runoff to the Glashacoomnafanida stream and the downstream. Water budget calculations (Appendix 7.3) indicate that there will be an increase in the estimated percolation rate to deep groundwater from 0.2 litres per second pre-development to 0.56 litres per second during phase 1, 1.47 litres per second during phase 2, 1.25 litres per second during phase 3, 2.0 litres per second during phase 4, and 1.64 litres per second during phase 5. This is an imperceptible, neutral (the reduced runoff to the local drainage network is minimal and will be offset by increased baseflow to the downgradient river drainage network) and permanent impact on the SAC.

Removal of peat and upper subsoil layers on more elevated areas of the proposed extension site will expose subsoil to erosion and is likely to lead to an increase in sediment laden runoff reaching surface water during the construction phase of the proposed extension. Disturbance of the peat cover on this site could lead to water with high suspended peat content entering the surface drainage network. This is a potentially negative, significant, and medium-term impact.

Site works could destabilise upgradient peat lands and cause a peat-slide, and lead to the clogging of the Glashacoomnafanida stream with mobilised peat. This is considered a negative, very significant, unlikely and long-term effect.

There is potential for accidental or unplanned surface water pollution to occur during the construction phase. Potential polluting activities include accidental fuel spillages during refuelling of plant/vehicles, and leaks from plant/vehicles reaching the surface drainage network. This is a negative, significant, and temporary impact.

The construction of the proposed extension will not increase flood risk downstream of the quarry as no removal of aggregate will take place below the water table, and no pumping of groundwater to the surface drainage network will take place from the proposed extension.

7.5.2 Operational Phase

During the operational period, impacts and effects listed during the construction phase will continue to apply. In addition, the following potential impacts could occur.

7.5.2.2 Impact on Surface Water

As extraction of sand and gravel aggregate progresses, the excavation at the proposed extension will deepen. All surface drainage at the proposed extension extraction site will be directed into the pit void reducing the volume of runoff to the Glashacoomnafanida stream. This is a negative, not significant and long term impact.

Perched groundwater overlying low permeability layers encountered during excavation works will be directed to the deep groundwater table, likely further reducing runoff to the Glashacoomnafanida stream. This is a negative, imperceptible, and long term impact.

Given all surface drainage from the proposed extraction area on the extension site site will be directed into the pit void, and there will be no risk that sediment laden runoff will discharge to the Glashacoomnafanida stream. This is a positive, slight and long term impact.

Cumulative Impacts

According to Catchments.ie, the surface water status of the adjacent Glashacoomnafanida stream and its downstream channel is under review. The main significant pressure identified on the waterbody is from agricultural, industry and extractive industry processes.

There are a number of sand and gravel pits located within the surface water catchment, including the existing Rangue sand pit and its proposed extension at Knocknaboola; the existing pit at Riordan's where the aggregate is being processed in the main pit at Rangue; the adjacent Roadstone sandpits (which have been reportedly exhausted, with reported reinstatement plans in place) which are located immediately adjacent to the pit at Rangue. The sandpit and associated works located at Muingaphuca c. 1.5km west of the existing Rangue pit, is within the same surface water catchment. In addition, there is an EPA licenced landfill located adjacent to sand pit at Muingaphuca (Licence no: P0018-02). Neighbouring land consists of a peat lands, and moderate intensity agricultural grass land. An End of Life Vehicle Facility is based in Rangue, c. 200m north of the main pit.

Discharge of groundwater and surface water pumped from the southern pond at the Rangue site to the Glashacoomnafanida stream, could impact on the stream and the downgradient SAC. This has not happened to date, and a discharge licence has been in place since 1989. Given water has to be pumped from the pit floor, there is no risk of an accidental discharge (breakout) from the site to surface water. The main risk to the catchment is from pumped discharge of water from the main pit at Rangue, and hydrocarbon contamination from the End of Life Vehicle Facility at Rangue.

Table 10: Summary of effects on Hydrology

Direct Impacts: Sureface Water	Nature of Impact Pre-Mitigation	Mitigation Measures	Nature of Impact Post Mitigation
Discharge of silt laden runoff from the proposed extension to surface water	Significant, Negative, Unlikely, Short-Term	No discharge of surface water to take place from the proposed extension. Runoff from the proposed extension to percolate to ground at extension site. Existing drainage to be maintained, where possible. Silt traps will be constructed within the drainage channels to allow suspended solids to settle before surface water discharges to the Glashacoomnafanida Stream. Silt traps to be inspected monthly and maintained as required.	Imperceptible, Neutral, Unlikely, Short-Term

		Stripping of soil and overburden to take place in dry weather. Material to be stockpiled in existing pit in Rangue, and not in elevated areas. Quarry traffic directed to dedicated roadways to avoid surface water flowing across quarry floor. Surface water to be piped under roadways where required. A 15 buffer zone and earth berm to be installed between proposed extension and Glashacoomnafanida Stream. A silt fence will be installed between the soil berm and the Glashacoomnafanida Stream. Topography means accidental discharge/breakout of silt laden waters is not possible from site.	
Discharge of silt laden runoff from the existing pit to surface water	Significant, Negative, Likely, Short-Term	There is no gravity discharge from the site to surface water. The water level in the ponds in the main pit at Rangue is controlled by pumping. Water which is pumped off site is subject to the condition of Discharge Licence W61. The vast ponds on site are sufficient to ensure the suspended load of the discharge water complies with the requirements of the discharge licence (i.e. TSS of less than 30). In fact, analysis of the discharge water indicates the suspended load is normally less than 4mg/l TSS. The pump intake will be maintained suspended above the base of the southern pond, to reduce the risk of pumping sediment from the floor of the pond. To date, no reported pollution of the Glashacoomnafanida Stream has taken place, and there has been no reported impact on the downgradient SAC.	Imperceptible, Neutral, Unlikely, Short-Term
Accidental spillages or leakages of fuel and lubrication oils from machinery and plant	Significant, Negative, Likely, Short-Term	To prevent contamination of the surface water, hazardous materials (oils, fuels, chemicals etc) should be used and stored in an appropriate manner and in accordance with professional guidelines such as for example "Control of Water Pollution from Construction sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001), and "Oils storage guidelines. Best Practice Guide" (Enterprise Ireland, BPGCS005). No storage of hydrocarbons to take place on extension site. Storage and refuelling areas on existing site should be designed to be sufficiently impermeable to prevent the infiltration of any spillage, leakage or runoff into the surface water. All runoff will be directed towards oil/water interceptor and silt traps prior to discharge to process lagoon. Spillage kits and action plans for their use should be available throughout the works.	Slight, Negative, Unlikely, Short-Term

		Re-fuelling of vehicles must take place in a designated, properly bunded area on the site. An incident spillage plan shall be prepared to provide guidance on response to emergency situations, such as the accidental spillage of oil, and fuel, as a result of leakage from plant and machinery, or resulting from an accident involving vehicles transporting material to and from the site.	
Site works could destabilise upgradient peat lands and cause a peat slide	Very Significant, Negative, Unlikely Permanent	A mineral soil berm will be constructed along the southwestern boundary to retain the upgradient wetlands. An upgradient interceptor drain will allow runoff from the upgradient peat lands continue to discharge to the Glashacoomnafanida stream. The proposed soil berm, drainage works along the southern boundary of the proposed extension, and the low topographic gradient means there is a low risk of any peat slide occurring.	Not Significant, Neutral, Long Term
Flooding downstream of quarry as a result of pumping from the Southern Pond to the Glashacoomnafanida Stream	Significant, Negative, Unlikely, Short Term	Pumped discharge from the site has been taking place since 1989 under discharge licence (W61). No flooding has ever been reported downstream of the quarry site. No increase in pumping is envisaged as part of this planning application and no pumping is required to control the water table beneath the proposed extension. Rainfall runoff from the proposed extension will be directed to groundwater, thereby slightly reducing the runoff to the Glashacoomnafanida Stream.	Imperceptible, Neutral, Unlikely, Short Term
Indirect Impacts: Surface Water	**Nature of Impact Pre-Mitigation**	**Mitigation Measures**	**Nature of Impact Post Mitigation**
Pollution of downgradient SAC via Glashacoomnafanida Stream	Slight, Negative Likely, Short-Term	As discussed for mitigation measures for direct impacts in relation to discharge of silt laden water and hydrocarbons to surface water. The dilution available in the stream and the estuarine environment will reduce the impact on the downstream SAC compared to the adjacent Glashacoomnafanida Stream.	Imperceptible, Neutral, Unlikely, Short-Long Term
Reduced baseflow to and reduced runoff to Glashacoomnafanida Stream resulting from extraction of aggregate and removal of perched water table.	Imperceptible, Neutral, Likely, Permanent	The reduction in base flow to surface water in the vicinity of the site is imperceptible. The reduction in runoff is high, given that up to 96% of effective rainfall percolates to groundwater pre development, though the land area contributing runoff to the Glashacoomnafanida Stream represents less than 1% of the catchment area to the stream prior to discharge to the downgradient SAC. A small reduction in Baseflow to, and runoff to, the Glashacoomnafanida Stream is offset by a small increase in percolation to deep groundwater and in baseflow to surface water downgradient of the site, and pumped	Imperceptible, Neutral, Likely, Permanent

		discharge of water under licence from the existing pit at Rangue.	

Mitigation

Mitigation measures are required during the construction and operation phases to reduce and possibly eliminate the impacts on the hydrology and hydrogeology outlined above. Mitigation measures are listed below:

- An upgradient interceptor drain will allow runoff from the upgradient peat lands discharge to the Glashacoomnafanida stream, whilst maintaining existing drainage in the peatlands. Existing drainage, which flows in a southwest to northeast direction, along the northwestern boundary of the extension will be maintained. Silt traps will be constructed within the drainage channels to allow suspended solids to settle before surface water discharges to the Glashacoomnafanida stream. The mineral soil berm, which along the southwestern boundary will be constructed to prevent peat slippage, drainage works along the southwestern boundary of the proposed extension, and the low topographic gradient means there is a low risk of any peat slide occurring.
- As the quarry is being worked, other areas will be reinstated in order to reduce surface runoff and prevent generation of suspended solids.
- Water which is pumped off site is subject to the condition of Discharge Licence W61. The vast ponds on site are sufficient to ensure the suspended load of the discharge water complies with the requirements of the discharge licence (i.e. TSS of less than 30). In fact, analysis of the discharge water indicates the suspended load is normally less than 4mg/l TSS.
- Water used in aggregate processing is pumped from the northern pond to a header tank. From here it is pumped to the aggregate washing facility, which consists of a wet cyclone system, which removes the majority of silt and clay from the wash water. After processing, sediment laden water discharges to a series of elongate settlement lagoons, linked in series, in the western portion of the site. Water drains from one lagoon to another, before being re-circulated to the sand washing plant (some water drains back to the northern pond). The fines that settle out in these lagoons are regularly removed and allowed to dry before disposal in the worked areas of the pit.
- A soil berm will be constructed around the perimeter of the proposed extraction area at Knocknaboola. A silt fence must be installed between the Glashacoomnafanida stream and the berm. The combination of these two mitigation measures will prevent silt laden runoff from entering the Glashacoomnafanida stream and migrating off site.
- A buffer of zone of 15 metres will be maintained between the proposed excavation and the Glashacoomnafanida steam. The combination of the buffer zone and the berm will minimize the potential seepage of water from the stream into the pit and subsequently to deep groundwater.
- The existing septic tank and soak pit are to be decommissioned and replaced with a secondary wastewater treatment and disposal system, with EN12566 certification, and a tertiary polishing filter constructed in compliance with the EPA Code of Practice 2021. This will reduce the impact on groundwater quality at the Rangue site, by improving the quality of wastewater effluent discharging to ground.
- To prevent contamination of surface or ground waters, hazardous materials on the Rangue sandpit (oils, fuels, chemicals etc.) should be used and stored in an appropriate manner and in accordance with professional guidelines such as for example "Control of Water Pollution from Construction sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001), and "Oils storage guidelines. Best Practice Guide" (Enterprise Ireland, BPGCS005). All quarrying works will be completed in line with the recommendations of this publication and this will serve to mitigate against any pollution occurring;
- An incident spillage plan shall be prepared to provide guidance on response to emergency situations, such as the accidental spillage of oil, fuel, as a result of leakage from plant or machinery,

or resulting from an accident involving vehicles transporting material(s) to and from the subject site.

- Emergency Scenario: An emergency spill plan will be drawn up for the site, taking account of environmental considerations.

In relation to Oil/refuelling mitigation measures – these are detailed in the Hydrogeology chapter (6) and also apply to the Hyrology Chapter.

7.7 Difficulties Encountered in Compiling Information

No difficulties encountered in compiling this information.

7.8 Residual Impacts

Implementation of mitigation measures during the operation phase, along with good site management and quarrying practices should eliminate any machinery and fuel oil related significant and/or permanent direct and indirect impacts on the receiving environment.

Removal of 16.75 Hectares of shallow degraded peat land is not significant in the wider blanket peat landscape.

7.9 Monitoring

A designated person within the quarry team will have overall responsibility for ensuring that the excavation is carried out in such a way as to minimize possible pollution of soils and geology. This person will also have the responsibility of monitoring the performance of any pollution control measures adopted.

7.10 References

Included at beginning of chapter 6.

Chapter Eight – Noise and Vibration

8.1 Introduction

The operational phase of the project will involve the extraction of aggregates at the proposed extension area, and transfer to the applicant's existing operations area. Initial enabling works will be required, and these will constitute the construction stage. Potential noise and vibration impacts may be divided into the following categories:

- Construction phase noise impacts on surrounding receptors.
- Construction phase vibration impacts on surrounding receptors.
- Operational phase noise impacts on surrounding receptors.
- Operational phase vibration impacts on surrounding receptors.

The proposed development is highly unlikely to give rise to perceptible ground borne vibration, and vibration is not typically associated with sand and gravel pits. Vibration has therefore been scoped out of the assessment. This chapter assesses construction phase and operational phase noise impacts.

The noise assessment was undertaken by Damian Brosnan BSc MSc MIOA MIEI of Damian Brosnan Acoustics who has over 20 years' experience in scoping and carrying out such impact assessments. His qualifications are as follows:

- Postgraduate diploma in Acoustics & Noise Control (Institute of Acoustics).
- MSc (Distinction) in Applied Acoustics (University of Derby).
- Member of Institute of Acoustics (MIOA) & secretary of Irish IOA branch.
- Founding member of Association of Acoustic Consultants of Ireland (AACI).
- 1996-2001: Noise Officer with Cork County Council.
- 2001-2014: Partner with Dixon Brosnan Environmental Consultants, specialising in EIA.
- 2015--: Principal at Damian Brosnan Acoustics.

8.2 Methodology

8.2.1 Guidance and Legislation

This chapter:

- Describes the proposed development and the existing baseline environment.
- Identifies, describes and assesses the noise effects of the proposed development.
- Proposes mitigation and monitoring measures where appropriate.
- Identifies any residual effects remaining.
- The above are achieved through the following objectives:
- Identify noise criteria relevant to the proposed development.
- Identify noise sensitive receptors.
- Describe the baseline noise environment by reference to measured noise data.
- Identify noise sources associated with the development.
- Predict noise levels arising at offsite receptors.
- Determine noise impacts at receptors by reference to identified criteria.
- Identify noise mitigation requirements.

Ambient noise levels in the vicinity of the proposed extraction area were measured. This data,

combined with historic monitoring data in relation to the applicant's existing operation, were used to describe the local noise environment, and to identify appropriate noise criteria. Proposed plant was identified, and noise emissions data used to predict likely noise levels at receptors. Predicted levels were assessed in the context of identified criteria, and mitigation measures identified where required. The following noise criteria were identified:

Quarries & Ancillary Activities: Guidelines for Planning Authorities (Department of The Environment, Heritage & Local Government, 2004)

The DOEHLG document draws on guidance presented in Environmental Protection Agency (EPA) report number MS-2000-M1, later published in 2006, and titled Environmental Management Guidelines: Environmental Management In The Extractive Industry (Non-Scheduled Minerals). The DOEHLG guidance and the related EPA document recommend a daytime $L_{Aeq\,1\,h}$ limit of 55 dB. The documents additionally recommend that audible tonal and impulsive components be minimised. The 55 dB limit is typically applied at offsite noise sensitive locations, defined by the EPA as any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.

The 55 dB $L_{Aeq\,1\,h}$ limit is identical to that which currently applies to the applicant's existing operation, which is subject to planning permissions 00/93744 and 00/93746. Both permissions specify that site operations shall comply with conditions set out previously in An Bord Pleanála permissions PL08.125728 and PL08.125729. Condition 8 of the former and condition 9 of the latter are identical: 'Equivalent sound levels attributable to all onsite operations associated with the proposed development shall not exceed 55 dB(A) (Leq) over a continuous one-hour period between the hours of 0700 and 1900 Monday to Saturday inclusive, when measured outside any dwelling house in the vicinity of the site. Sound levels shall not exceed 45 dB(A) at any other time.'

Therefore the 55 dB daytime $L_{Aeq\,1\,h}$ limit is considered the most suitable criterion with respect to the proposed development, applicable externally at offsite receptors during daytime working hours. The criterion applies to all noise emissions expected from the applicant's development, including emissions from the operations area and from the proposed extension area combined.

Guidelines For Environmental Noise Impact Assessment (Institute of Environmental Management & Assessment, 2014)

The IEMA guidelines set out guidance on impacts by comparison with ambient levels. Table 1 sets out a scale adapted from IEMA and EPA guidance, with the latter drawn from Draft Guidelines on The Information to Be Contained in Environmental Impact Assessment Reports (EPA, 2017). The table is considered relevant to total ambient $L_{Aeq\,1\,h}$ levels i.e., predicted levels may be compared to existing $L_{Aeq\,1\,h}$ levels.

Table 8.1: Assessment of Impact by reference to increase over existing noise levels.

Change	Impact	Effect
<2 dB	Imperceptible	Capable of measurement, but without significant consequences
2-4 dB	Not significant	Causes noticeable changes to soundscape, but without significant consequences
4-6 dB	Slight	Causes noticeable changes to soundscape without affecting its sensitivities
6-10 dB	Moderate	Alters soundscape in manner consistent with existing and emerging baseline trends
10-15 dB	Significant	Alters soundscape due to source character, magnitude, duration or intensity
15-20 dB	Very significant	Significantly alters soundscape due to source character, magnitude, duration or intensity

>20 dB	Profound	Obliterates soundscape

On a similar note, the above DOEHLG documents states that complaints can be expected where extraction noise results in levels 5-10 dB above background noise levels. In this case, the term background refers to LAF90 levels.

British Standard BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (2014)

British Standard BS 5228 sets out a procedure which may be used to determine the impacts of construction noise at surrounding receptors. This is considered relevant to the proposed initial construction works to enable the development. The procedure involves setting threshold values based on ambient $L_{Aeq,T}$ levels. The standard recommends that, during the construction phase, total noise levels including construction emissions should not exceed these levels. On the basis of guidance given in the standard, a limit of 65 dB is considered appropriate, applicable at receptors, and over a one-hour period. This applies to temporary construction works.

8.3 Study Area

The local terrain is relatively flat. Dwellings are scattered along Caragh Lake Road, the local secondary road separating the operations area from Riordan's pit, and local secondary roads to the east and south of the proposed extension area. The nearest dwellings are shown in Figures 2 to 5. There are 24 completed dwellings within 500 m of the extraction area. The nearest dwellings are located in a row outside the northwest corner. One dwelling lies opposite the northeast corner. All noise sensitive receptors in the local area are dwelling houses, and no other receptor types are present. No vulnerable groups have been identified.

Previous noise surveys near the applicant's sand and gravel pit indicate that the local noise environment is dominated by road traffic. Noise emissions from the applicant's existing operations area are audible at the nearest dwellings. Extraction in Riordan's pit is typically audible at a low level at dwellings to the south of the pit. A former quarry located to the north of the applicant's pit is not currently being worked. Some noise emissions arise from local agricultural practices.

In the Do-Nothing scenario, the following changes are likely:

- Noise emissions from Riordan's pit will end once the pit is exhausted.
- Emissions at the existing operations area may or may not continue, depending on aggregate availability.
- Road traffic noise is unlikely to change appreciably.
- At the proposed extension area, no noise emissions are likely to arise, unless the site is put into agricultural use or forestry.

Figure 8.1: Area north of the site. Dwelling houses are marked yellow. Derelict houses are marked blue. The proposed extraction area is delineated red. ↑N

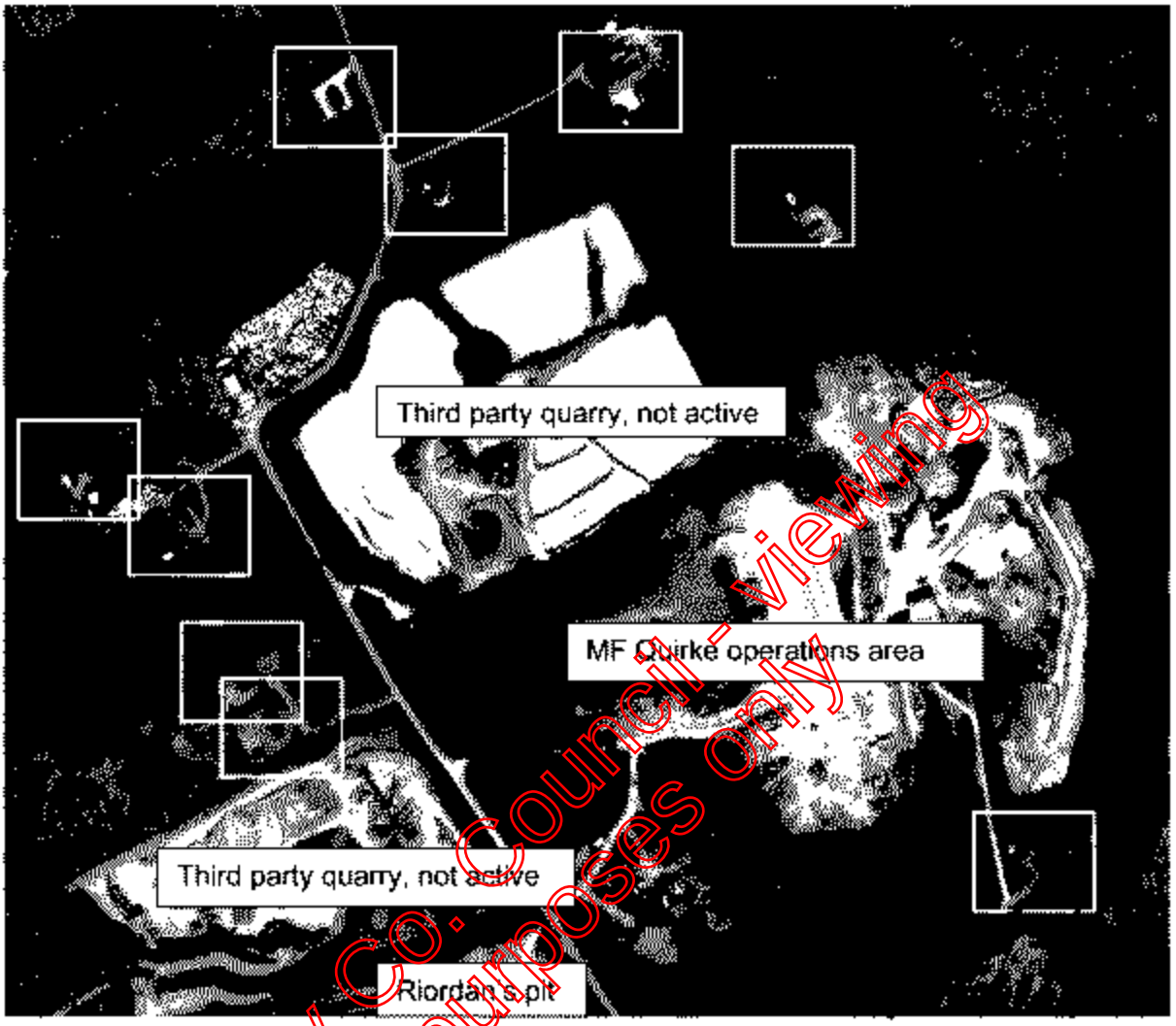


Figure 8.2: Area northeast of the site. Dwelling houses are marked yellow. The proposed extraction area is delineated red. ↑N

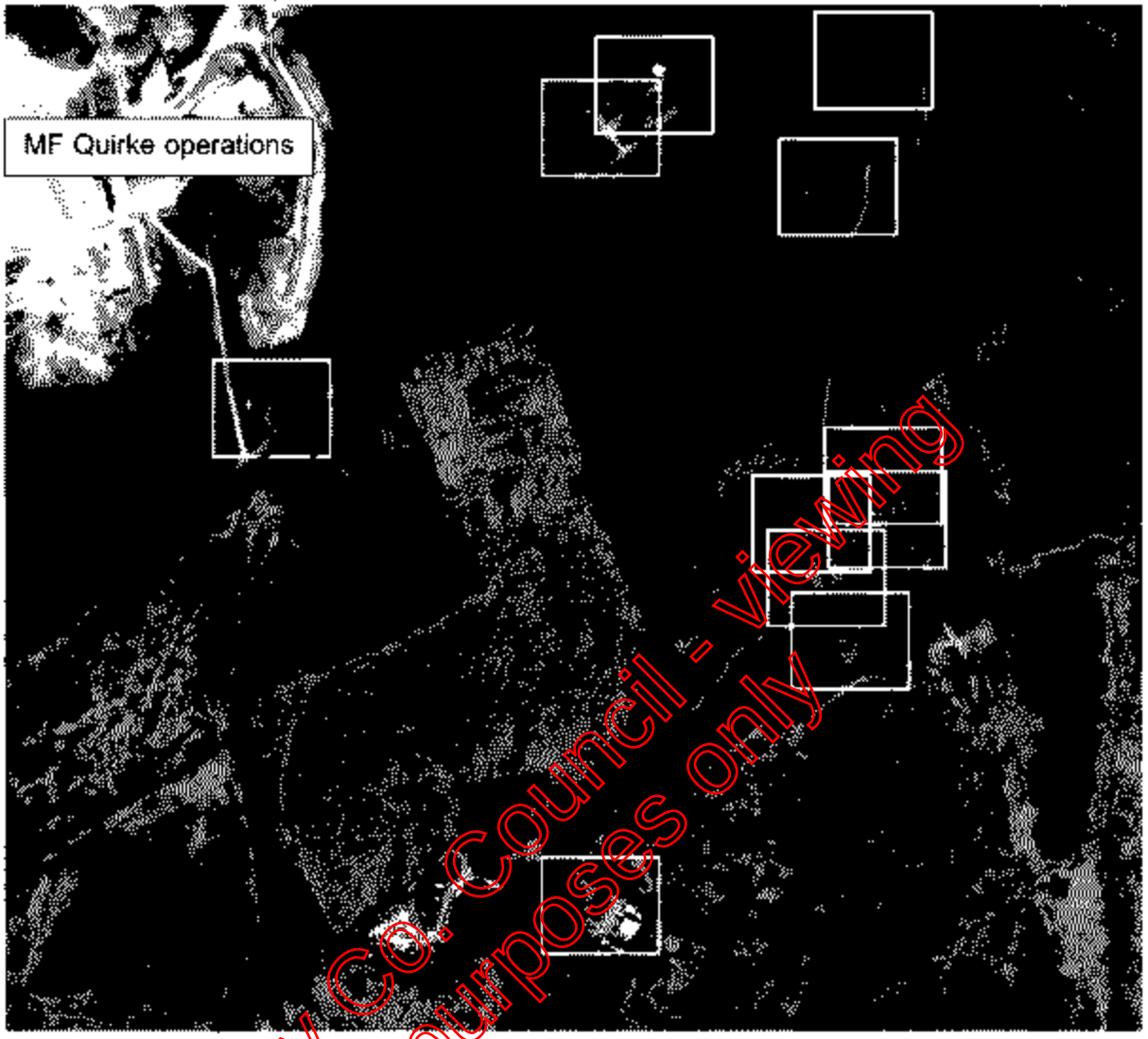


Figure 8.3: Area at center. Dwelling houses are marked yellow. A house under construction is marked green. The proposed extraction area is delineated red. ↑N

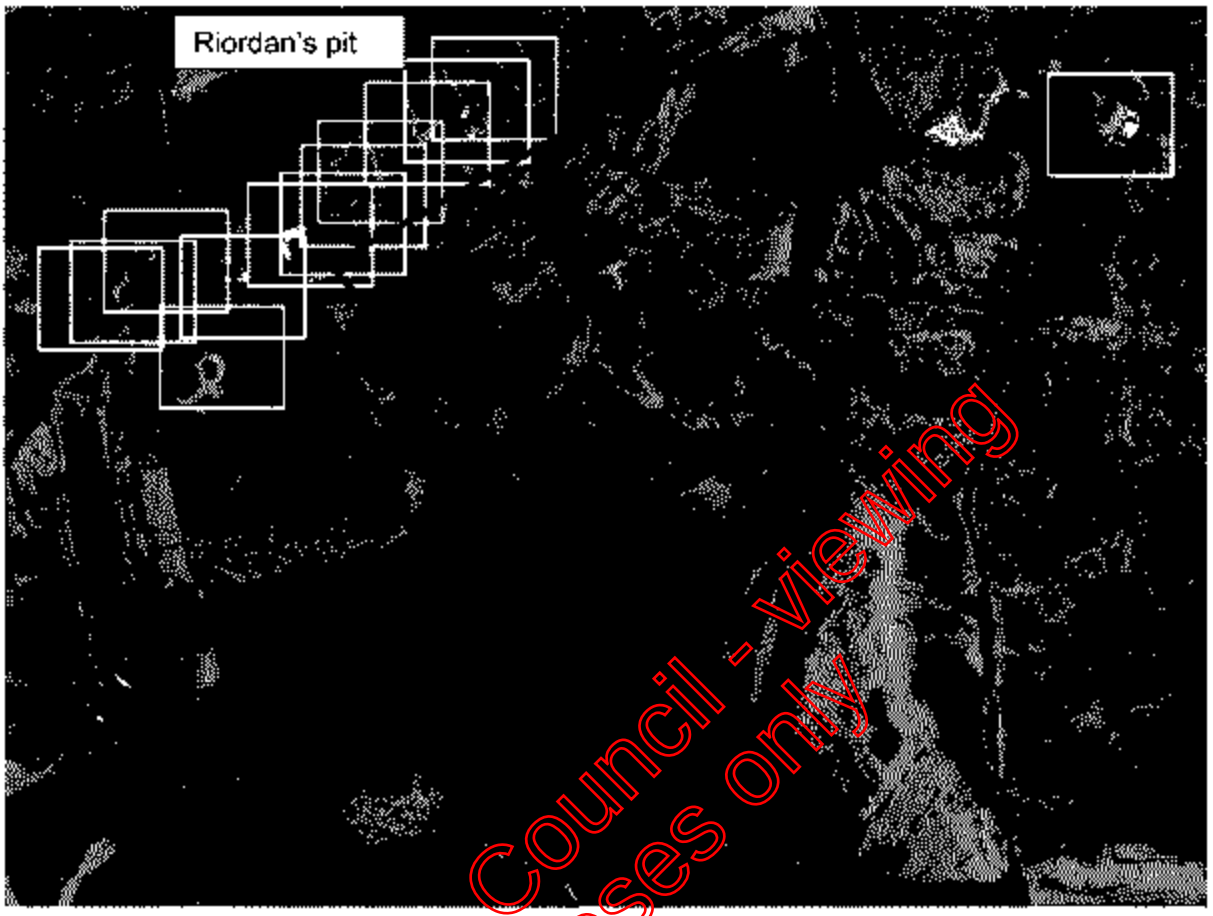


Figure 8.4: Area south of the site. Dwelling houses are marked yellow. The proposed extraction area is delineated red. ↑N

8.4 Receiving Environment

Noise surveys have been routinely carried out in the vicinity of the applicant's existing pit since 2003 by Damian Brosnan Acoustics. Monitoring was temporarily halted in 2010 during the recession years. The routine noise monitoring positions are shown in Figure 6. Measured noise levels are presented in Tables 2-7. Table 8 summarises the results of the routine surveys.

Figure 8.5: Historic noise monitoring positions. Positions were relocated slightly over the years to take account of local changes, access, etc. e.g., N1 and N1a.

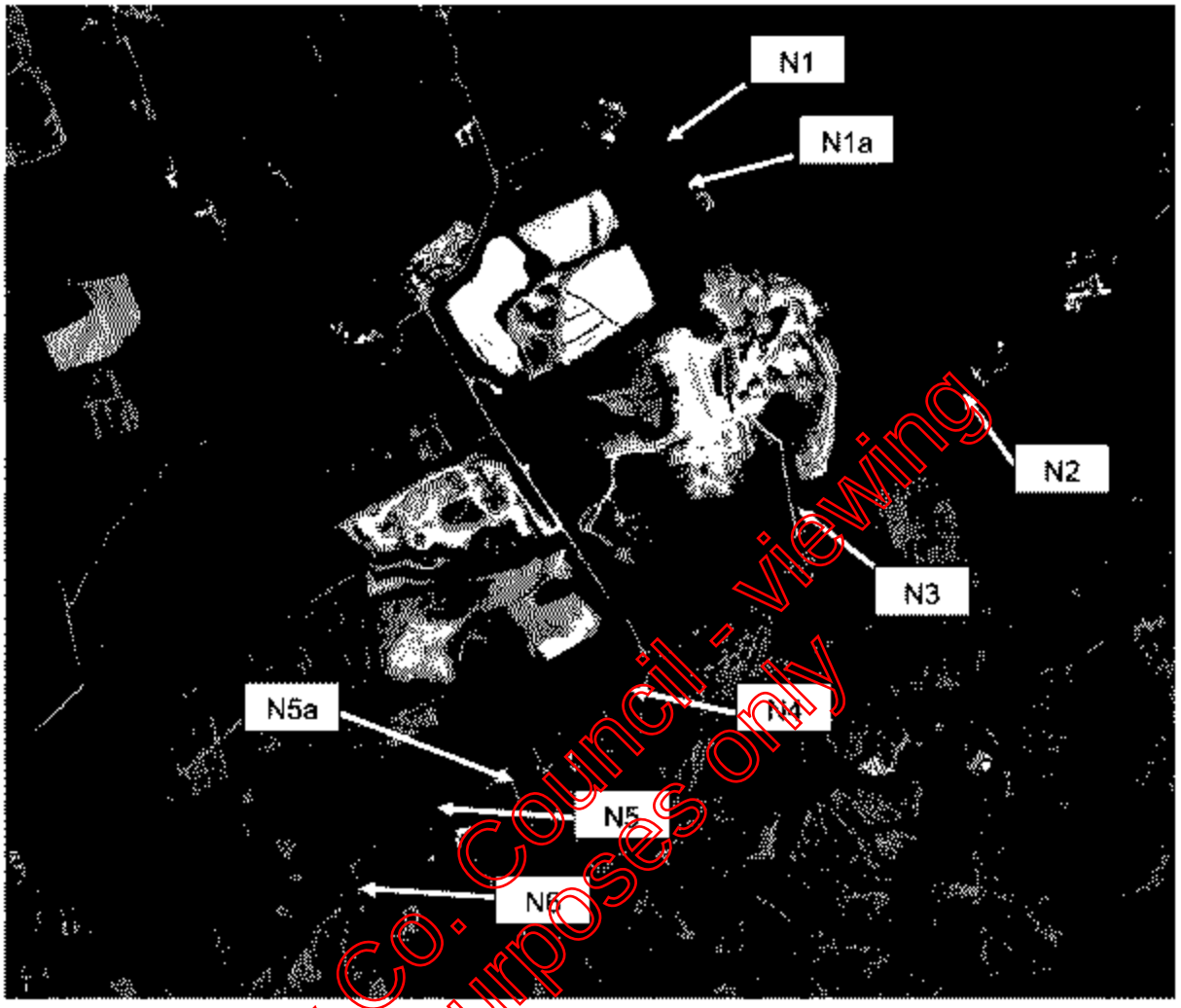


Table 8.2: Noise levels at N1 and N1a

Date	Time	$L_{Aeq,T}$	$L_{AF90,T}$	$L_{AF90,T}$	Comment
02/10/03	1152-1222	56 dB	59 dB	49 dB	Pit clearly audible. Pit level: 56 dB.
27/04/04	1115-1145	48 dB	50 dB	41 dB	Pit slightly audible. Pit level: <45 dB.
27/05/04	1122-1152	55 dB	58 dB	51 dB	Pit clearly audible. Pit level: <55 dB.
26/11/04	1118-1148	59 dB	57 dB	52 dB	Pit slightly audible. Pit level: <50 dB.
21/12/04	1111-1141	48 dB	48 dB	42 dB	Pit slightly audible. Pit level: 48 dB.
11/03/05	1007-1037	50 dB	52 dB	47 dB	Pit slightly audible. Pit level: <47 dB.
17/06/05	1004-1034	60 dB	60 dB	55 dB	Pit slightly audible. Pit level: <50 dB.
20/09/05	1054-1124	59 dB	61 dB	56 dB	Pit clearly audible. Pit level: 55 dB.
21/12/05	0946-1016	57 dB	59 dB	53 dB	Pit slightly audible. Pit level: <50 dB.
15/03/06	1004-1034	50 dB	54 dB	39 dB	Pit slightly audible. Pit level: <50 dB.
08/06/06	0902-0932	46 dB	50 dB	43 dB	Pit audible. Pit level: 46 dB.
07/09/06	1048-1118	44 dB	46 dB	38 dB	Pit audible. Pit level: 44 dB.
20/12/06	1627-1657	46 dB	49 dB	35 dB	Pit audible. Pit level: 46 dB.
27/03/07	0918-0948	43 dB	47 dB	38 dB	Pit audible. Pit level: 43 dB.
25/06/07	1046-1116	42 dB	44 dB	37 dB	Pit not audible. Pit level: <37 dB.
15/08/07	1328-1404	40 dB	42 dB	35 dB	Pit audible. Pit level: 40 dB.
31/10/07	1603-1633	55 dB	58 dB	52 dB	Pit audible. Pit level: <50 dB.
21/02/08	1031-1101	55 dB	57 dB	50 dB	Pit audible. Pit level: <53 dB.
03/07/08	1558-1628	49 dB	51 dB	46 dB	Pit audible. Pit level: <49 dB.
17/09/08	1525-1555	46 dB	44 dB	36 dB	Pit audible. Pit level: <46 dB.
20/11/08	1453-1553	46 dB	48 dB	42 dB	Pit audible. Pit level: <46 dB.
18/03/09	1157-1257	43 dB	39 dB	31 dB	Pit audible. Pit level: <43 dB.
17/06/09	1331-1431	46 dB	48 dB	44 dB	Pit audible. Pit level: 46 dB.
15/09/09	1437-1537	43 dB	44 dB	39 dB	Pit audible. Pit level: <43 dB.
15/10/09	1122-1208	48 dB	47 dB	37 dB	Pit audible. Pit level: 48 dB.
10/02/10	1128-1228	37 dB	39 dB	32 dB	Pit audible. Pit level: 32 dB.
21/04/10	1451-1551	48 dB	50 dB	41 dB	Pit audible. Pit level: 41 dB.
29/03/19	0921-1021	50 dB	54 dB	43 dB	Pit audible. Pit level: 50 dB.
11/06/19	1156-1256	40 dB	43 dB	34 dB	Pit audible. Pit level: 40 dB.
05/09/19	1341-1441	45 dB	47 dB	41 dB	Pit audible. Pit level: 45 dB.
09/12/19	1417-1517	46 dB	50 dB	34 dB	Pit audible. Pit level: 40 dB.
23/03/20	1515-1615	46 dB	48 dB	38 dB	Pit audible. Pit level: 46 dB.
02/06/20	1356-1456	39 dB	41 dB	33 dB	Pit audible. Pit level: 34 dB.
21/09/20	0933-1033	44 dB	45 dB	37 dB	Pit audible. Pit level: <44 dB.
05/11/20	1451-1551	39 dB	42 dB	34 dB	Pit audible. Pit level: 39 dB.
04/03/21	1007-1107	41 dB	42 dB	36 dB	Pit audible. Pit level: 39 dB.
20/04/21	1550-1650	46 dB	44 dB	34 dB	Pit audible. Pit level: <46 dB.

Table 8.3: Noise levels at N2.

Date	Time	$L_{Aeq,T}$	$L_{AF90,T}$	$L_{AF90,T}$	Comment
02/10/03	1020-1050	44 dB	47 dB	39 dB	Pit audible at low level. Pit level: <44 dB.
27/04/04	1000-1030	61 dB	46 dB	36 dB	Pit audible at low level. Pit level: <45 dB.
27/05/04	1001-1031	64 dB	54 dB	36 dB	Pit audible at low level. Pit level: <40 dB.
26/11/04	0930-1000	66 dB	57 dB	41 dB	Pit audible at low level. Pit level: 41 dB.
21/12/04	0918-0948	69 dB	65 dB	51 dB	Pit audible at low level. Pit level: 51 dB.
11/03/05	0833-0903	66 dB	61 dB	48 dB	Pit audible at low level. Pit level: 48 dB.
17/06/05	0810-0840	65 dB	55 dB	40 dB	Pit slightly audible. Pit level: 40 dB.
20/09/05	0906-0936	66 dB	60 dB	42 dB	Pit audible at low level. Pit level: 42 dB.
21/12/05	0759-0829	63 dB	54 dB	39 dB	Pit slightly audible. Pit level: <39 dB.
15/03/06	0757-0827	65 dB	51 dB	35 dB	Pit slightly audible. Pit level: <35 dB.
08/06/06	0754-0824	67 dB	55 dB	33 dB	Pit slightly audible. Pit level: <33 dB.

07/09/06	0939-1009	57 dB	47 dB	26 dB	Pit slightly audible. Pit level: <30 dB.
20/12/06	1333-1403	57 dB	56 dB	36 dB	Pit clearly audible. Pit level: <50 dB.
27/03/07	0803-0833	66 dB	54 dB	36 dB	Pit audible at low level. Pit level: <40 dB.
25/06/07	0927-0957	65 dB	59 dB	47 dB	Pit audible clearly. Pit level: <50 dB.
15/08/07	1447-1521	65 dB	59 dB	43 dB	Pit audible clearly. Pit level: <45 dB.
31/10/07	1714-1744	65 dB	62 dB	41 dB	Pit audible at low level. Pit level: 41 dB.
21/02/08	1218-1248	64 dB	62 dB	51 dB	Pit audible. Pit level: <48 dB.
03/07/08	1635-1705	66 dB	66 dB	42 dB	Pit not audible. Pit level: <42 dB.
17/09/08	1635-1705	65 dB	59 dB	30 dB	Pit slightly audible. Pit level: <35 dB.
20/11/08	1235-1307	65 dB	58 dB	47 dB	Pit audible. Pit level: <50 dB.
18/03/09	0945-1045	64 dB	52 dB	27 dB	Pit slightly audible. Pit level: <30 dB.
17/06/09	1141-1241	65 dB	58 dB	48 dB	Pit audible. Pit level: <48 dB.
15/09/09	1026-1126	61 dB	51 dB	32 dB	Pit slightly audible. Pit level: 32 dB.
15/10/09	1450-1550	59 dB	54 dB	37 dB	Pit slightly audible. Pit level: 37 dB.
10/02/10	1337-1442	65 dB	58 dB	28 dB	Pit slightly audible. Pit level: 28 dB.
21/04/10	1613-1713	64 dB	54 dB	31 dB	Pit slightly audible. Pit level: 31 dB.
29/03/19	1100-1200	56 dB	55 dB	43 dB	Pit audible. Pit level: 43 dB.
11/06/19	1035-1135	55 dB	53 dB	37 dB	Pit audible. Pit level: 37 dB.
05/09/19	1400-150	58 dB	58 dB	46 dB	Pit audible. Pit level: 46 dB.
09/12/19	1440-1540	59 dB	59 dB	44 dB	Pit audible. Pit level: 44 dB.
23/03/20	1510-1610	56 dB	57 dB	39 dB	Pit slightly audible. Pit level: 39 dB.
02/06/20	1530-1630	57 dB	55 dB	35 dB	Pit slightly audible. Pit level: <35 dB.
21/09/20	0900-1000	67 dB	61 dB	44 dB	Pit audible. Pit level: <46 dB.
05/11/20	1330-1430	63 dB	56 dB	41 dB	Pit audible. Pit level: <44 dB.
04/03/21	0845-0945	62 dB	56 dB	32 dB	Pit audible. Pit level: 32 dB.
20/04/21	1430-1530	61 dB	59 dB	35 dB	Pit audible. Pit level: 35 dB.

Table 8.4: Noise levels at N3.

Date	Time	$L_{Aeq,T}$	$L_{A90,T}$	$L_{A90,T}$	Comment
02/10/03	0913-0943	51 dB	54 dB	43 dB	Pit audible. Pit level: <51 dB.
27/04/04	0921-0951	52 dB	55 dB	42 dB	Pit audible. Pit level: <52 dB.
27/05/04	0925-0955	53 dB	57 dB	41 dB	Pit audible. Pit level: <53 dB.
26/11/04	1004-1034	51 dB	55 dB	40 dB	Pit audible. Pit level: <51 dB.
21/12/04	0953-1023	54 dB	55 dB	48 dB	Pit audible. Pit level: <54 dB.
11/03/05	0930-1000	60 dB	62 dB	52 dB	Pit audible. Pit level: 52 dB.
17/06/05	0845-0915	56 dB	56 dB	46 dB	Pit audible. Pit level: <48 dB.
20/09/05	0941-1011	55 dB	55 dB	48 dB	Pit audible. Pit level: <50 dB.
21/12/05	0833-0903	57 dB	61 dB	46 dB	Pit audible. Pit level: <50 dB.
15/03/06	0832-0902	56 dB	56 dB	47 dB	Pit audible. Pit level: <53 dB.
08/06/06	0827-0857	57 dB	56 dB	46 dB	Pit audible. Pit level: <53 dB.
07/09/06	1011-1041	50 dB	51 dB	44 dB	Pit audible. Pit level: <50 dB.
20/12/06	1404-1434	49 dB	53 dB	39 dB	Pit audible. Pit level: <49 dB.
27/03/07	0837-0907	58 dB	56 dB	44 dB	Pit audible. Pit level: <53 dB.
25/06/07	1006-1036	59 dB	61 dB	55 dB	Pit audible. Pit level: <53 dB.
15/08/07	1411-1441	66 dB	63 dB	48 dB	Pit audible. Pit level: <53 dB.
31/10/07	1640-1710	56 dB	59 dB	44 dB	Pit audible. Pit level: <53 dB.
21/02/08	1143-1213	59 dB	61 dB	52 dB	Pit audible. Pit level: <53 dB.
03/07/08	1517-1550	53 dB	54 dB	43 dB	Pit audible. Pit level: <50 dB.
17/09/08	1602-1632	51 dB	53 dB	43 dB	Pit audible. Pit level: <50 dB.
20/11/08	1129-1229	52 dB	55 dB	48 dB	Pit audible. Pit level: <50 dB.
18/03/09	0841-0941	50 dB	54 dB	35 dB	Pit audible. Pit level: <50 dB.
17/06/09	1035-1135	55 dB	57 dB	47 dB	Pit audible. Pit level: <50 dB.
15/09/09	1133-1233	50 dB	53 dB	43 dB	Pit audible. Pit level: <50 dB.
15/10/09	1346-1446	54 dB	53 dB	44 dB	Pit audible. Pit level: <44 dB.

10/02/10	1019-1119	52 dB	54 dB	44 dB	Pit audible. Pit level: <44 dB.
21/04/10	1518-1618	53 dB	52 dB	39 dB	Pit audible. Pit level: <39 dB.
29/03/19	1040-1140	52 dB	55 dB	43 dB	Pit audible. Pit level: 50 dB.
11/06/19	1132-1232	56 dB	54 dB	46 dB	Pit audible. Pit level: 55 dB.
05/09/19	1400-1500	53 dB	54 dB	49 dB	Pit audible. Pit level: 53 dB.
09/12/19	1430-1530	49 dB	51 dB	41 dB	Pit audible. Pit level: 46 dB.
23/03/20	1500-1600	57 dB	57 dB	47 dB	Pit audible. Pit level: 55 dB.
02/06/20	1530-1630	52 dB	50 dB	42 dB	Pit audible. Pit level: 48 dB.
21/09/20	0902-1002	52 dB	52 dB	47 dB	Pit audible. Pit level: <53 dB.
05/11/20	1325-1425	54 dB	51 dB	44 dB	Pit audible. Pit level: <55 dB.
04/03/21	0834-0934	52 dB	52 dB	42 dB	Pit audible. Pit level: 51 dB.
20/04/21	1420-1520	52 dB	52 dB	36 dB	Pit audible. Pit level: 50 dB.

Table 8.5: Noise levels at N4.

Date	Time	$L_{Aeq,T}$	$L_{A10,T}$	$L_{A90,T}$	Comment
02/10/03	1606-1636	60 dB	58 dB	46 dB	Pit audible at low level. Pit level: <46 dB.
27/04/04	1516-1546	54 dB	56 dB	47 dB	Pit clearly audible. Pit level: <50 dB.
27/05/04	1526-1556	54 dB	56 dB	44 dB	Pit not audible. Pit level: <40 dB.
26/11/04	1514-1544	57 dB	57 dB	36 dB	Pit not audible. Pit level: <35 dB.
21/12/04	1531-1601	57 dB	59 dB	37 dB	Pit not audible. Pit level: <35 dB.
11/03/05	1236-1306	58 dB	58 dB	39 dB	Pit not audible. Pit level: <39 dB.
17/06/05	1332-1402	56 dB	56 dB	29 dB	Pit not audible. Pit level: <29 dB.
20/09/05	1320-1350	52 dB	57 dB	28 dB	Pit not audible. Pit level: <28 dB.
21/12/05	1248-1318	64 dB	57 dB	32 dB	Pit not audible. Pit level: <32 dB.
29/03/19	1045-1145	55 dB	56 dB	37 dB	Pit slightly audible. Pit level: 37 dB.
11/06/19	1020-1120	58 dB	60 dB	47 dB	Pit audible. Pit level: 47 dB.
05/09/19	1538-1638	49 dB	53 dB	40 dB	Pit slightly audible. Pit level: <39 dB.
09/12/19	1430-1530	53 dB	57 dB	32 dB	Pit slightly audible. Pit level: <42 dB.
23/03/20	1342-1442	50 dB	51 dB	35 dB	Pit slightly audible. Pit level: <35 dB.
02/06/20	1400-1500	43 dB	45 dB	33 dB	Pit slightly audible. Pit level: <34 dB.
21/09/20	0911-1011	44 dB	46 dB	31 dB	Pit slightly audible. Pit level: <41 dB.
05/11/20	1340-1440	48 dB	50 dB	35 dB	Pit slightly audible. Pit level: 35 dB.
04/03/21	0851-0951	47 dB	51 dB	31 dB	Pit audible. Pit level: 31 dB.
20/04/21	1415-1515	42 dB	45 dB	29 dB	Pit audible. Pit level: 29 dB.

Table 8.6: Noise levels at N5 and N5a

Date	Time	$L_{Aeq,T}$	$L_{A10,T}$	$L_{A90,T}$	Comment
02/10/03	1451-1521	61 dB	60 dB	39 dB	Pit slightly audible. Pit level: <40 dB.
02/10/03	1417-1447	64 dB	56 dB	42 dB	Pit slightly audible. Pit level: <40 dB.
27/04/04	1406-1436	64 dB	56 dB	39 dB	Operations area audible. Pit level: <45 dB.
27/04/04	1441-1511	62 dB	62 dB	44 dB	Operations area audible. Pit level: <45 dB.
27/05/04	1414-1444	64 dB	63 dB	33 dB	Pit inaudible. Pit level: <33 dB.
27/05/04	1449-1519	60 dB	61 dB	45 dB	Pit inaudible. Pit level: <33 dB.
26/11/04	1408-1438	49 dB	52 dB	37 dB	Pit inaudible. Pit level: <31 dB.
26/11/04	1442-1512	61 dB	63 dB	31 dB	Pit inaudible. Pit level: <31 dB.
21/12/04	1426-1456	54 dB	58 dB	36 dB	Pit inaudible. Pit level: <33 dB.
21/12/04	1500-1530	63 dB	61 dB	33 dB	Pit inaudible. Pit level: <33 dB.
11/03/05	1201-1231	59 dB	60 dB	40 dB	Pit inaudible. Pit level: <36 dB.
11/03/05	1350-1420	63 dB	57 dB	36 dB	Pit inaudible. Pit level: <36 dB.

17/06/05	1148-1218	49 dB	52 dB	33 dB	Pit inaudible. Pit level: <32 dB.
17/06/05	1224-1254	59 dB	55 dB	32 dB	Pit inaudible. Pit level: <32 dB.
20/09/05	1220-1250	59 dB	55 dB	31 dB	Pit inaudible. Pit level: <31 dB.
20/09/05	1354-1424	51 dB	55 dB	31 dB	Pit inaudible. Pit level: <31 dB.
21/12/05	1140-1210	52 dB	53 dB	31 dB	Pit inaudible. Pit level: <31 dB.
21/12/05	1213-1243	61 dB	57 dB	31 dB	Pit inaudible. Pit level: <31 dB.
15/03/06	1122-1152	60 dB	57 dB	38 dB	Pit slightly audible. Pit level: 38-40 dB.
15/03/06	1231-1301	61 dB	59 dB	40 dB	Pit slightly audible. Pit level: 38-40 dB.
08/06/06	0942-1012	60 dB	55 dB	39 dB	Pit slightly audible. Pit level: <39 dB.
08/06/06	1047-1117	51 dB	51 dB	32 dB	Pit slightly audible. Pit level: <39 dB.
07/09/06	1130-1200	56 dB	52 dB	29 dB	Pit slightly audible. Pit level: <30 dB.
07/09/06	1238-1308	54 dB	53 dB	30 dB	Pit slightly audible. Pit level: <30 dB.
20/12/06	1516-1546	47 dB	42 dB	34 dB	Pit not audible. Pit level: <34 dB.
20/12/06	1551-1621	48 dB	54 dB	36 dB	Pit not audible. Pit level: <34 dB.
27/03/07	1043-1113	57 dB	54 dB	40 dB	Pit slightly audible. Pit level: <40 dB.
27/03/07	1122-1152	54 dB	52 dB	39 dB	Pit slightly audible. Pit level: <40 dB.
25/06/07	1125-1155	64 dB	58 dB	44 dB	Pit slightly audible. Pit level: <46 dB.
25/06/07	1236-1306	67 dB	61 dB	46 dB	Pit slightly audible. Pit level: <46 dB.
15/08/07	1144-1214	63 dB	62 dB	44 dB	Pit slightly audible. Pit level: <44 dB.
15/08/07	1219-1254	67 dB	62 dB	44 dB	Pit slightly audible. Pit level: <44 dB.
31/10/07	1452-1522	61 dB	57 dB	38 dB	Pit not audible. Pit level: <37 dB.
31/10/07	1526-1556	67 dB	62 dB	37 dB	Pit not audible. Pit level: <37 dB.
21/02/08	0953-1023	65 dB	60 dB	42 dB	Pit not audible. Pit level: <42 dB.
21/02/08	1108-1138	60 dB	58 dB	49 dB	Pit not audible. Pit level: <42 dB.
03/07/08	1407-1437	62 dB	59 dB	41 dB	Pit not audible. Pit level: <41 dB.
03/07/08	1444-1514	58 dB	54 dB	41 dB	Pit not audible. Pit level: <41 dB.
17/09/08	1406-1436	55 dB	54 dB	29 dB	Pit slightly audible. Pit level: <37 dB.
17/09/08	1441-1511	68 dB	64 dB	37 dB	Pit slightly audible. Pit level: <37 dB.
20/11/08	1345-1445	61 dB	58 dB	37 dB	Pit slightly audible. Pit level: <37 dB.
18/03/09	1051-1151	61 dB	58 dB	36 dB	Pit audible. Pit level: <36 dB.
17/06/09	1438-1538	62 dB	64 dB	49 dB	Pit audible. Pit level: <49 dB.
15/09/09	1331-1431	55 dB	57 dB	40 dB	Pit audible. Pit level: <40 dB.
15/10/09	1015-1115	64 dB	49 dB	33 dB	Pit slightly audible. Pit level: 33 dB.
10/02/10	0906-1006	55 dB	47 dB	33 dB	Pit slightly audible. Pit level: 33 dB.
21/04/10	1358-1458	56 dB	55 dB	37 dB	Pit slightly audible. Pit level: 37 dB.
11/06/19	1401-1501	54 dB	56 dB	43 dB	Pit audible. Pit level: <40 dB.
05/09/19	1548-1648	55 dB	56 dB	39 dB	Pit slightly audible. Pit level: <39 dB.
09/12/19	1540-1640	57 dB	60 dB	29 dB	Pit slightly audible. Pit level: <41 dB.
23/03/20	1350-1450	54 dB	54 dB	32 dB	Pit not audible. Pit level: <31 dB.
02/06/20	1400-1500	53 dB	51 dB	32 dB	Pit slightly audible. Pit level: 33 dB.
21/09/20	0922-1022	54 dB	53 dB	28 dB	Pit slightly audible. Pit level: <43 dB.
05/11/20	1335-1435	59 dB	59 dB	42 dB	Pit slightly audible. Pit level: 42 dB.
04/03/21	1015-1115	53 dB	49 dB	33 dB	Pit audible. Pit level: 43 dB.
20/04/21	1410-1510	57 dB	55 dB	30 dB	Pit audible. Pit level: 44 dB.

Table 8.7: Noise levels at N6. Position relocated slightly in mid-2007, resulting in closer proximity to road.

Date	Time	L_{Aeq}	L_{A10}	L_{A90}	Comment

02/10/03	1527-1557	55 dB	53 dB	30 dB	Operations area faintly audible. Pit level: <35 dB.
27/04/04	1335-1405	57 dB	57 dB	39 dB	Operations area faintly audible. Pit level: <40 dB.
27/05/04	1342-1412	55 dB	59 dB	39 dB	Pit inaudible. Pit level: <33 dB.
26/11/04	1336-1406	50 dB	52 dB	37 dB	Pit inaudible. Pit level: <31 dB.
21/12/04	1349-1419	54 dB	58 dB	35 dB	Pit inaudible. Pit level: <31 dB.
11/03/05	1129-1159	53 dB	53 dB	38 dB	Pit inaudible. Pit level: <33 dB.
17/06/05	1117-1147	48 dB	52 dB	29 dB	Pit inaudible. Pit level: <29 dB.
20/09/05	1429-1459	59 dB	57 dB	30 dB	Pit inaudible. Pit level: <30 dB.
21/12/05	1105-1135	53 dB	54 dB	31 dB	Pit inaudible. Pit level: <31 dB.
15/03/06	1156-1226	51 dB	51 dB	30 dB	Pit slightly audible. Pit level: 30 dB.
08/06/06	1016-1046	53 dB	55 dB	31 dB	Pit inaudible. Pit level: <31 dB.
07/09/06	1205-1235	49 dB	46 dB	22 dB	Pit slightly audible. Pit level: <25 dB.
20/12/06	1443-1513	57 dB	53 dB	34 dB	Pit not audible. Pit level: <34 dB.
27/03/07	1009-1039	52 dB	50 dB	33 dB	Pit not audible. Pit level: <33 dB.
25/06/07	1200-1230	66 dB	58 dB	38 dB	Pit not audible. Pit level: <38 dB.
15/08/07	1102-1139	68 dB	62 dB	34 dB	Pit slightly audible. Pit level: <34 dB.
31/10/07	1419-1449	65 dB	60 dB	37 dB	Pit not audible. Pit level: <37 dB.
21/02/08	0919-0949	69 dB	64 dB	44 dB	Pit not audible. Pit level: <42 dB.
03/07/08	1332-1402	65 dB	53 dB	32 dB	Pit not audible. Pit level: <32 dB.
17/09/08	1331-1401	61 dB	54 dB	27 dB	Pit slightly audible. Pit level: <27 dB.

Table 8.8: Summary of noise survey results.

Station	Comment
N1	The applicant's existing operations have been audible during almost all surveys, with $L_{Aeq\ T}$ levels of 34-50 dB in recent years. Levels were higher in earlier years. Operations at a nearby pit were also audible during earlier years.
N2	Operations at the applicant's operations area have been audible during almost all surveys. $L_{Aeq\ T}$ levels due to pit operations have varied with wind direction and site activity. In recent years, levels have been 46 dB or lower.
N3	Noise levels have been highest at N3, due to vehicles passing on the site access road close to the monitoring position. Levels have consistently been in the 40's or low 50's dB, but have not exceeded 55 dB at any time.
N4	In recent years, the pit has been slightly audible at N4, with typical $L_{Aeq\ T}$ levels of 30-40 dB. Audible sources have consisted of the operations area, as well as extraction at Riordan's pit.
N5	As at N4, the pit has typically been slightly audible in recent years. Typical $L_{Aeq\ T}$ levels are 30-40 dB.
N6	The pit was generally not audible at N6, and this station was removed in 2008.

In addition to the routine surveys, additional noise monitoring was undertaken during the preparation of this EIAR. Monitoring was carried out at positions shown in Figure 7. Data are presented in Table 9.

Figure 8.6: Additional noise stations.

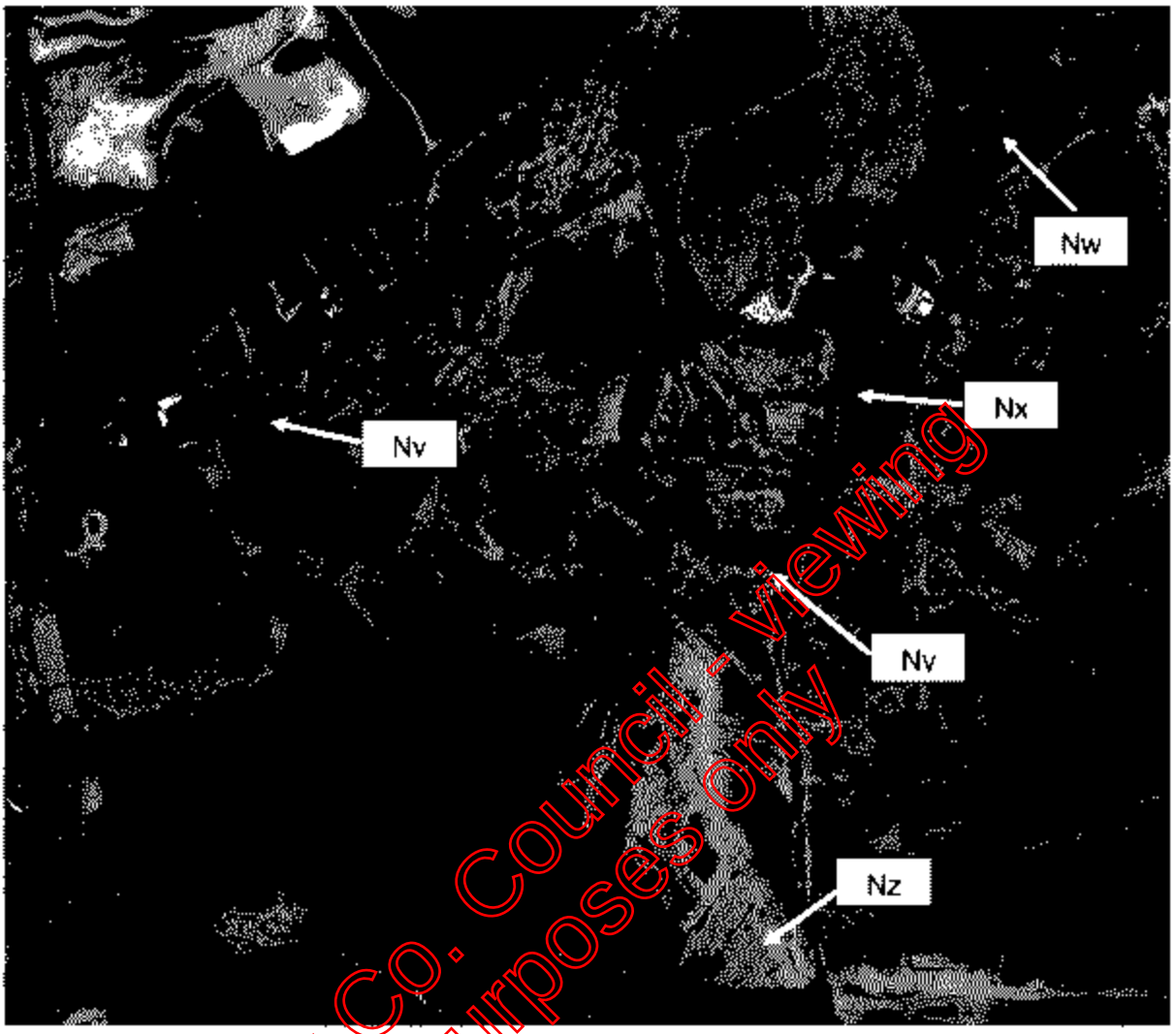


Table 8.9: Noise levels at additional monitoring positions.

Position	Date	Time	$L_{eq,1}$	$L_{eq,2}$	$L_{eq,3}$	Comment
Nv	11/06/19	1526-1626	48 dB	51 dB	42 dB	Excavator at Riordan's pit almost continuously audible at low level. Road traffic dominant.
		1626-1726	47 dB	50 dB	40 dB	
	05/09/19	1500-1600	44 dB	47 dB	38 dB	Excavator at Riordan's pit occasionally audible at low level, and 6x6 movements slightly audible. Road traffic dominant.
		1600-1700	46 dB	49 dB	40 dB	
	09/12/19	1540-1640	38 dB	41 dB	30 dB	Excavator at Riordan's pit faintly discernible on occasion. Road traffic dominant.
		1640-1740	39 dB	43 dB	29 dB	
	21/04/21	1000-1100	40 dB	43 dB	34 dB	Processing plant slightly audible on breeze. Road traffic dominant.
		1100-1200	40 dB	43 dB	34 dB	
		1200-1300	40 dB	43 dB	36 dB	
		1300-1400	41 dB	44 dB	36 dB	
		1400-1500	41 dB	45 dB	35 dB	
		1500-1600	41 dB	45 dB	34 dB	

		1600-1700	44 dB	48 dB	37 dB	
Nw	21/04/21	1000-1100	43 dB	48 dB	32 dB	No emissions audible from applicant's pit. Local traffic dominant.
		1100-1200	45 dB	49 dB	31 dB	
		1200-1300	46 dB	49 dB	32 dB	
		1300-1400	46 dB	50 dB	35 dB	
		1400-1500	46 dB	50 dB	37 dB	
		1500-1600	47 dB	50 dB	38 dB	
		1600-1700	51 dB	54 dB	41 dB	
		1700-1800	50 dB	53 dB	39 dB	
Nx	11/06/19	1545-1645	43 dB	43 dB	36 dB	No emissions audible from applicant's pit, apart from discernible blockmaker. Sporadic local traffic and distant traffic dominant.
		1645-1745	50 dB	45 dB	36 dB	
Ny	05/09/19	1315-1415	45 dB	49 dB	39 dB	Applicant's processing plant continuously slightly audible. Distant traffic regularly audible.
		1415-1515	45 dB	49 dB	40 dB	
		1515-1615	45 dB	48 dB	37 dB	
		1615-1715	47 dB	50 dB	40 dB	
	09/12/19	1550-1650	35 dB	37 dB	30 dB	Applicant's pit not audible. Distant traffic dominant.
		1650-1750	33 dB	35 dB	29 dB	
	21/04/21	1000-1100	51 dB	47 dB	29 dB	Applicant's pit not audible. Distant traffic dominant, with sporadic local traffic.
		1100-1200	50 dB	42 dB	27 dB	
		1200-1300	36 dB	39 dB	29 dB	
		1300-1400	46 dB	40 dB	30 dB	
		1400-1500	43 dB	42 dB	31 dB	
		1500-1600	39 dB	43 dB	30 dB	
		1600-1700	44 dB	46 dB	34 dB	
Nz	21/04/21	1000-1100	39 dB	40 dB	27 dB	Applicant's pit not audible. Distant traffic dominant, with sporadic local traffic.
		1100-1200	34 dB	38 dB	25 dB	
		1200-1300	35 dB	38 dB	27 dB	
		1300-1400	37 dB	41 dB	28 dB	
		1400-1500	39 dB	42 dB	29 dB	
		1500-1600	40 dB	43 dB	29 dB	
		1600-1700	43 dB	48 dB	32 dB	

At position Nv, to the rear of the dwellings outside the northwest corner of the proposed extension, excavator operations in Riordan's pit have been slightly audible on occasion. Operations area noise was also slightly audible on the breeze during one survey. $L_{eq\,T}$ levels due to these emissions were less than 40 dB. $L_{eq\,T}$ levels were dominated by Caragh Lake Road traffic during all surveys.

At Nw to the east of the pit, no emissions were audible. Further south at Nx, the blockmaker was slightly discernible. Pit emissions were audible on one occasion at Ny, resulting in operations noise levels less than 40 dB. Emissions were not audible at Nz to the south.

Results of the Assessment (Evaluation of receiving environment)

Data above may be used to infer residual noise levels in the absence of MF Quirke emissions. These are presented in Table 8.10.

Table 8.10: Residual noise levels in the vicinity of the proposed extension.

Position	Residual $L_{Aeq,T}$	Residual $L_{AF90,T}$	Comment
N2	38-40 dB	29-30 dB	Levels are dominated by Caragh Lake Road traffic. 2020 data presented in Table 6 indicate that $L_{AF90,T}$ levels closer to the road are in the order of 32 dB when pit emissions are not audible, with $L_{Aeq,T}$ levels rising to approximately 54-55 dB due to traffic.
Nw	43-47 dB	31-32 dB	Levels are dominated by local and distant traffic and vary with the time of day. The lowest values are selected.
Nx+Ny*	33-47 dB	27-30 dB	$L_{Aeq,T}$ levels, ignoring outliers, are highly variable, depending on local road activity. $L_{AF90,T}$ levels are also variable, depending on traffic noise on the breeze. The lowest values are selected.
N2	34-40 dB	25-27 dB	$L_{Aeq,T}$ levels, ignoring a 43 dB outlier, are variable due to local traffic activity. The lowest $L_{AF90,T}$ levels are selected.

**Nx and Ny may be used to represent the nearest dwelling several hundred meters north. During surveys, noisy activity at this dwelling prevented use of closer positions.*

The data suggest that residual $L_{Aeq,T}$ levels vary widely, depending on proximity to Caragh Lake Road. At receptors closer to the road, $L_{Aeq,T}$ levels fall to 38-40 dB at the southern extremity of rear gardens, rising to over 55 dB in front gardens.

Even at positions along the local road to the east of the site, levels vary markedly with local traffic. For instance, one or two car movements will result in local $L_{Aeq,T}$ levels being much higher than intervals where no car movements occur. Thus, $L_{Aeq,T}$ levels at receptors along the local road range from 33 dB when no car movements occur, to approximately 47 dB when several movements occur.

Residual $L_{AF90,T}$ levels show less variation, as levels are not affected by intermittent road traffic. However, levels are influenced by continuously audible distant traffic. The lowest $L_{AF90,T}$ range is evident near the southeast corner (25-27 dB), and these are likely to be reasonably representative of $L_{AF90,T}$ levels at dwellings further south. As one moves north along the local road, levels rise towards 32 dB, due to increasing influence of distant traffic noise. The continuous presence of distant traffic noise, from Caragh Lake Road and the N71 means that the local noise environment is not highly sensitive. In addition, the proliferation of dwellings to the northwest, east and south results in regular local car movements throughout the day, as well as activities such as grass cutting and strimming, and these inflate local $L_{Aeq,T}$ levels.

8.5 Impacts of the Development

The applicant currently processes aggregates at their existing operations area on the northern side of Caragh Lake Road. In this area, aggregates are washed and graded, and stockpiled for loading to trucks. Aggregates are also used to produce concrete, mortar and concrete blocks in an onsite batching plant. The aggregates are extracted at the applicant's pit ('Riordan's site') to the immediate west. At the pit working face, aggregates are extracted by tracked excavator or loader, and transferred to the operations area using a dump truck. The transfer route passes under a local secondary road which separates Riordan's pit from the operations area. The secondary road meets Caragh Lake Road at a nearby T-junction. Extraction and processing are permitted by planning permissions 00/93744 and 00/93746.

It is proposed to commence extraction of aggregates at a new site, on the southern side of Caragh Lake Road. At a new working face, aggregates will be extracted by excavator or loader, and transferred by dump truck to the existing operations area. On occasion, screening may be carried out at the

working face using a mobile screener. Temporary stockpiles will arise around the screener. As required, a loader will be brought over from the main operations area and used to load screened aggregates into the dump truck or road-going trucks for export.

A portion of the screened aggregates will be exported directly offsite by truck via a proposed exit to the Caragh Lake Road. However, most aggregates will be transferred to the operations area using the dump truck. A new underpass will be constructed underneath Caragh Lake Road, linking the proposed extraction area to the existing processing area.

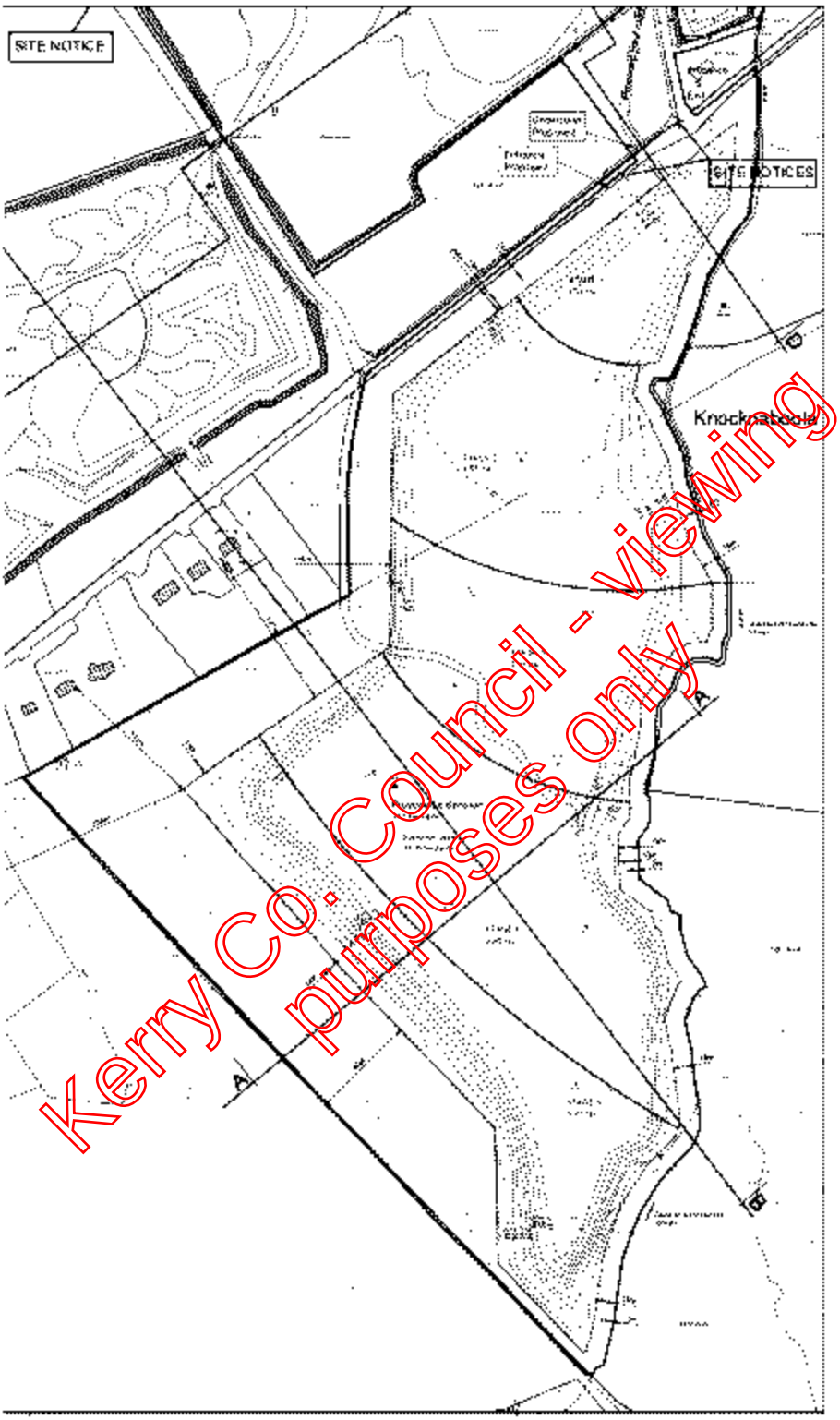
Extraction will be carried out over five phases shown in Figure 1. The phases will move in a generally southwest direction, over one bench. Bench height will be 6.5 m at the northeast corner, gradually increasing to 13.5 m towards the southwest as existing ground level rises. A large buffer, 80 m in width, will be retained around the northwest and southwest sides. The screener will only be imported to the extraction area from the end of phase 2.

Overburden will be removed at the start of each phase using up to two tracked excavators and up to two dump trucks. Overburden will be stockpiled in perimeter berms which will gradually extend southwest in tandem with each phase.

The proposed development will not result in any change in truck activity, and the number of truck movements will remain as at present. Thus, the proposed development merely represents the relocation of extraction from Riordan's pit to the new area, and the introduction of occasional screening. Operations at Riordan's pit will cease prior to commencement of operations at the extension, and there will no further activity at the former. There will be no changes at the existing operations area, apart from the construction of the new haul route to the new extraction area. It is noted that trucks no longer enter or depart from the operations area via the southern access gate.

Construction works required at the outset will involve the creation of the Caragh Lake Road underpass, and the onsite haul roads at both ends of the underpass. Construction works will also involve removal of overburden over the phase 1 area, and the clearing of the crushing zone.

Figure 8.7: Phasing plan.



8.5.1 Construction Noise

Construction noise sources

Construction works required to enable the development will involve the following:

Stage 1: A new haul road will be constructed between the existing operations area and the phase 1 area. This will require use of an excavator and two dump trucks. Material will be used to make berms at the northeast corner of the extraction area, which will require a second dump truck.

Stage 2: Overburden will be removed from the phase 1 area. This will require use of two excavators and two dump trucks. Overburden will be stored in a perimeter berm at the phase 1 area.

Stage 3: A reinforced concrete underpass will be constructed under the existing Caragh Lake Road, this will include the excavation of the existing ground. The floor level will be approximately 9 m below road level. These works will require an excavator, dump truck and mobile crane.

Stage 4: The initial working face will be extracted to create a small pit using an excavator, and extraction proper will commence. The initial pit will be located near the northeast corner of the site, with a floor 9 m below existing ground level.

Likely noise sources are listed in Table 11, along with noise emissions data from *British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* (2014).

Table 8.11: Construction phase sources.

Plant	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Total
Excavator	95	84	79	73	70	68	64	57	77
Dump truck	85	87	77	75	76	73	69	62	81
Small crane	80	76	71	67	64	63	56	50	70

With respect to the above, two worst case scenarios are as follows:

Scenario 1: The initial excavation of the proposed haul road, at ground level in proximity to the nearest dwelling, and the transfer of extracted material north into the operations area.

Scenario 2: Overburden removal and berm construction at the northeast corner.
Once these works have been completed, all subsequent construction works will be located below ground level, and/or will benefit from the completion of the initial berms.

Construction noise modelling
Noise modelling of the worst-case scenarios identified above was carried out using DGMR iNoise v.2021 software with the following parameters:

- Algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation of sound during propagation outdoors – Part 2 General method of calculation* (1996).
- Receivers: Only one receiver is of interest here: the dwelling at the site entrance. All other dwellings are relatively removed from the initial construction area.
- Receiver height: 2 m.
- Ground factor: 1.
- Scenarios modelled:
- Scenario 1: An excavator at ground level to the west of the dwelling, during the initial stage of haul road construction, and the loading of a dump truck for transport north into the operations area. 20 dump truck movements per hour.
- Scenario 2: An excavator stripping overburden near the northeast corner of the extraction area. Two dump trucks transferring the overburden to the perimeter, where a second excavator constructs the berm. 20 dump truck movements per hour.

Predicted $L_{Aeq\,1\,h}$ levels are shown in Figures 8 and 9.

Figure 8.8: Predicted $L_{Aeq\,1\,h}$ levels during the construction phase, scenario 1. The $L_{Aeq\,1\,h}$ level at the nearest dwelling will be 60 dB.

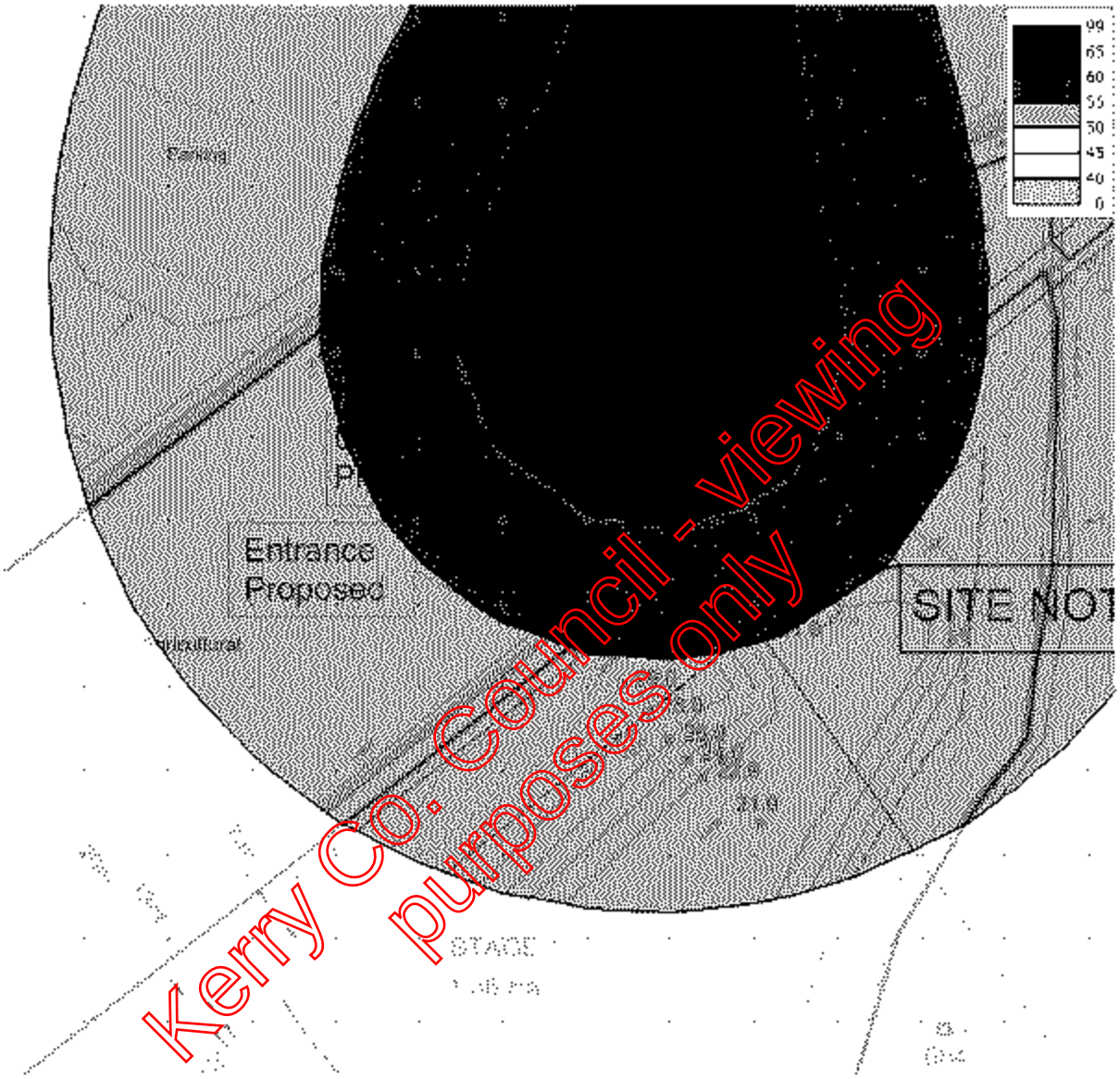
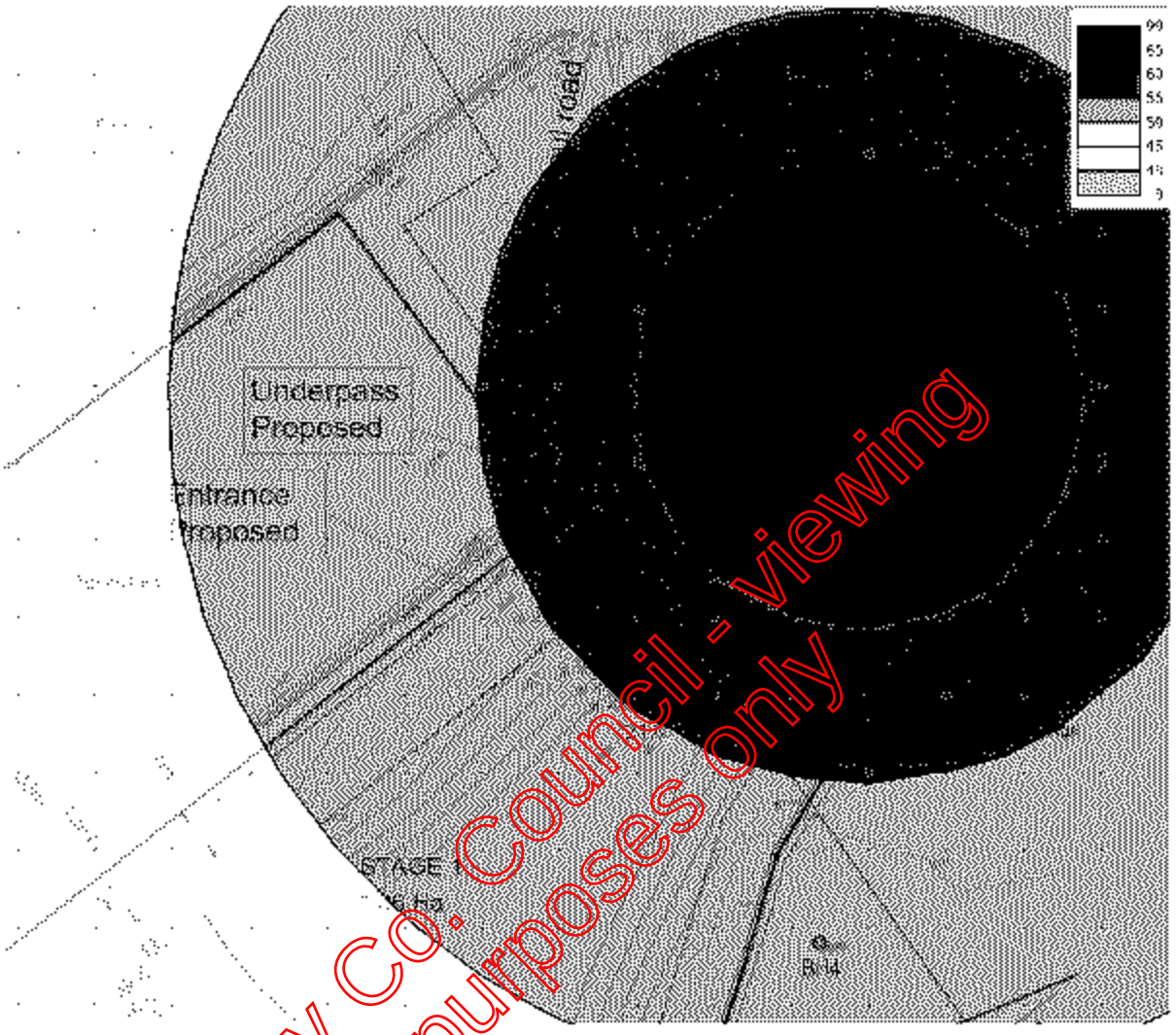


Figure 8.9: Predicted $L_{Aeq\,1\,h}$ levels during the construction phase, scenario 2. The $L_{Aeq\,1\,h}$ level at the nearest dwelling will be 64 dB.



Construction noise impacts

Construction phase noise impacts may be assessed by reference to the 65 dB $L_{Aeq\,1\,h}$ criterion recommended by BS 5228. The predicted $L_{Aeq\,1\,h}$ level at the nearest dwelling during scenario 1 will be 60 dB, increasing to 64 dB during scenario 2. Levels will therefore not exceed the 65 dB criterion. It should be noted that both scenarios will be particularly short. Scenario 1 is likely to arise for only one day, following which the excavator and dump truck will be gradually relocated down below ground level. At this point, screening will be provided by the excavated haul roadside face, and levels will gradually decrease below 55 dB.

In relation to scenario 2, overburden removal and berm construction at the northeast corner is likely to last several days at most. After this, the removal operation will move southwest into the site. In addition, the gradually extending boundary berm will provide significant screening, and noise levels will quickly reduce.

Normal daily operations will continue during the construction works. Historic noise data near the dwelling indicate that $L_{Aeq\,1\,h}$ levels are typically around 52 dB at their highest, depending on access road vehicle movements. Levels predicted in Figures 8 and 9 may be combined with the 52 dB level to

provide an indication of cumulative noise impact while construction operations proceed in tandem with day-to-day activity. Cumulative levels are calculated in Table 12.

Table 8.12: Cumulative $L_{Aeq\ 1\ h}$ levels due to the worst-case scenario construction activity and worst-case day to day operations.

Construction scenario	Construction $L_{Aeq\ 1\ h}$	Typical operations $L_{Aeq\ 1\ h}$	Combined $L_{Aeq\ 1\ h}$
Scenario 1	60 dB	52 dB	61 dB
Scenario 2	64 dB	52 dB	64 dB

Cumulative noise levels will not exceed the 65 dB criterion. It is again reiterated that the cumulative scenarios calculated represent worst cases, unlikely to last for more than a few days at the start of the construction phase.

8.5.2 Operational Noise

Operational noise sources

Extraction will commence at the initial small pit at the northeast corner of the phase 1 area, and extraction will work gradually southwest, with the face height gradually increasing to 13.5 m. Face extraction will be carried out using an excavator or loader. For the purposes of this assessment, it is assumed that an excavator will be used. The excavator will load a dump truck several times an hour at the working face. The dump truck will transfer aggregates to the main operations area to the north, via the proposed underpass.

From the end of phase 2, a mobile screener may be used at the working face from time to time. In this scenario, the excavator will load the screener directly at the face. The screener will operate several hours a day. Screened material will be stored in temporary stockpiles around the screener. As required, material in these stockpiles will be loaded into the dump truck for transfer to the operations area. On occasion, material may also be loaded into road going trucks for direct export via a proposed exit to the Caragh Lake Road. Trucks may be loaded with the excavator, or a loader may be brought over from the operations area. For the purposes of this assessment, the latter is assumed.

During periods when the screener is not in use, which is expected to be the majority of the time, aggregates will be loaded directly at the face into the dump truck for transfer to the main operations area. It is expected that 50 dump truck loads will be extracted per day. During periods when the screener is in use, the number of loads exported will remain unchanged.

The expected noise sources are listed in Table 13, along with noise emissions data from BS 5228.

Table 8.13: Operation phase sources.

Plant	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Total
Face excavator	95	84	79	73	70	68	64	57	77
Dump truck	98	94	89	85	79	79	70	65	87
Screener	84	82	79	79	74	74	71	64	81
Loader	77	83	91	75	75	72	65	59	84
Truck	73	78	78	78	74	73	68	66	80

Once extraction commences, operations at Riordan's pit will end. No further emissions will arise here. Transfer of aggregates will be relocated to the new haulage road near the main site entrance.

Operational noise modelling

Noise modelling of operational phase activity was carried out using DGMR iNoise v.2021 software with the following parameters:

- Algorithm: *International Standard wISO 9613-2:1996 Acoustics: Attenuation of sound during propagation outdoors – Part 2 General method of calculation* (1996).
- Source data: Table 13.
- Receivers: All dwellings surrounding the proposed extension area. The proposed development will have no implications for dwellings north of the existing operations area, and therefore these have been omitted from the assessment. The development will also have minimal implications for dwellings north of Riordan's pit, and these dwellings will benefit from a reduction in noise levels due to termination of extraction at Riordan's pit. All receptors north of the applicant's existing area lie in close proximity to a third-party pit.
- Receiver height: 4 m, to represent two storey dwellings, as worst case.
- Ground factor: 1 outside excavated areas, 0.7 in worked areas.
- Scenarios modelled:
- Scenario 1: Extraction in the phase 1 near the underpass, 9 m below ground level, and transfer of screened aggregates to the main operations area by dump truck via the underpass. A 3 m berm will have been erected around the phase 1 perimeter.
- Scenario 2: Extraction near the western end of the face towards the end of phase 2, and transfer to the operations area. A 3 m berm will have been erected around the phase 2 perimeter.
- Scenario 3: Extraction at the center of phase 3, and operation of the mobile screener at the working face. Simultaneous use of a loader to load trucks for export offsite via the proposed exit to the Caragh Lake Road. A 3 m berm will have been erected around the phase 3 perimeter.
- Scenario 4: Extraction at the end of phase 3 (no screening), with overburden removal underway near the west corner, ahead of the next phase. Overburden will be stored in a 3 m high berm along the next phase. Overburden stripping will require use of an excavator, with a second excavator on berm construction, and two dump trucks. Stripping will last approximately two weeks. While stripping will also occur during other phases, this scenario is modelled here as it will represent the worst-case scenario stripping event after the initial construction overburden removal event.
- Scenario 5: Extraction and screening near the northwest corner of phase 5. Simultaneous use of a loader to load trucks for export offsite via the proposed exit to the Caragh Lake Road.
- Scenario 6: Extraction and screening near the southern tip of phase 5 at the end of the project. Simultaneous use of a loader to load trucks for export offsite via the proposed exit to the Caragh Lake Road.
- On-times: Outside of screening, face extraction will occur approximately four times per hour. Transfer of aggregates to the operations area will result in four dump truck loads per hour. During screening: Screener on-time 100 %, with four truck movements per hour, loaded by loader, with 80 % excavator on-time.

Predicted $L_{Aeq,1h}$ levels are shown in Figures 10 to 15. Levels at receptors are given in Table 14.

Figure 8.10: Predicted $L_{Aeq,1h}$ levels during operational scenario 1.

Figure 8.11: Predicted $L_{Aeq,1h}$ levels during operational scenario 2

Figure 8.12: Predicted $L_{Aeq,1h}$ levels during operational scenario 3.

Figure 8.13: Predicted $L_{Aeq,1h}$ levels during operational scenario 4.

Figure 8.14: Predicted $L_{Aeq,1h}$ levels during operational scenario 5.

Figure 8.15: Predicted $L_{Aeq,1h}$ levels during operational scenario 6.

Table 8.14: Predicted $L_{Aeq\,1h}$ levels at receptors during the operational phases. Levels do not include emissions from existing operations.

Receptor	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Dwelling on high ground W of NW corner	33	36	30	45	36	35
Row of dwellings outside NW corner	32-36	36-43	28-42	45-52	33-38	37-39
Dwelling opposite NE corner	50	51	41	50	38	37
2 dwellings NE of site	39	41	34	41	31	30
Group of dwellings E of site at T junction	33-35	35-36	31-34	38	32	31
Dwelling E of site on minor road	32	38	37	41	36	34
Row of dwellings 320 m S of site	<30	<30	<30	≤34	<30	<30

Operational noise impacts

Operations within the proposed extension will give rise to $L_{Aeq\,1h}$ levels which will vary from receptor to receptor, and from scenario to scenario. The highest levels will arise at the dwelling adjacent to the site entrance. Here, levels will fluctuate depending on whether aggregates are transferred from the proposed extension to the operations area by articulated dump truck or exported to the Caragh Lake Road directly by road going truck. When the former is used, levels will generally approach 50-51 dB, and will fall to 37 dB when trucks are used. The latter will generally be used during periods of screening. Levels at all other dwellings will be considerably lower, apart from scenario 4. This scenario will involve routine extraction in addition to overburden stripping across the phase 4 and 5 areas, and construction of the perimeter berm, resulting in a short-term increase in noise levels at dwellings outside the northwest corner. $L_{Aeq\,1h}$ levels at the nearest dwellings here will temporarily reach 52 dB. This activity will last up to 2 weeks. In all cases, levels will be lower than the 55 dB criterion discussed above.

Predicted noise levels may be added to existing levels in order to assess total cumulative noise impacts due to activities at the applicant's existing operations area and the proposed extension. In this regard, emissions from Riordan's pit may be discounted, as operations here will cease. Cumulative levels are presented in Table 15.

Cumulative levels in all cases will not exceed the 55 dB criterion. At the dwelling adjacent to the site entrance, the cumulative level will rise towards 55 dB during scenarios 2 and 4. In many cases, the chief contributor to cumulative levels will be the existing operations site, and emissions at the proposed extension area will give rise to minimal contribution.

Table 8.15: Cumulative worst case noise levels from the existing operations area and the proposed

extension.

Receptor	Existing worst case	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Dwelling on high ground W of NW corner	40	41	41	40	46	41	41
Row of dwellings outside NW corner	40	41	41-45	40-44	46-52	41-42	42-43
Dwelling opposite NE corner	52*	54	55	52	54	52	52
2 dwellings NE of site	46	47	47	46	47	46	46
Group of dwellings E of site at T junction	<35	<38	<38	<38	<39	<35	<35
Dwelling E of site on minor road	<40	<40	<41	<40	<41	<40	<40
Row of dwellings 320 m S of site	<20	<30	<30	<30	<34	<30	<30

*This value based on typical worst-case level.

Calculated cumulative noise levels may be compared to existing $L_{Aeq\,1h}$ levels. The comparison is given in Table 16. On this basis, impacts are presented in Table 17.

Table 8.16: Increase in residual $L_{Aeq\,T}$ levels due to cumulative levels.

Receptor	Residual $L_{Aeq\,T}$	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Dwelling on high ground W of NW corner	38-40	1-3	1-3	0-2	6-8	1-3	1-3
Row of dwellings outside NW corner	38-40[1]	1-3	1-7	0-6	6-14	1-4	2-5
Dwelling opposite NE corner	>55[2]	0-3	0-3	0-3	0-3	0-3	0-3
2 dwellings NE of site	>60	0	0	0	0	0	0
Group of dwellings E of site at T junction	43-47	0-1	0-1	0-1	0-1	0-1	0-1
Dwelling E of site on minor road	33-47[3]	0-7	0-7	0-7	0-9	0-7	0-7
Row of dwellings 320 m S of site	34-40	0	0	0	0	0	0

[1]At rear of dwellings i.e., side facing proposed extension
[2]At front of dwelling i.e., side facing proposed extension
[3]Significant variation in range, depending on presence/absence of local traffic

Table 8.17: Impacts based on IEMA guidance.

Receptor	Impacts
Dwelling on high ground W of NW corner	Imperceptible to not significant throughout most of the project, increasing to moderate during the 2-week overburden removal event at the nearest part of the site
Row of dwellings outside NW corner	Imperceptible to slight throughout most of the project, increasing to moderate during extraction towards the western end of the working face during phases 2 and 3, and increasing to significant during the 2-week overburden removal event at the nearest part of the site
Dwelling opposite NE corner	Imperceptible throughout the project when aggregates are transferred by road going truck, increasing to not significant when the dump truck is used
2 dwellings NE of site	Imperceptible during all phases
Group of dwellings E of site at T junction	Imperceptible during all phases
Dwelling E of site on minor road	Imperceptible to moderate, depending on the baseline $L_{AF90,T}$ level applied
Row of dwellings 320 m S of site	Imperceptible during all phases

The DOEHLG document states that complaints can be expected where extraction noise results in levels 5-10 dB above background $L_{AF90,T}$ levels. It is arguable that the noise emissions from the applicant's existing operations area form part of the background noise environment, given that operations have been carried out here for several decades. Table 18 presents an assessment in the context of this guidance. The only increases of significance over $L_{AF90,T}$ levels will arise during the 1–2-week overburden removal stage. Given that the overburden will be used to construct perimeter berms which will subsequently provide a reduction in noise levels at receptors, this temporary increase is considered acceptable.

Table 8.18: Increases over existing $L_{AF90,T}$ levels due to the predicted noise levels from the proposed extension. $L_{AF90,T}$ levels are arithmetic average values taken from Tables 2-10.

Receptor	Existing $L_{AF90,T}$	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Dwelling on high ground W of NW corner	36	0	0	0	9	0	0
Row of dwellings outside NW corner	36	0	0·7	0·6	9·14	0·2	1·3
Dwelling opposite NE corner	45	5	6	0	5	0	0
2 dwellings NE of site	39	0	2	0	2	0	0
Group of dwellings E of site at T junction	36	0	0	0	2	0	0

Dwelling E of site on minor road	33	0	5	4	8	3	1
Row of dwellings 320 m S of site	28	0	0	0	0-5	0	0

8.6 Mitigation

Construction phase:

Noise levels at surrounding receptors due to construction operations, combined with ongoing operations at the existing pit, will not exceed the 65 dB criterion at any time. Where construction noise emissions are audible, they will occur for several days or several weeks, depending on the activity. No specific mitigation measures are required. The following general measures have been agreed with the applicant:

- Residents at the dwelling adjacent to the site entrance will be notified in advance of construction works associated with the proposed haul road and underpass, and berm construction at the northeast corner.
- Construction operations at the haul road, underpass and northeast corner will not occur before 08:00 or continue after 18:00.

Operation phase

No specific mitigation measures have been identified, apart from the erection of 3 m berms around the site perimeter, and the introduction of screening only from the end of phase 2 onwards. The following general measures will be implemented:

- Plant used onsite will be maintained in accordance with manufacturer specifications.
- Exhaust silencers will be maintained in a satisfactory condition.
- Communication through plant horns will be prohibited.
- Unnecessary revving of truck engines will be prohibited.
- Site haul roads will be maintained in a satisfactory condition, and free from surface defects that may generate rattles in empty truck bodies.
- The current noise monitoring programme will be continued and will be modified to take into account the cessation of Riordan's pit activity, and the commencement of extraction at the extension. This will ensure compliance with criteria set out in conditions attached to planning permission.

8.7 Difficulties Encountered in Compiling Information

No difficulties were encountered in preparing this chapter.

8.8 Residual Impacts

Noise levels throughout the operation phase will be lower than the identified 55 dB criterion. The highest levels will arise at the dwelling adjacent to the site entrance. However, impacts here will be imperceptible due to elevated road traffic noise.
At all other dwellings, levels will be considerably lower. Cumulative noise levels (i.e., proposed extension plus existing operations) will also not exceed the 55 dB limit at receptors.

Residual impacts will be imperceptible to not significant at most receptors throughout the project. Temporary increases in impacts will occur during the 2-week overburden removal event at the end of phase 3. Impacts during extraction may also increase towards moderate at receptors outside the northwest corner when extraction occurs at the nearest end of the working face.

8.9 Cumulative Impact

Cumulative impacts with the applicant's existing operations are assessed above. No other noise sources of significance which could give rise to cumulative impacts were noted.

8.10 References

- BS 5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise (British Standards Institution, 2014).
- Draft Advice Notes for Preparing Environmental Impact Assessment Reports (Environmental Protection Agency, 2015).
- Draft Guidelines on The Information to Be Contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2017).
- Environmental Management Guidelines: Environmental Management in The Extractive Industry (Non-Scheduled Minerals) (Environmental Protection Agency, 2006).
- Guidelines For Environmental Noise Impact Assessment (Institute of Environmental Management & Assessment, 2014).
- International Standard ISO 9613-2:1996 Acoustics: Attenuation of Sound During Propagation Outdoors – Part 2 General Method of Calculation (International Standards Organisation, 1996).
- International Standard ISO 1996-2:2017 Acoustics – Description, Measurement and Assessment of Environmental Noise, Part 2: Determination of Environmental Noise Levels (International Standards Organisation, 2017).
- Quarries & Ancillary Activities: Guidelines for Planning Authorities (Department of The Environment, Heritage & Local Government, 2004).

Chapter Nine — Air Quality and Odour

9.1 INTRODUCTION

9.1.1. Overview

This chapter provides an assessment of the impact of atmospheric emissions associated with development by M.F. Quirke and Sons at Rangue of a new extraction site for sand and gravel on adjacent land at Knocknaboola and continued processing and production of ready-mix concrete and concrete blocks at the existing Rangue Factory site. The potential impact and significance of emissions generated during extraction of this material, transfer and existing processing activities within the existing site are addressed in the following sections.

9.1.2 Statement of Authority

The following chapter was prepared by Michael Bailey, Managing Director of Envirocon Ltd, air pollution and environmental consultancy, who has over 25 years' experience in the preparation of air quality assessment studies for numerous rock quarry and sand and gravel pit developments throughout Ireland

9.2 ASSESSMENT, STRUCTURE AND METHODOLOGY

9.2.1 Chapter structure

This chapter contains the following sections:-

- Assessment Methodology and Significance Criteria – a description of the methods used in the assessment of the significance of effects taking into account relevant legislation and Policy
- Existing Environment – an assessment of the existing air quality within the area in terms of category of air quality zone, existing emission sources in the area and ambient concentrations for certain air pollutants.
- Do 'Nothing' Impact – Assessment of change in existing air quality if proposed development does not proceed.
- Potential Impacts of the proposed development – An assessment of potential air quality impacts during the construction and operational phase of the development will be undertaken
- Mitigation Measures and Residual Effects - a description of measures recommended to avoid, prevent, reduce or, if necessary, offset any potential significant adverse effects on local air quality. Where potential significant residual effects may occur after mitigation measures have been implemented a summary of the significance of these will be stated.
- Summary of Significant Effects – A summary of the significance of potential effects on local air quality will be provided.

9.2.2. Methodology

The method used for assessing the potential effects on local air quality during the construction and operation phases of the proposed aggregate extraction site at Knocknaboola and continued operation of the Rangue factory site on air quality was:-

- Site visit of proposed extraction site location, factory site and environs.
- Review of design and operation of extraction and aggregate processing methods
- Desk-based evaluation of potential atmospheric emissions during the construction and operation of the Knocknaboola Site including scale of activity, volumes of material recovered and processed and traffic movements.
- Evaluation of significance of air quality effects in terms of dust and small-sized particulates (including PM_{10}) on local community and environment.

Information including plans of site layout and section drawings were provided by the company to assess the planned sand and gravel extraction at the Knocknaboola site and processing and production at the Rangue Factory site. This included the type of equipment used to recover the material, operation of screening/washing plant, concrete production, block-making and the projected traffic movements off-site. A site visit was made in June 2021 and locations of potential sensitive receptors identified. A base-line survey of dust deposition rates near the boundary of the Knocknaboola site also commenced in March 2021.

9.3 SAND AND GRAVEL PIT SITE PROPOSAL

The sand and gravel pit development is at Knocknaboola, approximately 3km southwest of Killorglin on the L-4021 (Caragh Lake Road), opposite the existing aggregate production, concrete batching and block-yard at Rangue (Factory Site). The Quirke's landholding extends over a total area of 70 ha, with the Factory Site covering 18.5 ha and the Knocknaboola lands extending over a total area of 24.5 hectares. The proposed extraction pit will extend over 16.75 hectares. Sand and gravel is currently extracted from the extensively worked pit that is accessed from the Factory Site via an underpass under the L-7504.

Land-use in the locality mainly comprises extensive areas of blanket bog and pasture fields used for livestock grazing. The terrain is generally flat with no significant gradient within 4km of the site. The lower slopes of the MacGillycuddy mountain range are about 6km to the Knocknaboola site. The topography across the proposed extraction site slopes gently from 31m OD in the north-east section of the site to 39m OD in the south-west with a minor change of 2m east to west across the site increasing from 34m near the eastern boundary to 36m at the boundary along the L-4021 road.

The number of houses within the surrounding area is very low, with the nearest property on the opposite side of the road at the entrance to the Factory site, approximately 50m from the extraction area. To the south-west there is a cluster of 13 detached dwellings located along the L-4021 with the nearest about 475m from the northern corner of the Phase 1 extraction area. 7 of these properties are within 200 m of the proposed Phase 5 extraction area. To the north and east of the planned extraction area, the nearest house is 550m from the boundary and to the south of the site the nearest properties are 650m from the site.

A detailed description of the site location regarding topography, land-use, housing and local infrastructure is given in Chapter 2.

9.4 LEGISLATION

9.4.1 National Air Quality Standards

Ambient Air Quality Standards for short-term and annual concentrations of suspended particles (PM), nitrogen dioxide (NO_2), and Sulphur Dioxide (SO_2) used for the protection of community health and the amenity value of the local environment are provided in National Legislation published in 2011[1]

The National Air Quality Standards (NAQS) for these air pollutants are given in Table 9.1. PM is expressed as PM_{10} in these standards, which relate to airborne particles with a mean diameter below 10 µm.

Table 9.1: National Air Quality Standards

Pollutant	Criteria	(µg/m³)
Particulates (PM_{10})	Daily – 90.4% (not to be exceeded more than 35 times per year)	50
Nitrogen Dioxide (NO_2)	Annual average Hourly – 99.8% (not to be exceeded more than 18 times per year)	40 200
	Annual Average	40
Sulphur Dioxide (SO_2)	Hourly – 99.9% (not to be exceeded more than 24 times per year)	350
	Daily – 99.2% (not to be exceeded more than 3 times per year)	125

Source: Air Quality Standards Regulations 2011 (SI No 180 of 2011)

9.4.2 Dust Nuisance Guide Values

Dust is defined as particulate material up to 75 µm (1µm= 1/1,000,000th of a metre), with the smaller size particles (<30 µm) remaining airborne for longer than the large particles that are rapidly deposited within 100m of the source. The small particles can remain airborne by wind-blow and result in soiling and staining on vegetation and at houses and other sensitive amenity areas up to 500m from the source. The distance and direction of houses and sensitive ecological receptors (grazing land, gardens etc.) from the source of dust emissions will determine the potential for dust nuisance complaints.

There are no European or National ambient standards for dust deposition associated with sand and gravel pit activities. The DoEHLG (2004)[2] recommended guidance to Local Authorities in setting dust deposition limit values is based on the German TA Luft legislation[3]. The guidance value to protect the local community from potential dust nuisance is a monthly average dust deposition limit value of 350 mg/m^2.day. The method of dust-fall collection and analytical method specific to this dust-fall limit value is the German Bergerhoff method that is recommended by the EPA in the Guidance Note for Environmental Management in the Extractive Industry[4]. It is widely used throughout Ireland to assess the potential for a community nuisance associated with quarries and sand and gravel pits.

9.5 EXISTING ENVIRONMENT

9.5.1 Local Air Quality

Table 9.2: Air Quality in Zone D (rural) Regions of Ireland in 2016-2019 (µg/m³)

Pollutant	Concentration
Particulates (PM_{10})	7-10
Nitrogen Dioxide (NO_2)	2-5
Nitrogen Oxides (NO_x)	3-8
Sulphur Dioxide (SO_2)	2-3

Source: Air Quality Reports, 2016, 2019, 2018 &19, EPA 2019-2020[5]

Ambient concentrations of air pollutants in the locality are very low and comparable to levels recorded in rural locations elsewhere in Ireland (Table 9.2). EU Legislation on Air Quality requires Member States to divide their country into 4 zones (A-D), for the purpose of air quality monitoring, reporting, assessment and management. Outside of Dublin and other cities and large towns, the remainder of the country is within Zone D. The Killorglin area is within the Zone D (rural) classification.

The main source of SO_2 in the area is from burning solid fuel (peat/coal) or gas oil in the relatively small number of houses in the locality. As there are no industrial emissions in the surrounding area, ambient SO_2 levels are very low and the annual average value will be within the range given in Table 9.2. Maximum hourly and daily SO_2 concentrations will be below 3% of both the short-term NAQS values.

The primary source contributing to ambient NO_x and NO_2 levels is from traffic travelling along the L-4021 past the proposed Knocknaboola extraction site. Beyond the roadside verge, NO_2 concentrations will be very low, with annual levels typically below 3 µg/m^3, compared to the NAQS annual average of 40 µg/m^3. The annual average concentrations for SO_2 and NO_x in the locality will be comparable to the values in Table 9.2 and well below the annual limit of 20 µg/m^3 and 30 µg/m^3 respectively that is applied for the protection of ecosystems at ecologically sensitive sites.

Suspended particulates (PM) originate from a wide range of sources including agricultural sources, resuspension of silt washed onto road surfaces, domestic emissions and biological sources such as pollen and spores. Where there are exposed areas of soil or dry peat bog, unpaved agricultural roads and yards as well as silt on roads, wind-blown dust and PM are the principal source in rural areas.

Of relevance to potential community health impacts, the particulate size referred to as PM_{10} (particulate material with a mean aerodynamic diameter of less than 10 µm) is recognised by the World Health Organisation as being associated with health concerns as they can enter the lower respiratory tract, and may result in acute or chronic health symptoms depending on the degree and duration of exposure. The annual NAQS value for PM_{10} is 40 µg/m^3, with a daily limit value of 50 µg/m^3 (no more than 35 exceedances per year). Ambient concentrations of PM_{10} in the Rangue area would be typically <10-15 µg/m^3, with the highest rates near the road-side and Factory Site boundary.

9.5.2 EPA Air Quality Index for Health

The EPA have developed an Air Quality Index for Health (AQIH) that is a number from 1 to 10 that is used to indicate the risk to the community from exposure to ambient pollutant concentrations during outdoor activities. The AQIH ranges from good (1-3), fair (4-6), poor (7-9) to very poor(10) air quality with short-term ozone, NO_2, SO_2, PM_{10} and $PM_{2.5}$ concentrations given for each category. The calculated AQIH is used to assess the risk to the young, elderly and those with respiratory conditions or related sensitivity to ambient air pollutants.

The Rangue/Knocknaboola area is within the AQIH index of 1 or 2 for NO_2, SO_2, PM_{10} and $PM_{2.5}$ and so is within the category of ambient air quality that can be described as good with very low exposure risk to individuals within the community. Short-term ozone levels that are part of the AQIH may occasionally raise the index to 3 in Co. Kerry, which is still within the category of good air quality, but are unrelated to aggregate extraction industries as this air pollutant it is due to atmospheric processes on a Regional scale and proximity to the coast.

9.5.3 Dust Deposition Survey

Monitoring of dust deposition rates has been undertaken in recent years at 3 locations (Figure 9.1 - RD1, RD2 and RD3) to assess dust-fall at the entrance of the Factory Site on the L-4021, L-7504 junction and SW corner of existing sand and gravel site. The sampling method is the Bergerhoff gauge to measure monthly dust-fall rates that uses a glass jar supported on a pole to collect dust-fall. The rainwater and particulate material in the jar is evaporated in the laboratory and the dry weight determined. Sample results are reported as milligrams per square metre day (mg/m^2.day). The monthly dust deposition limit in Ireland is a monthly rate of 350 mg/m^2.day at the boundary to prevent a nuisance at the nearest houses.

The results for this network over the period 2019-21 indicate monthly dust-fall rates of 83-371 mg/m^2.day, with the highest levels reported at the access road to the Rangue factory site. The

deposition rate at the junction of the L7504 with the L-4021 that is the route for trucks entering or departing from the factory site of the 3 years give monthly values of 83- 281 mg/m².day, equivalent to 24-80% of the dust-fall limit value. The monitoring location is close to the nearest house to the south of the factory site and demonstrates compliance with the 350 mg/m².day limit value.

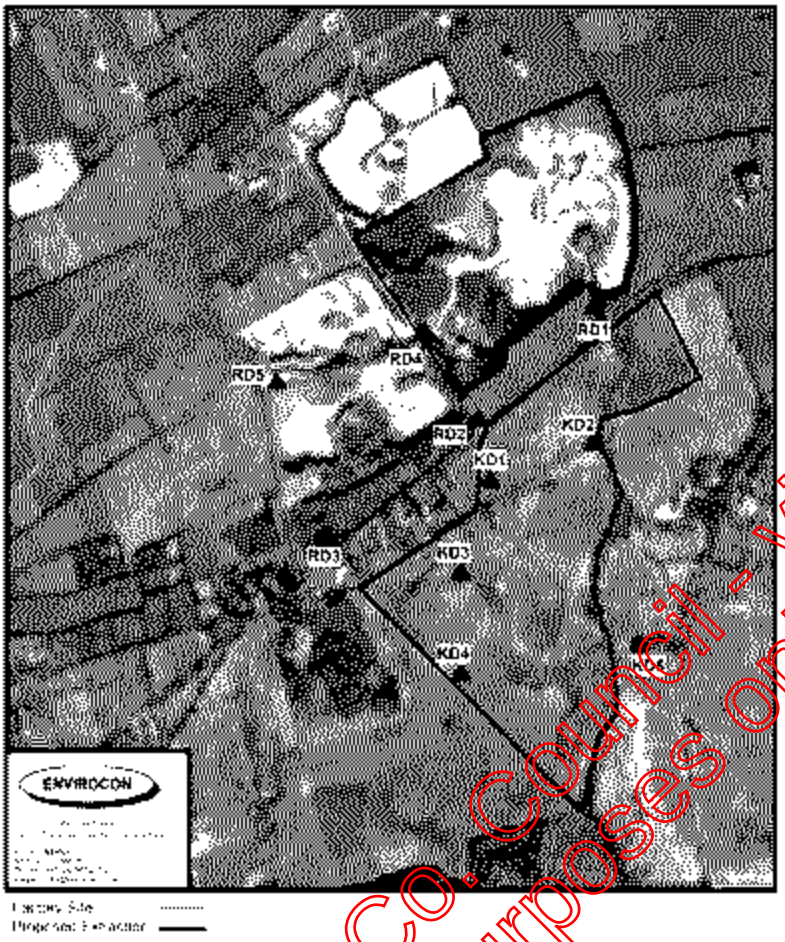


Figure 9.1: Location of Dust monitoring Sites

Table 9.3: Dust deposition survey results for 2019-21 (mg/m².day)

Site	11/6-19/7/19	19/9-21/8/19	14/11-13/12/19	12/9-11/08/20	10/3-9/4/21	9/5-4/6/21	21/9-18/08/21
RD1- Entrance on L-4021	248	NA	NA	302	348	371	209
RD2- Junction at L-9504	115	281	93	220	179	83	59
RD3-SW boundary	325	188	308	NA	146	338	339
RD4- Main Entrance	-	-	-	-	323	431	379
RD5- N boundary	-	-	-	-	206	467	52
KD1-W boundary	-	-	-	-	85	NA	17
KD2-NE boundary	-	-	-	-	86	87	34
KD3- SW boundary	-	-	-	-	207	55	52
KD4- S boundary	-	-	-	-	93	64	11
KD5 - E boundary	-	-	-	-	164	119	138

Note: Refer Figure 9.1 for locations – RD1-RD5 existing Rangue site, locations KD1-KD5- proposed Knocknaboola Extraction Area. NA – Sample unsuitable for analysis due to biological contamination

As part of the environmental assessment for the proposed development at Knocknaboola, 7 additional sites were installed in March 2021 with 5 of these sites (Figure 9.1 – Sites KD1-KD5) near the boundary of the planned extraction area. This provided base-line dust-fall rates during the period March-August to establish baseline dust-fall rates at the boundary of the site during the summer months. The results obtained from the 5 sites indicate deposition rates within the Knocknaboola site of 11-207 mg/m^2.day, which is equivalent to 3-59% of the dust deposition limit value. The highest back-ground monthly dust-fall rates were obtained from Site KD3, which is close to the nearest houses along the L-20141 and at Site KD4 that is located near the eastern boundary of the proposed development area.

9.5.4 Sensitive Receptors

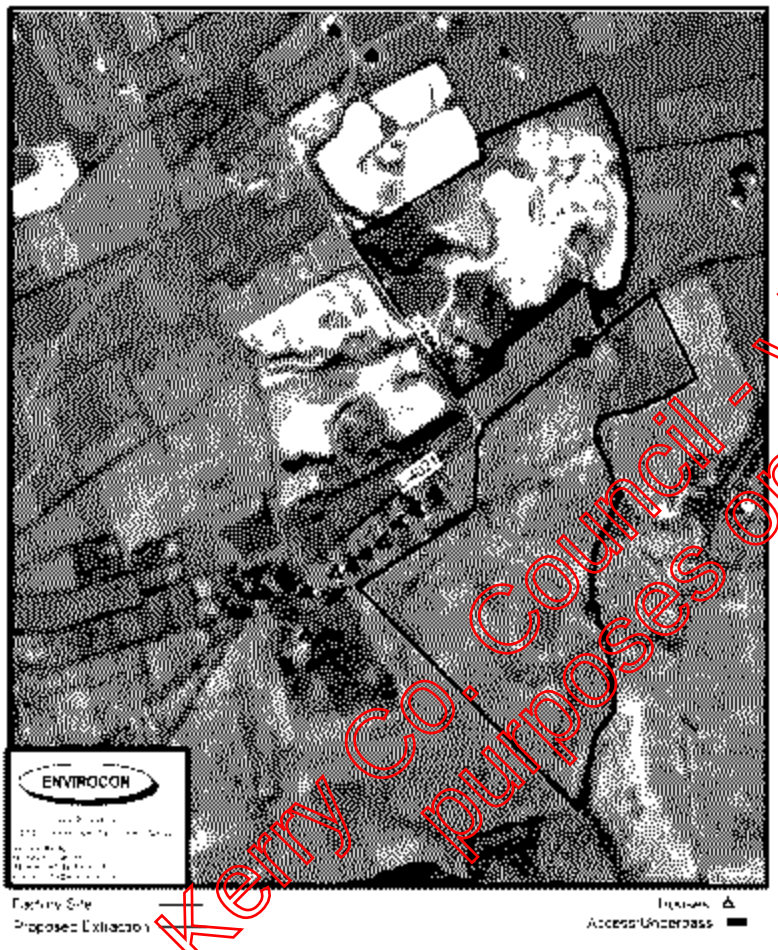


Figure 9.2 Location of houses within 500m of existing Rangue Factory site and extraction area at Knocknaboola.

The number of houses within the surrounding area is very low, with the nearest property on the opposite side of the road at the entrance to the Factory Site from the L-4021. This property that is within the ownership of the applicant is approximately 35m from the boundary of the extraction area. To the south-west there are 13 detached dwellings along the L-4021 with the nearest about 475m from the northern corner of the Phase 1 extraction area. These properties are also within 200 m of the proposed Phase 5 extraction area with the closest property 104m from the boundary extraction site. To the east, the nearest house is 540m from the eastern boundary of the extraction site. This cluster of private properties, with land bordering the site are directly opposite the existing sand and gravel pit that is currently being worked. The pit is well-screened, comprising mature vegetation of trees and hedging, from the road with a separation distance of over 60-120m from the pit face to the front garden of the houses

No other sensitive receptors, such as nursing homes or hospitals, garden centres or similar businesses were identified within 500m of the Rangue factory site and Knocknaboola extraction area.

9.6 CHARACTERISTICS OF PROPOSED DEVELOPMENT

The proposed Knocknaboola extraction is to replace the current sand and gravel reserves at Rangue that are almost exhausted. The extraction area will be worked over 5 phases, with each phase taking approximately 4 years to complete over a proposed 20 year life-span, depending on aggregate demand for processing at the Factory Site. It is planned that overburden within the northern part of the Phase 1 zone will be removed and ripping and extraction of the underlying deposits commence. The rate of aggregate processing at the Factory Site of the material from the new site will be comparable to existing volumes, of 100,000 m^3/year.

It is planned to construct an underpass under the L-4021 at a location approximately 50m to the south-west of the existing entrance into the Factory Site that is used only for cars and LGVs. This will take place about mid-way through the development of the Phase 1 extraction area near the north of the Knocknaboola site. For the initial 1st and 2nd year of the sand and gravel extraction a mobile screening plant will be installed within the northern part of the site to supply partially screened aggregate for construction work, hard-core for foundations, car-parks and local road repairs/re-surfacing in the Killorglin area. As the rate of extraction of sand and gravel increases during Phase 1 the material will be loaded directly into truck and transported via the underpass to the main aggregate processing plant at the factory site. An entrance will be constructed for trucks to enter and exit onto the L-4021. The mobile plant used on-site will likely remain at the Knocknaboola site and be used intermittently during the initial stages of the subsequent other 4 phases.

9.9 AIR QUALITY IMPACTS

9.9.1 Potential Impacts

The potential air quality impact of sand and gravel extraction on the local community is determined by the following factors: -

- Direction and distance to houses, schools and other sensitive receptors
- The characteristics of the aggregate material
- The local climate, incidence of rain-fall and pattern of wind direction/speed.
- The mode of extraction
- Location/type of aggregate processing plant
- Provision of dust suppression measures and overall sand and gravel pit management

The principal atmospheric emissions from the extraction site will be from fugitive dust and PM (PM_{10}) emissions generated by the trucks travelling along unpaved haul roads, aggregate recovery and operation of plant equipment. Dust generated from open sources are termed 'fugitive emissions' since it is uncontrolled and is not released in a confined flow. As the dust and PM is re-suspended by the wind from exposed surfaces such as haul roads, pit floor and stockpiles, the heavier dust or grit will rapidly fall out of the emission plume with the smaller particles remaining suspended in the air for a longer period before being depositing on the ground. Dust and smaller particles undergo gravitational settling that is dependent on the weight and size of particle and so smaller size particulates including PM_{10} material tend to disperse over a wider distance from the source.

Aggregate material is produced by screening the recovered material to separate the finer sized sand and gravel from larger sized material. Washing of the sand takes place after the bulk screening and the sized material grades are then stockpiled. The potential for significant dust emissions increases as the finer-sized grades are processed and deposited onto stockpiles. When the screened material is wet, dust emissions will not be significant. However, as the stockpile surfaces dry then the potential for fugitive dust and PM emissions increases.

The floor and unpaved haul roads around the sand and gravel pit can be a significant source of dust and PM emissions due to the re-entrainment of settled sand by wind action or resuspension from the surface of haul roads by truck movements. Trucks travelling along the haul road will result in the resuspension of silt and dust by the wheel action of the trucks. Significant resuspension of dust by the wind may occur when the road surface has a low moisture content due to lack of rain or inadequate artificial dust suppression.

The potential for substantial fugitive dust and PM emissions to be generated from the haul roads, exposed sand faces around the site, stockpiling and from aggregate processing depends to a large extent on the surface moisture content. The surface moisture will be affected by the frequency and rate of precipitation and from artificial dust suppression such as mobile or static sprinkler systems. As the wind speed increases above 5 m/s, sand and fine-sized material may become airborne by the wind, generating fugitive dust emissions. A prevailing damp aggregate significantly reduces the potential for conditions to arise where dust is likely to become a nuisance. Precipitation records for the area indicate that the annual number of 'wet-days' (daily rainfall>1mm) in the area is about 205 days per year, equivalent to 56% of the year and especially during the winter months the ground conditions may be saturated for much of the time. The prevailing rainfall pattern in West Kerry will greatly reduce dust-blow from activities at the sand and gravel pit, including stockpiles and from the haul roads, even during periods of high winds in the area.

Dust controls applied during the removal of overburden material, extraction and aggregate processing can also reduce dust emissions by upwards of 80%. The normal methods of dust control include spraying water onto haul roads and the use of sprays on crushing plant. Surface wetting causes fine particles to adhere to the larger stones thereby reducing dust emissions. Even a small amount of rain during the day may provide sufficient 'natural' dust control. In the case of unpaved haul roads and concrete yards, a small increase in the moisture content, from a dry state to a damp condition by spraying with a water bowser can increase the control efficiency to up to 75%.

9.9.2 Predicted Air quality impacts

9.9.2.1 Excavation of aggregate

Sand and Gravel deposits will be excavated by ripping the exposed face of the extraction area using a loading shovel with a scraper bucket. The active face will have a maximum height of 12m above the pit floor as the face is excavated north-south through each of the 5 extraction phases. Extraction of the deposit during each phase will take 3-5 years, depending on market demand for sand and aggregates. Overburden stripped from the aggregate deposits will be transferred to a temporary stockpile for re-use during restoration of the excavated bog-land and also for construction the boundary berm at the boundary with the cluster of houses along the L-4021, near the south-western corner of the excavation site.

Although a small amount of dust and PM may be re-suspended close to the loading operation, the quantity of emissions will not be significant due to the high moisture content of the material. The rate of fugitive dust emissions at the face will not normally require dust suppression measures. Generation of dust emissions during the excavation of the sand and gravel will be small and so the impact on local air quality beyond the site boundary will be imperceptible.

9.9.2.2 Processing plant

During the initial 2 years of extraction in the northern part (Phase 1 zone) of the Knocknaboola site a mobile screen plant will be installed within the Phase 1 zone, close to the entrance onto the L-4021. The aggregate will be transported from the active exposed face by excavator to the plant. Partial screening of the coarse aggregate (Clause 804 (mixed) aggregate, >50mm ad >25mm) will be carried out and transferred by conveyor arms radiating from the screening plant to stockpiles. Sand will be transferred to the washing plant and into a sand cyclone unit used to separate out the coarse and fine sand grades.

Once the underpass of the L-4021 is completed, dump trucks will be directly loaded at the active face in the pit and transport the material along an unpaved haul road through the underpass to be processed at the aggregate production plant in the Factory Site. The use of the mobile plant will cease and be restricted to intermittent use over the remaining 4 phases at the Knocknaboola site.

9.9.2.3 Potential Dust Emissions from Trucks near the site entrance

The projected annual extraction rate at the Knocknaboola site is estimated at 100,000 m^3 of sand and gravel, depending on market demand. This is equivalent to an average of 333 m^3 per day (extraction duration of 300 days per year) and the material will be loaded into 15 tonne trucks at a daily rate of about 50 truck-loads, as well as a small number of trailer loads.

The processing of aggregate will be carried out at the existing factory site post 2025 when the underpass will be operational. The underpass will be constructed 50m to the southwest of the existing entrance for non-HGV traffic into and out of the factory site. The design of the underpass is similar to the one installed under the L-7504 that is used by trucks/loaders between the current aggregate extraction site and the factory site.

Prior to 2025 the trucks collecting the aggregate from the mobile plant operation will travel along an unpaved haul road to the temporary entrance on the L-4021. A steel wheel-wash unit will be installed about 50m from the gate. At the entrance a concrete apron will be constructed with macadam laid to the tie-in with the surface of the L-4021. In addition, a mobile bowser will be used if required during dry weather conditions to dampen and control fugitive dust emissions from the access road and from haul roads within the extraction area and aggregate storage areas.

The impact on existing air quality near the sand and gravel pit site boundary due to trucks travelling along the unpaved haul route to the entrance is predicted to be slight. This will result in an imperceptible minor impact at the nearest houses to the SW and NE of the temporary gate to the Knocknaboola lands. A mobile tanker sprayer may be used to wet the road surface of the L-4021 especially during dry weather conditions. Overall, the change in existing air quality impact near the road-side will be imperceptible in the vicinity of the new entrance. Once the underpass is completed all traffic from the Knocknaboola site will travel under the road to the factory site.

9.9.2.4 Public Road Vehicle Emissions

From the information on existing and future road traffic volumes near the Rangue site provided in Chapter 12, current traffic volumes of traffic travelling along the L-4021 past the Rangue site is low. Surveys undertaken in 2021 provide a daily AADT rate of 4,930 vehicles with 20% mix of HGVs and LDVs999. Peak morning and evening traffic flows recorded during 2021 at the junction of the L7504 and the L-4021 were 192 and 108 vehicles respectively. From the traffic count of vehicles entering the

factory site there were a total of 34 trucks during peak hour entering/departing the main entrance and 8 non-HGV vehicles entering/departing the secondary entrance on the L-4021.

Compared to future traffic flow over the 20-year life-time of the proposed Knocknaboola site to the existing low level of truck movements, no additional traffic is anticipated over the volume currently experienced. Therefore no significant change in exhaust-pipe emissions from trucks entering/departing the factory is predicted with future air quality near the road-side of the L-4021 comparable to existing levels.

9.9.4 'Do-Nothing' Scenario

In the 'Do Nothing' scenario, the proposed sand and gravel extraction development does not proceed. The present ground cover of blanket bog and overburden across the Knocknaboola site will stay undisturbed. Exposure of bare ground across the development lands to potential wind-blown fugitive dust and PM emissions occurring will remain during dry, windy weather.

It is likely that the existing processing site will continue to operate at current volumes until permitted extraction areas within the Quirks landholding at Rangue are exhausted. Once this stage is reached the company will cease to operate the aggregate processing plant at the factory site since other quarries that they own are too distant as a feasible alternative supply source of aggregate material for manufacture of ready-mix concrete (Refer Chapter 2 for further details).

9.8 MITIGATION MEASURES

The following measures will be undertaken for controlling dust and PM_{10} emissions from the proposed sand and gravel extraction site at Knocknaboola :-

- Stripping of overburden for each extraction phase will be carried out so that dust emissions are minimised. If this operation is undertaken during dry weather conditions, then appropriate control measures including the use of a mobile tanker to spray temporary haul routes will be implemented as required.
- All plant machinery including dump trucks, loading shovel and other plant will be properly maintained to control and reduce exhaust emissions from running diesel engines.
- The drop height from the loading shovel when loading trucks with aggregate or sand will be minimised to control and reduce dust emissions.
- Truck speeds within the Knocknaboola lands will be restricted to 25 km/h.
- Where trucks are stationary, engines should be switched off and should not be left in idle mode when temporarily parked before being loaded.
- A mobile water tanker will be used to spray the surface of the active haul roads in the sand and gravel pit floor during dry weather conditions to control dust emissions.
- All trucks departing from the sand and gravel pit will pass through the wheel-wash that will be installed near the temporary entrance of the Knocknaboola land onto the L-4021 during the period prior to the completion of the underpass to the factory site.
- Any spillage or drag-out of silt deposited from the tyres or body of trucks leaving the site will be promptly removed from the L-4021.

- A mechanical road-sweeper will be regularly used if necessary during dry weather conditions to control and reduce dust resuspension along the road surface

9.9 RESIDUAL EFFECTS

Dust mitigation measures, as outlined in Section 9.6, during the development of the proposed Knocknaboola site will be incorporated in the management plan operated by Quirke and Sons for the Rangue factory site. Implementation of these measures will ensure that the significance of any residual impact on existing air quality beyond the boundary will be imperceptible to slight depending on the location of the extraction activity within the Knocknaboola site.

No significant residual effect at houses near the boundary of the Knocknaboola site/access road is predicted arising from dust and particulate emissions from the planned development.

There will be no significant change to existing air quality near the road-side due to fugitive dust emissions from the road surface of the L-4021 with the implementation of the dust abatement measures proposed.

9.10 SUMMARY OF EFFECTS

The impact of atmospheric emissions resulting from the proposed sand and gravel pit development at Knocknaboola is predicted to be imperceptible in terms of additional loading on existing air quality at the nearest houses. The scale and type of aggregate recovery and processing operation, with low potential dust/PM emissions from the sand and gravel pit activities during the phases over the life-time of the extraction, will not result in significant impacts on the air quality beyond the boundary. The volume of daily truck movements along the local roads will be very small and comparable to current number of trucks travelling to and from the Rangue factory site. No significant impact on the existing air quality at the site entrance and along the local roads is predicted due to emissions resulting from the movement of vehicles to and from the planned development.

9.11 References

- *Government Publications Office, Dublin 2, Air Quality Standards Regulations, SI No 180 of 2011 (2011)*
- *Department of the Environment, Heritage and Local Government: 'Quarries and Ancillary Activities Guidelines for Planning Authorities' (2004)*
- *German Federal Ministry for Environment, Technical Instructions on Air Quality Control (TA Luft), 1986*
- *Environmental Protection Agency, Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (2006)*
- *Environmental Protection Agency, Air Quality in Ireland (2016, 2017, 2018 & 2019), Indicators of Air Quality (2017, 2018, 2019 and 2020)*

Chapter Ten – Archaeology & Cultural Heritage

10.1 Introduction

This environmental impact assessment report (EIAR) prepared on behalf of M.F. Quirke and Sons has been undertaken to assess the significant effects, if any, on the cultural heritage, archaeology and architecture which can reasonably be expected to occur because of the proposal to extend an existing sand and gravel pit onto lands Rangue and Knocknaboola townlands, Co. Kerry. There will be no HGV traffic using south entrance from L4021 (see Fig. 1.1). A wide variety of paper, cartographic, photographic, and archival sources was consulted. All the lands of the application area were visually inspected.

This study which complies with the requirements of Directive EIA 2014/52/EU is an assessment of the known or potential cultural heritage resource within a specified area and includes the information that may be required for reaching a reasoned conclusion on the significant effects of the project on the environment, considering current knowledge and methods of assessment. It consists of a collation of existing written and graphic information to identify the context, character, significance, and sensitivity of the known or potential cultural heritage, archaeological and structural resource using an appropriate methodology (EPA 2002 and 2003).

The assessment was prepared by Dr. Charles Mount who has more than thirty years of cultural heritage assessment experience. He holds B.A., M.A. and Ph.D. degrees in archaeology as well as a professional diploma in EIA and SEA Management and is a member of the Institute of Archaeologists of Ireland.

10.2 Methodology

This study which complies with the requirements of Directive EIA 2014/52/EU is an assessment of the known or potential cultural heritage resource within a specified area and includes the information that may be required for reaching a reasoned conclusion on the significant effects of the project on the environment, considering current knowledge and methods of assessment. It consists of a collation of existing written and graphic information to identify the context, character, significance, and sensitivity of the known or potential cultural heritage, archaeological and structural resource using an appropriate methodology (EPA 2002 and 2003).

The study involved detailed investigation of the cultural heritage including the archaeological, architectural and historical background of the application area and the surrounding area up to 1km from the development. The study area is indicated on Fig 1.1. This area was examined using information from the:

- Record of Monuments and Places (RMP) of County Kerry;
- The Site and Monuments Record (SMR)
- The Kerry County Development Plan 2015-21 including the Record of Protected Structures;
- The National Inventory of Architectural Heritage (NIAH)
- Aerial photographs;
- Excavation and assessment reports;
- Cartographic and
- Documentary sources.

Pre-development archaeological test excavation of the application area was carried out in May 2021 to identify and assess any potential unknown archaeological sites or structures within the application area.

10.3 Existing Environment

The Landscape

The application area is situated in south County Kerry, about 2.8km south-west of the town of Killorglin and just to the east of the Caragh lake road. It is situated in blanket peatland ranging from 0.2m – 2m in depth overlay a beige-grey stony subsoil.

Archaeological and historical development of the study area

The following is a brief summary of the archaeological and historical development of the study area and the main types of sites and monuments that are known from the surrounding landscape. The information is drawn from the assessment. It is intended to indicate the types of sites and monuments known to be present in the study area as well as the pattern of landholding and to place this material in its cultural heritage context. The application area is situated in the townlands of Rangue and Knocknaboola, the civil parish of Killorglin and the baronies of Trughanacmy and Dunkerron North. Note the spellings of place names varied throughout history, the historical spellings are used here.

Prehistoric Period

Prehistoric activity in the study area is unclear. There is no archaeological material known from the application and the only possible prehistoric remains in the study area is an undated burnt spread, possibly the remains of a fulacht fiadh in Rangue townland (Appendix 1.1).

Early medieval period

In the early medieval period, the study area formed part of the cantred of Mag Coinchinn later known as Moconekyn and Magunihy (McCotter 2008, 167-8). Classically, settlement at this period is indicated by the presence of enclosed farmsteads known as ringforts when they are enclosed by an earthen bank and cashels when they are enclosed by a stone wall. However, there are no ringforts or cashels known from the study area and the nature of medieval settlement is unknown.

Later medieval period

Following the invasion of the Anglo-Normans at the end of the twelfth century in 1200 King John granted the study area which formed part of the MacCarthy Kingdom of Desmond, to Meyler fitz Henry (Orpen 1911-20, Vol. II, 127). However, it was not until 1214 that the study area came under Norman control when Maurice Fitz Thomas built a castle at Killorglin (Otway-Ruthven 1980, 80). In this period the study area was part of the cantred of Morconekyn with its caput at Killorglin (MacCotter 2008, 167-8). Meyler fitz Henry entered a monastery in 1216 and his lands in Kerry were granted to John fitz Thomas fitz Gerald ancestor of the Earls of Desmond (Otway-Ruthven 1980, 87). Norman activity in the study area was brief as, after the victory of Finghin MacCarthy King of Desmond over John fitz Gerald Baron of Desmond at the Battle of Callann in 1261, Killorglin was taken and burned. Killorglin was taken again by the MacCarthys in 1280 and the Normans evacuated the area after this. The study area then remained in the hands of the MacCarthy Mor Kings of Desmond until the late sixteenth century.

The process of Norman infeudation is normally associated with the construction of timber castles, known as Motte and Baileys. There are no Motte castles known from the study area or this part of Co. Kerry. In Ireland the manor houses of local lords were sometimes enclosed by rectangular moats and are referred to as moated sites. They are a useful indicator of Anglo-Norman settlement. There are no

moated sites in the study area or this part of Co. Kerry and no evidence for any Anglo-Norman occupation.

Later medieval activity is often identified by the construction of masonry tower houses which were encouraged by King Henry VI's introduction of a building subsidy of £10 in 1429 (Sweetman 1999, 137). However, there are no tower houses in the study area and the closest example is in Killorglin (RMP KE056-025----) 3km to the north-east.

The post-medieval period

The Down Survey and Book of Survey and Distribution record that in Rangue and Knocknaboola were common land and Rangue remained common land in 1670 but Knocknaboola had come into the hands of Sir William Petty, Director of the Down Survey (downsurvey.tcd.ie). Griffith's valuation of 1847-64 records that Rangue townland was mainly held by Robert Rea. The Ordnance Survey Name Books for Co. Kerry record that in the 1830s Knocknaboola was held by Arthur Blennerhassett of Ballysheedy (http://griffiths.askaboutireland.ie/).

Buildings

Designated structures

The Kerry County Development Plan 2015-21 was examined as part of the baseline study for this section of the EIAR. The review established that there are no buildings situated within the application area or the study area listed as Protected Structures.

Non-designated structures in the NIAH

The National Inventory of Architectural Heritage (NIAH) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the baseline study for this section of the EIAR on the 8th of June 2021. The review established that there are no buildings situated within the application area or the study area listed in the inventory.

Other non-designated structures

The assessment of other non-designated structures involved the 1894 edition of the six-inch Ordnance Survey mapping for all upstanding structures that are marked on within 100m of the application area (see Fig. 1.1). There are no upstanding structures indicated on the mapping within this area.

Archaeological Assessment

Recorded Monuments

The Record of Monuments and Places (RMP) which was established under section 12 (1) of the 1994 National Monuments (Amendment) Act and is maintained by the Department of Housing, Local Government and Heritage was examined as part of the baseline study for this section of the EIAR. The review established that there are no Recorded Monuments situated within the application area or the study area.

Undesignated monuments

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the baseline study for this section of the EIAR. There are no monuments included in the SMR in the application area. Outside the application area a burnt spread (SMR KE056-058----) in Rangue townland is included (see Appendix 1.1 for description). This burnt spread is situated 0.56km to the north-east of the application area and is considered too far distant to be directly or indirectly impacted by the proposal.

Cartographic Sources

The Ordnance Survey 1st and 3rd edition six-inch and the 1st edition twenty-five-inch maps of the study area were examined. This analysis did not indicate any previously unrecorded archaeological sites or monuments in the application area or vicinity.

Place Name Evidence

The place names were extracted from the cartography in order to facilitate the search for structures and monuments and small finds, to help identify any unrecorded monuments or structures, to search for any published papers and documents related to the study area and to assist in the study of the historical development of the area. The English translations of the townland names of the study presented below are based on the Placenames Database of Ireland at https://www.logainm.ie/. The placenames refer to topography and landcover and do not indicate any additional cultural heritage material in the application area.

Coomnafanida	hollow of the flaying
Garrahadoo	the black garden
Glannagilliagh	glen of the cocks
Knocknaboola	hill of the booly or dairy
Muingaphuca	the fairey's moiass
Ownagarry	river of Garry or the garden
Rangue	a land division

Aerial Photographs

Examination of the Ordnance Survey 1995, 2000 and 2005 imagery as well as Google Earth imagery from 2003, 2010, 2011, 2015, 2018 and 2019 and Bing maps imagery from 2011 did not indicate any additional cultural heritage or archaeological sites in the application area.

National Museum of Ireland

Examination of the find's registers of the National Museum of Ireland indicated that no finds from the application area or vicinity have been reported to the Museum.

Other sources

Examination of archaeological corpus works on prehistoric artefacts (Harbison 1969, Eogan 1965, 1983, 2000) and pottery (O'Riordáin and Waddell 1993) and Iron Age material (Raftery 1984) indicated no finds from the study area.

Archaeological investigations

Examinations of the Excavations Bulletin www.excavations.ie indicated that there have been no archaeological investigation carried out in the application area. Several phases of licenced monitoring have taken place in advance of the development of the existing sand and gravel pit since 2002. No features or finds of archaeological interest were uncovered during the work apart from a low mound of stones, of uncertain date and function found in 2004. In 2016 a burnt spread was identified during testing in advance of a solar farm elsewhere in Rangue townland (16E0282).

Rangue No archaeological significance 02E1184
Monitoring took place at a sand and gravel pit development at Rangue, Killorglin, from 29 July to 2 August 2002. Ground clearance activities at the site will be undertaken in phases over the coming years.

The first phase consisted of the clearance of a strip of bog c. 20m wide along the northern and southern boundaries of the site and a strip c. 10m wide along the eastern boundary. This work was undertaken

primarily to facilitate the initial phase of bund construction along these boundaries. In addition, a number of existing open drains were cleared and widened, where required. Depth was found to range from 0.2m to 1.11m. No features or finds of archaeological interest were uncovered during the work.

Rangue Monitoring 04E1435
Monitoring of groundworks was carried out from 27 October to 1 November 2004 at Rangue, Killorglin, Co. Kerry, during the first phase of the development of a sand and gravel pit which involved the construction of an access road around the perimeter of the site. The site comprised a rectangular area of ground situated on a north-east-facing slope, with a mid-20th-century house and associated outbuildings surrounded by a garden and small fields that were separated by low stone walls. The whole site was very boggy in nature, especially at the foot of the slope, where the ground was waterlogged. The stripped area was covered by a thin layer of black, well-humified peat, typically around 0.3m deep, although in the waterlogged area this reached a maximum of 0.9m. The only feature of archaeological interest was a small, low mound of stones, of uncertain date and function, which was cordoned off from the rest of the site.

Monitoring of Phase 2 of the groundworks at Rangue, Killorglin, Co. Kerry, was carried out from 7 to 10 March 2005. The site consists of 5.2ha of land, much of which is covered by a blanket bog. The development involves the phased clearance and excavation of a sand and gravel sand and gravel pit. Although no archaeological features were located on the site in the course of Phase 1 of monitoring (Excavations 2004, No. 777), the large nature of the development necessitated monitoring of all groundworks. Nothing of archaeological significance was discovered as a result of this phase of the works.

Monitoring of Phase 4 of the groundworks at Rangue, Killorglin, Co. Kerry, was carried out on 25–29 February 2008. The site consists of 5.2ha of land, much of which is covered by a blanket bog. The development involves the phased clearance and excavation of a sand and gravel pit. Although no archaeological features have been located on the site in the course of previous phases of monitoring by Sinclair Turrell (ADS Ltd) (Excavations 2004, No. 777; Excavations 2005, No. 706), the large nature of the development necessitates monitoring of all groundworks.

Rangue Burnt spread 16E0282
Test trenching was carried out from 14–17 June 2016, within the townland of Rangue, Co. Kerry. This testing was necessary for planning permission being sought for a solar farm development. A total of 1600 linear metres were excavated using 15 test trenches which examined the solar panel layout and other elements of the design.

All trenches were located in present day pastural farmland. The majority of the area has been reclaimed from peat bog during the 20th century. This reclamation work was evident in all trenches and the stratigraphy was very disturbed in places. No artefacts were recovered from any trench.

A single archaeological feature was identified at the centre of the proposed development (ITM 476314, 594396). This was a probable burnt spread or fulacht fiadh, found 0.6m below current ground level. Here, the test trench was extended to the north and south and the site appears to have been situated along the edge of a body of water to the west. The deposit of heat-shattered stone and charcoal-rich soil is at least 0.75m in thickness and its extent can be measured as 14m north-south by 8.5m. This has been preserved in situ and reported to the Archaeological Survey of Ireland (added as KE056-058—-).

Previous assessments

The existing sand and gravel pit was the subject of an EIS which included an Archaeology and Cultural Heritage Impact Assessment Report by Michael Connolly which was carried out in 2000. The assessment did not identify any archaeological or cultural heritage sites in the application area.

Field Assessment

Tobar Archaeological Services were engaged by M.F. Quirke and Sons Ltd. to carry out pre-development archaeological testing of the proposed application area. The testing was carried out by Miriam Carroll in May 2021 under excavation licence 20E0517 and involved the excavation of 50 test trenches within the proposed extraction area. No archaeological finds, features or deposits were identified during the testing. No potential sub-surface archaeological features or deposits were encountered and no impacts on any features were identified. The report concluded that the overall archaeological potential of the proposed development site is regarded as low, and no mitigation measures are therefore recommended (see Appendix 1.2 for the full report).

10.4 Assessment of potential impacts

Direct Impacts

There will be no direct impacts on any known items of archaeology, cultural heritage or buildings of heritage or special architectural interest in the application area or the vicinity.

Indirect Impacts

There will be no indirect impacts on any known items of archaeology, cultural heritage or buildings of heritage or special architectural interest in the application area or the vicinity.

Do nothing impacts

If the proposed development were not to proceed there would be no negative impact on the cultural heritage.

Worst case impact

The proposed development has been thoroughly assessed including test excavation and the likelihood of a worse case impact has been assessed as low.

Cumulative Impact

No cultural heritage has been identified in the application area or vicinity by the assessment and therefore there is no cumulative impact.

Residual Impact

No cultural heritage has been identified in the application area or vicinity by the assessment and therefore there will be no residual impact.

Unplanned Events

No impacts on any known items of cultural heritage in the application area or the vicinity arising from unplanned events associated with the proposal have been identified by the assessment.

10.5 Recommendations / proposed mitigation measures

Direct impacts

No direct impacts warranting specific mitigation were identified during the course of the cultural heritage assessment. The overall archaeological potential of the proposed development site is regarded as low, and no mitigation measures are therefore recommended.

Indirect impacts
No indirect impacts warranting specific mitigation were identified during the course of the cultural heritage assessment.

10.6 Conclusions and Recommendations

There are no items of cultural heritage, monuments or buildings of special architectural interest known within the application area or vicinity.

The proposal will not directly or indirectly impact any known items of cultural heritage, archaeology or buildings of special architectural interest in the application area or the vicinity. All the lands of the application area have been archaeologically tested and no potential sub-surface archaeological features or deposits were encountered and no impacts on any features were identified.

The overall archaeological potential of the proposed development site is regarded as low, and no mitigation measures are therefore recommended.

10.7 References

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- Waddell, J. 1998. *The Prehistoric Archaeology of Ireland*. Galway.

Figures

Fig. 10.1. The assessment study area superimposed on the Record of Monuments for Co. Kerry. The application area is outlined in red; the landed interest is outlined in blue and the proposed extraction area is outlined with a black dashed line.

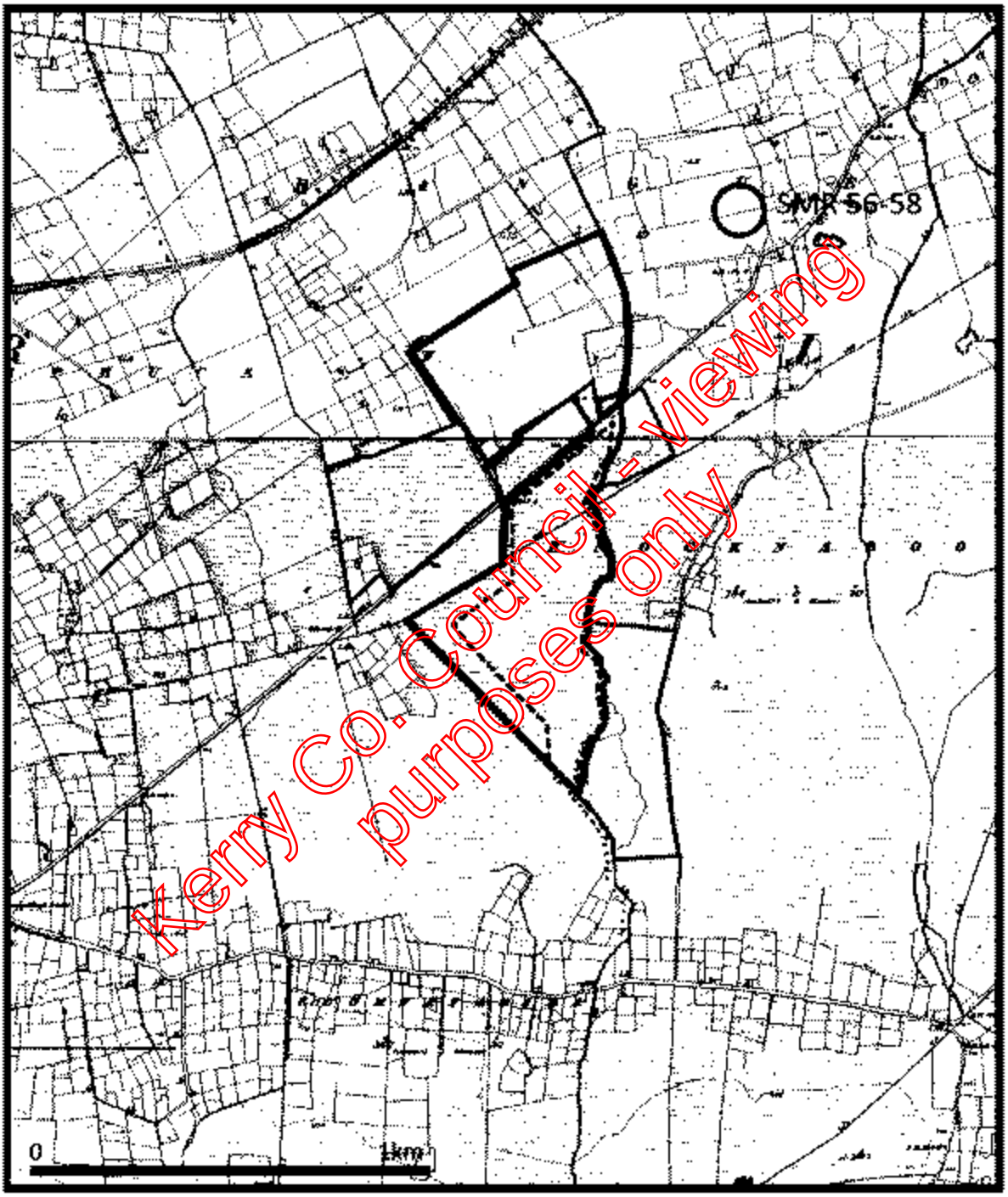


Plate 10.1 Aerial view from Google earth taken July 2018 showing the proposed extraction area outlined with a dashed line.

Chapter Eleven – Population and Human Health

11.1 Introduction

The objective of this chapter is to assess the positive and negative impacts of the proposed development on population and human health with respect to the socio-economic effects and potential adverse effects on human beings arising from environmental impacts, Human beings comprise one of the most important elements in the environment. In carrying out development, one of the principal concerns is that human beings should experience no reduction in the quality of life as a consequence of the construction and occupational phases of a development.

Direct effects may include such matters as safety, air and water quality, noise, landscape quality and road traffic. Indirect effects pertain to such matters as flora, fauna, heritage and archaeology. These matters form sections of this EIAR along with corresponding mitigation measures are comprehensively provided in those sections.

Page 16 of the draft *Advice Notes for Preparing Environmental Impact Statements* produced by the EPA in September 2015 lists a number of issues which may be examined under the topic of Population & Human Health, including the following:

- *Economic Activity likely to lead to projects - will the development stimulate additional development and/or reduce economic activity, and if either, what type, how much and where?*
- *Social Consideration - will the development change the intensity of patterns and types of activity and land use*
- *Land-use - will there be severance, loss of rights of way or amenities, conflicts, or other changes likely to ultimately to alter the character and use of the surroundings?*
- *Tourism – will the development affect the tourism profile of the area?*
- *Health – have the vectors through which human health impacts could be caused been assessed, including adequate consideration of inter relationships between those assessments?*

These issues are discussed separately and in more detail, below in section 11.4.

Publications and other data sources that guided the preparation of this chapter are listed hereunder:

- The Central Statistics Office – data from the 2011 and 2016 Census.
- Kerry County Development Plan (2015-2021)
- Kerry County Development Plan (2022-2028)
- Killorglin Local Area Plan

11.1.1 Competent Expertise

The assessment of human health was completed by Jessica Boyd, Environmental Consultant OES, who holds a BSc Environmental Management, BSc Geography and Environmental Management and an MSC in Masters: Spatial Planning: Cities, Water & Climate Change.

11.2 Baseline Study and Methodology

The baseline study comprises a desk-top review online and published resources and information provided by the applicant. Ordnance Survey maps and aerial photography were also examined. The desk-based study was undertaken to assist information regarding:

- Population
- Age Structure

- Economic Activity
- Employment; and
- Unemployment

The aim of the study was to assess the positive and negative impacts of the proposed development on the socio-economic environment. Publications and other data sources that guided the preparation of this chapter are listed hereunder:

- The central Statistics Office (CSO) – data from the 2011 Census
- Kerry County Development Plan, 2015-2021

In regard to human health, the other chapters of this EIAR assess implications and set down mitigation measures for other environmental factors that ultimately require emission regulation by national/internal standard or specific planning/licensing condition for reason of protection of human health and the environment.

Two population groups have been identified as likely to experience effects from the pit and plant area land-uses the subject of this EIAR:

1. The local non-EIAR population. This is the existing and planned population of the area including residents and related groups having a connection to the area by occasional or habitual presence e.g., workers, students and visitors
2. The EIAR population. This is the non-indigenous population consisting of the employees and related service providers of the lands subject of this EIAR. This population group includes the employees and related service providers.

11.3 Receiving Environment

11.3.1 Environmental and Heritage Designations

Sites of international importance including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are collectively known as Natura 2000 sites. These contain examples of some of the most important natural and semi-natural ecosystems in Europe. Designated sites, which also include Natural Heritage Areas (NHA's) and proposed Natural Heritage Areas (pNHA's) were also identified within the proposed development's area of influence. The designated search area was 15km from the site for Natura 2000 sites.

Numerous sites of international importance within a 15km radius of the extension site were detected. The special designated areas of closest proximity include; Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and pNHA (2.5km SW of the site), Castlemaine Harbour SAC and pNHA(2.5km W), Castlemaine Harbour SPA (5km N), Lough Yganavan and Lough Nambrackdarrig SAC and pNHA (4km E). There are other designated sites in the vicinity, albeit further away, including Killarney National Park SPA (14kmSE), Slieve Mish Mountains SAC (9.7km N) and Dingle Peninsula SPA (12.9km NW).

In the subsequent analysis of designated sites, particular attention was given to potential for the site operations to influence a designated site. In other words, potential current and historical ecological pathways were identified, these pathways can be hydrological, physically overlapping or exhibiting habitat and species synergies that could result in temporary or residual effects being afforded to a designated site.

The Record of Monuments and Places includes the following recorded monuments within the vicinity of the application area:

- Kilcoolaght East Ogham Stones are located ca. 5km SE of the site

Other monuments and places are a further 3-4km North of the site and are located in Killorglin town, including Ballykissane Monument and Killorglin Railway Station Monument. Essentially, the Record of Protected Structures (RPS) lists 32 properties and structures in Killorglin. However, these are over 3km from the site and therefore will not be impacted.

There are no recorded monuments within the application area. Co Kerry is famous for its archaeological importance and its prevalence of monuments. Albeit, in relation to the Iveragh Peninsula, which is where the pit extension site is located, the majority of these are situated on the outskirts of the peninsula, being a lengthy distance from the site (located inland of Iveragh Peninsula).

11.3.2 Environmental and Human Health

Legislation relevant to the protection of Human Health included:

- Recital 1 of Directive 2014/52/EU makes reference to the fact that the 2011 Directive contributes to a high level of protection of the environment and human health.
- Article 3 of the 2014 Directive effectively defines the EIA process as identifying, describing and assessing in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on a series of specified environmental factors. The first of these is 'population and human health' which replaces 'human beings' in the 2011 Directive.
- European Commission guidance relating to the implementation of the 2014 Directive, in reference to 'human health' states, "Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the releases of toxic substances to the environment, health risks arising from major hazards associated with the project, effects caused by changes in disease vectors caused by the project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study.
- In addition, these would concern the commissioning, operation, and decommissioning of a project in relation to workers on the project and surrounding population.

11.3.3 Population and Settlement Structure

The results of the Census 2011 indicate that the population of County Kerry has grown to 145,502 persons, an increase of just fewer than 5,677 persons compared with the census 2006 population figures. Census 2016 revealed the county's population stood at 147,707 people in 2016, representing a population increase of 1.5% in Kerry since 2011 (+2,205 people). There has been an increase in population around the towns of Tralee, Killarney, Kenmare and Killorglin. It was also revealed that there are more women in Kerry than men, as 74,652 women were recorded in Census 2016 compared with 73,055.

Killorglin Population

In the Kerry County Development Plan 2022-2028, Killorglin is classified as a 'Tier 2 Town'. Tier 2 settlements are strong, active and economically vibrant towns. These towns serve significant rural hinterlands as important service centres for trade and commerce, often providing large numbers of

local employment. While many Tier 2 Towns experience population decline, the Kerry Hub and Knowledge triangle (Tralee-Killarney-Killorglin) has experienced an increase.

While the town has a small population, employment levels are high with 2.2 local jobs per resident worker; the highest employment density of any town in Ireland. Also, higher than average levels of employment are evident in Commerce and Trade. The population of Killorglin has increased from 1,359 to 1,627, 2,082 and 2,199 from census statistics recorded in 2000, 2006, 2011 and 2016, respectively. The Pit which is to undergo extension works is ca. 3.2km SW of Killorglin. The table below displays population levels within Killorglin, juxtaposed with County Kerry.

Table 11.1 Population of Killorglin and Co Kerry

Town	Population 1996	2002	2006	2011	% change between 2006 &2011
Kerry County	126,130	132,835	139,835	145,502	4.1%
Killorglin	1,278	1,359	1,627	2,082	28.0%

Source: (CSO, 2016)

Table 11.2 *Population by sex and social class in Killorglin (2016)*

Social Class	Male	Female	Total (2016)
Professional Workers	54	36	90
Managerial and technical	215	266	481
Non-manual	174	299	473
Skilled Manual	244	122	366
Semi-skilled	145	159	304
Unskilled	46	38	84
All others gainfully occupied and unknown	174	227	401
Total	**1,052**	**1,147**	**2,199**

Source: (CSO, 2016)

Of the working population in Killorglin, 47.7% is engaged in professional, managerial, technical and non-manual labour activities. This is however lower than the county figure of 49.7% and the national figure of 53.7%. Commerce and Trade accounts for a substantial portion of employment at 28.3%, which is considerably higher than is the case of Kerry (20.4%) and nationally (23.9%).

Based on the GeoDirectory registers between 2015 and 2020, 1,840 new addresses were added to its register. 59% of these additions have taken place outside of the County's urban areas including small towns and villages (Kerry County Development Plan 2022-2028). This confirms population growth within the County and within its Municipal Districts which was predicted in the previous County Development Plan (2015-2021).

Table 11.3: Persons in private households by socio-economic group of reference person in Killorglin (2016)

Socio-economic group of reference person	Households	Persons
A Employers and managers	107	251
B Higher professional	36	72
C Lower Professional	107	210

D Non-Manual	223	564
E Manual Skilled	82	225
F Semi-skilled	90	243
G Unskilled	33	66
H Own account workers	48	123
I Farmers	18	43
J Agricultural	5	12
Z All others gainfully occupied and unknown	178	375
Total	927	2,184

Source: CSO, 2016

Age

The prime three ageing counties of Ireland include Mayo, Kerry and Leitrim. Within Kerry, there is considerable spatial variation in respect of distributions of person 60+. As the following table shows, the South and West Municipal District has the highest proportion of persons aged over 60 and the CSO projects that the ageing trend will continue:

Table 11.4: Person Aged 60+ by Age Cohort and Municipal District (MD) in Co Kerry, 2016.

MD	60 to 64	65 to 69	70 to 74	75 to 80	80 to 84	85+ years	Total Aged 60+	Total Aged 75+	Total Persons	% Aged 60+	% Aged 75+
Killarney	2,289	2,254	1,647	1,151	720	622	8,683	2,493	39,935	21.7%	6.2%
Listowel	1,861	1,755	1,354	941	690	535	7,136	2,166	28,418	25.1%	7.6%
South & West	2,729	2,537	1,945	1,211	821	739	9,982	2,771	39,607	25.2%	7%
Tralee	2,277	2,038	1,594	1,124	793	563	8,389	2,480	39,747	21.1%	6.2%
Kerry	9,156	8,584	6,540	4,427	3,024	2,459	34,190	9,910	147,707	23.1%	6.7%

Source: CSO, 2016

The ageing population of County Kerry overall has steadily increased. Census 2016 revealed the average age in Kerry now stands at 40.2 years. This represents an increase of 1.7 years since 2011 when the average age in Kerry was 38.5.

The age profile for Killorglin in the year 2011 is illustrated in the table below, describing Persons Classified by Age Group, detailed by CSO (2011), Killorglin (pertinent to the study site), Co. Kerry, 2011.

Table 11.5: Population by age group

Area	Total	Age group (Years) (2011)				
		0-14	15-24	25-44	45-64	65+
Killorglin	2,082	408	267	710	424	273
Killorglin % Total		19.6%	12.8%	34.1%	20.4%	13.1%
County Kerry	145,502	29,352	16,311	41,600	37,249	20,988
County Kerry % Total		20.2%	11.2%	28.6%	25.6%	14.4%
State		21.3	12.6	31.6	22.7	11.7

Source: CSO, 2016

The age profile for Kerry County is strong, with a large percentage of eligible workforce (25–64-year age groups = 54.2% of population), while maintaining a strong youth population for the support of this group in later years (0–24-year age groups = 31.4%). After Mayo, Kerry has the oldest population of any county in the state, with both states being subject to an 'older than average' age profile.

Killorglin exhibits the strong youth group (0–24-year age groups = 32.4%) as displayed within the County statistics. The over 65 age group (13.1%) is below the county average, while the under 25s grouping, as a percentage, is slightly smaller than the county average. While reviewing the figures for the working age group (24-64), Killorglin has an eligible workforce of approximately 977 persons in 2011.

11.3.4 Local Economy and Employment

Killorglin is an attractive place to live and work, acting as a 'gateway' to the Ring of Kerry. The town has the ability to create, develop and sustain high quality export-orientated and technology-led local employment. There are 2.2 local jobs per resident worker; the highest employment density of any town in Ireland (source CSO, 2016).

Within the economy of the wider area, Killorglin plays an imperative role. It is within commuting distance of the other main settlements on the Iveragh Peninsula and functions as an employment centre for those areas separated by distance from the development corridor of Tralee and Killarney. Killorglin supports diverse sectors such as retail, services, industry, manufacturing and small-scale tourism. Also, Killorglin also has higher than average levels of employment in Commerce and Trade. It is an appealing location for industries, with a number of prestigious international companies in operation for several years. However, it holds a relatively low resident population relative to local employment provision which inhibits the capacity to build scale and critical mass in the town and its environs.

Within 'Opportunities' of the Killorglin Functional Area Adopted Local Area Plan, it is stated that, 'there are a number of greenfield and brownfield sites in the town centre and contiguous to the town centre that are suitable for development'. Thus, extension of the Pit at Rangue should be encouraged in order to advocate development and subsequently employment.

One of the overall aims of the Killorglin Functional Area Adopted Local Area Plan is to facilitate the ongoing development of the existing employment sector and services in Killorglin town and secure the development of further diverse employment in order to create a self-sustaining attractive town. It is also an objective of the Council to: EEA-1: Ensure the town maximises its potential to develop as a principal employment centre for the area.

As for County Kerry, overall, in the census, unemployment is measured on a Principal Economic Status basis and the results in Ireland Part 2 showed an overall unemployment rate of 19%. However, there were over 82,000 people aged 15-24 out of work in April 2011 up from 47,122 in 2006, resulting in an unemployment rate for this age group of 39%. Among males in this group the numbers rose from 26,448 to 50,440 over the five years giving an unemployment rate of 45%. For females the numbers out of work increased from 20,674 to 31,713 giving an unemployment rate of 32%.

In the 2016 Census, the number of persons at work was recorded as 61,222. Persons at work by industry and sex is detailed in the table below.

Table 11.6. Persons at work by industry and sex

Persons at work by industry and sex (2016)			
Industry	Male	Female	Total
Agriculture, forestry and fishing	4,491	422	4,913
Building and construction	3,259	180	3,439
Manufacturing industries	5,078	1,565	6,643
Commerce and Trade	6,201	6,326	12,527

Transport and communications	2,114	647	2,761
Public administration	1,514	1,437	2,951
Professional Services	3,515	10,330	13,845
Other	6,800	7,343	14,143
Total	32,972	28,250	61,222

Overall, in County Kerry there are a higher number of males in the workforce, with the exception of those employed in 'professional services'. An increasing number of females work in 'professional services', a sector that encompasses jobs ranging from the well-paid, to those that only pay minimum wage, such as many in support services and caring professions. Males are much more likely to work in agriculture, manufacturing and construction. Almost 10% of the male workforce is employed in construction, suggesting caution of an overreliance on this sector in the future.

In relation to operations at the proposed site, aggregates are a tied resource – they can only be worked where they occur, and this is the major constraint in the location of quarries. Development of the favourable geological reserves at Rangue are required to continue to supply the Applicant's existing concrete manufacturing facilities on site and to supply crushed stone products to the regional market they have built up since their first operational activities in the 1950's.

The 2016 census showed the average travel time of commuting workers in Ireland is 28.2 minutes. Kerry, however, had a lower time of 22.7 minutes, falling into the top ten counties in Ireland (along with other rural counties such as Sligo, Donegal and Mayo), with shortest commuting distances. Creating employment and generating economic activity in areas within the County, provides significant social and environmental benefits, as people do not need to spend longer travelling to places of employment outside the County.

According to the CSO (2011), the entire county of Kerry had a strong tourism industry and it is the sector most likely to drive economic growth in the short to medium term. Ten percent of the labour force is employed in hotels and restaurants alone. It is also the sector that can contribute the most to the economic development of peripheral areas in the County.

11.3.5 National Employment

Nationally, Limerick City and Donegal had the highest levels of youth unemployment with rates of 50% and 49% in 2011, respectively, essentially half of all young people in the labour force. Fingal, Cork County and Galway City were also at the lower end of the youth unemployment spectrum. Overall, according to the 2011 Census, the unemployment rate for Killorglin and its environs was 34%.

Throughout the recession however exports have continued to grow and Ireland is one of the biggest exporters pro rata of pharmaceuticals in the world (28% of the value of the country's total exports). Others include organic chemicals (21%), data processing equipment and software (12%) and food (7%). Foreign Direct Investment in these markets has created more than 140,000 jobs in Ireland. Irish exports grew to record levels in 2012 breaking the €16bn point for the first time and creating 13,000 jobs in 2012.

There are however significant regional disparities in growth within County Kerry with most Foreign Direct Investment (FDI) located in the gateways of Dublin, Cork, Limerick and Galway. It is inevitable that other areas will have to depend on growing local indigenous industries to create future employment. This is exemplified by the success of numerous businesses, headquartered in Co. Kerry, including; Kerry Group PLC, Dairymaster, Fexco and Liebherr, as well as the growth of the agri-food sector.

Inevitably, indigenous growth has acted as a powerful engine of economic and employment growth. It is an objective within the 'Kerry County Development Plan 2015-2021', to support new and existing indigenous businesses to grow and export, (ES-5: Actively foster and support the sustainable development of new indigenous industries and the expansion of existing firms).

In relation to employment and the need for development, the Department of the Environment, Heritage and Local Government (2004) guidelines for planning authorities on extraction and ancillary activities state that:

"There will be a continuing need for new or expanded aggregate extraction operations on land to meet regional and local requirements. There is thus a need to identify and protect aggregate resource areas through the planning system, to ensure adequate supply of aggregates to meet the likely scale of future demand whilst at the same time protecting Ireland's natural and cultural heritage."

Thus, the importance of extractive industries to the local and national economy is recognised not only regionally but also nationally. This policy states that the industry is essential to the continued development of the county and the achievement of the objectives of the National Development Plan. Furthermore, the pit industry in Ireland is a significant sector of the Irish economy. Though production levels are significantly reduced from those of 2008 there are still a large number of operating quarries and the industry is in a good position to expand if there is growth in the construction industry.

In 2018 the National Planning Framework have also announced the importance of extraction industry:

"Extractive industries are important for the supply of aggregates and construction materials and minerals to a variety of sectors, for both domestic requirements and for export. The planning process will play a key role in realising the potential of the extractive industries sector by identifying and protecting important reserves of aggregates and minerals from development that might prejudice their utilisation. Aggregates and minerals extraction will continue to be enabled where this is compatible with the protection of the environment in terms of air and water quality, natural and cultural heritage, the quality of life of residents in the vicinity, and provides for appropriate site rehabilitation."

11.4 Sensitive Receptors

The application site is an established facility located in a rural area, largely surrounded by agricultural land to the North and bogland to the South. There are no dispersed patterns of residential development and any residential housing is sparsely distributed outside the vicinity of the site. There are no dwellings within the EIAR lands. Trailflow Biking Adventures is located ca. 1km North of the site and a vet clinic ca 200m east of the site.

Caragh Village is also located 2km south of the site, which also is a direct link to Killorglin.

In terms of infrastructure, the site is well positioned to the west of a regional road from the Farrantoreen Rd, which runs south from Killorglin town centre. The 'Ring of Kerry' (N70) is located circa 3.7km NW from the site and is also accessed off a regional road.

Existing extraction and processing operations will be ongoing, while full development of the proposed extension area envisages an approximate 25 year working lifespan for the overall activity.

Landuse in the area is predominantly agricultural. There are several residential dwellings forming the northern boundary of the extension area. Land cover in the extension area is a mixture of dry heath and bog, which has been cut away (for fuel) in the past. A small watercourse – Douglas Stream – runs along the eastern perimeter and ultimately drains to Castlemaine Harbour.
Essentially, County Kerry contains areas of outstanding natural beauty which are recognised internationally. There is a requirement to protect and conserve views and prospects adjoining public roads throughout the Country. These views are imperative to the amenity of the County and to its tourist industry. It is not proposed that the protection and conservation of these views and prospects should give rise to the prohibition of development along these routes, but development where permitted, should not seriously hinder or obstruct these views and should be designed and located to minimise their impact.

Within the County Development Plan 2022-2028, a strength highlighted in the SWOT analysis details; 'Proximity to areas of outstanding natural beauty and protected/designated heritage and Natura 2000 sites of national and international significance comprised of Special Areas of Conservation (SAC) and Special Areas of Protection (SPA) and Natural Heritage Area (NHA).

The proposed extension site will not hinder any views as it is not existed nearby any viewing points and it is of utmost importance that those situated within 15km are protected from future extraction operations.

11.4.1 Impact Assessment

Evaluation Methodology
The evaluation of effects on employment, human health and amenity comprises a qualitative assessment based on quantitative and qualitative analysis of potential effects on the environment undertaken in other chapters. The assessment also takes into account a review of relevant literature and professional judgement in relation to impact on population and human health.

11.4.2 Employment

Operational Stage Impacts
The proposed development will provide employment of up to 38 people directly on-site, in addition to a number of indirect employees including hauliers, sub-contractors, material suppliers and maintenance contractors. Albeit such auxiliary staff may not have a permanent workplace on site. In addition, the proposed extension will contribute indirectly to sustaining and developing the local regional economy through continued supply of construction aggregates.

The creation of new jobs is consistent with the creation of new employment opportunities and is a direct, positive, long term, significant effect on the site working and local populations. There is an associated indirect, positive, long term, slight positive effect in the land use and jobs on site supporting other services employment.

This is a medium-term and positive impact that would not have significant effects on the environment. The application site may also need restoring, which would provide some short-term employment. Also, the operation at the Rangue site would provide an alternative rural economic enterprise away from agriculture and agri-foods.

The rural economy is an important component of Kerry's overall economy and the Council recognises the contribution of rural employment to the continued and sustainable growth of the Country's

economy. The provision of employment opportunities in rural areas close to rural communities not only supports economic growth but is critical in maintaining sustainable vibrant rural communities. On a national basis, extraction has traditionally been second only to agriculture as a source of rural employment. Therefore, the significance of extractive industries to the local and national economy is recognised in national, regional and local planning policy.

The development proposal has been necessary in order to retain existing employment at the site and allowed for the continued supply of mineral and manufacturing of products associated with the extraction of the mineral won at the site.

11.4.3 Human Health

Operational Stage Impacts

The key pathways in relation to human health pertinent to extraction are air, noise, water and soil. The operational phase of the development relates to the extraction of aggregates within the pit area using conventional extraction techniques and the restoration of the pit to a natural habitat. This stage of operations has the potential to generate impacts that would have effects on human health through the pathways of noise, dust, soil and water. In relation to these pathways, a number of mitigation measures are proposed and the residual effect of the proposed development is predicted to be negligible to acceptable.

When the pit is no longer operational, restoration may be a desirable option. Following restoration, the potential effects on air, vibration and noise would cease owing to the cessation of extraction operations and restoration operations.

11.4.4 Population

The construction phase of the proposed extension will not have significant direct impacts on the population structure of the hinterland of the subject site. There may be a resultant increase in the temporary population of the area because of the employment of workers from outside the area of Killorglin, who may decide to reside in the immediate local area during the construction process. If this ensued it would only amount to a small percentage of the workforce employed during the construction phase but would beneficially result in some additional trade for local accommodation and services. The proposed development does not include residential element and will not result in an increase in the permanent population of the area.

11.4.5 Amenity

The key matters in relation to amenity in this instance are air, noise, vibration, landscape and traffic. The subject lands do not offer amenity opportunities for the public being a private commercial enterprise.

Operational Stage Impacts

The construction and operational phase would require the extraction of aggregates, which has the potential to generate dust, noise and vibrations. In addition, there would be vehicle movements associated with the pit and a change in the landscape.

Local amenities in the area primarily include Killorglin Community College, Intermediate school, Killorglin AFC football pitch, as well as holiday homes and lodges, located NE from the site. These amenities are not directly adjacent the site and are located sufficiently far away from the proposed development site so as to be likely to have no recognisable impact on their amenity.

As outlined in previous chapters pertinent to air, noise and vibrations, landscape and traffic, mitigation measures are proposed. With sufficient mitigation measures proposed, the potential for residual effects during the construction and operational phase is likely to be negligible to acceptable. On this basis, it is considered that there would be no likely significant effect on amenity of local residents surrounding the site during the operational stage.

11.4.6 Unplanned Events

According to EPA guidelines, unplanned events, such as accidents, can include "spill from traffic accidents, floods or land-slides affecting the site, fire, collapse or equipment failure on the site". The 2014 EIA Directive refers to "major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes)".

In this instance, the vulnerability of the proposed development to accidents, unplanned events or natural disasters is relatively limited owing to the relatively simple nature of the development works, the established nature of the techniques, regulations and procedures to be followed, the material to be handled on site and the relatively rural location of the proposed works.

Unplanned events in relation to the proposed development could potentially relate to:

- Instability following the extraction of rock;
- Spill from traffic accidents;
- Flooding.

Adhering to the HAS (Health & Safety Authority) Safe Pit Guidelines to the Safety Health and Welfare at Work (Quarries) Regulations 2008 should limit the potential for unplanned events in the form of instability in the pit faces. In any event, instability following the extraction of rock would be unlikely to have any significant impacts on employment, human health or amenity, particularly beyond the site. In relation to water, spillages of fuels or chemicals during site activities could happen without proper control and supervision. Discharged water off site could potentially breach water quality limits without monitoring. Pump failure in the pit could result in the pit floor flooding leading to the potential for groundwater pollution by plant and equipment.

The existing road network will accommodate the proposed development if required, the erection of warning signs may be needed at the entrance to the application area. It is considered that the risk of an accident resulting in a spillage would be no greater in relation to this development than it is for any other form of development that relies on the transportation of goods and materials by HGVs. The potential for significant impacts on employment, human health in the wider population or amenity as a result of a road spillage is likely to be low and such effects would be temporary.

11.4.7 Transboundary Impacts

It is not anticipated that the impacts of the proposed development would have any significant transboundary effect on population and human health.

11.4.8 Interaction with Other Impacts

It is not anticipated that the effects of the proposed development on population and human health would interact significantly with other impacts.

11.4.9 'Do-nothing Scenario'

If planning permission is not approved for the continued use and deepening of the existing pit, the current permission would expire, after which the site would be restored. This would ensue in a cessation of impacts related to noise, air, dust, water, vibration and traffic. This would also ensue in a negative impact on employment, because the workforce that would have been otherwise employed by the pit would no longer exist.

The 'do-nothing scenario' would also ensue in a number of job losses and the considerable level of financial contribution withing the economy would be reduced or ultimately ceased. The closure or discontinuing of works at the pit would not impact the level of demand for construction aggregates or concrete in the area. There would still be an ongoing demand for these vital materials and supplies would need to be provided from alternative sources.

There would also be implications for the construction industry in the area which would be deprived of a readily available local source of construction aggregates, and ready mixed concrete. Supplies of these materials would need to be provided from other sites which could result in greater transport distances, vehicle emissions and carbon footprint.

The site extension would provide benefits from the site restoration in terms of biodiversity and landscape.

11.4.10 Mitigation Measures

Operational Stage

Mitigation measures to be adopted in relation to population and human health during the operational stage would relate to minimising the effect of the development on surrounding sensitive receptors in relation to air, noise, water, soil, traffic and landscape. These measures relate primarily to avoidance, prevention and are presented in the table below.

Table 11.7. Mitigation Measures

Topic	Mitigation Measure
Soil	In order to limit the effects of erosion on any existing excavated soil material the following mitigation measures will be used on site during handling: ➢ Soil material will be placed in permanent or temporary locations at a safe angle of repose; ➢ The re-handling of soil material will be minimised as much as possible in order to preserve the integrity of the soil material
Water	➢ All petroleum-based products (lubricating oils, waste oils, etc.) will be stored in a bunded area to prevent pollution by accidental leaks; ➢ All plant used on site will be inspected regularly for signs of leaks. Mobile plant/machinery will only be serviced on a hardstand refuelling area draining to an interceptor to prevent uncontrolled releases of pollutants to ground. No refuelling or servicing will be undertaken within the pit void ➢ Spill kits will be maintained on site to stop the migration of any accidental spillages, should they occur ➢ Interceptors will be located in areas close to potential sources of hydrocarbon contamination ➢ No pumping during flooding events which eliminates the slight risk from flooding during extreme events

Topic	Mitigation Measure
	➢ Extraction will be carried out above the high-water table thus reducing the potential for impact on hydrological functioning ➢ No discharges from the pit off-site to the nearest watercourse, which is part of the Douglas Stream, which drains to Castlemaine Harbour.
Dust	➢ Minimise drop heights when handling materials. Soils placed directly into progressive works. Avoid working in adverse/windy conditions ➢ Minimise distances on onsite haul routes ➢ Restrict vehicle speed though signage and/or staff training ➢ Location of haul routes away from sensitive receptors ➢ Use of road sweeper to reduce the amount of available material for re-suspension ➢ Pave the access road ➢ Avoid working in adverse weather conditions and faulty dust filters
Noise	➢ Existing screening berms and screen planting shall be retained to act as acoustic barriers ➢ Noise monitoring and assessment will be conducted with due regard to the requirements of NG4 (EPA's Guidance Note for Noise), as well as the Irish Concrete Federations (ICF) ➢ Plant:- • All mobile plant used at the development should have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments; • All plant items should be properly maintained and operated according to the manufacturers' recommendations, in such a manner as to avoid causing excessive noise (i.e., all moving parts are kept well lubricated, all cutting edges are kept sharpened, the integrity of silencers and acoustic hoods are maintained); • All plant should be subject to regular maintenance, i.e., all moving parts are kept well lubricated, all cutting edges are kept sharpened, the integrity of silencers and acoustic hoods are maintained • Minimise drop heights of materials, line the inside of chutes and hoppers with attenuating materials to reduce noise impacts • Start-up plant and vehicles sequentially rather than all together • Switch off equipment when not required ➢ Traffic:- • Any deliveries should be programmed to arrive during daytime hours only; • Adhere to the stated operating hours of the site and ensure that the site working hour restrictions are effectively communicated to all site staff and subcontractors

Topic	Mitigation Measure
	• Care should be taken when unloading vehicles to reduce or minimise potential disturbance to local residents. • Access/internal haul roads should be kept clean and maintained in a good state of repair, i.e., any potholes are filled and large bumps removed • Vehicles waiting within the pit should be prohibited from leaving their engines running and there should be no unnecessary revving of engines
Vibration	➢ All blasting operations should be carried out by a certified 'shotfirer' in accordance with the relevant health & safety regulations ➢ The optimum blast ratio is maintained ➢ To avoid any risk of damage to properties in the vicinity of the site, the ground borne vibration levels from blasting should not exceed a peak particle velocity of 12mm/sec
Traffic	If necessary, the erection of warning signage on the approach roads. The impact of the traffic generated by the proposed development will have no additional effects on the amenity of the area. The Traffic Impact Assessment will be undertaken to ensure traffic flow is curtailed, if necessary.
Landscape	If necessary, hedgerow and woodland planting using native species is proposed along the boundaries of the application area which, along with existing vegetation to be retained and protected as necessary, would mitigate landscape and visual effects. Also, mitigation measures will be prepared as deemed necessary for existing and future operations including a Landscaping Plan for inclusion in a restoration Plan for the pit.
Designated sites	No specific mitigation above the continued adoption of current working practices is deemed possible to be required or proposed in relation to those sites in closest proximity to the MFQ Rangue site, including, Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and pNHA (2.5km SW of the site), as well as Castlemaine Harbour SAC and pNHA(2.5km W).

Mitigation Conclusions

With noise, traffic, dust and vibration control recommendations implemented and the exercise of reasonable control over general site operations, the proposed extension at MF Quirke Rangue site should be able to be enforce in line with current planning practice guidance for mineral sites.

Furthermore, assessment concludes that with limited and simple measures for the amelioration of impacts upon the water environment, invokes no hydrogeological or hydrologically based concerns

that would normally indicate that development should not proceed in the manner described by the planning application.

In relation to designated sites and landscape, no significant adverse ecological impacts have been predicted and it is considered that the proposal would provide a net gain for biodiversity following completion of mineral extraction and restoration activities.

Lastly, during the Post-Operational Stage the majority of effects of the proposed development will diminish or cease following the cessation of operations. No specific mitigation measures are proposed in relation to the post operational phase.

11.4.11 Residual Impact Assessment

Operational Stage;
Mitigation measured would successfully reduce the effects of the proposed development during the operational phase as follows:

- Land, Soils and Geology: None
- Water: None
- Dust: Insignificant to Acceptable
- Noise: Negligible to Minor
- Vibration: None
- Traffic: the assessments have concluded that the links and junctions will operate within capacity for each of the assessment years
- Landscape: Very small and beneficial

Post Operational Stage;

- Land, Soils and Geology: None
- Water: None
- Dust: Insignificant to Acceptable
- Noise: Negligible to Minor
- Vibration: None
- Traffic: all associated traffic will cease
- Landscape: Very small and beneficial

The proposed development will have a positive long-term impact on the immediate and secondary hinterlands, particularly County Kerry and its Border region through continued expanded employment and the associated economic and social benefit.

11.4.12 Monitoring

Monitoring in relation to the proposed development will be undertaken in respect of water, noise, air and vibrations. On this basis, no specific monitoring is required in relation to population and human health.

Environmental Monitoring System
An established environmental monitoring system has been implemented on site and the operators regularly monitor for dust, noise and water quality. This will also be implemented for the new extension area.

Water

All surface water monitoring required under the existing Trade Effluent Discharge Licence will be carried out once activities recommence on site.

Groundwater quality monitoring should be carried out on a biannual basis from a representative number of monitoring wells around and within the pit. A review of this data will be conducted to determine effects, if any, on water quality and water levels which could be potentially attributed to past, current or proposed extraction activities.

It is understood that extraction will be carried out above the high-water table thus reducing the potential impact on hydrological functioning.

Dust and air

Dust deposition monitoring is carried out at the application site, when operational. Dust monitoring locations shall be reviewed and revised where necessary. Traffic would also generate or increase levels of dust generated, albeit the existing road network is currently operating well.

The traffic impact assessment undertaken indicated that the existing road network can successfully accommodate the traffic generated from the proposal. The impact of the traffic generated by the proposed development will have no additional effects on the amenity of the area.

Existing mitigation measures will be reviewed and new measures developed where necessary.

Noise

Noise monitoring should be undertaken at the application site, when operational. Noise monitoring locations shall be reviewed and revised where necessary. The results of the noise monitoring will be submitted to Kerry County Council on a regular basis for review and record purposes.

Vibration

Monitoring of blasts (both for ground borne vibration and air overpressure) should be carried out at the site. The blast monitoring results should be submitted to Kerry County Council for record purposes.

Traffic & Transport

The traffic Impact Assessment (TIA) will be undertaken whereby projected traffic flow arising from the proposed extension operation will be quantified. The TIA will review the nature and characteristics of the route taken by HGV's associated with the operation and will also identify and quantify other users of the road. The TIA will identify the ability of the existing road network to accommodate existing and future proposed traffic levels arising from the operation. Safety considerations such as sightlines at entrances will also be assessed. In order to complete this assessment consultation with the Transport section of Kerry Co Council will be undertaken. Mitigation measures will be identified where necessary.

Chapter Twelve – Traffic and Transport

12.1 Introduction

This material assets (Traffic & Transport) chapter assesses and evaluates the likely impact the proposed development will have on the existing roads network in the vicinity of the site, as well as identifying proposed mitigation measures to minimise such impacts.

12.1.1 Author Information and Competency

This chapter was prepared by Ken Manley BE CEng MIEI HDip Envm Eng FConsEI of MHL Consulting Engineers. Ken has been involved in the preparation of Traffic & Transportation Schemes for over 20 years and is fully competent in the use of traffic modelling software used as part of this assessment, namely Junctions 9: PICADY and TRICS.

12.1.2 Reference to Guidelines Relevant to Discipline

The structure of this TTA is in accordance with TII Document, Traffic and Transport Assessment Guidelines, 2014 and is developed using data from independently commissioned traffic counts at key junctions/locations, and local data extracted from the 2016 National Census.

12.2 Methodology

The scope of this study has been reviewed and discussed with Kerry County Council's area engineer. Key parameters relating to the traffic modelling carried out including, junctions to be assessed, trip generation, trip distribution, assessment years, and the presentation of results were reviewed prior to the commencement of the study.

The Traffic & Transport Assessment includes the following tasks:

- Review of the existing infrastructure and traffic conditions.
- Estimation of the trips generated from the proposed development in the AM and PM peak hours and the distribution onto the local road network.
- Estimation of the traffic growth rates and calculation of predicted future traffic volumes.
- Assessment of impacted junctions surrounding the proposed development (as discussed with Kerry County Council as part of the scoping process); and
- Proposed mitigation measures (if required) to help offset any impact the development may have.

The aim of this TTA is to identify the characteristics of the application site and surrounding area, examine the likely transport implications, ensure sustainable accessibility is maximized and appropriate infrastructure provided to accommodate the proposed development.

The key issues that need to be addressed within this TTA, with reference to the size and location of the development proposal, are as follows:

- Review of the site location, composition, and local roads network.
- Analysis of Road Safety data.
- A review of the relevant planning and transport policy.
- Description of the development proposal.

- Forecast trip generation as agreed with the Local Authority.
- The use of appropriate and agreed traffic modelling software for the assessment of individual junctions.
- Provide With/Without Development assessment for each of the critical junctions.
- Assess significance of development generated traffic upon the surrounding transport infrastructure and identify any necessary mitigation.

The TTA concludes that the proposed development, in traffic and transportation terms is acceptable, and there are no traffic and transportation reasons that should prevent the Planning Authority from recommending approval of this application.

12.3 Existing Environment

12.3.1 Land Use

The existing site in Rangue, Killorglin, Co. Kerry, currently operates under An Bord Pleanála Ref. PL 08.125729 permitting the use of its aggregate production Factory site and the production of raw aggregates from the adjacent Riordan's site.

Existing Roads Network

The nature of the surrounding area is greenfield with some intermittent dwellings. The lands are located adjacent to the L-4021 and L-7504 local roads which run east-west between Killorglin and Caragh Village, and north-south from the L-4021 to the N70 national secondary road, respectively.

The site is accessed via two entrances; one "non-HGV" entrance from the L-4021, and one HGV entrance from the L-7504.

Fig 12.3.1: Existing site entrance locations

Discussions with the Local Authority resulted in the identification of the following four junctions as critical and to be included in this traffic analysis.

Junction 1: T-junction between the L-7504 & L-11733 local roads.

The L-7504 provides a vehicular access for the surrounding residential areas to the N70 national secondary road. The measured two-way AADT (Annual Average Daily Traffic) at the T-junction is 700 vehicles.

Image 12.3.1: Image of L-7504/L-11733 T-junction

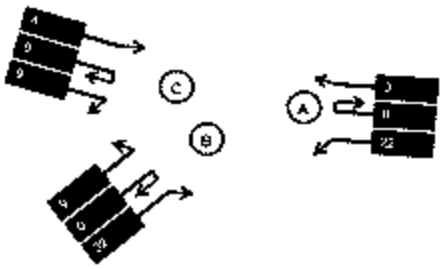


Fig 12.3.2. L-7504/L-11733 T-junction – AM Peak Hour Flows

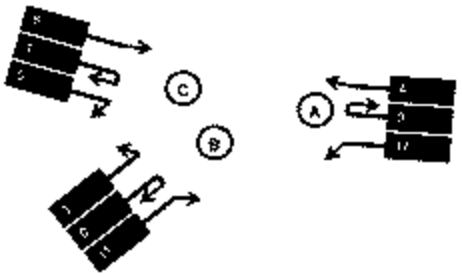


Fig 12.3.3: L-7504/L-11733 T-junction – PM Peak Hour Flows

Junction 2: T-junction between the L-7504 local road and N70 national secondary road.

This T-junction to the north of the site provides access for local traffic to the national road network. The measured two-way AADT (Annual Average Daily Traffic) at the T-junction is 9,180 vehicles.

Image 12.3.2: Image of L-7504/N-70 T-junction

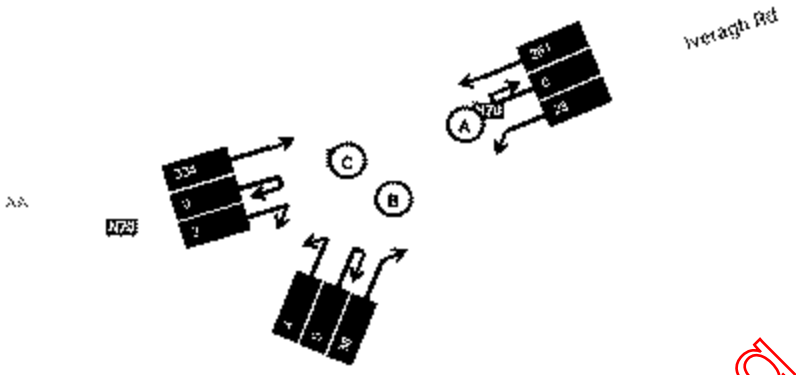


Fig 12.3.4: L-7504/N-70 T-junction – AM Peak Hour Flows

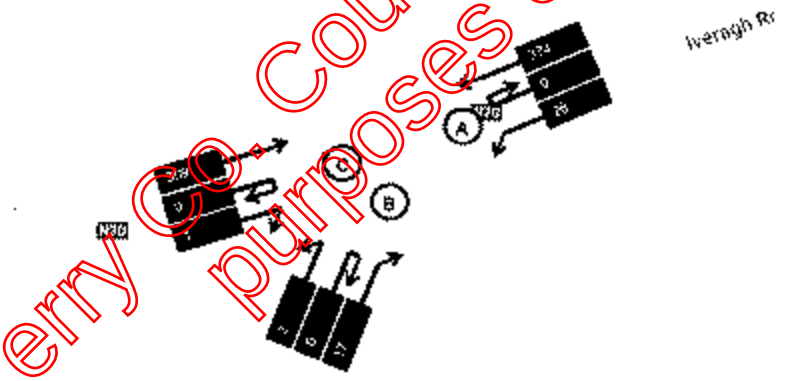


Fig 12.3.5: L-7504/N-70 T-junction – PM Peak Hour Flows

Junction 3: T-junction between the L-7504 and L-4021 local roads.

This T-junction is located to the south of the site HGV entrance and west of the "non-HGV" entrance. The L-4021 serves as a primary vehicular route between Killorglin and Caragh Village with the L-7504 offering a through road for local traffic towards the N-70 national secondary road. The measured two-way AADT (Annual Average Daily Traffic) at the T-junction is 1,865 vehicles.

Image 12.3 3: Image of L-7504/L-4021 T-junction (facing west)

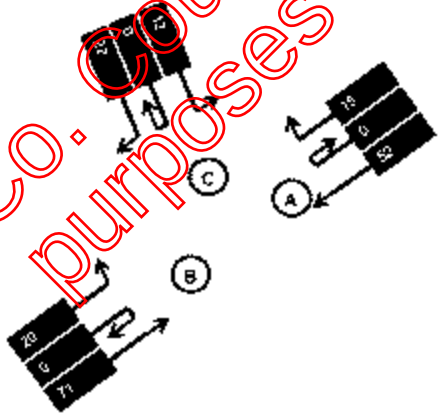


Fig 12.3.6: L-7504/L-4021 T-junction – AM Peak Hour Flows

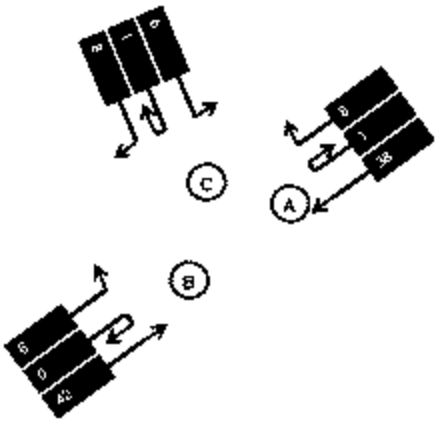


Fig 12.3.7: L-7504/L-4021 T-junction – PM Peak Hour Flows

Junction 4: Four-way intersection between the L-4021 and L-7505 local roads.

This T-junction located to the east of the site entrance serves as a part of the primary vehicular access towards Killorglin. The measured two-way AADT (Annual Average Daily Traffic) at the T-junction is 4,930 vehicles.

Image 12.3 4. Image of L 4021/L 7505 Four way intersection (heading toward site)

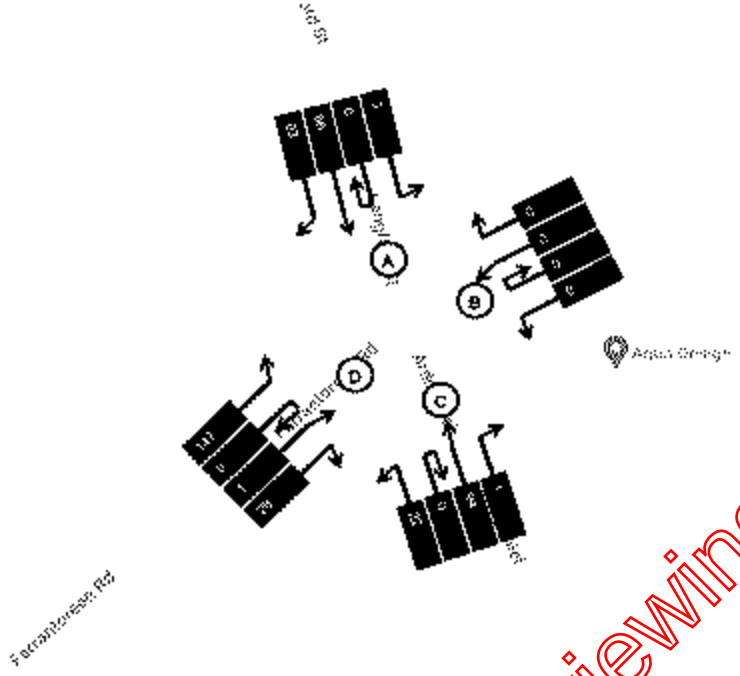


Fig 12.3.8: L-4021/L-7505 Four-way intersection – AM Peak Hour Flows

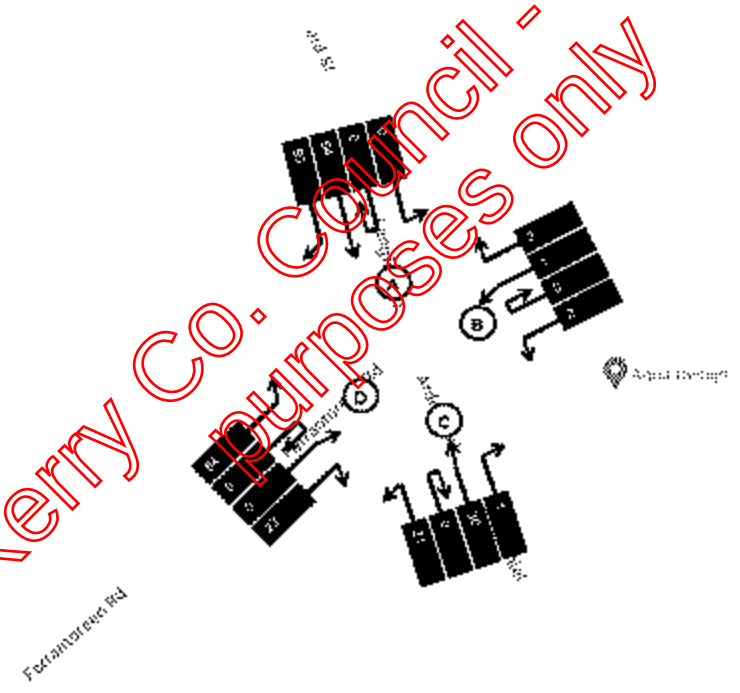


Fig 12.3.9: L-4021/L-7505 Four-way intersection – PM Peak Hour Flows

12.3.2 Existing Traffic Conditions

As part of the pre-application process the extent of data collection and the critical links and junctions were discussed with the Local Authority.

A variety of different data sources have been used, including:

- 12-hour classified turning counts (4 sites, refer Figure 12.3.7).
- Background OS Mapping and aerial photography.

- On-site junction measurements including saturation flows, link speeds, and geometric data for each of the modelled junctions.

Turning count surveys were undertaken at the identified junctions as part of the study on April 21st, 2021 (refer Figure 12.3.7). On-site measurements including lane widths, junction turning radii, lane lengths and saturation flows were undertaken by MHL.

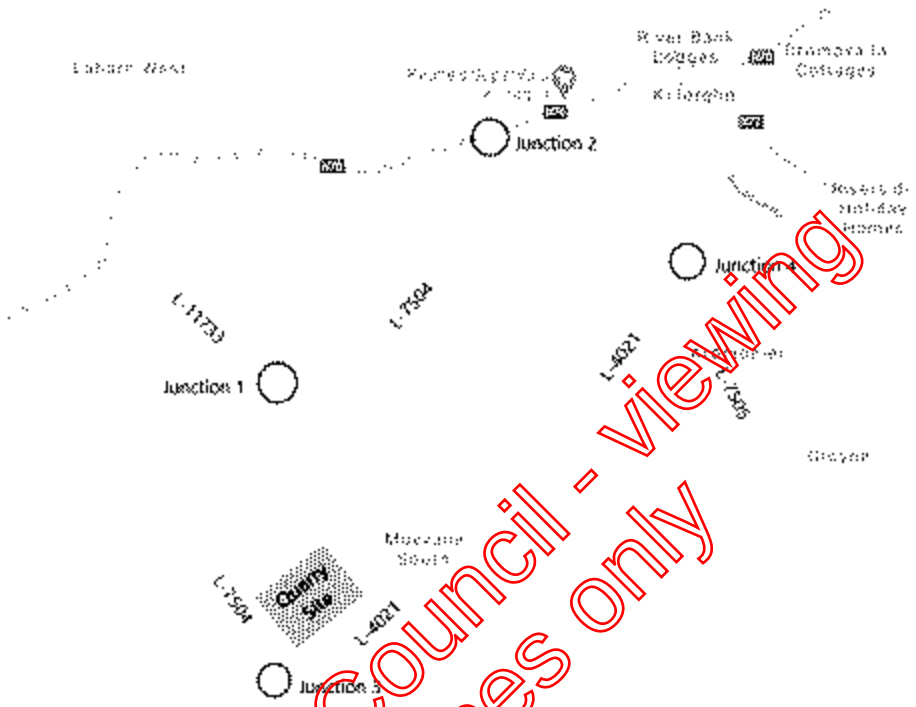


Fig 12.3.10: Traffic Count Survey Locations – Junction sites

The following figures present the recorded 12-hour traffic profile, percentage of classified vehicles and turning movements for each of the modelled junctions carried out April 21st, 2021:

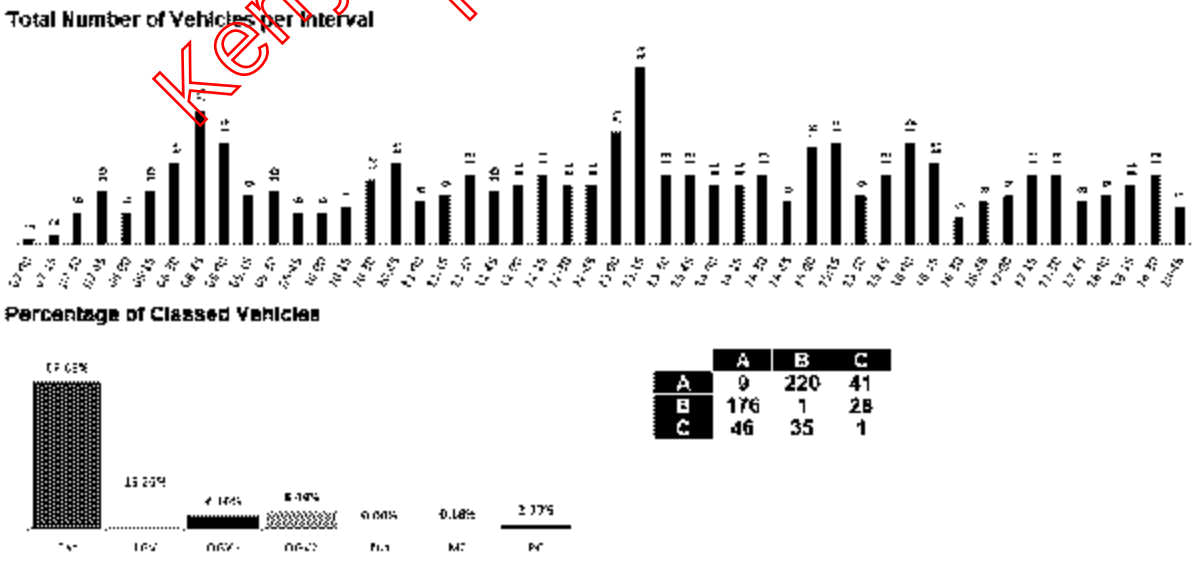


Figure 12.3.11: L-7504/L-11733 T-junction

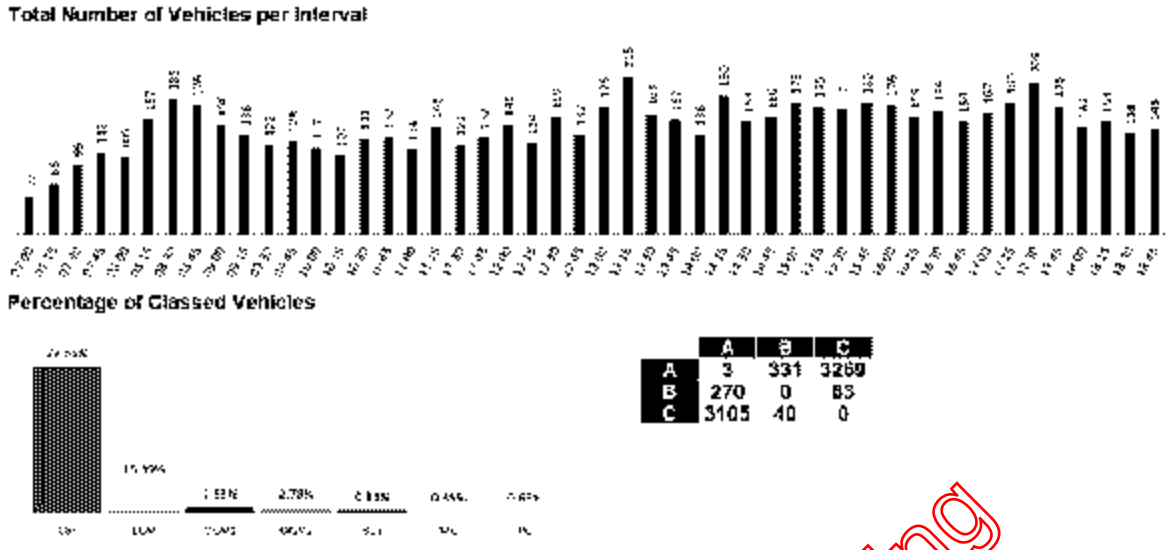


Figure 12.3.12: L-7504/N-70 T-junction

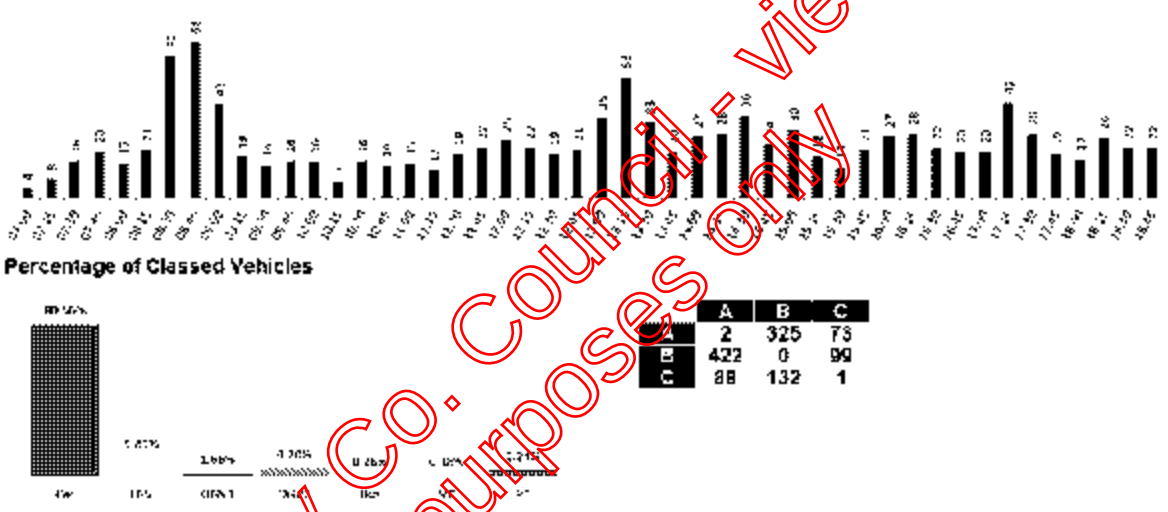


Figure 12.3.13: L-7504/L-4021 T-junction

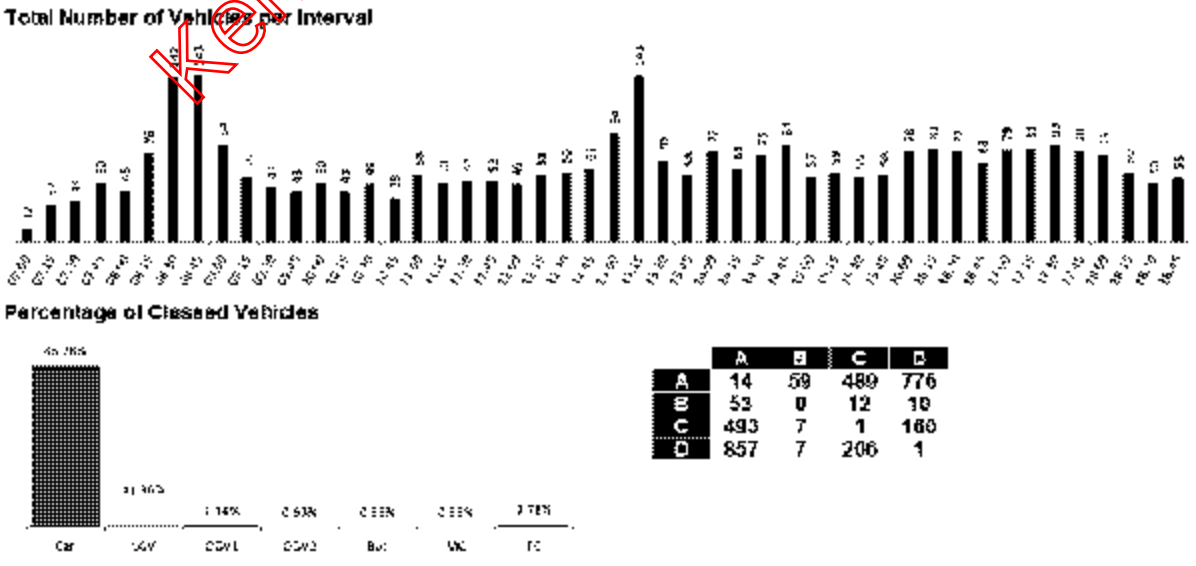


Figure 12.3.14: L-4021/L-7505 junction

The data presented in the above figures shows the respective morning and evening peak hour traffic periods for each junction to be as follows: the L-7504/L-11733 junction to be 08:15 to 09:15 and 16:00 to 17:00; the L-7504/N-70 junction to be 08:15 to 09:15 and 17:00 to 18:00; the L-7504/L-4021 junction to be 08:15 to 09:15 and 16:45 to 17:45; and the L-4021/L-7505 junction to be 08:15 to 09:15 and 17:00 to 18:00. For the purposes of modelling each junction in the network, the respective peak volumes were used. This ensures the worst-case traffic conditions are modelled.

The percentage of classified vehicles was used within the generated traffic models to reflect existing conditions more accurately.

To account for the reduced traffic volumes experienced at the time of the traffic surveys due to Covid-19 travel restrictions, a growth factor was applied to the traffic counts to better represent "normal" traffic volumes. This growth factor was determined by comparing TII Traffic Data volumes from 2019 (pre-covid) to volumes in 2021. The site selected for the comparison study is the TII Traffic Data Site located on the N72 between Killorglin and Killarney. The week during which the new traffic counts were taken (April 19th to April 25th, 2021) was compared the week of April 22nd to April 28th, 2019. It was found that traffic volumes in 2021 were 76.88% of the volumes measured in 2019.

12.3.3 RSA Collision Data

From accessing Ireland's road collisions database produced from the Road Safety Authority, included as shown in Figure 12.3.12**Error! Reference source not found.**, it can be seen that there have been a n umber of road traffic incidents in the greater area of the proposed development from 2005 to 2016.

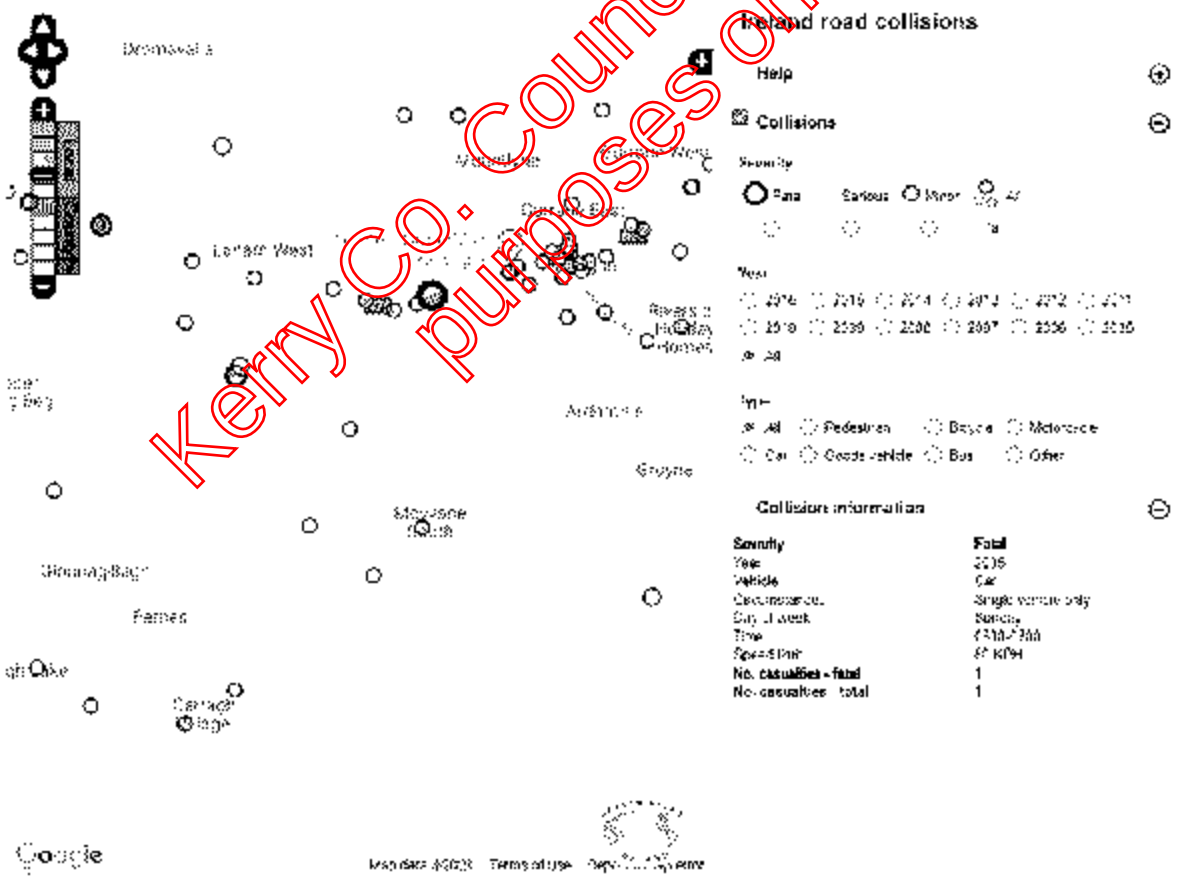


Fig 12.3.15: RSA Collisions Database for surrounding area

One fatal incident involving a single vehicle only occurred on the N-70 in 2005 at a location approximately 310m to the west of the N-70/L-7504 junction. Two incidents (one fatal and one

serious) occurred on the N-70 at a location just west of the N-70/L-11733 junction in 2008 and 2006, respectively. The 2008 incident notes a head-on conflict involving a goods vehicle with the 2006 incident involving a single vehicle only.

One minor incident involving a car occurred in 2013 at the "non-HGV" entrance to the existing site on L-4021. Another minor incident involving a car in a head-on conflict occurred in 2006 at the L-7504/L-11733 junction. A number of other minor incidents can be seen to have occurred in the surrounding road network during the selected time span.

12.4 Proposed Development

12.4.1 Description of Proposed Development

Michael F Quirke & Sons intend to apply to Kerry County Council for a 20-year permission to continue the use of its existing Aggregate Production Factory site in Rangue, Killorglin, and to begin the extraction of aggregate in the contiguous Knocknaboola lands (approx. 16.75 hectares). Included in this application is the construction of a new underpass under L-4021 for the transport of aggregate from the Knocknaboola lands to the Aggregate Production Factory.

The following Figure 12.4.1 presents the scheme layout, the subject of this application.

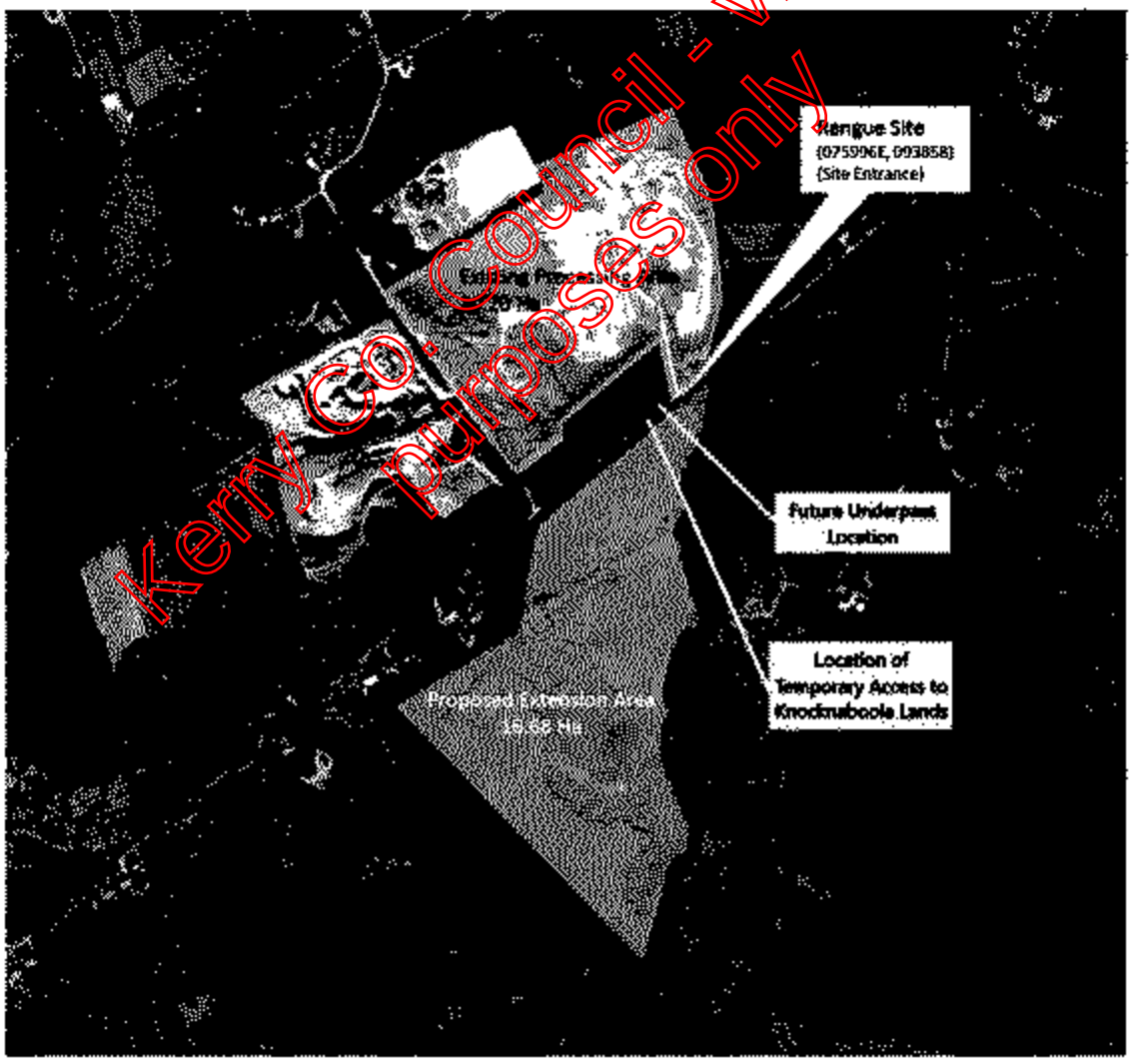


Fig 12.4.1: Proposed Site Layout

The existing HGV entrance access to the Factory site is from the L-7504 and is proposed to remain as the access for the proposed operation upon completion of the proposed underpass. A temporary access road to the Knocknaboola lands from the L-4021 is proposed while construction of the underpass is underway. The temporary access road is proposed to be operational from 2023 to 2025. The "non-HGV" entrance to the Factory site is from the L-4021 and will remain operational throughout the proposed works. No HGV traffic is permitted to use the "non-HGV" entrance at any time.

12.4.2 Phasing of Proposed Scheme

The proposed scheme is seeking permission for a 20-year permission starting in 2022 with the following notes relevant to traffic generation.

- 2023 to 2025 – Construction of the underpass under L-4021 from Knocknaboola lands to Factory site. Temporary access road to Knocknaboola lands off L-4021 in operation.
- 2026 to 2042 – Underpass in operation for transport of aggregate from Knocknaboola to Factory site. Existing HGV access from L-7504 operating as lone HGV access to site.

The Traffic Impact Assessment is carried out for the following time periods: Current Year 2021, Design Year 2023 (Temporary access road in operation), Design Year 2026 (full development), Design Year 2031 (full dev. +5 years), and the Design Year 2041 (full dev. +15 years).

12.5 Predicted Impacts

The proposed development will impact on the surrounding roads network during operation. As previously outlined the primary HGV access to the site is the existing entrance from the L-7504, with a separate "non-HGV" entrance accessing the site from the L-4021. A temporary access to the contiguous Knocknaboola lands from the L-4021 will be in operation from 2023 to 2025.

The inclusion of both existing entrance junctions and the proposed temporary Knocknaboola access in the detailed analysis will be carried out using operational phase traffic generation.

12.5.1 Do Nothing Scenario

The local roads network has been assessed for the Do-Nothing Scenario and is presented as the 'without dev' results for the modelled junctions. The results tables generated by the Junctions 9 Picady traffic modelling package have been constructed to make it easy to make a direct comparison between the with/without scenarios for each of the years and peak periods, refer to Section 12.5.2.6 Network Modelling Results.

12.5.2 Operational Stage Traffic Impact

In order to assess the impact of the proposed development on the identified study area, the key junctions have been assessed both with/without development traffic for both AM and PM peak hours. As the development will be delivered in phases results are presented for the current year 2021, Design Year 2023 when the temporary access to Knocknaboola lands is in operation, Design Year 2026 when the full development is in operation, 5 years after the full operation start 2031, and 15 years after the full operation start 2041.

The traffic data recorded shows the respective morning and evening peak hour traffic periods for the L-7504/L-11733 junction to be 08:15 to 09:15 and 16:00 to 17:00; the L-7504/N-70 junction to be 08:15 to 09:15 and 17:00 to 18:00; the L-7504/L-4021 junction to be 08:15 to 09:15 and 16:45 to 17:45; and the L-4021/L-7505 junction to be 08:15 to 09:15 and 17:00 to 18:00. Ref Figures 12.3.11 to 12.3.14.

Traffic Forecasting

The TII Guidelines have been followed when forecasting growth rates for background traffic for the area. Recorded background traffic was factored using TII (Transport Infrastructure Ireland) Project Appraisal Guidelines (PE-PAG-02017) for use in future year scenarios. The following table presents the factors used on recorded PCU's based on Link Based Growth Rates (Central Growth) for County Kerry.

Table 12.5.1, Background Traffic Growth Rates Per Annum

			Cars/LGV	HGV	Combined
Count %			93%	7%	100%
2021	to	2023	1.022	1.058	1.025
2021	to	2026	1.057	1.151	1.063
2021	to	2031	1.106	1.299	1.119
2021	to	2041	1.116	1.421	1.137

TII Project Appraisal Guidelines for National Roads Unit 5.3
Travel Demand Projections (PE-PAG-02017-02)

Traffic Generation

This section describes the traffic generation from the development and is based on recorded traffic generation from the existing site. To determine the existing traffic generation of the works, the traffic entering & exiting the site at each entrance was tallied for a typical day of operation (21st April 2021).

Table 12.5.2 Traffic Generation from existing site (April 2021 Count)

HGV Entrance	Hour	Count	Movements
AM Peak	09:00-10:00	7	14
PM Peak	15:30 - 16:30	10	20

Non-HGV Entrance	Hour	Count	Movements
AM Peak	08:00-09:00	3	6
PM Peak	17:00-18:00	1	2

Modal Shift

This section describes the current level of modal shift (the use of sustainable modes of travel) based on available data and compares these to national targets.

The 2016 Census online SAP data was used to assess current modal shift patterns in the Killorglin area. 19% of people in this area said they were commuting on foot, bike or using public transport.

Table 12.5.3: 2016 Modal Shift by means of travel to work, school, or college. (Electoral Division of Killorglin)

Population aged 5 years and over by means of travel to work, school or college

On foot	203	127	330
Bicycle	93	4	97
Bus, minibus or coach	59	133	192
Train, DART or LUAS	4	2	6
Motorcycle or scooter	4	0	4
Car driver	1,319	93	1,412
Car passenger	79	107	186
Van	197	5	202
Other, incl. lorry	37	5	42
Work mainly at or from home	63	4	67
Not stated	56	10	66
Total	2,094	490	2,584

The Killorglin Modal Shift is significantly lower than the national target of 45%. For the purposes of this model, no future increase in modal shift has been applied to the background traffic. This should ensure a conservative analysis of the junctions is carried out.

Trip Generation

This section describes the trip generation from the development and is based on recorded traffic flows from the existing occupied site along with the anticipated usage of the temporary access to the Knocknaboola lands as previously outlined.

The following tables present the operation traffic for future years. No additional traffic is anticipated in future years over what is currently experienced (Table 12.5.4). The below Table 12.5.5 presents the proposed trip generation from the Knocknaboola lands while the temporary access entrance off L-4021 is in operation. This temporary access is proposed to be in operation from 2023 to 2025 until the proposed underpass is completed. This traffic has been added to existing background flows of the model for each junction as applicable. The results are presented in Section 12.5.2.6 of this report.

Table 12.5.4, Proposed Development Traffic (2021 Existing Site HGV Entrance)

2021

Existing Quarry - HGV Entrance	AM PEAK		PM PEAK	
	Arrivals	Departures	Arrivals	Departures
Existing Quarry Trip Generation - based on traffic counts				
Peak Trips (converted to pcu)	16	16	23	23
Total Peak Trips (pcu)	32		46	

Table 12.5.5, Proposed Development Traffic (2023 Temporary Access to Knocknaboola lands)

2023

Temporary Access to Knocknaboola Lands	AM PEAK		PM PEAK	
	Arrivals	Departures	Arrivals	Departures
Knocknaboola Trip Generation - based on projected counts				
Peak Trips (converted to pcu)	6	6	9	9
Total Peak Trips (pcu)	12		18	

Trip Distribution

Traffic flow matrices have been developed for each junction for the following scenarios:

- 2021 AM/PM With/Without Dev
- 2023 AM/PM With/Without Dev (Temporary access to Knocknaboola lands operational)
- 2026 AM/PM With/Without Dev (Underpass in operation, temporary access closed)
- 2031 AM/PM With/Without Dev (full operation +5 years)
- 2041 AM/PM With/Without Dev (full operation +15 years)

As previously mentioned in Section 12.3.2, a growth factor was applied to the traffic surveys undertaken to account for reduced traffic volumes experienced during the survey due to Covid-19 related travel restrictions. This growth factor was determined by comparing TII Traffic Data volumes from 2019 (pre-covid) to volumes in 2021. The site selected for the comparison study is the TII Traffic Data Site located on the N72 between Killorglin and Killarney. The week during which the new traffic counts were taken (April 19th to April 25th, 2021) was compared to the week of April 22nd to April 28th, 2019. It was found that traffic volumes in 2021 were 76.88% of the volumes measured in 2019. To account for this in the survey undertaken, a growth factor of 1.30 was applied to the survey results and is included in the matrices presented below. The factored volumes should better represent "normal" traffic volumes as would be typically experienced resulting in a more robust analysis of the traffic network.

Table 12.5 6. Traffic flow matrices for Junction 1 with development traffic

2021 AM

Origin \ Destination	A	B	C	Tot
A	0	30	5	35
B	37	0	10	47
C	5	13	0	18
Total	36	43	21	100

2021 PM

Origin \ Destination	A	B	C	Tot
A	0	25	5	29
B	17	0	4	21
C	8	8	1	17
Total	25	33	10	66

2023 AM

Origin \ Destination	A	B	C	Tot
A	0	32	6	38
B	33	0	7	50
C	6	14	0	19
Total	39	46	21	106

2023 PM

Origin \ Destination	A	B	C	Tot
A	0	25	6	30
B	18	0	4	22
C	8	8	1	18
Total	26	33	11	70

2026 AM

Origin \ Destination	A	B	C	Tot
A	0	31	6	40
B	35	0	18	53
C	6	16	0	21
Total	41	49	24	113

2026 PM

Origin \ Destination	A	B	C	Tot
A	0	26	6	32
B	19	0	4	24
C	9	9	1	19
Total	28	35	12	75

2031 AM

Origin \ Destination	A	B	C	Tot
A	0	35	6	42
B	37	0	19	56
C	6	15	0	22
Total	43	51	25	119

2031 PM

Origin \ Destination	A	B	C	Tot
A	0	28	6	34
B	20	0	5	25
C	9	9	2	20
Total	29	37	12	79

2041 AM

Origin \ Destination	A	B	C	Tot
A	0	36	6	42
B	38	0	19	57
C	6	16	0	22
Total	44	52	25	121

2041 PM

Origin \ Destination	A	B	C	Tot
A	0	29	6	35
B	20	0	5	25
C	9	9	2	20
Total	30	38	13	80

Table 12.5.7: Traffic flow matrices for Junction 1 without development traffic

2023 AM

Origin \ Destination	A	B	C	Tot
A	0	36	8	31
B	28	0	14	42
C	6	12	0	17
Total	34	38	19	90

2023 PM

Origin \ Destination	A	B	C	Tot
A	0	16	5	21
B	8	0	2	10
C	8	6	0	14
Total	16	21	8	45

2026 AM

Origin \ Destination	A	B	C	Tot
A	0	28	6	34
B	30	0	15	45
C	6	13	0	19
Total	36	41	21	97

2026 PM

Origin \ Destination	A	B	C	Tot
A	0	17	6	23
B	9	0	2	12
C	9	6	0	15
Total	18	23	8	49

2031 AM

Origin \ Destination	A	B	C	Tot
A	0	30	6	36
B	32	0	16	48
C	6	13	0	20
Total	38	43	22	103

2031 PM

Origin \ Destination	A	B	C	Tot
A	0	19	6	25
B	10	0	3	13
C	9	6	0	16
Total	19	25	9	53

2041 AM

Origin \ Destination	A	B	C	Tot
A	0	30	6	36
B	33	0	16	49
C	6	14	0	20
Total	39	44	22	105

2041 PM

Origin \ Destination	A	B	C	Tot
A	0	19	6	26
B	10	0	3	13
C	9	6	0	16
Total	20	26	9	55

Table 12.5.8: Traffic flow matrices for Junction 1 with development traffic

2021 AM

Origin \ Destination	A	B	C	Tot
A	0	30	367	403
B	49	0	5	55
C	455	4	0	459
Total	504	40	372	917

2021 PM

Origin \ Destination	A	B	C	Tot
A	0	36	498	534
B	22	0	3	25
C	406	1	0	407
Total	428	38	501	966

2023 AM

Origin \ Destination	A	B	C	Tot
A	0	39	390	429
B	53	0	6	58
C	494	4	0	498
Total	536	43	396	975

2023 PM

Origin \ Destination	A	B	C	Tot
A	0	38	529	566
B	23	0	3	26
C	431	1	0	433
Total	455	40	532	1027

2026 AM

Origin \ Destination	A	B	C	Tot
A	0	41	415	456
B	56	0	6	62
C	514	4	0	519
Total	570	46	420	1036

2026 PM

Origin \ Destination	A	B	C	Tot
A	0	41	563	604
B	25	0	3	28
C	456	1	0	460
Total	481	43	566	1092

2031 AM

Origin \ Destination	A	B	C	Tot
A	0	43	436	480
B	59	0	6	65
C	541	5	0	546
Total	600	48	442	1091

2031 PM

Origin \ Destination	A	B	C	Tot
A	0	43	592	636
B	25	0	3	29
C	480	3	0	484
Total	505	45	596	1149

2041 AM

Origin \ Destination	A	B	C	Tot
A	0	44	443	487
B	60	0	6	66
C	550	6	0	556
Total	610	40	449	1108

PM

Origin \ Destination	A	B	C	Tot
A	0	44	602	646
B	27	0	3	30
C	490	2	0	492
Total	517	46	605	1168

Table 12.5.9: Traffic flow matrices for junction 2 without development traffic

2023 AM

Origin \ Destination	A	B	C	Tot
A	0	34	390	424
B	49	0	5	53
C	484	3	0	487
Total	532	37	394	964

PM

Origin \ Destination	A	B	C	Tot
A	0	30	529	559
B	14	0	2	16
C	431	1	0	433
Total	446	31	531	1008

2026 AM

Origin \ Destination	A	B	C	Tot
A	0	38	413	451
B	52	0	5	57
C	514	3	0	518
Total	566	40	419	1025

PM

Origin \ Destination	A	B	C	Tot
A	0	32	563	595
B	16	0	2	18
C	459	1	0	460
Total	475	34	565	1073

2031 AM

Origin \ Destination	A	B	C	Tot
A	0	38	436	475
B	55	0	5	60
C	541	4	0	545
Total	596	42	441	1080

PM

Origin \ Destination	A	B	C	Tot
A	0	34	592	626
B	17	0	2	19
C	493	2	0	495
Total	509	36	595	1140

2041 AM

Origin \ Destination	A	B	C	Tot
A	0	39	443	482
B	56	0	5	61
C	550	4	0	554
Total	606	43	448	1097

PM

Origin \ Destination	A	B	C	Tot
A	0	35	602	637
B	18	0	2	20
C	474	2	0	492
Total	526	37	604	1149

Table 12.5.10: Traffic flow matrices for junction 2 with development traffic

2021 AM

Origin \ Destination	A	B	C	Tot
A	3	54	31	88
B	95	0	30	125
C	13	29	1	44
Total	111	90	61	257

PM

Origin \ Destination	A	B	C	Tot
A	3	47	10	60
B	52	0	7	59
C	8	9	1	18
Total	62	56	18	137

2023 AM

Origin \ Destination	A	B	C	Tot
A	3	47	33	84
B	101	0	32	133
C	17	30	3	47
Total	117	102	54	274

PM

Origin \ Destination	A	B	C	Tot
A	3	50	11	64
B	55	0	7	62
C	8	10	1	19
Total	66	59	19	145

2026 AM

Origin \ Destination	A	B	C	Tot
A	3	76	24	103
B	107	0	34	141
C	15	32	3	50
Total	125	109	57	291

PM

Origin \ Destination	A	B	C	Tot
A	3	53	12	68
B	59	0	7	66
C	9	10	1	21
Total	71	63	21	154

2031 AM

Origin	Destination A	B	C	Tot
A	0	83	25	105
B	113	0	36	149
C	19	34	0	53
Total	131	114	60	305

2031 PM

Origin	Destination A	B	C	Tot
A	3	58	10	71
B	62	0	8	70
C	9	11	2	22
Total	74	67	22	162

2041 AM

Origin	Destination A	B	C	Tot
A	0	83	25	107
B	113	0	38	151
C	19	35	0	53
Total	134	118	61	311

2041 PM

Origin	Destination A	B	C	Tot
A	3	57	12	72
B	63	0	8	71
C	9	11	2	22
Total	75	68	22	165

Table 12.5.11. Traffic flow matrices for junction 3 with development traffic incl. HGV movements between temporary access to Knockanbaola lands and Factory site

Table 12.5.12. Traffic flow matrices for junction 3 with development traffic

2023 AM

Origin	Destination A	B	C	Tot
A	0	72	28	100
B	101	0	32	133
C	20	30	0	50
Total	120	102	60	283

2023 PM

Origin	Destination A	B	C	Tot
A	0	50	30	80
B	55	0	7	62
C	13	10	1	24
Total	68	60	38	166

2026 AM

Origin	Destination A	B	C	Tot
A	0	76	21	97
B	107	0	29	136
C	15	27	0	42
Total	122	104	49	275

2026 PM

Origin	Destination A	B	C	Tot
A	3	53	5	61
B	59	0	3	62
C	4	4	1	10
Total	66	57	10	133

2031 AM

Origin	Destination A	B	C	Tot
A	0	80	22	102
B	113	0	31	144
C	15	29	0	45
Total	128	109	52	290

2031 PM

Origin	Destination A	B	C	Tot
A	3	58	5	64
B	62	0	4	66
C	4	5	2	11
Total	69	61	11	140

2041 AM

Origin	Destination A	B	C	Tot
A	0	82	22	104
B	115	0	31	146
C	15	30	0	45
Total	131	111	53	295

2041 PM

Origin	Destination A	B	C	Tot
A	3	57	6	65
B	63	0	4	67
C	4	5	2	11
Total	70	62	11	143

Table 12.5.13. Traffic flow matrices for junction 4 with development traffic

2021 *AM*

Origin \ Destination	A	B	C	D	Tot
A	0	4	88	107	199
B	0	0	0	0	0
C	124	1	0	30	155
D	192	1	38	0	231
Total	316	7	126	137	585

PM

Origin \ Destination	A	B	C	D	Tot
A	0	0	82	118	200
B	3	0	3	1	7
C	39	1	0	29	69
D	108	0	27	0	135
Total	150	1	112	148	411

2023 *AM*

Origin \ Destination	A	B	C	D	Tot
A	0	7	112	116	236
B	0	0	0	0	0
C	133	1	0	31	165
D	201	1	39	0	241
Total	334	10	151	147	642

PM

Origin \ Destination	A	B	C	D	Tot
A	0	2	94	125	221
B	5	0	3	1	9
C	52	1	0	30	83
D	117	0	28	0	145
Total	174	3	125	156	458

2026 *AM*

Origin \ Destination	A	B	C	D	Tot
A	0	7	116	120	243
B	0	0	0	0	0
C	137	1	0	32	171
D	208	1	40	0	250
Total	345	10	156	152	663

PM

Origin \ Destination	A	B	C	D	Tot
A	0	2	97	130	229
B	5	0	3	1	9
C	54	1	0	31	86
D	120	0	29	0	150
Total	179	3	129	162	473

2031 *AM*

Origin \ Destination	A	B	C	D	Tot
A	0	8	124	130	262
B	0	0	0	0	0
C	149	2	0	35	185
D	226	2	44	0	272
Total	375	11	168	165	719

PM

Origin \ Destination	A	B	C	D	Tot
A	[illegible]	2	104	[illegible]	247
B	5	0	3	2	10
C	[illegible]	2	[illegible]	33	92
D	[illegible]	[illegible]	32	0	163
Total	193	[illegible]	139	176	512

2041 *AM*

Origin \ Destination	A	B	C	D	Tot
A	0	8	133	141	283
B	0	0	0	0	0
C	162	2	0	38	202
D	246	2	48	0	296
Total	408	11	[illegible]	179	[illegible]

PM

Origin \ Destination	A	B	C	D	Tot
A	0	2	113	153	268
B	5	0	3	2	10
C	62	2	0	36	100
D	142	0	35	0	177
Total	209	4	151	191	555

Table 12.5.14. Traffic flow matrices for junction 4 without development traffic

2031 *AM*

Origin \ Destination	A	B	C	D	Tot
A	0	5	[illegible]	[illegible]	[illegible]
B	0	0	0	0	0
C	119	2	0	34	154
D	223	2	44	0	269
Total	372	11	168	162	713

PM

Origin \ Destination	A	B	C	D	Tot
A	[illegible]	2	104	[illegible]	241
B	5	0	3	2	10
C	57	2	0	32	91
D	[illegible]	0	31	0	158
Total	189	4	138	169	500

2041 *AM*

Origin \ Destination	A	B	C	D	Tot
A	0	5	[illegible]	139	281
B	0	0	0	0	0
C	102	2	0	37	201
D	243	2	48	0	293
Total	405	11	181	178	[illegible]

PM

Origin \ Destination	A	B	C	D	Tot
A	[illegible]	2	113	[illegible]	202
B	5	0	3	2	10
C	62	2	0	35	99
D	[illegible]	0	34	0	172
Total	205	4	150	184	543

Network Modelling Results

This section presents the results of the traffic modelling at each junction presented both with/without development in place for the current year 2021, Design Year 2023 when the temporary access to Knocknaboola lands is in operation, Design Year 2026 when the full development is in operation, 5 years after the full operation start 2031, and 15 years after the full operation start 2041.The Junctions 9: PICADY software package is used to analyse each junction. **PICADY (Priority Junction CApacity and DelaY) is a computer software program dealing with capacities, queue lengths and delays at priority controlled 'T' junctions.**

The Junctions 9: PICADY modelling software produces an RFC % (Ratio of Flow to Capacity), a Delay figure measured in seconds and a LOS (Level of Service) which are used to compare the effects the development will have on the junction being modelled. An RFC of 85% on a T- junction implies that the junction has reached capacity but is still operational with delay incurred. The following table describes the different LOS and the implications for the junction being assessed.

Table 12.5.15 Level of Service

Level of Service A	Free-Flow
Level of Service B	Reasonably Free-Flow (no delay incurred)
Level of Service C	Stable Operation (busy but operational with acceptable delay incurred)
Level of Service D	Borderline Unstable (Junctions reaching capacity – but still operational-delay incurred)
Level of Service E	Extremely Unstable (Junctions at capacity or over, any incident will cause a grid-lock situation - significant delay incurred)
Level of Service F	Breakdown (Junctions over capacity – unacceptable delay traffic at a standstill)

The PICADY results for the selected junctions both with/without development are presented in Table 12.5.16 below.

Table 12.5.16: Junctions 9: PICADY Traffic Modelling Results

	AM						PM					
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
Junction 1: L-7504/L-11733 - 2021												
Stream B-AC	D1	0.1	7.61	0.10	A	621 %	D2	0.0	7.44	0.05	A	900 %
Stream C-AB		0.0	6.14	0.02	A	(Stream B-AC)		0.0	6.05	0.01	A	[]
Junction 1: L-7504/L-11733 - 2023 Without Development												
Stream B-AC	D3	0.1	7.53	0.09	A	696 %	D4	0.0	7.22	0.02	A	900 %
Stream C-AB		0.0	6.12	0.02	A	(Stream B-AC)		0.0	6.00	0.01	A	[]
Junction 1: L-7504/L-11733 - 2023 With Development												
Stream B-AC	D5	0.1	7.68	0.11	A	574 %	D6	0.1	7.48	0.05	A	900 %
Stream C-AB		0.0	6.16	0.03	A	(Stream B-AC)		0.0	6.05	0.01	A	[]
Junction 1: L-7504/L-11733 - 2026 Without Development												
Stream B-AC	D7	0.1	7.59	0.09	A	644 %	D8	0.0	7.28	0.02	A	900 %
Stream C-AB		0.0	6.13	0.02	A	(Stream B-AC)		0.0	6.00	0.01	A	[]
Junction 1: L-7504/L-11733 - 2026 With Development												
Stream B-AC	D9	0.1	7.74	0.11	A	537 %	D10	0.1	7.53	0.05	A	900 %
Stream C-AB		0.0	6.17	0.03	A	(Stream B-AC)		0.0	6.06	0.02	A	[]
Junction 1: L-7504/L-11733 - 2031 Without Development												
Stream B-AC	D11	0.1	7.65	0.10	A	602 %	D12	0.0	7.22	0.03	A	900 %
Stream C-AB		0.0	6.14	0.02	A	(Stream B-AC)		0.0	6.01	0.01	A	[]
Junction 1: L-7504/L-11733 - 2031 With Development												
Stream B-AC	D13	0.1	7.80	0.12	A	506 %	D14	0.1	7.31	0.05	A	900 %
Stream C-AB		0.0	6.18	0.03	A	(Stream B-AC)		0.0	6.06	0.02	A	[]
Junction 1: L-7504/L-11733 - 2041 Without Development												
Stream B-AC	D15	0.1	7.69	0.10	A	580 %	D16	0.0	7.22	0.03	A	900 %
Stream C-AB		0.0	6.15	0.03	A	(Stream B-AC)		0.0	6.01	0.01	A	[]
Junction 1: L-7504/L-11733 - 2041 With Development												
Stream B-AC	D17	0.1	7.84	0.12	A	493 %	D18	0.1	7.51	0.05	A	900 %
Stream C-AB		0.0	6.19	0.03	A	(Stream B-AC)		0.0	6.06	0.02	A	[]

	AM						PM					
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
Junction 2: L7504/N70 - 2021												
Stream B-AC	D1	0.2	12.28	0.17	B	83 %	D2	0.1	11.85	0.08	B	90 %
Stream C-AB		0.0	4.22	0.01	A	[Stream B-AC]		0.0	4.44	0.00	A	[Stream B-AC]
Junction 2: L7504/N70 - 2023 Without Development												
Stream B-AC	D3	0.2	12.71	0.17	B	76 %	D4	0.1	11.88	0.08	B	88 %
Stream C-AB		0.0	4.17	0.01	A	[Stream B-AC]		0.0	4.40	0.00	A	[Stream B-AC]
Junction 2: L7504/N70 - 2023 With Development												
Stream B-AC	D5	0.2	12.94	0.19	B	71 %	D6	0.1	12.42	0.09	B	79 %
Stream C-AB		0.0	4.17	0.01	A	[Stream B-AC]		0.0	4.41	0.00	A	[Stream B-AC]
Junction 2: L7504/N70 - 2026 Without Development												
Stream B-AC	D7	0.2	13.43	0.19	B	65 %	D8	0.1	12.60	0.06	B	76 %
Stream C-AB		0.0	4.12	0.01	A	[Stream B-AC]		0.0	4.36	0.00	A	[Stream B-AC]
Junction 2: L7504/N70 - 2026 With Development												
Stream B-AC	D9	0.3	13.69	0.21	B	62 %	D10	0.1	13.18	0.10	B	67 %
Stream C-AB		0.0	4.13	0.01	A	[Stream B-AC]		0.0	4.36	0.00	A	[Stream B-AC]
Junction 2: L7504/N70 - 2031 Without Development												
Stream B-AC	D11	0.3	14.18	0.21	B	57 %	D12	0.1	13.24	0.07	B	66 %
Stream C-AB		0.0	4.08	0.01	A	[Stream B-AC]		0.0	4.33	0.01	A	[Stream B-AC]
Junction 2: L7504/N70 - 2031 With Development												
Stream B-AC	D13	0.3	14.47	0.22	B	53 %	D14	0.1	13.86	0.11	B	59 %
Stream C-AB		0.0	4.09	0.01	A	[Stream B-AC]		0.0	4.33	0.01	A	[Stream B-AC]
Junction 2: L7504/N70 - 2041 Without Development												
Stream B-AC	D15	0.3	14.44	0.21	B	54 %	D16	0.1	13.52	0.08	B	63 %
Stream C-AB		0.0	4.06	0.01	A	[Stream B-AC]		0.0	4.32	0.01	A	[Stream B-AC]
Junction 2: L7504/N70 - 2041 With Development												
Stream B-AC	D17	0.3	14.75	0.23	B	51 %	D18	0.1	14.15	0.11	B	58 %
Stream C-AB		0.0	4.07	0.01	A	[Stream B-AC]		0.0	4.32	0.01	A	[Stream B-AC]

	AM						PM					
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
Junction 3: L7504/L4021 - 2021												
Stream B-C	D1	0.0	6.75	0.03	A	357 %	D2	0.0	6.38	0.02	A	900 %
Stream B-A		0.1	9.54	0.08	A	[Stream B-A]		0.0	8.45	0.02	A	[]
Stream C-AB		0.0	5.16	0.04	A			0.0	5.01	0.02	A	
Junction 3: L7504/L4021 - 2023 Without Development												
Stream B-C	D3	0.0	6.72	0.03	A	361 %	D4	0.0	6.30	0.01	A	900 %
Stream B-A		0.1	9.26	0.07	A	[Stream B-A]		0.0	8.27	0.01	A	[]
Stream C-AB		0.0	5.13	0.03	A			0.0	4.96	0.01	A	
Junction 3: L7504/L4021 - 2023 With Development												
Stream B-C	D5	0.0	6.79	0.03	A	349 %	D6	0.0	6.39	0.02	A	880 %
Stream B-A		0.1	9.43	0.08	A	[Stream B-A]		0.0	8.46	0.03	A	[Stream B-A]
Stream C-AB		0.0	5.17	0.04	A			0.0	5.01	0.02	A	
Junction 3: L7504/L4021 - 2026 Without Development												
Stream B-C	D7	0.0	6.76	0.03	A	354 %	D8	0.0	6.33	0.01	A	900 %
Stream B-A		0.1	9.39	0.07	A	[Stream B-A]		0.0	8.31	0.01	A	[]
Stream C-AB		0.0	5.14	0.04	A			0.0	4.97	0.01	A	
Junction 3: L7504/L4021 - 2026 With Development												
Stream B-C	D9	0.0	6.84	0.04	A	318 %	D10	0.0	6.42	0.02	A	815 %
Stream B-A		0.1	9.51	0.08	A	[Stream B-A]		0.0	8.40	0.02	A	[Stream B-A]
Stream C-AB		0.0	5.18	0.04	A			0.0	5.01	0.02	A	
Junction 3: L7504/L4021 - 2031 Without Development												
Stream B-C	D11	0.0	6.81	0.03	A	328 %	D12	0.0	6.34	0.01	A	900 %
Stream B-A		0.1	9.51	0.08	A	[Stream B-A]		0.0	8.36	0.01	A	[]
Stream C-AB		0.0	5.16	0.04	A			0.0	4.96	0.01	A	
Junction 3: L7504/L4021 - 2031 With Development												
Stream B-C	D13	0.0	6.89	0.04	A	295 %	D14	0.0	6.42	0.02	A	762 %
Stream B-A		0.1	9.69	0.09	A	[Stream B-A]		0.0	8.56	0.01	A	[Stream B-A]
Stream C-AB		0.1	5.19	0.04	A			0.0	5.01	0.02	A	
Junction 3: L7504/L4021 - 2041 Without Development												
Stream B-C	D15	0.0	6.82	0.03	A	319 %	D16	0.0	6.34	0.01	A	900 %
Stream B-A		0.1	9.56	0.08	A	[Stream B-A]		0.0	8.37	0.01	A	[]
Stream C-AB		0.0	5.15	0.04	A			0.0	4.97	0.01	A	
Junction 3: L7504/L4021 - 2041 With Development												
Stream B-C	D17	0.0	6.90	0.04	A	287 %	D18	0.0	6.44	0.02	A	746 %
Stream B-A		0.1	9.74	0.09	A	[Stream B-A]		0.0	8.56	0.03	A	[Stream B-A]
Stream C-AB		0.1	5.19	0.04	A			0.0	5.01	0.02	A	
Junction 3: L7504/L4021 - 2023 Without Development With HGVs												
Stream B-C	D19	0.0	6.83	0.04	A	703 %	D20	0.0	6.46	0.03	A	782 %
Stream B-A		0.1	9.49	0.08	A	[Stream B-A]		0.0	8.53	0.03	A	[Stream B-A]
Stream C-AB		0.1	5.22	0.05	A			0.0	5.06	0.03	A	
Junction 3: L7504/L4021 - 2023 With Development With HGVs												
Stream B-C	D21	0.0	6.79	0.03	A	345 %	D22	0.0	6.39	0.02	A	860 %
Stream B-A		0.1	9.43	0.08	A	[Stream B-A]		0.0	8.46	0.03	A	[Stream B-A]
Stream C-AB		0.0	5.17	0.04	A			0.0	5.01	0.02	A	

	AM						PM					
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
Junction 4: L4021/L7505 - 2021												
Stream B-ACD	D1	0.0	0.00	0.00	A	100 %	D2	0.0	5.94	0.01	A	233 %
Stream A-BCD		0.3	6.94	0.25	A			0.3	6.79	0.23	A	
Stream D-AB		0.3	9.76	0.36	A	[Stream D-AB]		0.2	7.34	0.20	A	[Stream A-BCD]
Stream D-BC		0.1	5.69	0.10	A			0.1	6.76	0.07	A	
Stream C-ABD		0.0	4.87	0.00	A			0.0	5.22	0.00	A	
Junction 4: L4021/L7505 - 2023 Without Development												
Stream B-ACD	D3	0.0	0.00	0.00	A	93 %	D4	0.0	7.30	0.01	A	209 %
Stream A-BCD		0.3	6.91	0.25	A			0.3	6.77	0.23	A	
Stream D-AB		0.3	10.02	0.38	B	[Stream D-AB]		0.3	7.48	0.21	A	[Stream A-BCD]
Stream D-BC		0.1	5.74	0.11	A			0.1	6.92	0.07	A	
Stream C-ABD		0.0	4.85	0.00	A			0.0	5.18	0.00	A	
Junction 4: L4021/L7505 - 2023 With Development												
Stream B-ACD	D5	0.0	0.00	0.00	A	91 %	D6	0.0	7.40	0.01	A	198 %
Stream A-BCD		0.4	6.87	0.25	A			0.4	6.87	0.24	A	
Stream D-AB		0.3	10.12	0.38	B	[Stream D-AB]		0.3	7.56	0.21	A	[Stream A-BCD]
Stream D-BC		0.1	5.77	0.11	A			0.1	6.99	0.07	A	
Stream C-ABD		0.0	4.85	0.00	A			0.0	5.21	0.00	A	
Junction 4: L4021/L7505 - 2026 Without Development												
Stream B-ACD	D7	0.0	0.00	0.00	A	87 %	D8	0.0	7.41	0.01	A	187 %
Stream A-BCD		0.4	6.89	0.24	A			0.4	6.84	0.24	A	
Stream D-AB		0.3	10.26	0.39	B	[Stream D-AB]		0.3	7.55	0.21	A	[Stream A-BCD]
Stream D-BC		0.1	5.86	0.11	A			0.1	7.01	0.07	A	
Stream C-ABD		0.0	4.85	0.00	A			0.0	5.20	0.00	A	
Junction 4: L4021/L7505 - 2026 With Development												
Stream B-ACD	D9	0.0	0.00	0.00	A	84 %	D10	0.0	7.44	0.01	A	187 %
Stream A-BCD		0.4	6.93	0.24	A			0.4	6.95	0.24	A	
Stream D-AB		0.3	10.35	0.40	B	[Stream D-AB]		0.3	7.61	0.21	A	[Stream A-BCD]
Stream D-BC		0.1	5.88	0.11	A			0.1	7.06	0.07	A	
Stream C-ABD		0.0	4.89	0.00	A			0.0	5.20	0.00	A	
Junction 4: L4021/L7505 - 2031 Without Development												
Stream B-ACD	D11	0.0	0.00	0.00	A	71 %	D12	0.0	7.60	0.02	A	174 %
Stream A-BCD		0.4	7.05	0.25	A			0.4	7.02	0.26	A	
Stream D-AB		0.4	11.14	0.43	B	[Stream D-AB]		0.3	7.76	0.23	A	[Stream A-BCD]
Stream D-BC		0.1	10.24	0.12	B			0.1	7.24	0.08	A	
Stream C-ABD		0.0	4.88	0.00	A			0.0	5.23	0.00	A	
Junction 4: L4021/L7505 - 2031 With Development												
Stream B-ACD	D13	0.0	0.00	0.00	A	69 %	D14	0.0	7.63	0.02	A	168 %
Stream A-BCD		0.4	7.13	0.26	A			0.4	7.13	0.27	A	
Stream D-AB		0.4	11.26	0.44	B	[Stream D-AB]		0.3	7.87	0.24	A	[Stream A-BCD]
Stream D-BC		0.1	10.37	0.13	B			0.1	7.32	0.08	A	
Stream C-ABD		0.0	4.88	0.00	A			0.0	5.25	0.00	A	
Junction 4: L4021/L7505 - 2041 Without Development												
Stream B-ACD	D15	0.0	0.00	0.00	A	67 %	D16	0.0	7.73	0.02	A	152 %
Stream A-BCD		0.5	7.32	0.29	A			0.5	7.32	0.28	A	
Stream D-AB		0.4	11.49	0.48	B	[Stream D-AB]		0.3	8.08	0.25	A	[Stream A-BCD]
Stream D-BC		0.2	10.46	0.14	B			0.1	9.51	0.06	A	
Stream C-ABD		0.0	4.86	0.00	A			0.0	5.26	0.00	A	
Junction 4: L4021/L7505 - 2041 With Development												
Stream B-ACD	D17	0.0	0.00	0.00	A	65 %	D18	0.0	7.78	0.02	A	144 %
Stream A-BCD		0.5	7.37	0.30	A			0.5	7.35	0.30	A	
Stream D-AB		0.4	11.61	0.49	B	[Stream D-AB]		0.4	8.15	0.26	A	[Stream A-BCD]
Stream D-BC		0.2	10.51	0.14	B			0.1	9.60	0.06	A	
Stream C-ABD		0.0	4.86	0.00	A			0.0	5.26	0.00	A	

The current year (2021) results are representative of how each junction currently operates during peak periods. This is borne out in terms of measured queue and observed delay recorded as part of the data collection process. Figures 12.5.1, 12.5.2, 12.5.3, and 12.5.4 is referred to for each individual junction's arm designation when interpreting the results. The constructed model is deemed to be fit for purpose.

Junction 1: T-junction between the L-7504 & L-11733 local roads.

The results indicate that the junction operates within capacity currently and will continue to do so up to and including the design year 2041 with the development in place. The maximum future year RFC (Ratio of Flow to Capacity) is 12% in 2041 AM peak. The Level of Service is A – Free-Flow. The full results are included in the Appendix section of this report.

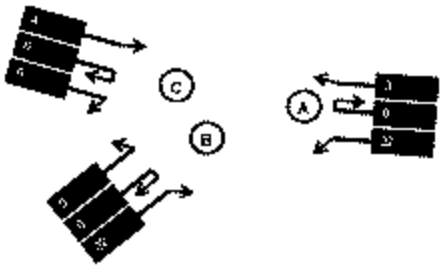


Fig 12.5.1: L-7504/L-13733 T-junction Arm Designation

Junction 2: T-junction between the L-7504 local road and N70 national secondary road.

The results indicate that the junction operates within capacity currently and will continue to do so up to and including the design year 2041 with the development in place. The maximum future year RFC (Ratio of Flow to Capacity) is 23% in 2041 PM peak. The Level of Service is B – Reasonably Free-Flow (no delay incurred). The full results are included in the Appendix section of this report.

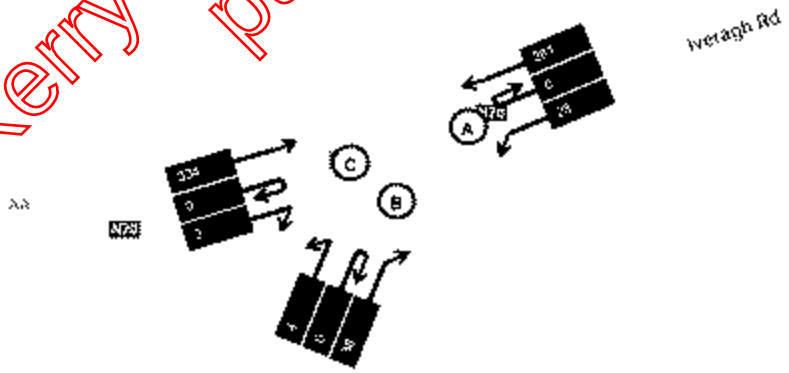


Fig 12.5.2: L-7504/N-70 T-junction Arm Designation

Junction 3: T-junction between the L-7504 and L-4021 local roads.

The results indicate that the junction operates within capacity currently and will continue to do so up to and including the design year 2041 with the development in place. The maximum future year RFC (Ratio of Flow to Capacity) is 8% in 2041 AM peak. The Level of Service is A – Free-Flow. The full results are included in the Appendix section of this report.

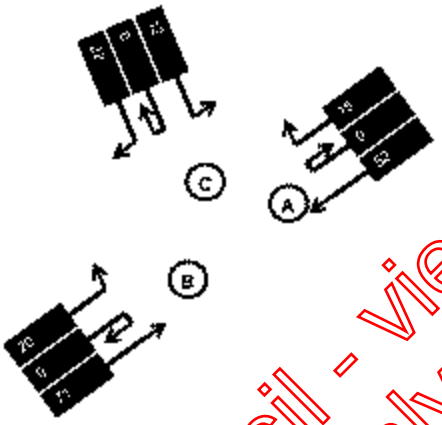


Fig 12.5.3: L-7504/L-4021 T-junction Arm Designation

Junction 4: Four-way intersection between the L-4021 and L-7505 local roads.

The results indicate that the junction operates within capacity currently and will continue to do so up to and including the design year 2041 with the development in place. The maximum future year RFC (Ratio of Flow to Capacity) is 48% in 2041 AM peak. The Level of Service is B – Reasonably Free-Flow (no delay incurred). The full results are included in the Appendix section of this report.

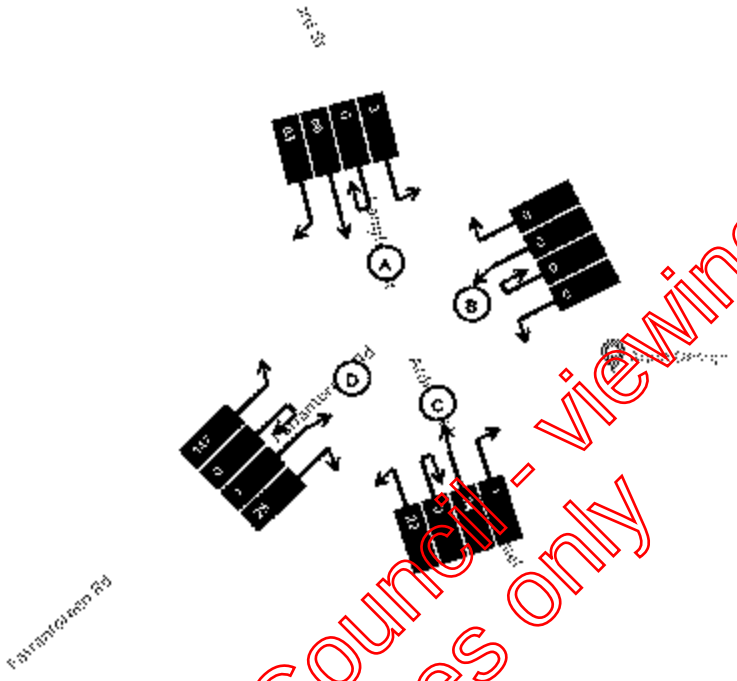


Fig 12.5.4: L-4021/L-7505 Four-way Intersection Arm Designation

12.5.3 Summary of Operational Phase Impacts

A summary of predicted operational phase impacts are presented in Table 12.5.17.

Table 12.5.17: Development Related Impacts

Mode	Cause	Impact
Operation Stage		
Traffic	Development Generated Traffic onto Roads Network	Slight Negative

12.5.4 Risk of Major Accidents and Disasters

The likelihood of an accident occurring involving development traffic is unlikely with HGV access to the site solely from the L-7504 with good visibility in both directions.

12.6 Mitigation Measures

The proposed development will impact on the surrounding roads network during operation. To minimise disruption to the local roads network the following measures are proposed:

12.6.1 Operational Phase Mitigation Measures

In terms of traffic-generation the following measures are proposed.

Mitigation Measure 1

In general, workers will travel to site before the measured AM peak hour of 08:15 – 09:15, to be on location for a 07:00 start-time. A limited number of employees are likely to travel to the site during peak hours. Working hours for the site will continue to be from 07.00 to 18:00, Monday to Saturday, through each phase of the operation. The PM peak period will conflict with that of background traffic.

Mitigation Measure 2

Typically, HGV's carrying material to and from the site will arrive interspersed throughout the day avoiding a clustered arrival. It is anticipated that HGV's will predominantly be restricted to movements on the local road network during off-peak periods.

12.6.2 Cumulative Impacts

Industry standard growth rates have been applied to background traffic for future year assessments (to account for further development within the area). These growth rates make allowance for modal shift targets as set by national policy but do not take account of site-specific measures that may be implemented to mitigate against traffic generation from a particular development.

12.7 Residual Impacts

The following table outlines the residual impacts of the proposed development on the study area.

Table 12.7.1: Residual Impacts

Mode	Cause	Impact	Mitigation	Residual Impact	Impact Rating	Duration of Impact
			Operational Stage			
Traffic	Development Traffic Movements	Slight	Off peak employee arrival [illegible] of imported materials HGVs	Slight	Negative	Medium/long term

Chapter Thirteen – Material Assets and Climate

13.1 Introduction

This Chapter provides an overview of the materials and amenity resources within the vicinity of the development. It details the assets that may be potentially impacted by the extraction of aggregate in the proposed extraction extension site lands and indicates the Chapters that considers these potential impacts.

The development of the subject of this EIAR consists of continuation of use of the Factory/Processing site and an extension for sand and gravel extraction activities. All related ancillary works equate to an area of 35.25 Hectares (including the Rangue/Riordan's Extraction site which ceases in 2022), at Rangue and Knocknaboola, Co Kerry.

This report overall details the direct and indirect significant effects, if any, which each emission factor could pose on the environment, which can reasonably be expected to occur as a result of the proposed development.

The objective of this chapter is therefore to identify and assess the significant effects that can be reasonably expected to ensue in respect of material assets and climate.

13.2 Study Assessment and Methodology

The objective of the assessment of assets is to ensure that they are used in a sustainable manner, in order to preserve these for future generations after the development of the project.

Some examples of potential impacts on material assets to the proposed development include; effects of vibration of surface structure, road damage due to transport and machinery use, loss of or damage to water supply and impacts on geological heritage. This EIAR has been conducted in order to ensure negative direct or indirect impacts to the aforementioned material assets are circumvented.

13.2.1 Competent Expertise

This Chapter was completed by Jessica Boyd, Environmental Consultant OES, who holds a BSc Environmental Management, BSc Geography and Environmental Management and an MSC in Masters: Spatial Planning: Cities, Water & Climate Change. The Climate section was prepared by Mr. Michael Bailey of Envirocon Ltd.

13.3 Description of Development

The development includes the continuation of use and necessary license renewal of existing aggregation production factory at Rangue, concurrent with proposed sand and gravel pit extension at Knocknaboola as a means of replacing Riordan's Extraction site. The factory site occupies an area of 18.5 hectares, none of which is used for the extraction of raw aggregates.

The construction of an underpass is also mandated to facilitate the transportation of aggregates from the Knocknaboola site to the factory site for processing, along with the manufacturing and sale of concrete blocks. Additionally, permission is sought to dry screen and grade raw aggregates for direct

sale to, via the new entrance, from the Knocknaboola site. This new entance is temporary and will be used only for a duration of 12 months while the underpass is under construction. The description of the development is further detailed in Chapter 4 of this EIAR.

13.4 Receiving Environment/Material Assets

13.4.1 Cities, Towns, villages and Settlements

The facility is located circa 2.5km southwest of Killorglin, on the Caragh Lake local Road which links Killorglin with Caragh Village.

Landuse in the vicinity of the site is fundamentally agricultural, with some rural one-off houses and farmyards.

13.4.2 Transport Infrastructure

The traffic assessment conducted discussed in detail in Chapter 12 determined that there would be no perceptible increase in traffic pressure on surrounding transportation infrastructure as a result of the continuation of use of the factory site in conjunction with the extractive extension site.

Mitigation measures will maintain traffic levels and include workers travelling to the site before rush hour. Also, HGV's travelling to the site will arrive interspersed throughout the day to circumvent clustered arrival. Mitigation measures are detailed in more depth in Chapter 12 of this EIAR.

13.4.3 Utilities

The proposed development will not require further development or increase of onsite or public utility infrastructure.

The impact on hydrogeology and hydrology is further detailed in Chapter 6 and 7.

Foul water generated from the site is quite low due to the low number of employees on site and is treated via waste treatment systems.

Electricity is supplied via connection to the electrical grid.

Telecommunication lines are present at the main factory site, providing telephones and internet access.

13.4.4 Ownership and Access

The subject site is owned by MF Quirke & Sons who have operated the site since the 1970's. Access to and from the site is via a semi-private road off the N70, Ring of Kerry, national road to the north.

13.4.5 Tourism

The site itself is not in close proximity to any tourist locations other than the N70 (Ring of Kerry Route and part of the Wild Atlantic Way scenic drive). The impacts the site has on the N70 is noted as imperceptible and this is detailed in greater depth in Chapter 14.

13.4.6 Waste Management

Waste management is enforced by stockpiling wastes on site for future reuse in land rehabilitation works. Wastes generated include soil and subsoil clearance, and the silts from the settlement ponds.

13.4.7 Agriculture

The site is located in a primarily agricultural area, within a rural location and small residential and agricultural units within the surrounding area. The proposed activity will not adversely impact on the agricultural activity within the surrounding area.

13.4.8 Cultural Heritage

A detailed assessment on the predicted impact of the proposed development on Cultural Heritage/Archaeology is discussed in greater detail in Chapter 10. This assessment did not identify any items of cultural heritage, monuments or buildings of heritage interest known from the application area. There are no direct or indirect impacts on any known items of cultural heritage, archaeology or buildings of heritage interest in the application area or the vicinity.

13.5 Material Assets of Natural Origin

13.5.1 Natural Resources

The nature of the activity will ensue in a permanent loss of material from the local site area. The proposed expansion of the area and excavation of materials represent a positive utilisation of natural resources and is required to meet continuing demand for aggregates and concrete materials supplying customers in the surrounding local area and wider Kerry region. Excavated soil will be retained on site and reused once activities have ceased.

13.5.2 Assimilative Capacity of Air and Water

The predicted impact of the proposed extraction extension on the local and surrounding hydrology has been assessed and discussed in detail in Chapter 7. The assessment concluded that there was no direct connection with the proposed site with any existing natural water bodies and thus no variations to hydrology and water quality on the surrounding site will ensue. With respect to assimilative capacity of air a detailed assessment of the predicted impact of the proposed developments implications on air

quality is delved into in Chapter 9. It concludes that there will be no significant emission of dust from the site as a result of the proposed activity. Dust emissions continue to exist at an acceptable level.

13.6 Impacts of the Activity

Direct impacts involve the removal of sand and gravel material within the proposed site area in order to meet the continuing demand for aggregate and concrete products. Indirect impacts are unlikely and are discussed in relevant chapters.

13.7 Appropriate Mitigation Measures

Appropriate Mitigation measures are discussed in relevant chapters

13.8 Reinstatement

Stripped soil and subsoil have been retained onsite for rehabilitation once the activities at the existing extractive site have ceased. In relation to utilities, no reinstatement of utilities and services is proposed after quarry activities have finished.

13.9 Conclusions

The proposed development of the extraction extension and processing operations within the factory will not significantly impact on the material assets within the immediate and surrounding area. The proposed activity will not require an increased demand on available utilities, services and materials. The fundamental impact pertinent to the development is the removal of the sand and gravel material to be excavated. Relevant chapters within this EIAR should be referred to with regards to the conclusions drawn on those particular environmental attributes for specific conclusion, e.g. Biodiversity, Noise and Vibrations, Hydrology etc.

13.10 Difficulties Encountered

No difficulties were encountered in the preparation of this chapter.

13.11 Climate

This section provides an assessment of local climate and effects on dust and noise emissions associated with the planned development of the sand and gravel quarry Knockaboola Quarry and continuation of the aggregate processing plant and block yard at the existing Rangue Factory site. An assessment of changes in greenhouse gas emissions resulting from the overall planned quarry extension is also included.

This chapter was prepared by Michael Bailey of Envirocon, air quality and environmental consultancy, who has undertaken climate assessment studies for inclusion in EIS studies over the past 30 years for a wide range of extractive and other industrial projects throughout Ireland.

13.12 GENERAL CLIMATOLOGY

13.12.1 Synoptic

The general climate of the Killorglin area is characterised by the passage of Atlantic low pressure weather systems and associated frontal rain belts from the west during much of the winter period. Strong winds frequently occur in this part of Co. Kerry, with stormy conditions giving wind speeds of over 20 m/s and prolonged rainfall.

During the summer months, the occurrence of anticyclonic weather conditions and easterly winds can result in drier conditions over this part of Ireland that can occasionally result in dry and warm conditions that can last up to 2-3 weeks as occurred during the 2019 summer, interspersed by the return to rain-bearing Atlantic frontal systems from the west.

13.12.2 Wind

Results of hourly wind speed and direction from the meteorological station at Valentia (Cahersiveen)[3] situated 32 km to the southwest, over the years 2015-2020 are indicative of long-term wind conditions experienced in the Killorglin area of Co. Kerry. Approximately 27% of winds were from a southwest-westerly direction with winds from the NE occurring for about 18% of the year (Figure 8.1). The lowest frequency of winds are those from a southeast direction, accounting for less than 5% of hourly records.

The average wind speed in the Killorglin Region is 5 m/s, with winds of 5 m/s or more recorded for about 47% of the year. The frequency of calm conditions in West Kerry is very low and less than 2% of the year and low wind speeds of below 3m/s are associated mainly with winds from a north-easterly direction. High wind speeds are typically associated with Atlantic stormy conditions from the west during the winter months. The highest hourly wind speed over the 5-year period was 22 m/s with winds above 9 m/s recorded for about 10% of the time and hourly average wind speeds above 12m/s measured for about 2% of the year.

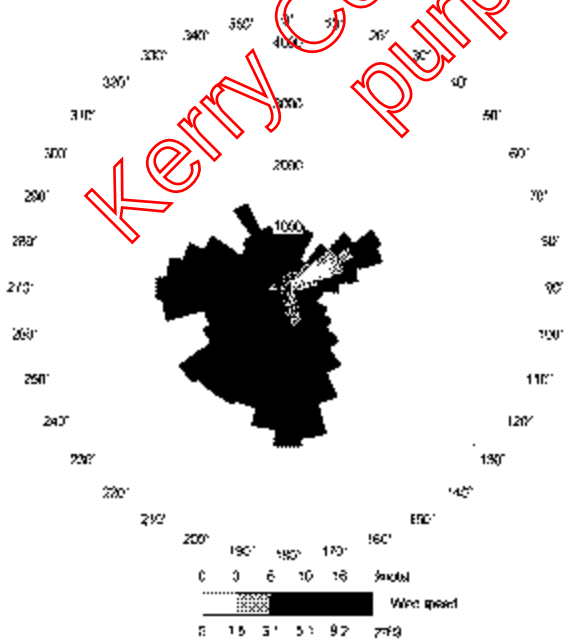


Figure 8.1: Wind Rose of hourly wind direction and speed for 2015-2020 -Valentia, Co. Kerry

13.12.3 Rainfall

Long-term rainfall records from a climatological station located at Glenbeigh, 7km to the southwest of the quarry site for the period 2011-2020 gives an annual precipitation rate of 1435mm (Table 8.1). The monthly total during the winter months (October-March) accounts for about 62% of the annual total, with a maximum monthly rate of 196mm. During the winter months, the rainfall will be commonly associated with Atlantic frontal depressions whereas during the summer months high rainfall amounts will tend to be associated with intense thundery showers.

The number of 'wet-days' (rainfall ≥1mm) at the quarry site is about 55% of the year, with 70% of days with ≥0.2mm rainfall. Therefore, for a substantial percentage of the days, especially during the winter months, the amount of rainfall occurring over a day will normally be sufficient to keep the surface of haul roads and the sand and gravel pit floor damp for much of the time. This will help to control dust emissions, without the need for additional dust control measures. However, during the summer months, the higher day-time temperatures and lower relative humidity increase the evaporation rate of surface water and so this increases the potential for dust-blow from surfaces and plant equipment especially during windy conditions.

Table 8.1: Average monthly precipitation and days ≥1mm at Glenbeigh (2011-2020)

Site	J	F	M	A	M	J	J	A	S	O	N	D	ann.
Average Monthly (mm)	149	134	105	80	92	64	84	108	120	153	151	196	1435
Wet-Days (≥1mm)	22	19	16	12	14	13	13	17	17	17	20	22	202

Source: Met Eireann – www.met.ie: Glenbeigh, Dook, Co Kerry (069245E, 093320N)

13.12.4 Air Temperature

Table 8.2 :Maximum monthly and hourly average air temperature by month over period 2015-2020. (°C)

Site	J	F	M	A	M	J	J	A	S	O	N	D	ann.
Max Monthly Average T[ii]	7.9	7.3	7.6	9.6	11.8	13.9	15.1	15.1	13.7	11.6	9.2	8.8	11.0
Max Hourly Average T[iii]	15.5	16.0	22.0	23.5	25.1	31.0	31.0	26.5	25.0	20.5	20.1	16.0	31.0

Source:Met Eireann – www.met.ie: (i)Cahirciveen (ii) Glenbeigh

The maximum average monthly air temperature and the maximum hourly temperature reported at Glenbeigh, over the period 2015-2020 are given in Table 8.2. The highest hourly temperature measured was 31°C in July 2018 with the highest monthly average reported in July 2018. A similar pattern in the air temperature would be likely near the Rangue site.

The air temperature is a critical factor in scheduling adequate dust suppression measures such as use of a mobile bowser on haul roads since high temperatures result in rapid drying of road surfaces and

aggregate stockpiles. With high daily temperatures, especially during periods of low rainfall amounts there is a high risk of dust-blow that may extend beyond the quarry boundary unless dust control measures are regularly carried out.

13.13 MICROCLIMATE

The microclimate is defined as the climate within the immediate locality of the quarry site, which may be characterised by the local landscape and vegetation features. Microclimate is important where there are valleys or steep slopes formed by quarries which can cause extensive cold air drainage and ponding of cold air in hollows under cold calm night-time conditions.

There are no significant features such as steep slopes or extensive shelter belts within 1km of the site boundary that would create micro-scale wind flow changes in the area with relatively uniform wind flow or temperature profile across the area. The terrain across the Rangue and Knocknaboola sites is generally flat with the overall gradient increasing from 30m at the NW boundary to 40m in the SE corner. Within 2-3km to the south of the Knocknaboola site the gradient begins to increase steeply rising to 200m at the lower slopes of the McGillycuddy Reeks range. The north facing slopes of these peaks will result in local wind flows and cold air drainage at night-time within the Knocknaboola/Rangue area. This mountain range dominates the local wind flow and air temperature profiles experienced within the area near the foot of the steep lower slopes, especially with light winds from a southerly direction.

Within the surrounding area beyond the quarry site boundary there will be no perceptible effect on the existing micro-climate in terms of existing wind flow as a result of the proposed phased development of the sand and gravel extraction quarry. The maximum extraction depth will be about 12m as it progress south-eastwards across the site over the planned phasing of the quarry. It is proposed to construct 3m boundary berms along the north western, southern and northern boundary that will planted with native trees and shrubs. The size of these berms and the orientation and height of the working face will not significantly change the present wind flow pattern beyond the development area.

13.14 CLIMATE CHANGE

13.14.1 Greenhouse Gas Emissions

The quarrying sector in Ireland contributed an estimated 0.17 million tonnes of Carbon Dioxide equivalent (CO_2eq) emissions of a National total across the industrial and power generation sector of 63.3 million CO_2eq in 2019[2]. This volume of greenhouse gas emissions is about 0.2% of the National total. As an industrial activity the quarrying sector have a responsibility to control and reduce greenhouse gas emissions.

The quantity of emissions from a quarry depend on the size and activities taking place within the site. Operation of large plant machinery, onsite asphalt or lime production, plant equipment and traffic all contribute to the carbon footprint for the site.

The size of the quarry activity at Rangue is small with the sand and gravel quarry extending over an area of 16.75 hectares with a projected maximum annual extraction rate of 100,000 cubic meters, subject to market demands. Compared to large quarry sites elsewhere in Ireland, the rate of extraction and volume of truck movements is very small with a maximum projected daily rate of approximately 410m^3. This material will be transported via an underpass under the L4021 to the main processing plant at the Rangue site, involving about 50 truckloads per day.

Emissions of CO_2 from the proposed sand and gravel extraction and aggregate production at the Knocknaboola quarry over the life-time of the development will be imperceptible as a percentage of the National total emitted from the quarrying industrial sector. However, measures to reduce the carbon footprint for the site will be included as part of the Environmental Management Plan.

13.14.2. Peat Removal

Peatlands in Ireland in their natural state provide a removal mechanism of atmospheric CO_2 and act as important long-term sinks for CO_2 in the country. Removal of peat from blanket bogs by commercial extraction for fuel and damage to the vegetation and habitat of the peatlands results in the release of the stored CO_2 and related greenhouse gases such as methane into the atmosphere. The physical and chemical mechanisms that control the rate of flux of CO_2 in peat bogs, as a sink or emission source, are complex and depend on many factors such as water table level, depth of the type and density of the vegetation layer as well as the thickness of lower layers in the peatland. CO_2 is generated from anaerobic decomposition and formation of peat within the anoxic layer of the peat bed.

The quarry site at Rangue is within an area of low quality wet-heath with pockets of blanket-bog and so removal of this material will take place as part of the stripping process to expose the sand and gravel deposits. The vegetation across the site is mainly low-lying dwarf shrubs and extensive areas of heather. Trial trenches carried out during the hydrogeological assessment of the site (refer to Chapter 6) provides an indication of the depth of peat present on-site. The vast majority of the site is underlain by peat depths of less than 0.25m. There are areas of the site where there is no peat cover, particularly on the elevated hillock on the south-eastern part of the proposed extension. The deepest portions of bog is present on the southern portion of the site, where a maximum depth of 6.1m of peat was recorded (this area is not within the proposed extraction area). The site (and bog) is heavily drained, with numerous shallow drains discharging to the Glashacoonafanida stream, along the eastern boundary of the site.

No significant anoxic peat layer was found and the underlying subsoil was found to be stony clay with larger boulders present and so active formation of peat is limited.

The total area where removal of the highly degraded shallow peat layer would take place is about 16.75 Ha and is small in the context of the wider blanket peat landscape and the capacity for this area to act as a sink for atmospheric CO_2 is limited given the relatively shallow depth across the site and poor quality of the peat layers.

Regarding emissions of CO_2 during the overburden stripping process during each of the extraction phases, this will only occur in negligible quantities for a limited time as it is removed down to the sand and gravel layers. Therefore, as an emission source or sink for CO_2 and other greenhouse gases, the peat deposits that cover the proposed development area will have an imperceptible effect on the total emissions or sink flux from the atmosphere of CO_2 occurring across peatlands within the west Kerry area.

13.15 MITIGATION MEASURES

Measures to reduce the carbon footprint at the planned extension of the Rangue quarry development are:-

- Efficient operation of the washing/screen and other processing plant by regular maintenance to reduce exhaust emissions from generators and engines.
- Truck and other on-site vehicles will be serviced at regular intervals to control and reduce exhaust emissions from diesel engines.

- Efficient driving on-site will be encouraged by speed controls within the site and switching off engines if queuing for materials.

13.16 RESIDUAL EFFECTS

No significant residual effect on the microclimate is likely with the sand and gravel quarry development.

13.17 SUMMARY OF EFFECTS

The area of extraction in the proposed quarry site at Rangue is 16.75 ha and recovery of the material with take place across a working face of approximately 12m.

The change in topography will not significantly change the present microclimate beyond the development area.

The removal of the existing peat deposits across the quarry site will have an imperceptible effect on the annual potential CO_2 removal rate from the atmosphere by peatlands within the West Kerry area.

13.18 REFERENCES

- *Met Eireann, www.met.ie*
- *Eurostat, European Commission , Greenhouse gas emissions by economic activity, 2020, Luxembourg*

Chapter Fourteen Landscape

14.1 Introduction

This chapter, prepared by Cunnane Stratton Reynolds, describes the landscape and visual effects of a proposed continuation of use at the factory site (processing area) at Rangue, as well as a proposed sand and gravel pit at Knocknabooola, near Killorglin, Co. Kerry.

This Landscape and Visual Assessment was carried out by Evelyn Sikora, BA MA, MILI. She has seven years' experience in Landscape and Visual Assessment (LVIA), and has worked on the Landscape and Visual assessment for a range of developments including wind and solar energy, infrastructure, quarries, flood relief, and recreation projects. Oversight of the chapter was provided by Jim Kelly, CMLI, MILI, Director of Cunnane Stratton Reynolds.

The elements of the proposal most relevant to the landscape and visual assessment are the removal of soil, peat and overburden and the extraction of rock. Other elements include the creation of an underpass between the existing processing area and the proposed extension area.

14.2 Methodology

Ireland is a signatory to the European Landscape Convention (ELC). The ELC defines landscape as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'. This definition is important in that it expands beyond the idea that landscape is only a matter of aesthetics and visual amenity. It encourages a focus on landscape as a resource in its own right - a shared resource providing a complex range of cultural, environmental, and economic benefits to individuals and society.

The Guidelines for Landscape and Visual Impact Assessment 2013 (GLVIA) notes that as a cultural resource, the landscape functions as the setting for our day-to-day lives, also providing opportunities for recreation and aesthetic enjoyment and inspiration. It contributes to the sense of place experienced by individuals and communities and provides a link to the past as a record of historic socio-economic and environmental conditions. As an environmental resource, the landscape provides habitat for fauna and flora. It receives, stores, conveys, and cleans water, and vegetation in the landscape stores carbon and produces oxygen. As an economic resource, the landscape provides the raw materials and space for the production of food, materials (e.g. timber, aggregates) and energy (e.g. carbon-based fuels, wind, solar), living space and for recreation and tourism activities.

The GLVIA notes that the landscape is change is ongoing. Many different pressures have progressively altered familiar landscapes over time and will continue to do so in the future, creating new landscapes. For example, within the receiving environment, the environs of the proposed development have altered over the last thousand years, from wilderness to agriculture and settlement.

Many of the drivers for change arise from the requirement for development to meet the needs of a growing population and economy. The concept of sustainable development recognises that change must and will occur to meet the needs of the present, but that it should not compromise the ability of future generations to meet their needs. This involves finding an appropriate balance between economic, social and environmental forces and values.

The reversibility of change is an important consideration. If change must occur to meet a current need, can it be reversed to return the resource (in this case, the landscape) to its previous state to allow for development or management for future needs.
Climate change is one of the major factors likely to bring about future change in the landscape, and it is accepted to be the most serious long-term threat to the natural environment, as well as economic activity (particularly primary production) and society. The need for climate change mitigation and adaptation, which includes the management of water and more extreme weather and rainfall patterns, is part of this.

14.2.1 Guidance

Landscape and Visual Impact Assessment (LVIA) is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity. The methodology for assessment of the landscape and visual effects is informed by the following key guidance documents, namely:

- Landscape Institute and the Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (hereafter referred to as the GLVIA).

- The EPA Draft Guidelines for Information to be Contained in Environmental Impact Assessment Reports Draft (2017)

References are also made to the 'Landscape and Landscape Assessment – Consultation Draft of Guidelines for Planning Authorities' document, published in 2000 by the Department of Environment, Heritage and Local Government. The Development Plan for Co. Kerry was also reviewed. Based on the above guidance and in particular the GLVIA guidance, the following assessment criteria is used.

The assessment of Landscape and Visual Effects assesses the effects of the development on the landscape as a resource, and on the fabric and character of the landscape. Assessment of visual effects relates to the change in views and visual amenity experienced by groups of people. The assessment includes the review of the proposed development, desktop study, and several site visits both to the site and the wider landscape.

The assessment of landscape and visual effects included a desktop study, review of the proposed development drawings and a site visit carried out in June 2021. A number of viewpoints in the vicinity of the site were visited and photographed to assist in the assessment of visual effects.

14.2.2 Landscape Impact Assessment Criteria

A key distinction to make in a LVIA is that between landscape effects and the visual effects of development.

'Landscape' results from the interplay between the physical, natural, and cultural components of our surroundings. Different combinations of these elements and their spatial distribution create distinctive character of landscape in different places. 'Landscape character assessment' is the method used in LVIA to describe landscape, and by which to understand the potential effects of a development on the landscape as 'a resource'. Character is not just about the physical elements and features that make up a landscape, but also embraces the aesthetic, perceptual and experiential aspects of landscape that make a place distinctive.

The GLVIA (3rd Edition) outlines the assessment process, which combines judgements on the sensitivity of the resource and the magnitude of the change which it will undergo as a result of the

proposed development. These are then combined to reach an assessment of the significance of the effect.

Landscape Sensitivity: Landscape sensitivity is determined by the value of the landscape, and its susceptibility to change – which is related to the proposed development.

Landscape values can be identified by the presence of landscape designations or policies which indicate particular values, either on a national or local level. In addition, a number of criteria are used to assess the value of a landscape.

Landscape susceptibility is defined in the GLVIA as the ability of the landscape receptor to accommodate the proposed development without undue consequences for the maintenance of the baseline scenario and/or the achievement of landscape planning policies and strategies. Susceptibility also relates to the type of development – a landscape may be highly susceptible to certain types of development but have a low susceptibility to other types of development.
Landscape susceptibility in relation to wind energy developments can include consideration of:

- Topography and skyline –extraction operations may be more visible in undulating landscapes or landscapes with dramatic changes in topography as opposed to flatter topography
- Landscape pattern and landcover– a more complex landcover with a number of patterns can be more susceptible
- Settlement pattern – this can influence susceptibility

Landscape Sensitivity is categorised from Low to Very High as outlined in Table 14-1.

Table Error! No text of specified style in document.-26: Categories of Landscape Sensitivity

Sensitivity	Description
Very High	Areas where the landscape exhibits a very strong, positive character with valued elements, features and characteristics that combine to give an experience of unity, richness and harmony. The character of the landscape is such that its capacity for accommodating change in the form of development is very low. These attributes are recognised in landscape policy or designations as being of national or international value and the principal management objective for the area is protection of the existing character from change
High	Areas where the landscape exhibits strong, positive character with valued elements, features and characteristics. The character of the landscape is such that it has limited/low capacity for accommodating change in the form of development. These attributes are recognised in landscape policy or designations as being of national, regional or county value and the principal management objective for the area is conservation of the existing character.
Medium	Areas where the landscape has certain valued elements, features or characteristics but where the character is mixed or not particularly strong. The character of the landscape is such that there is some capacity for change in the form of development. These areas may be recognised in landscape policy at local or county level and the principal management objective may be to consolidate landscape character or facilitate appropriate, necessary change
Low	Areas where the landscape has few valued elements, features or characteristics and the character is weak. The character of the landscape is such that it has capacity for

	change; where development would make no significant change or would make a positive change. Such landscapes are generally unrecognised in policy and where the principal management objective is to facilitate change through development, repair, restoration or enhancement.
Negligible	Areas where the landscape exhibits negative character, with no valued elements, features or characteristics. The character of the landscape is such that its capacity for accommodating change is high; where development would make no significant change or would make a positive change. Such landscapes include derelict industrial lands or extraction sites, as well as sites or areas that are designated for a particular type of development. The principal management objective for the area is to facilitate change in the landscape through development, repair or restoration.

Magnitude of Landscape Change: The magnitude of change is a factor of the scale, extent and degree of change imposed on the landscape with reference to its key elements, features and characteristics (also known as 'landscape receptors'). Five categories are used to classify magnitude of landscape change.

For the purpose of assessment, five categories are used to classify the landscape sensitivity of the receiving environment, from Very High sensitivity to Negligible. These categories are defined in Table 14-2.

Table Error! No text of specified style in document.-27: Magnitude of Landscape Change

Sensitivity	Description
Very High	Change that is large in extent, resulting in the loss of or major alteration to key elements, features or characteristics of the landscape (i.e. landscape receptors), and/or introduction of large elements considered totally uncharacteristic in the context. Such development results in fundamental change in the character of the landscape.
High	Change that is moderate to large in extent, resulting in major alteration or compromise of important landscape receptors, and/or introduction of large elements considered uncharacteristic in the context. Such development results in change to the character of the landscape.
Medium	Change that is moderate in extent, resulting in partial loss or alteration of landscape receptors, and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic in the context. Such development results in change to the character of the landscape.
Low	Change that is moderate or limited in scale, resulting in minor alteration of landscape receptors, and/or introduction of elements that are not uncharacteristic in the context. Such development results in minor change to the character of the landscape.
Negligible	Change that is limited in scale, resulting in no alteration to landscape receptors, and/or introduction of elements that are characteristic of the context. Such development results in no change to the landscape character.

Significance of Effects

In order to classify the significance of landscape and visual effects, the predicted magnitude of change is measured against the sensitivity of the landscape/viewpoint. The definitions used by the EPA (2017) provide a useful scale to describe the significance of the effects.

There are seven classifications of significance, namely: (1) imperceptible, (2) not significant, (3) slight, (4) moderate, (5) significant, (6) very significant, (7) profound.

Table *Error! No text of specified style in document.*-28: Significance of Effect

Magnitude of Change	Sensitivity of the Resource: Very High	High	Medium	Low	Negligible
Very High	Profound	Profound-Very Significant	Very Significant-Significant	Moderate	Slight
High	Profound-Very Significant	Very Significant	Significant	Moderate-Slight	Slight-Not Significant
Medium	Very Significant-Significant	Significant	Moderate	Slight	Not Significant
Low	Moderate	Moderate-Slight	Slight	Not significant	Imperceptible
Negligible	Slight	Slight-Not Significant	Not significant	Imperceptible	Imperceptible

Note: This matrix is a guideline only, and an element of professional judgment is also applied.

With regard to landscape effects, development has the potential to improve the environment as well as damage it. In certain situations, there might be policy encouraging a type of change in the landscape, and if a development achieves the objective of the policy the resulting effect might be positive, even if the landscape character is changed.

14.2.3 Visual Assessment Criteria

Views and 'visual amenity' refer to the interrelationship between people and the landscape. The GLVIA prescribes those effects on views and visual amenity should be assessed separately from landscape, although the two topics are inherently linked. Visual assessment is concerned with changes that arise in the composition of available views, the response of people to these changes and the overall effects on the area's visual amenity.

Visual assessment considers the sensitivity of the viewers, (groups of people) and the magnitude of the changes to the composition and character of views. The assessment is made for a number of viewpoints selected to represent the range of visual receptors in the receiving environment. The significance of the visual effects experienced at these locations is assessed by measuring the visual receptor sensitivity against the magnitude of change to the view resulting from the development.

Sensitivity of the Visual Receptor

Visual receptor sensitivity is a function of two main considerations:

Susceptibility of the visual receptor to change. This depends on the occupation or activity of the people experiencing the view, and the extent to which their attention or interest is focussed on the views or visual amenity they experience at that location.
Value attached to the view. This depends to a large extent on the subjective opinion of the visual receptor but also on factors such as policy and designations (e.g. scenic routes, protected views), or the view or setting being associated with a heritage asset, visitor attraction or having some other cultural status (e.g. by appearing in arts).

For the purpose of assessment, five categories are used to classify a visual receptor's s sensitivity. These categories range from Very High to Negligible and the definitions are contained in Table 14.4.

Table Error! No text of specified style in document.-29: Categories of Visual Receptor Sensitivity

Sensitivity	Description
Very High	Viewers at iconic viewpoints - towards or from a landscape feature or area - that are recognised in policy or otherwise designated as being of high value or national value. This may also include residential viewers who are focussed to a large extent on the view.
High	Viewers at viewpoints that are recognised in policy or otherwise designated as being of value, or viewpoints that are highly valued by people that experience them regularly (such as views from houses or outdoor recreation features) and views which are valued by the local community. This would include tourist attractions, and heritage features of regional or county value, and viewers travelling on scenic routes.
Medium	Viewers at viewpoints representing people travelling at slow or moderate speed through or past the affected landscape in cars or on public transport, where they are partly but not entirely focused on the landscape, or where the landscape has some valued views. The views are generally not designated, but which include panoramic views or views judged to be of some scenic quality, which demonstrate some sense of naturalness, tranquillity or some rare element in the view.
Low	Viewers at viewpoints reflecting people involved in activities not focused on the landscape e.g. people at their place of work or engaged in similar activities such as shopping, etc. The view may present an attractive backdrop to these activities but there is no evidence of that the view is valued, and not regarded as an important element of these activities. Viewers travelling at high speeds (e.g. motorways) may also be considered of low susceptibility.
Negligible	Viewpoints reflecting people involved in activities not focused on the landscape e.g. people at their place of work or engaged in similar activities such as shopping where the view has no relevance or is of poor quality and not valued

Magnitude of Change to the View
Classification of the magnitude of change takes into account the size or scale of the intrusion of development into the view (relative to the other elements and features in the composition, i.e. its relative visual dominance), the degree to which it contrasts or integrates with the other elements and the general character of the view, and the way in which the change will be experienced (e.g. in full view, partial or peripheral, or glimpses). It also takes into account the geographical extent of the change, the duration and the reversibility of the visual effects.

Five categories are used to classify magnitude of change to a view. These range from Very High to Negligible and are defined in **Table 14.5:**

Table Error! No text of specified style in document.-30: Magnitude of Visual Change

Magnitude of Change	Description
Very High	Full or extensive intrusion of the development in the view, or partial intrusion that obstructs valued features or characteristics, or introduction of elements that are completely out of character in the context, to the extent that the development becomes the dominant the composition and defines the character of the view and the visual amenity
High	Extensive intrusion of the development in the view, or partial intrusion that obstructs valued features, or introduction of elements that may be considered uncharacteristic in the context, to the extent that the development becomes co-dominant with other elements in the composition and affects the character of the view and the visual amenity.
Medium	Partial intrusion of the development in the view, or introduction of elements that may be prominent but not necessarily uncharacteristic in the context, resulting in change to the composition but not necessarily the character of the view or the visual amenity
Low	Minor intrusion of the development into the view, or introduction of elements that are not uncharacteristic in the context, resulting in minor alteration to the composition and character of the view but no change to visual amenity
Negligible	Barely discernible intrusion of the development into the view, or introduction of elements that are characteristic in the context, resulting in slight change to the composition of the view and no change in visual amenity.

14.2.4 Quality and Timescale

The predicted impacts are also classified as beneficial, neutral, or adverse. This is not an absolute exercise; in particular, visual receptors' attitudes to development, and thus their response to the impact of a development, will vary. However, the methodology applied is designed to provide robust justification for the conclusions drawn. These qualitative definitions are included in Table **14.6.**

Table Error! No text of specified style in document.-31: Quality of Effect

Definition of quality of effects	
Duration	**Description**
Adverse	Scheme at variance with landform, scale, pattern. Would degrade, diminish or destroy the integrity of valued features, elements or their setting or cause the quality of the landscape(townscape)/view to be diminished;
Neutral	Scheme complements (or does not detract from) the scale, landform and pattern of the landscape(townscape)/view and maintains landscape quality;
Beneficia	improves landscape(townscape)/view quality and character, fits with the scale, landform and pattern and enables the restoration of valued characteristic features or repairs / removes damage caused by existing land uses.

Impacts/effects are also categorised according to their longevity or timescale as in Table 14.7 below:

Table Error! No text of specified style in document.-32: Duration of Effect

Definition of duration of effects	
Duration	**Description**
Temporary	Effects lasting one year or less
Short Term	Effects lasting one to seven years
Medium Term	Effects lasting seven to fifteen years
Long Term	Effects lasting fifteen to sixty years
Permanent	Effects lasting over sixty years

14.3 The Proposed Development

The Proposed Development is fully described in Chapter 2. The most relevant elements of the proposal include the proposed extension of the site which will involve excavation of an area across the road form the existing facility.

The proposed development continuation of use for the existing factory site in the townland of Rangue, as well as the proposed sand and gravel pit extension on adjacent lands.

The new proposed sand and gravel pit extension is situated in the townland of Knocknaboola. As the proposed extension is located on the other (south-eastern) side of the Caragh Lake Road (L-40210), the proposal also involves the construction of a tunnel/underpass beneath the Caragh Lake Road (L-40210) to facilitate the transportation of aggregates from the Knocknaboola site to the factory site for further processing of aggregates, as well as manufacture and sale of concrete and concrete blocks.

There will be no changes of production at the factory site and the layout of all plant and settling ponds will remain as they have over the duration of the present planning permission.

The lifetime of the new extension area is expected to be 20 years (16 years to exhaustion at full extraction).

14.4 Receiving Environment

Relevant planning policy, identifying relevant designations and objectives for the landscape around the site were identified during the desk study. This includes extracts from the Kerry County Development Plan 2015-2021. The baseline environment, which was visited in June 2021, is then described in terms of landscape and visual character, which includes description of topography, landform, and settlement. Sensitive landscape and visual receptors are also identified.

14.4.1 Study Area

The study area includes the site itself, and the wider landscape including the area west near Caragh Village and Caragh Lake, the area north including Rangue and area north the existing pit, including the N70 road, and the lands along of the local road at Knocknaboola/Coomnafanida.

14.4.2 Landscape Policy – Kerry County Development Plan 2015-2021

The Kerry County Development Plan, (hereafter referred to as the Plan) was reviewed, including a Landscape Character Assessment, which is contained in the Renewable Energy Strategy and was produced in 2012. While the focus of this document is classifying landscapes in relation to their capacity for wind energy, is also gives a description of the main characteristics of each character area, along with prominent features, natural and cultural heritage, amenity and recreation features and the landscape quality.

14.4.1 Landscape Character

Figure 14.1 below shows the site location within the County, just outside Killorglin, in Landscape Character Area 13. This is described as the Killorglin Pasturelands, and it extends from the north of Killorglin to the lower foothills of the Macgillicuddy's Reeks, and along the ridge of higher ground east of Lough Caragh.

The McGillycuddy Reeks are a prominent feature of the area, with the landscape forming a backdrop to the mountains. The area has a high population density, and the assessment notes that the Ring of Kerry route passes through the north of the LCA (also to the north of the site. The landscape is considered to be of County level importance.

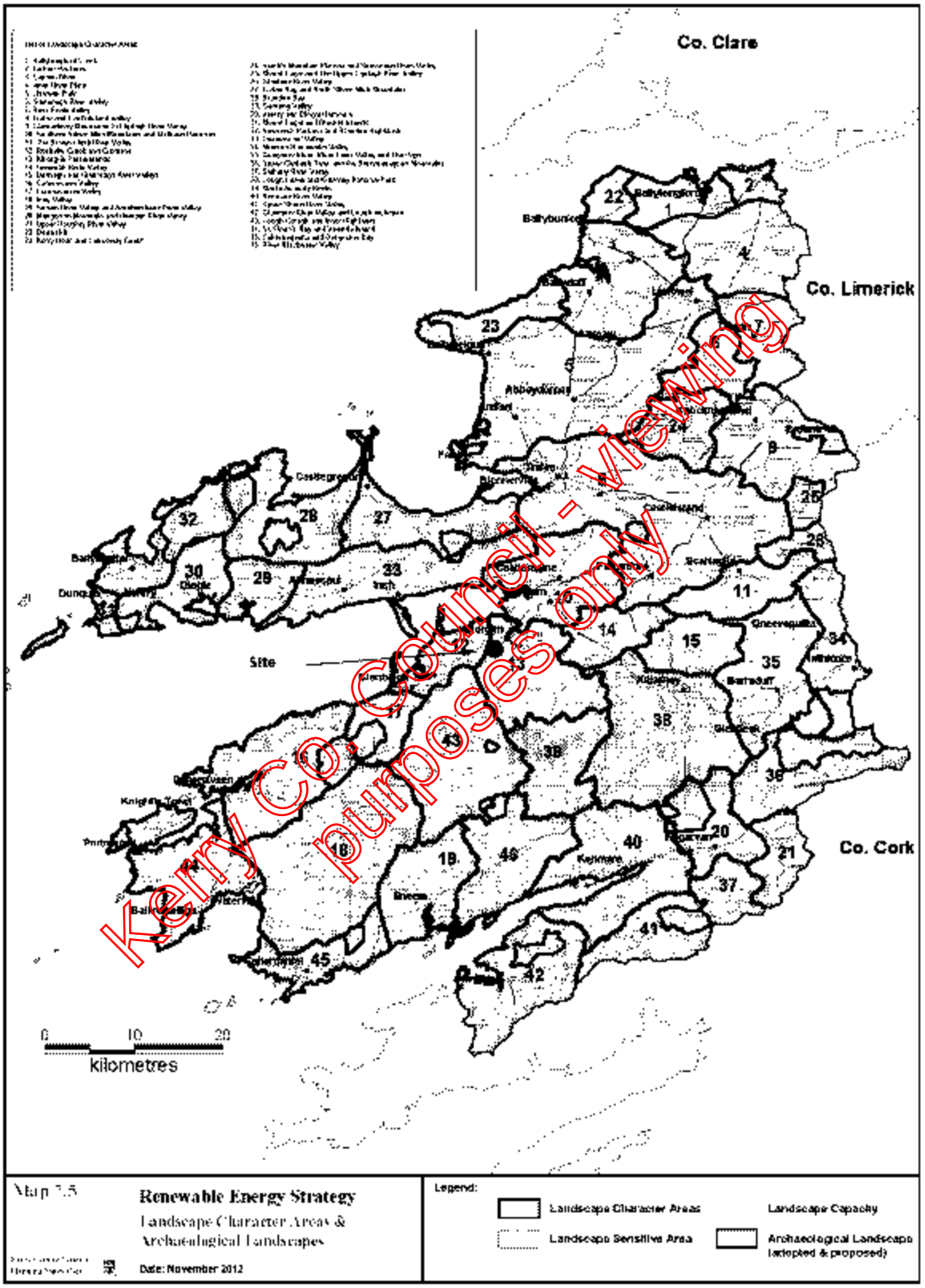


Figure Error! No text of specified style in document.-27: Landscape Character Areas in Co. Kerry (from Renewable Energy Strategy)

Policy ZL-1 states that it is an objective of the Council to:

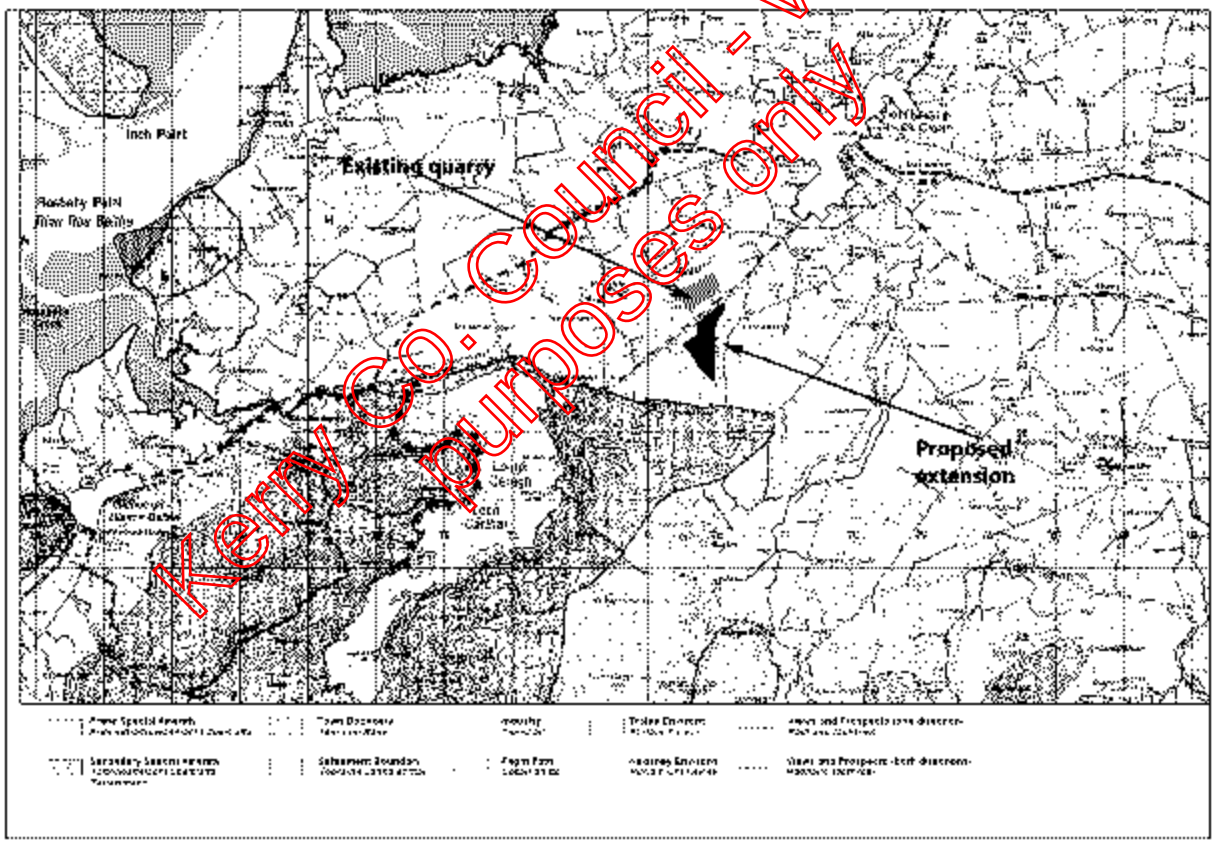
Protect the landscape of the County as a major economic asset and an invaluable amenity which contributes to the quality of people's lives.

Policy ZL-2 relates to Landscape Character Assessment:
Prepare a Landscape Character Assessment of the County following the publication of the proposed National Landscape Strategy. This assessment will include capacity studies for different forms of development and will involve consultation with adjoining local authorities.

14.4.2.2 Landscape and Visual Zoning and Designations

Chapter 12 Zoning and Landscape of the Kerry County Development Plan contains objectives and policies relating to landscape character, zoning and views and prospects. Relevant designations for Co. Kerry in the vicinity of the proposed extension are illustrated on Figure 14.2 Landscape Designations and Views. The existing pit is indicated in orange and the proposed extension in pink (approximate boundaries).

Figure Error! No text of specified style in document.-28: Extract from Map 12j Amenities/Views and Prospects



The existing pit and processing area and the proposed extension area are both zoned Rural General. These areas are identified which :

"have a higher capacity to absorb development than the previous rural designations. It is important that development in these areas be integrated into their surroundings in order to minimise the effect on the landscape and to maximise the potential for development".

An area of Rural Secondary Special Amenity is located approximately 0.48 kilometres south of the proposed extension site, which extends around the shores of Caragh Lake, and including as shown in Figure 14.2 above as shaded in blue. Caragh lake itself is Prime Special Scenic Amenity.

14.4.1.3 Views and Prospects

The Plan has identified a number of views and prospects which are considered important to the amenity of the County as well as to the tourist industry. These views and prospects include views along walking, cycling and driving routes and include viewpoints along the Wild Atlantic Way. The Plan notes that the protection of these views and prospects should not give rise to prohibition of development along these routes, but that development where permitted, should not seriously hinder of obstruct these views and should be designed and located to minimise their impact. These are identified in Volume 3 of the Plan and are included in Figure 14.2 above.

The policy states that it is an objective to:

- ***ZL-5:*** *Preserve the views and prospects as defined on Map No's 12.1, 12.1a-12.1u.*
- ***ZL-6:*** *facilitate the sustainable development of existing viewing points as identified by Fáilte Ireland along the route of the Wild Atlantic Way, while ensuring the protection of environmental attributes in the area through the implementation of environmental protection objectives, standards and guidelines of this Plan.*

As indicated on Figure 14.2, viewpoints are divided into views facing in a single direction, or in both directions. No written description is provided in the Plan.

Three views and prospects are indicated on the above Figure 14.2, but none are in close proximity to the site. The closest is a relatively short section of view to the southwest (indicated by red arrows) from the N70 Killorglin-Glenbeigh road, which is also part of the Ring of Kerry route, from Tullig More to Tullig Beg. This lies approximately 2.13 kilometres north of the proposed extension and approximately 1.7 kilometres from the existing processing area. Further along this route to the west, views in both directions are identified, from Tullig Beg to Quaybawn. These views are discussed in Section 14.4.4 below. There are also views indicated along the far (western) shore of Caragh Lake.

However this will not have any potential visibility due to the topography as the hills to the east of Caragh Lake would prevent any visibility.

14.4.1.4 Extractive Industry Objectives

The Development Plan contains several policies related to quarrying and the extractive industry. These are as follows:

NR-4: *Facilitate the sustainable development of the extractive industry and seek to ensure the ongoing availability of an adequate supply of aggregates for the construction industry, while ensuring environmental protection, through the implementation of the objectives and Development Management, Guidelines and Standards of this Plan.*

NR-5 *Ensure all extractive development proposals comply with the objectives of this plan as they relate to development management standards, flood risk management*
requirements and the protection of landscape, biodiversity, infrastructure, water and air quality, built and cultural heritage and residential amenity.

NR-6 *Ensure that quarrying and mining proposals are not permitted in areas where the visual or other impacts of such works would significantly adversely injure the amenities of the area or create significant adverse affects (sic) on the road network in the area.*

NR-7 *Ensure that development for aggregates / mineral extraction, processing and associated concrete production will be prohibited in Prime Special Amenity Areas and will not generally be permitted in other open or sensitive landscapes.*

The Plan also notes that the potential for some quarries to have a beneficial effect on the environment at the decommissioning phase where opportunities for habitat creation and alternative uses can arise.

14.4.3 Landscape Character of Site and Surrounds

The landscape character of the site and surrounds is described in terms of Landform (topography and drainage) Landcover (vegetation and built form and cultural heritage) as well as settlement patterns (settlements and roads, dwellings).

14.4.5.1 Landform

Site and immediate vicinity

The site (comprising an existing processing and factory site, and a proposed extension (sand and gravel quarry) to the is located approximately 3 kilometres southwest of Killorglin. The site is accessed by a local road which connects Killorglin to Caragh village. The existing quarry and processing area is located to the north of this road, the proposed extension to the south as shown in Figure 14.3. The topography, as shown in Figure 14 below, is generally flat in the vicinity of the site and ranges from approximately 30-52mOD.

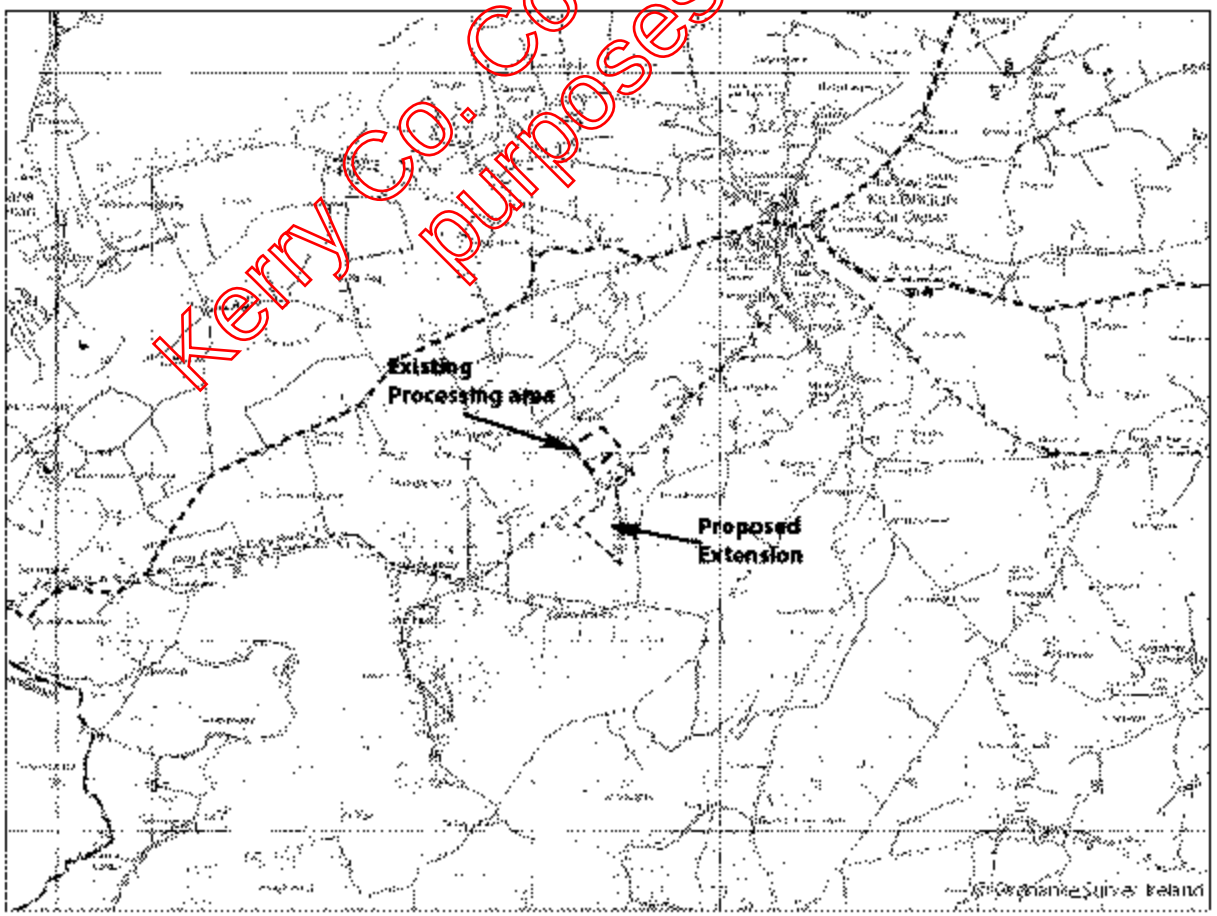


Figure Error! No text of specified style in document.-29: Topography in vicinity of site (Map Source: www.myplan.ie)

Plate Error! No text of specified style in document.-5: Flat topography on site of proposed extension

The proposed extension site south of the road is bounded by a stream, the Glashacoomnafanida stream, which flows from Lough Nafanida to the south. The stream is difficult to see but denoted by a tree line.

The topography of the existing processing area as well as a worked out area to the south (not part of this application) has been modified by extraction with the ground level lower than the surrounds, and some surface water features have resulted from these activities.

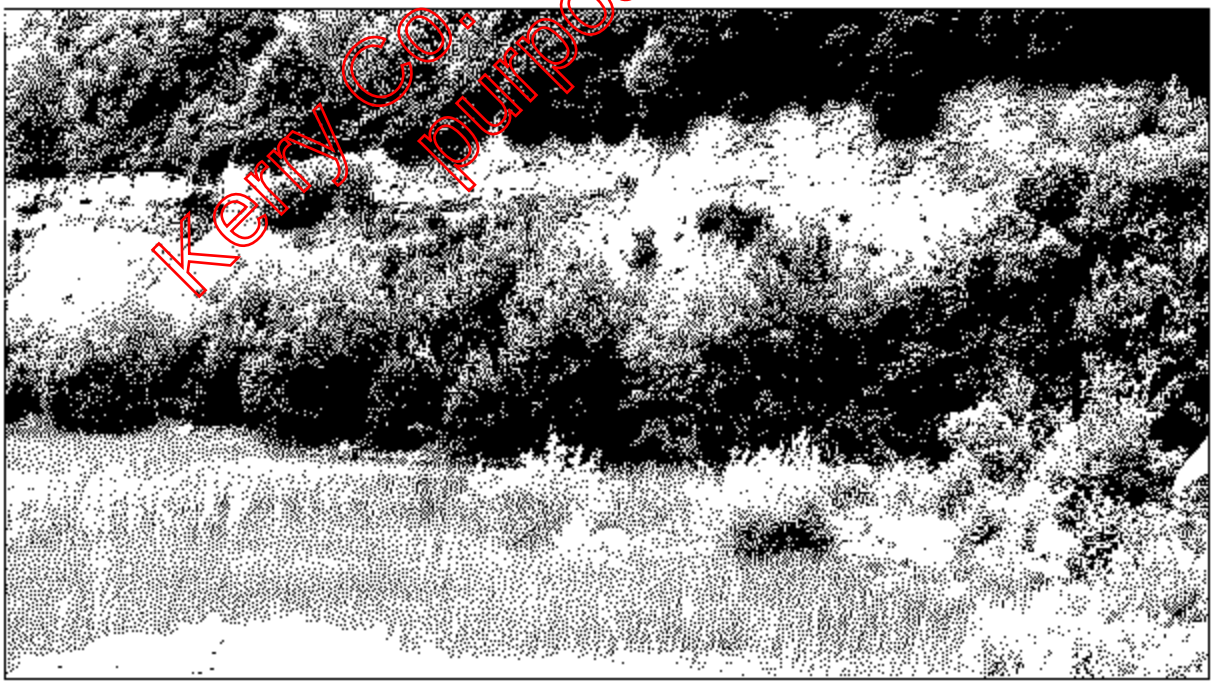


Plate Error! No text of specified style in document.-6: Varying topography, re-vegetation of pit edge and water body in adjacent worked-out pit

Wider Landscape

In the wider landscape, the topography between the site and Killorglin town, as well as to the north towards the N70 is generally flat or gently undulating with similar levels. The topography rises to the south of the proposed extension site, in the townland of Coomnafanida, and this area of higher ground extends close to the eastern shore of Caragh Lake. This rising ground culminates in a high point of 205m which is known as 'Caragh Lake Mountain' but has no official name on the OS map. A viewing point is located on the summit of this hill, accessed through a Coillte forest and extensive panoramic views are available. Plate 14-3 below shows the view includes the pit and surrounds.

Plate Error! No text of specified style in document.-7: Generally flat landscape seen from elevated viewing point at Caragh Lake Forest Recreation Area

To the north, the higher ground on the Dingle Peninsula is visible as in Figure 14-4 above. Further to the south, the Magillicuddys Reeks are an obvious element in the view and are visible from the site of the proposed extension as well as form more elevated areas.

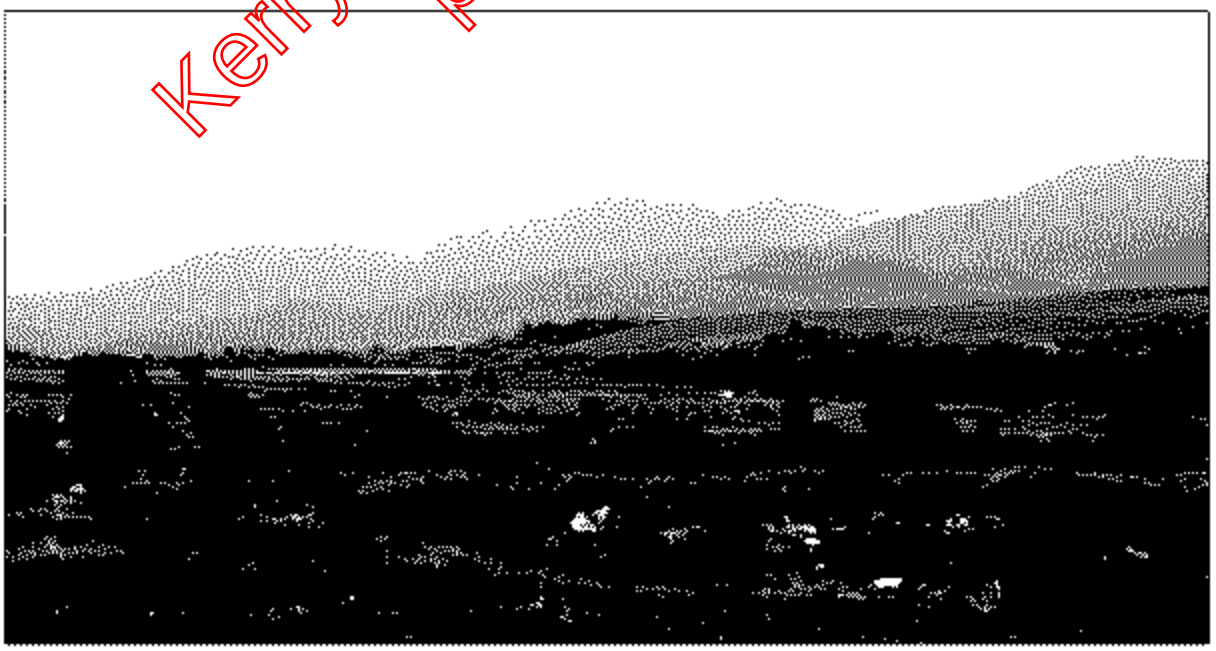


Plate Error! No text of specified style in document.-8: Macgillicuddy's Reeks contrast with the flat landscape of the extension site

14.4.3.2 Landcover – Vegetation, Built Form and Cultural Heritage

Site and Immediate vicinity

The site and immediate surrounds include the existing processing area which is a quarried-out pit area where the processing takes place. It also includes areas which are regenerating naturally including a waterbody as well as other areas of trees and vegetation, stockpiles, machinery, plant and equipment and areas of bare ground/hard surface as shown in Plate 14-4 below.

A worked out pit (Riordan's) lies to the west of the processing area, accessed by an underpass. This is not part of the application site but has a variety of landcover types, including a water body, re-vegetating pit edges and areas of tree and scrub vegetation and is illustrated in Figure 14-2.

Plate Error! No text of specified style in document.-9: Existing processing area with bare ground and vegetated areas

The landcover of the proposed extension to the south is bogland, which is disturbed in parts, and cutover in places. The vegetation is mainly bog vegetation including grasses, heath and scrubby vegetation. Plate 14-5 below shows disturbed bogland to the north of the extension site, with the treeline in the background indicating the road.

Plate Error! No text of specified style in document.-10: Partly disturbed bogland on proposed extension site

The stream along the eastern boundary is bordered by trees, some of which are outside the site boundary. These are seen in Figure 14-6 below. Some other small areas of trees and scrub are present on the site but the majority of open bogland.

Plate Error! No text of specified style in document.-11: Trees border the proposed extension site to the east

The local road which divides the existing factory site (processing area) from the proposed pit site, is lined with trees and vegetation, as is the stream which forms the eastern boundary. Open bogland lies beyond the south-western boundary, with an elevated vegetated area to the west. Some areas of coniferous tree plantation lie to the south. A number of dwellings are located to the northwest and east of the extension site.

Wider Landscape

Beyond this, an aerial view shows bogland is a feature of the wider landcover, particularly to the east and west of the proposed extension area. To the north, in the vicinity of the existing processing area,

there are smaller areas of bogland interspersed with agricultural fields. Some areas of conifer plantation are also evident, particularly to the east of Lough Caragh where there is a Coillte forest and recreation area, as well as south of the site on the slopes of the higher ground.

Built form in the wider landscape includes scattered dwellings and farms, with some settlements which are described below. There are several hotels and large estates locates along the shores of Caragh Lake.

14.4.5.3 Land Use

Land uses in the site and immediate surrounds include quarrying, agriculture, turf cutting. In the wider landscape, land uses include agriculture, forestry, quarrying and peat cutting. Tourism and recreation are evident in the wider landscape which include the Caragh Lake and nearby recreational aera, Ring of Kerry drive, Ring of Kerry cycleway which runs along the Killorglin-Caragh road. Mountain climbing is another attraction of the wider area.

14.4.3.4 Settlement patterns

Killorglin town is the main settlement in the area, approximately 3km from the site, with Caragh village, a small village approximately 1.3km west of the site.

There are several dwellings along the Killorglin-Caragh Lake road, some in relatively close proximity to the site, and several along the local road to the east of the site. Another minor local road runs south of the site from Knocknaboola to Caragh Village and a number of dwellings are also along this road. The N70 Ring of Kerry route passes north of the site, approximately 1.7 kilometres north of the existing pit. This is shown in Figure 14.2 above.

14.4.3.5 Summary of Landscape Characteristics

The landscape characteristics of the site and immediate vicinity include:

- Distant higher ground is visible from the site and surrounds - Macgillicuddy's Reeks to the south and the Slieve Mish mountains to the north – contrasts with and visually contains the flatter landscape in the vicinity of the site.
- High ground is also found near Caragh Lake's eastern shore which prevents views of the lake from the site and surrounds
- Settlement is found at Killorglin and Caragh Village and in the vicinity of the site the areas would appear to be well settled - there is a considerable proportion of scattered dwellings along the roads outside of these settlements.
- Relatively flat bogland is seen on the site of the proposed extension and in the vicinity.
- Trees are found to the east of the proposed extension and along the Killorglin-Caragh road which screen much of the existing pit and the proposed extension. The character of some of the open bogland can be glimpsed from some of the minor roads where there is less screening. Many of the main roads are well screened by tree lines and hedgerows.

Views and Visual Amenity

From the site of the existing pit, views are restricted by the sunken topography. However vies form the proposed extension site include views to the Macgillicuddy's Reeks to the southeast as well as some views to the Slieve Mish mountains to the north. These are considered to have scenic qualities. Views toother elements of the landscape the surrounds are restricted by the dense roadside vegetation though some glimpses of dwellings along the roads are visible and some open ground to the south of the site can be seen.

14.4.3.6 Landscape Values ~

Landscape Values

As set out in the GLVIA (2013) The landscape values of a site can be identified through formal designations which infer landscape value, as well as values which are not enshrined in policy but are evident on the site. These values are listed below, and further be categorised in two ways – values which should be conserved, and those that provide opportunity for enhancement.

There are no landscape designations on the site of the proposed development.

However, in addition to formal designations at international, nation and local level, the GLVIA 3rd edition (2013) recommend the use of a number of criteria which can help to describe landscape values. These are listed below and include:

- *Landscape Quality/Condition*
- *Heritage/Conservation interests*
- *Scenic Quality*
- *Rarity*
- *Perceptual aspects:*
- *Recreation Value*

The site is considered of relatively good condition and as a blanket bog is an important landscape feature. However the bog has considerable disturbance and peat cutting is ongoing on the site. The site has some pleasant visual qualities – in particular the views from the site to the mountains to the south and north – but the site itself as a tract of bog has an open and expansive nature and is a typical element of the character of the landscape in this area.

Conservation values

The conservation values indicate those aspects of the receiving environment which are sensitive and could be negatively impacted on by the proposed development. These values form the potential landscape and visual constraints to the proposed development. These include:

- Existing tree and scrub growth particularly along the edges of the processing area and the proposed extension and near the roads should be retained and enhanced.
- Any areas of bogland left intact would be preferable
- The stream corridor is a landscape features and vegetation to be retained where possible

Enhancement Values

The enhancement values reflect change that is occurring in the landscape and its inherent robustness, and identify elements which could be enhanced.

- Existing vegetation which screens the site should be enhanced with similar types of species

14.4.4 Views and Potential Visual Receptors

Visual receptors, as outlined in Section 14.2.3, can range from High to Negligible sensitivity. More sensitive visual receptors include those involved in recreation, or at amenity areas where there is a focus on a scenic landscape, or residents with views of scenic quality. Less sensitive receptors would include those driving at higher speeds or those engaged in activities where there is not a focus on the landscape and where the views are not considered of high quality.

A review of the desktop study and the site visit identified several potentially sensitive visual receptors. The roads in the vicinity of the site were travelled in both directions, and locations which were subject to landscape or visual designations in the Development Plan were reviewed and visited. In addition, locally relevant locations including the Caragh Lake shoreline and Coillte Forest Recreation Area were visited on foot. The areas where potential views of the site are possible include some short stretches of road close to the extension site, and the elevated ground to the west and southwest of the site. The roadside views include some potential views from residences.

Ring of Kerry/Scenic Route west of site

Viewers along the Ring of Kerry scenic route north of the site. However, this route was driven and due to dense tree lines along the road, particularly to the northern section of the route, there are few views to the landscape in the direction of the proposed development. A view showing the screening is illustrated by Plate 14-8 below, with a more open view is shown in Plate 14.9. However, no views of the existing pit were identified. The proposed extension will therefore not be visible from this location and is not considered further.

Plate Error! No text of specified style in document.-12: Dense screening travelling west along Ring of Kerry/Scenic Route prevents views to site

Plate Error! No text of specified style in document.-13: View towards site from open section of Ring of Kerry/Scenic Route

Caragh Lake Viewing Point

This area was visited and from the elevated viewing point, there are extensive and panoramic views of the countryside, the Macgillicuddy's Reeks and other mountains to the west and north, as well as scenic views of Caragh Lake.

There is a view of the existing pit and the proposed extension site. This view over Caragh lake and the mountains to the south is shown in Plate 14-10 below.

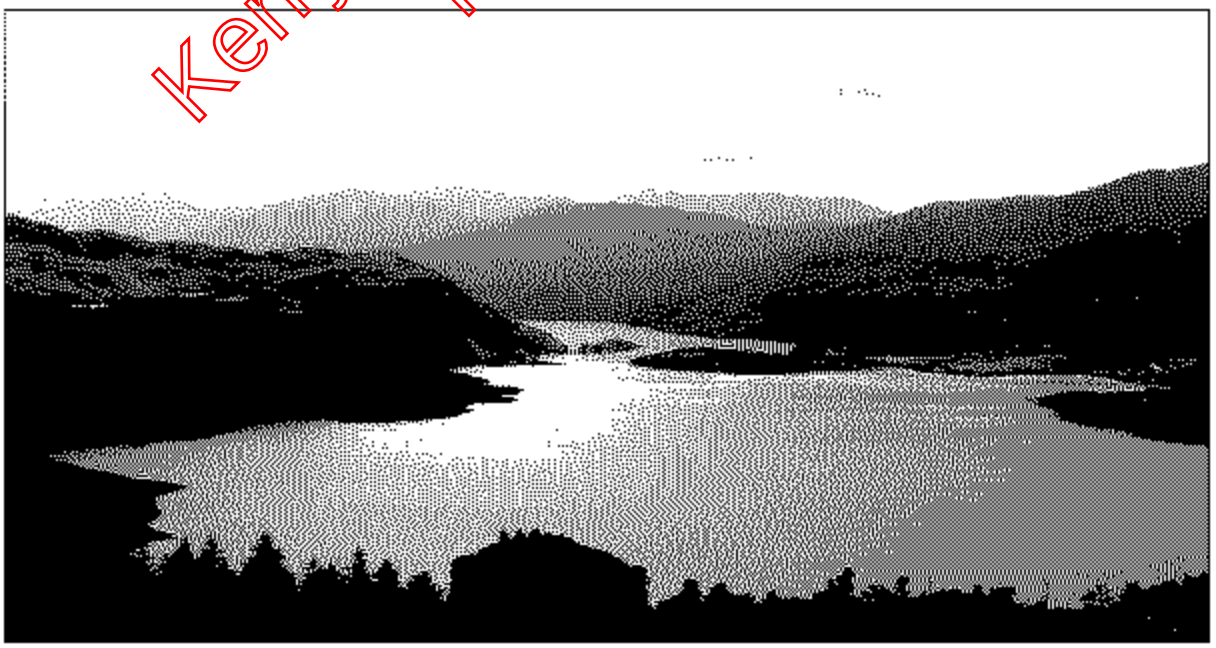


Plate Error! No text of specified style in document.-14: View of Caragh Lake and mountains from viewing point.

Plate Error! No text of specified style in document.-15: View to north towards existing quarry, agricultural lands, bogland and woodland

There are views in all directions, and the views to the south, west and east are particularly scenic. The views to the north, in the direction of the pit are towards flatter land, with the existing pit at Range visible as shown above . Another pit is also visible closer to Caragh Lake.

Residences in close proximity to the site

Other potential sensitive visual receptors include some residences which are close to the proposed extension area.

These include residents along the Killorglin-Caragh road which are close to the proposed extension. There are also a small number of residences with potential visibility located along the local road in Rangue to the east and Knocknaboola to the south of the proposed extension, where there are gaps in vegetation. These locations are illustrated in Figure 14-4 below and Plates 14-16 illustrate the roads in the vicinity. In some locations, visibility is likely to be from the rear of the residences, as there are few open views along the majority of these roads and the visual effects are likely to be more

pronounced from the properties. The areas where there are potential visual receptors are described below.

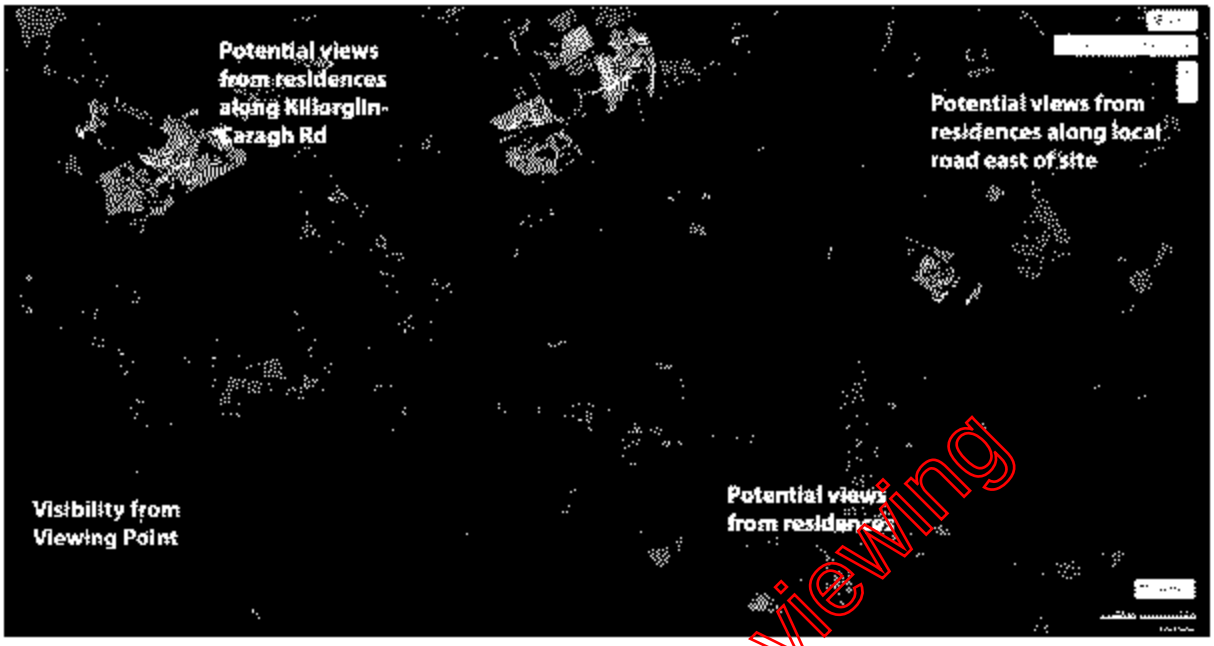


Figure Error! No text of specified style in document.-30 Potential Visual Receptors

Killorglin-Caragh Road

This road runs between the existing pit and the proposed extension. In general this road is well screened by vegetation, however a number of areas were identified where residents may experience more open views of the site. This includes a row of approximately six properties which border the north-western end of the proposed extension. While there are very few open views from the road, as shown in Plate 14.12 below, there are potential views from the rear of some of these dwellings, especially ones where there is no intervening vegetation as shown in Plate 14.13.

Plate Error! No text of specified style in document.-16: Vegetation and houses screen views to extension site from road

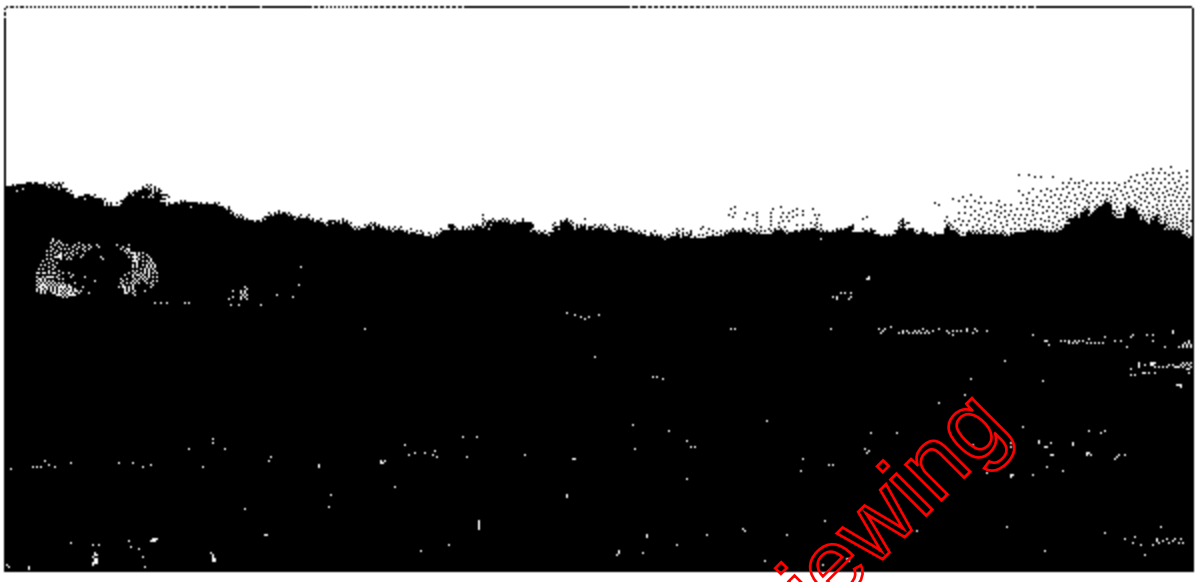


Plate Error! No text of specified style in document.-17: Rear of some houses along Killorglin-Caragh Road visible from proposed extension site

A dwelling set back from the Killorglin-Caragh road but on elevated ground also has potential views over the expansion site.

Local road at Rangue/Knocknaboola, east of proposed extension area

This is a narrow road which travels east of the proposed extension site. There are a number of houses near the junction with the Killorglin-Caragh road, and some three of these are slightly elevated and may have views from the rear of the properties. There are few open views from the road itself as shown in Plate 14-14 below. The road travels trees and as it runs south through the bog and there are very open views towards the proposed extension site, but no dwellings on this part of the road.

Plate Error! No text of specified style in document.-18: Dense screening along local road east of site

Plate Error! No text of specified style in document.-19: Elevated dwellings visible from site

Plate Error! No text of specified style in document.-20: Open views through wire fence from local road southeast of site

Local Road at Knocknaboola/Coomnafanida, south of proposed extension area

The local road at Knocknaboola travels lies south of the proposed pit extension and is slightly elevated in sections. Some short sections of open views are available near the junction with the bog road that travels east of the proposed extension area, where there are some residences which face in the direction of the site. A view towards these residences is evident from a slightly elevated mound on the site, as seen in Plate 14.17 below.

Plate Error! No text of specified style in document.-21:

As the road travels towards Caragh Village the screening becomes denser and views towards the site are restricted.

14.4.5 Viewpoints

A list of provisional viewpoints were identified, and after a site visit, several of these were selected to represent the various visual receptors. In certain locations, open views were not available close to the residences and nearby open views were chosen instead. The views and these are listed in Table 14.8 and mapped in Figure 14.5 in Section 14.5.3.

14.5 Impacts of the Development

14.5.1 Construction Phase Landscape Effects

14.5.1.1 Landscape Value & Sensitivity

Wider Landscape - The wider landscape includes areas of Secondary Special Amenity to the south, while Lough Caragh itself is an area of Prime Special Amenity. The N70 Ring of Kerry route is a scenic route to the north of the site (but will not have visibility of the site). The scenic qualities of the mountains and lake are described in the earlier sections, and this wider landscape is considered to be of High landscape value.

Site and immediate vicinity - The landscape values are referred to in Section 14.4.3 and the landscape values of the site are considered to be Low to Medium. The existing processing area is described as of Low sensitivity, though areas which are regenerating would be Medium. Regarding the expansion site, this has few features but representing a partly intact area of bogland, with a stream bordering the eastern boundary, some clumps of bogland vegetation and vegetation bordering the local Caragh-Killorglin road. The immediate vicinity of the site is pleasant but not covered by any designations.

14.5.1.2 Magnitude of Change

The existing aggregation and production factory area (processing area) in Rangue will undergo very little change – these being that the landscape continuing to regenerate in certain areas -considered No change to Negligible. The underpass and the Caragh Road is considered a Low magnitude of change.

The proposed sand and gravel pit at Knocknaboola (the proposed extension) will result in more pronounced change, with the extraction of material over an area of over 16 ha, and the removal of areas of blanket bog, cutover bog and disturbed areas as well as smaller areas of vegetation within the site, along the eastern boundary and along the northern boundary along the local road. . This will be carried out in phases from north to south, and the activities will include the stripping of overburden, construction of berms, and primary screening. An entrance off the Caragh-Killorglin road is proposed and the area will be extracted to a level of approximately 21mOD in the northern part of the proposed sand and gravel pit, to 23.5 in the southern part of the site. The levels at the pit boundaries range from 29-38 metres OD, resulting in a considerable drop in level.

The magnitude of change is considered High, and this is described as:

> *Change that is moderate to large in extent, resulting in major alteration or compromise of important landscape receptors...*

14.5.1.3 Significance of Effect

The continuation of the activities at the processing area at Rangue is considered to have No effect to Negligible landscape effect. The direct effect on the landscape of the proposed expansion site and the immediate surrounds is considered to be Significant, adverse, and permanent however but this is very localised, confined to the site and immediate vicinity including the closest roads to the site.

However the wider landscape character is considered to undergo a lesser degree of change, as the pit will be largely screened from the wider landscape with the exception of the more elevated areas including the viewpoint at Caragh Lake Forest, and landscape effects as the proposed extraction progresses, are considered Slight and adverse.

14.5.2 Operational Phase Landscape Effects

The extraction phase of the proposed extension is described above, and therefore during the operational phase the activities are considered to continue at the processing area, while the areas undergoing regeneration will continue.

14.5.3 Construction Phase Visual Effects

Visual Effects were assessed based on the site visit and desk study, and analysis of the proposed development proposals. The main elements relevant to the assessment of visual effects is the proposed extension area, as the elements within the existing processing area which is to be continued, are already present. Therefore the visual assessment focusses on the proposed extension area at Knocknaboola.

The viewpoints were chosen as described in Section 14.4.4 and 14.4.5 above. Photographs were taken form a number of locations, to the north, south, east and west, and represent amenity viewpoints (Viewpoint 1, Caragh Lake Woods) as well as residential receptors and road users.

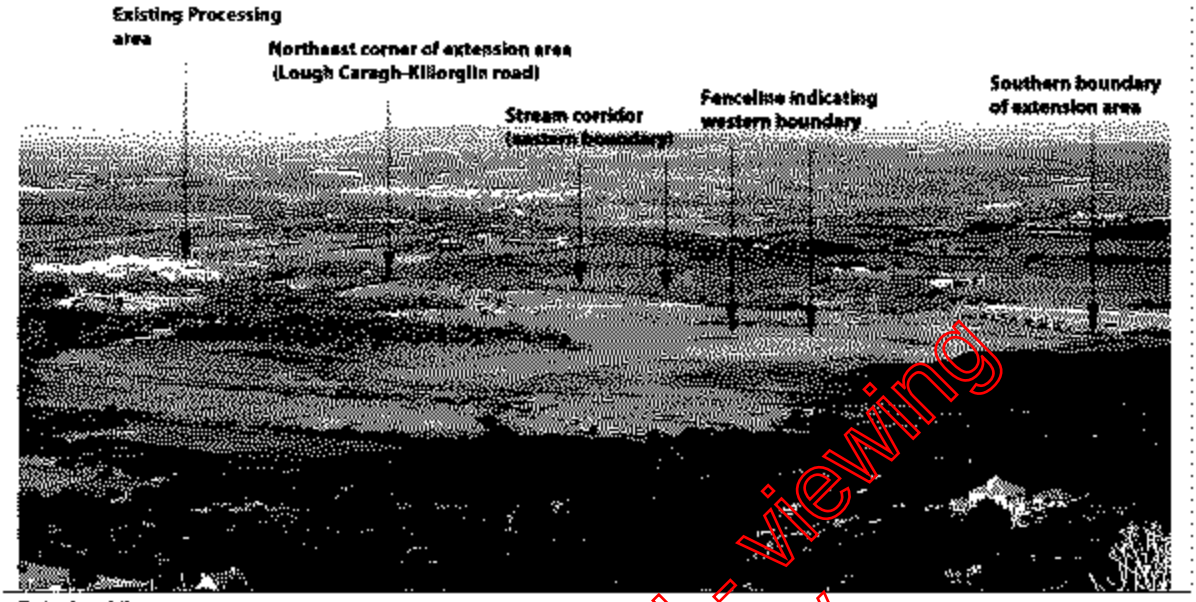
The viewpoints were photographed with a Canon EOS 6000D with a 35mm lens, giving a 56 degree field of view. Eight viewpoints were chosen, and these are described below. In order, however, for the images and annotations to be legible, these had to be cropped so the images are larger in size.

Table Error! No text of specified style in document.**-33: Viewpoint Locations**

Viewpoint Locations	
Viewpoint Number	**Description**
1	View from hilltop above Caragh Lake Forest
2	View from Caragh Lake-Killorglin road west of site
3	View from local road at Rangue (west of processing area)
4	View from Caragh Lake-Killorglin road east of existing pit entrance
5	View from local (bog) road at Knocknaboola
6	View from local road (bog road) at Knocknaboola
7	View from local road at Coomnafanida

Figure Error! No text of specified style in document.**-31: Viewpoint Location Map**

Viewpoint 1: View from hilltop above Caragh Lake Forest



Existing View

This view shows a panoramic view from the viewing point at the top of the Caragh Lake Forest recreation area. Though the main direction of view is towards the dramatic view of Caragh Lake with the backdrop of mountains, there are panoramic views in many directions, including views to the north over Dingle Bay/Castlemaine harbour. This view shows a sloping, vegetated hillside in the foreground, with several scattered dwellings, and a large, flat expanse of bogland in the foreground, with clumps of vegetation at the edge, and the existing pit and processing area visible to the left of the view. In the distance, the landscape is a patchwork of fields, clumps of trees and scattered buildings, with the urban area of Killorglin visible in the background. A long low ridge of hills is visible in the distance.

Visual Receptor Sensitivity

Visual receptor sensitivity is considered High. The view is form a recreational trail within an area of Secondary Special Amenity. (However the value of the view in this direction is not as high as the view looking towards Caragh Lake.)

Proposed View

The image above indicates the approximate boundaries of the proposed extension, which extend form the Lough-Caragh-Killorglin road to the left of the image, close to the clump of trees to the right of the image. The site boundary to the east is defined by the stream. This will gradually be excavated in phases, beginning form the left and progressing to the right of the view.

Magnitude of Change

The proposed extension occupies a considerable horizontal proportion of the view, but will occupy a limited proportion of the vertical extent. The proposed extraction area will be visible against a backdrop of the stream corridor, delineated by small trees and shrubs, and clumps of vegetation to the right and left of the view. The magnitude of change is considered Medium: *Partial intrusion of the development in the view, or introduction of elements that may be prominent but not necessarily uncharacteristic in the context, resulting in change to the composition but not necessarily the character of the view or the visual amenity*

Significance of Effect

Table 14.3 indicates that a High visual receptor sensitivity and Moderate magnitude of change would result in a Significant visual effect, once the entirety of the expansion area is worked out. The quality of the effect is considered to be adverse. During the initial construction phase, berming will be gradually deposited along the boundary of the proposed extension and this will then be planted. Such measures will improve the visual effects and the boundaries of the pit however from this elevation it is likely that the deeper excavated areas will be visible.

Viewpoint 2: View from Caragh Lake-Killorglin road west of site

Existing View

The above view shows the tree lined Caragh -Killorglin road, at a location where there are a number of dwellings along the road. The entrance to two dwellings is visible in the above view, with mature roadside trees in between. In the distance the road is lined with mature trees. The proposed extension is located to the right of the image (screened by the vegetation). There are some glimpses in between the houses to the higher hills and mountains in the landscape beyond, but no open views towards the site.

Visual Receptor Sensitivity

Visual receptors at this location would be road users and those entering and exiting the dwellings, and considered medium. Though close to dwellings, it does not represent users within the dwellings who would have different views form their properties.

Proposed View

The proposed view would show no changes due to the roadside screening.

Magnitude of Change

None.

Significance of Effect

No visual effect.

Viewpoint 3: View from local road at Rangue (west of processing area)

Existing View

The existing view shows the junction between the Caragh Lake-Killorglin road and the local road at Rangue, south of the entrance. This view shows the road lined with relatively mature roadside trees and shrubby vegetation, with a track (leading to the proposed extension site) in the left of the view. A glimpse of the shrubby vegetation on the site, and the higher ground beyond is seen in the gap in the vegetation.

Visual Receptor Sensitivity

Visual receptors would be those travelling on the road and would be considered Medium sensitivity as there are some scenic views in the vicinity.

Proposed View

The extents of the proposed extension area are indicated on the above image. To the left of the view, the proposed extension occupies the foreground to the left of the track. While the track forms the western site boundary, the extraction area will be in the background to the right of the view. The main elements likely to change are the vegetation to the left of the track which, apart form the immediate roadside vegetation, is likely to be removed. Trees and shrubby vegetation to the rear of the track is also likely to be removed. To the right of the view, the roadside vegetation will be retained as the pit boundary is set back somewhat from the roadside so the vegetation will continue to screen view form this side.

Magnitude of Change

The magnitude of change is considered Low, as the majority of the view (to the right of the track) will remain the same. The removal of some but not all vegetation to the left will open up views though views are likely to be of the earth berm in the short term and some views may be available to the higher ground in the distance.

Significance of Effect

The visual effect is considered **Slight and adverse** in quality. Over time, any roadside vegetation which is affected should regenerate or be replanted and the planted berm will help to screen views in the short to medium term.

Viewpoint 4: View from Caragh Lake-Killorglin road east of existing pit entrance

Existing View

The existing view shows a relatively straight section of road with dense roadside trees and vegetation. There are no buildings in the view, with an (the existing pit entrance) visible to the right of the view and some ornamental hedging in the foreground. A dwelling entrance is adjacent to the viewpoint.

Visual Receptor Sensitivity

Visual receptors would be those traveling along the road, and those entering and exiting the adjacent dwelling. These are considered of Medium sensitivity.

Proposed View

Indicated on the image above are the approximate extents of the proposed extension area which lies adjacent to this section of road. The layout plan indicates the removal vegetation along the road, the majority of the roadside vegetation approximately to the left side of the image above, with a narrow band left to the extreme left of the image. The proposed view will include the creation of a proposed entrance to the expansion area, approximately 50 metres west of the existing entrance (on the opposite side) which will be clearly visible in this view. Beyond this entrance, roadside vegetation is to be retained.

Magnitude of Change

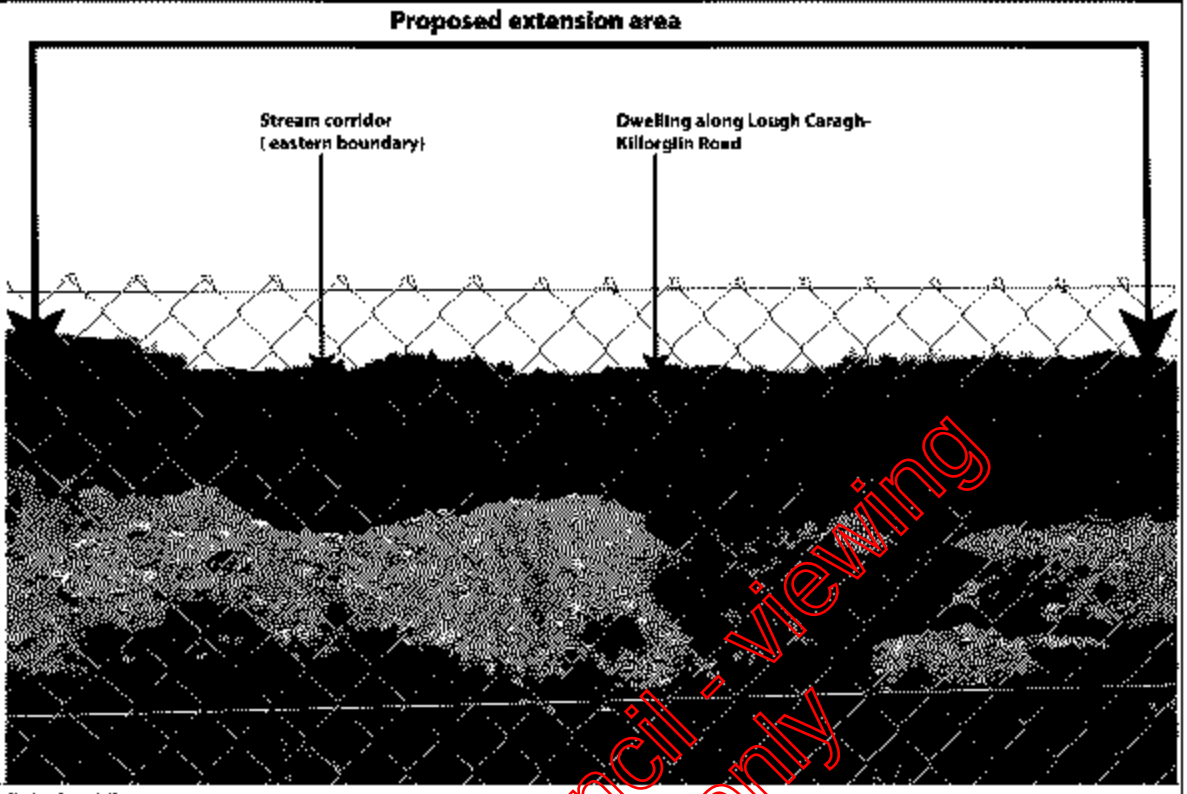
The proposed extension area extends along a considerable section of this road, and while some vegetation west of the proposed entrance is to be retained (to a width of 7 metres), vegetation removal and the creation of a new entrance will result in a Medium magnitude of change to the view.

Significance of Effect

The short-term visual effect is considered **Moderate- Significant and adverse,** becoming **Slight and adverse** in the medium-long term.

Some views into the site and to the landscape beyond are likely in the short term due to vegetation removal and the creation of an entrance. With the implementation of the landscape mitigation measures these should reduce over time as replacement vegetation re-grows and the berms put in place and vegetated. Some views to the mountains beyond may be opened up and this would be beneficial.

Viewpoint 5: View from local (bog) road at Knocknaboola



Existing View

The existing view shows a view from the more open section of the bog road at Knocknaboola, though a post and wire fence erected adjacent to the road prevents cleaner views. However it is possible to make out the landscape beyond, with disturbed ground – mounds of earth and spoil – visible in the foreground. Behind this, in the middle ground, are areas of what appear to be wet grassland or bogland, interspersed with clumps of vegetation – mainly small shrubs and trees – which include the stream corridor which forms the site's eastern boundary. In the background, an elevated vegetated mound is visible to the left of the view, and clumps of trees and vegetation in the background denote the Lough Caragh-Kilforglin road.

Visual Receptor Sensitivity

Visual receptors would be those travelling along the road, at slow speeds, which is regarded as moderately scenic. These are considered of Medium sensitivity.

Proposed View

The image is annotated to identify some features such as the stream corridor, which forms the eastern site boundary, denoted by shrubby vegetation in the middle ground of the view. Though this is the eastern site boundary, in the background the proposed extension area extends along the width of the view, to the rear of the houses along the Lough Caragh-Kilforglin road, and along the road verge further to the left of the view. The proposed berm

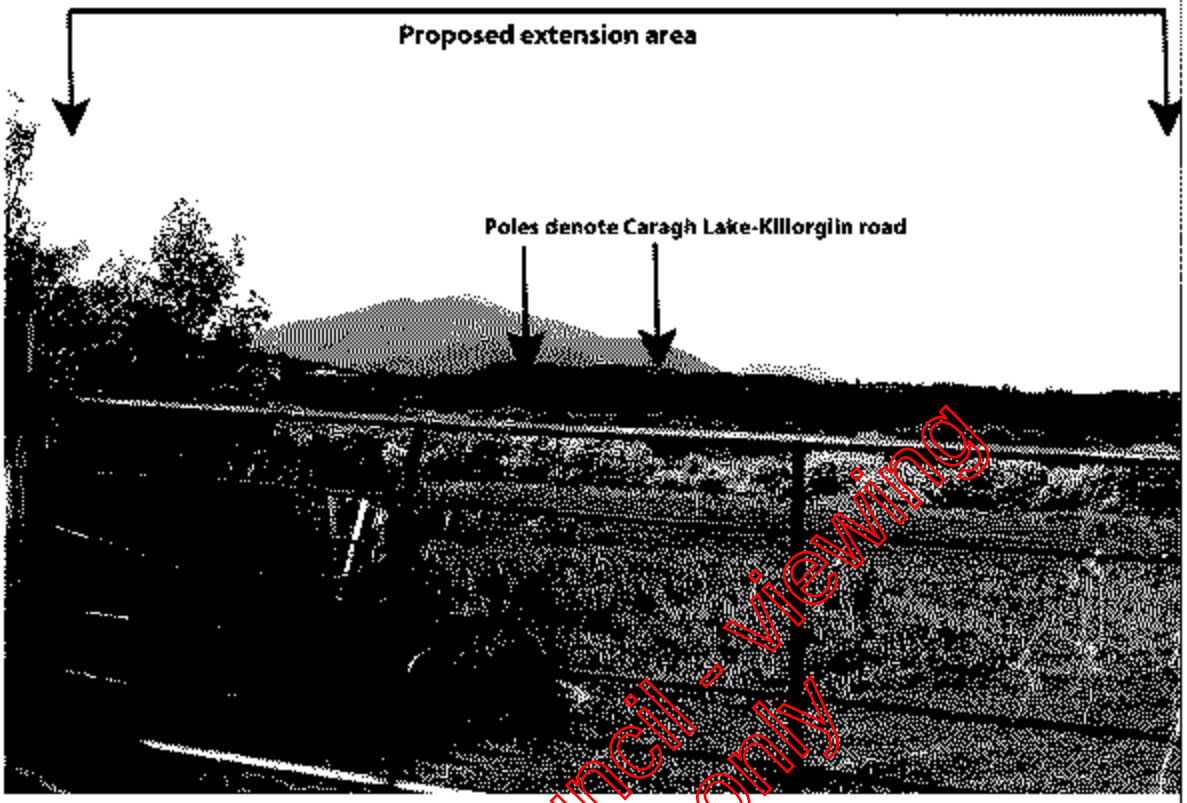
Magnitude of Change

The proposed extension area extends along the entire width of this view, mainly in the middle ground. The vegetation in the foreground, if retained, will provide partial screening, and the retention of vegetation along the stream corridor will also screen views Though some vegetation thinning and removal is proposed along the Caragh-Kilforglin road, this will not be very noticeable in the view. The magnitude of change is considered Low.

Significance of Effect

The visual effect is considered **Slight and adverse** in the short term and **Slight and neutral** in the long term. Some views into the site and to the landscape beyond are likely in the short term to the right and left of the view, in between the foreground vegetation. With the implementation of the landscape mitigation measures these should reduce over time as the berms are put in place and vegetated, which will screen views of the proposed extension. This will also restrict some views to the landscape beyond.

Viewpoint 6: View from local road (bog road) at Knocknaboola



Existing View

The existing view shows the view form the local road east of the site, at Knocknaboola. This view looks through a gate where a gap in an otherwise heavily vegetated road allows some views towards the site. In the foreground a field of marginal grassland is evident, while in the middleground there are large swathes of shrubby vegetation and trees, interspersed with smaller areas of bog or heath. A dwelling stands on a mound to the left of the image but otherwise there is no built form visible. The existing extraction area and the worked out pit at Rangue are off to the right of the image. The mountains form a dramatic backdrop to the view.

Visual Receptor Sensitivity

The view is taken from a narrow local road and represents viewers travelling at slow speeds at a view with some scenic qualities. The receptor sensitivity is considered Medium to High.

Proposed View

The annotations on the above image indicate that the proposed extension will extend across most of the view (the existing Riordan's pit is off to the right of the view). The Caragh-Killorglin road runs through he middleground, denoted by the wooden poles and the dense tree line. Though the different areas of trees and shrubby vegetation are not easily deciphered, the vegetation at the boundary of the field will remain, however the vegetation in the middleground along the stream may be affected, and the planted berm, once in place, will be visible to the rear of this. Vegetation removal and thinning along the roadside is also likely to be visible, especially in the short term before the bund and vegetation is established. The extent of the excavation likely to be visible will vary over time but once the bund and vegetation is established visibility of the excavation is likely to be largely screened.

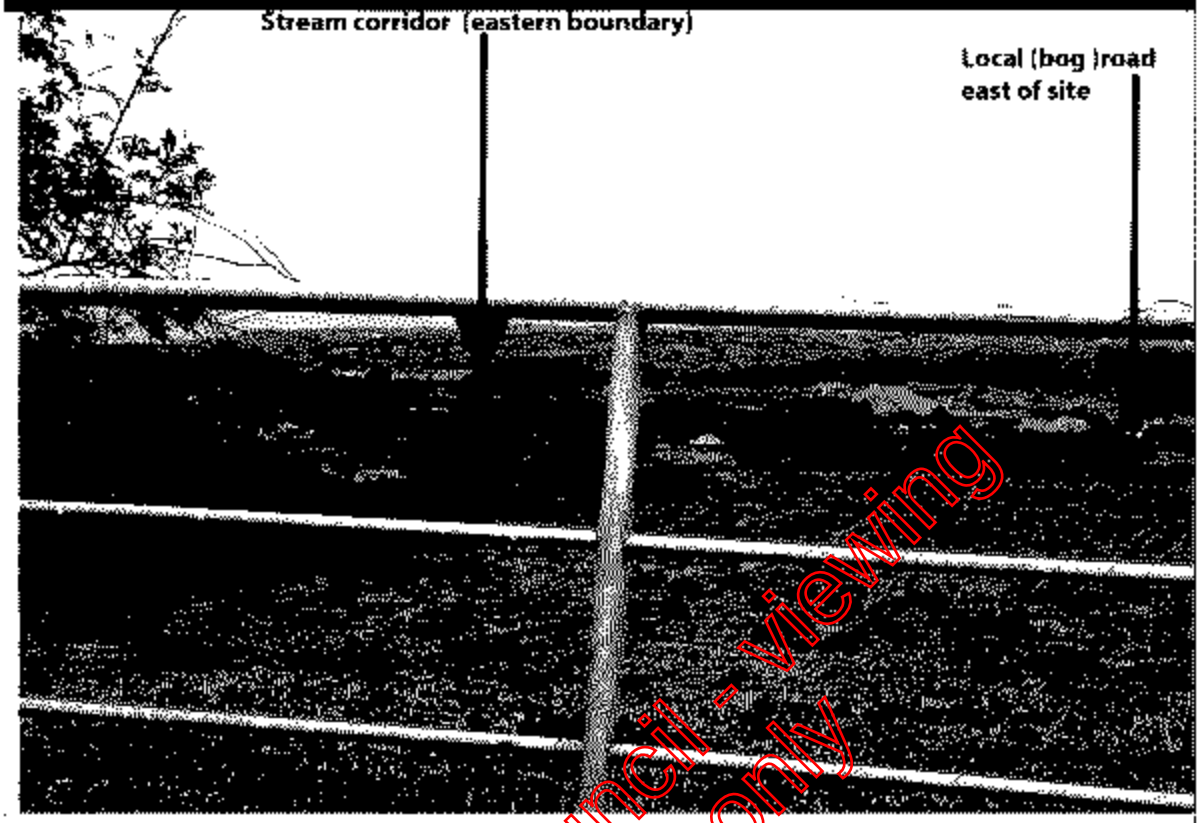
Magnitude of Change

The magnitude of change is considered High. In the short term, this will be the area first excavated, with excavation progressing from right to left across the image.

Significance of Effect

The visual effect is considered to be Moderate to Significant in the short term. Disturbance will be considerable in the short term, and though the extent of excavation will increase over time, so too will the bund and vegetation establish. The long term effects are considered **Moderate and adverse.**

Viewpoint 7: View from local road at Coomnafanida



Existing View

The existing view taken form the local road south of the site shows a field of marginal grassland in the foreground, with some hedgerow vegetation to the left of the view. In the middleground, some scattered shrub growth is visible, while to the right of the image the Knocknaboola bog road is just discernible (lined with mounds of soil). In the middle ground, the stream corridor is indicated by a curving line of vegetation, which then blends with another area of vegetation outside (east of) the site boundary. To the left of the stream corridor some of the open bogland on the site is just glimpsed. In the background, the vegetation that lines the Lough Caragh – Killorglin road is visible, and the ground rises slightly behind this. In the distance, the hills across Castlemaine harbour provide an attractive backdrop to the flatter foreground land.

Visual Receptor Sensitivity

Visual receptors would be those travelling along the road at slow speeds. There are some houses and farms near this viewpoint which would have similar views. The view is considered moderately scenic and the sensitivity is Medium.

Proposed View

The image above indicated the stream corridor which forms the extension's eastern boundary. To the left of this, the proposed berm will be visible, and disturbance to the ground will be evident. Glimpses of the site closer to the Caragh-Killorglin local road are available and therefore disturbance of ground here too is likely to be visible.

Magnitude of Change

The magnitude of change is considered Low in this view.

Significance of Effect

The visual effect is considered **Slight and adverse** visual effect However in the short to medium term, the proposed earth berm which will be vegetated will reduce visibility of the extraction area.

Summary

The 7 viewpoints represent areas where the proposed development (and mainly the proposed extension at Knocknaboola) are likely to be visible, while other views show partial visibility or in the case of Viewpoint 2, full screening. The likely visual effects range from Slight to Significant, in the short term, with some views (such as the Ring of Kerry N70) being screened out. In general visibility is localised, and confined to the roads and areas in the immediate vicinity, and over time screening and mitigation will result in restricted visibility.

It is important to note the change in views and visual effects over time as the mitigation measures establish. The viewpoints and the visual effects at Post construction, Short term and Long terms are summarised in the table below. It should be noted that as the pit is worked out, some views will experience more pronounced visual effects as in Viewpoint 1. However, at the same time, the proposed mitigation measures will gradually establish.

It should also be noted that there are very few places where both the existing processing area at Rangue and the proposed extension are both visible. While they will be visible in Viewpoint 1, most of the other viewpoints will not have visibility of both areas. Where this may occur (such as in Viewpoint 6, some of the existing processing area and Riordan's pit may be seen in sequence (off to the right of the view.

14.5.4 Construction and Operational Phase Visual Effects- Summary

Table **Error! No text of specified style in document.**-34: Summary of visual effects

Visual Effects Summary			
Viewpoint Number	**Description**	**Short-Medium term**	**Medium-Long term**
1	View from hilltop above Caragh Lake Forest	Moderate, adverse	Significant, adverse
2	View from Caragh Lake-Killorglin road west of site	None	None
3	View from local road at Rangue (west of processing area)	Slight, adverse	Not Significant, neutral
4	View from Caragh Lake-Killorglin road east of existing pit entrance	Moderate-Significant adverse	Slight, adverse
5	View from local (bog) road at Knocknaboola	Slight, adverse	Slight, neutral
6	View from local road (bog road) at Knocknaboola	Moderate-Significant	Moderate, adverse
7	View from local road at Coomnafanida	Slight, adverse	Not significant, neutral

The views above, representing views from the roads nearby the processing area and proposed extension , and one view from a recreational area, range from No effect where the proposed extension is not visible, to Significant. These views, as indicated in the table above, are likely to change as the proposed extraction continues and becomes larger in area, and the visual effects would be more pronounced as extraction continues, while at the same time the proposed mitigation measures will establish as time goes on.

Views from Lough Caragh-Killorglin Road

In general many views from this road will be screened, with some visibility likely as roadside vegetation is removed for the proposed entrance. The row of houses which line this road and are to the north of the extension area boundary are likely to have some views of the proposed development before the proposed mitigation measures establish, but the exact extent of visibility is difficult to establish from the public road. Views of some dwellings from the extension area indicate potential visibility is likely during the early construction stages but are likely to be screened during the later phases of construction. Visual effects from the road itself are likely to range from none, to Moderate and adverse, with the potential for a locally Significant view at the proposed entrance to the site.

Local road at Rangue/Knocknaboola, east of proposed extension area

While certain sections of this road are well screened, some open views are available, particularly along the southern part of the road, with more pronounced visual effects likely in these areas during the initial stages of extraction. Visual effects are likely to range from Moderate to potentially Significant especially in the initial phases of extraction. The proposed mitigation measures (the planted 3 metres high berm surrounding the site) should reduce these visual effects once established.

Some of the (low number of) residences which are located to the west of the road, and overlooking the proposed extension area, are likely to have views of the proposed extension. This is not easily determined from the roadside however it is estimated visual effects will arise from certain locations where views are from elevated areas or upper storeys, and these are likely to be more pronounced than the visual effects from the road.

Local Road at Knocknaboola/Coomnafanida, south of proposed extension area

While some open views are available from this local road, namely a cluster of houses in the vicinity of Viewpoint 7, as one moves further west dense screening reduces visibility. Views from this short section of road, close to the junction with the Knocknaboola bog road, are likely, and while they may be pronounced during the initial phases of construction, they are likely to reduce over time as mitigation establishes.

Caragh Lake area

This highly scenic area around Caragh Lake will not have visibility of the proposed development. While the viewpoint at the top of the forest (Viewpoint 1) is considered Significant and adverse, the remaining areas around the lake at a lower level, which are highly sensitive, will not have visibility. Therefore though this view is included, is represents the only open view from this area. The view towards Caragh lake and the mountains will not be affected.

Other areas- wider landscape

In general, the wider landscape will not have visibility of the proposed extension area, with visibility form the wider landscape confined to certain elevated locations and mountains to the south.

14.5.5 Decommissioning Phase

14.5.3.1 Decommissioning Impacts

- All buildings and equipment will be decommissioned and demolished in accordance with a phased demolition plan, and either sold for reuse or recycled, or disposed of by an authorised waste contractor, as appropriate. In general, specialist equipment, pipelines and storage tanks will be sold for reuse, where possible, or disposed of offsite;
- Roadways to be broken up and removed and security fences dismantled and the access onto the Caragh Lake-Killorglin Road is to be closed up.

- All hazardous and non-hazardous process substances to be removed;
- All roads and hardstanding areas to be removed and recycled or disposed of by an authorised waste contractor, as appropriate;
- Landscaped will be reinstated in accordance with a landscape Restoration plan as shown in Appendix 14-1. This is described in more detail in the Mitigation section.

14.6 Mitigation

14.6.1 Construction phase mitigation

Construction phase mitigation measures include:

- Existing boundary vegetation especially that along the Caragh-Killorglin road is to be retained where possible and damage to this vegetation avoided during construction. Vegetation along the Glashacoomnafanida stream along the eastern boundary to be retained where possible.
- Proposed dense screen planting is proposed along the site boundary to the south of the houses along the Caragh-Killorglin road to screen potential views
- A berm will be created along the eastern boundary adjacent to Glashacoomnafanida Stream and a silt fence will be provided between this berm and the stream. The berm will be planted with native species (as specified in the Landscape Restoration Plan Drawing 21555-2-101) to assist in the assimilation of the development into the landscape and to restrict views.
- During the construction phase of the proposed extension, shallow peat, where present, will be excavated and largely removed from the excavation area of the site and stored for reuse during restoration and will help to form the areas show in the Landscape Restoration Plan.
- Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped, as appropriate, once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary. Any new planting for landscape purposes will be predominantly of native species.

14.6.2 Operational phase mitigation

A mineral soil berm will be constructed surrounding the entire extension at Knocknaboola. The mineral soil berm along the southwestern boundary will be constructed to retain the upgradient wetlands. The restoration phase is described below.

14.6.3 Landscape restoration/ mitigation measures

Once extraction activity comes to an end the restoration process will facilitate natural recolonisation. A Landscape restoration plan has been prepared for the existing pit and the proposed extension (as shown in Appendix 14-1) Restoration of the proposed extension will be completed in a phased and progressive basis. The proposed measures include:

- The berm is to be planted with native species including Alder, Birch, Willow – species already present on the site – to screen views and assist in assimilating the extraction area into the landscape.
- Shallow peat will be stored during the extraction phase and will be deposited in areas on the floor of the pit to allow natural recolonisation to take place.
- Smaller mounds of soil will be deposited and areas of native tree/woodland planting located in these areas to provide diversity of habitat

- Rock faces and benches will allow for colonisation by sand martins and will not be planted

14.7 Difficulties Encountered in Compiling Information

Some limitations include lack of visibility of the proposed extension site from the road, thus making it difficult to describe the likely visual effects from individual properties when viewed from the public road.

14.8 Residual Impacts

The residual impacts, that is, the landscape and visual effects once the mitigation measures have been applied, are addressed above in Sections 14.5, where references to the proposed mitigation measures are shown to lessen the visual effects in some locations. However the effects once the restoration plan has been implemented are referred to below.

14.8.1 Landscape effects

Landscape effects are considered to be Significant and adverse at a localised level due to the removal of the intact and disturbed areas of bog, vegetation which has an overall naturalistic and remote character. Landscape effects are considered Slight and adverse in the wider landscape.

Following restoration, the landscape effects outlined above remain, however there will be some additional and beneficial effects resulting from the natural colonisation and the tree planting.

14.8.2 Visual effects

The visual effects assessment takes into account the mitigation measures which will over time, reduce visual effects from some viewpoints as outlined above.

However the visual effects following restoration, will reduce in a number of cases. Visual effects from views which area elevated – including Viewpoint 1 – the viewpoint above Caragh Lake Forest – and similar elevated views from the hills to the south, will improve after restoration. The floor of the extraction area will be recolonised with a mixture of grasses shrubs and trees, which will greatly reduce the visual effects, though the benches will remain visible from these more elevated views are likely to improve after restoration.

Visual effects from the areas and roads closer to the site will also reduce as the boundary vegetation thickens though the majority of the restoration measures are not likely to be visible due to screening. The residences near the site (especially those which are elevated) are likely to experience an improvement in visual effects, with any views showing the floor of the extraction area during the extraction phase, having visibility of the regenerating vegetation and overall blending in more effectively to the local landscape.

14.9 Cumulative Impact

Cumulative effects are considered in terms of other extraction activities in the area. There is a quarry to the west of the site, closer to Caragh Lake.

This existing pit only visible along with the existing processing area and the proposed extension, from one view - Viewpoint 1 (Caragh Lake Forest), where, while it would not be visible in this image, the existing pit would be visible off to the left of the view, resulting in sequential views.

However, the proposed extension area would result in a Slight-Moderate, adverse cumulative visual effect as the area of the overall panoramic view occupied by the two extraction areas would increase. The panoramic nature of the view means that while both extraction areas would be visible, there are other remarkable features in the view, notable Caragh Lake and the mountains. Non of the other

Viewpoints 1-7 will result in cumulative effects due to the visibility of the other pit, due to the distance and the low lying landscape and screening in the immediate vicinity of both pits.

Cumulative landscape effects would arise from the increase in the extraction area, with more of the land cover removed in this area, and extraction area increasing. Therefore cumulative landscape effects are considered Slight-Moderate in the immediate vicinity of the site.

14.10 References

- EPA (2017) *Draft Guidelines for Information to be Contained in Environmental Impact Assessment Reports*
- Kerry County Council. *Kerry County Development Plan 2015-2021*
- Landscape Institute and the Institute of Environmental Management and Assessment (2013) *Guidelines for Landscape and Visual Impact Assessment, 3rd Edition*

Chapter Fifteen – Consideration of Alternatives

15. Alternatives Considered

15.1The 'Do Nothing' Scenario

In support of this EIAR, alternative options and locations were assessed and are detailed as follows.

The 'Do Nothing' Scenario is extremely unfavourable for the company. Essentially, there are numerous elements within the planning application, the two most imperative including; continuation of use of existing aggregate production factory site and the proposed extension which entails extraction of aggregate on 16.75Ha of contiguous lands at Knocknaboola.

If the proposed extension is not approved, the remaining viable reserves will only be sufficient until 2022, when their planning application expires. Following the cessation of operations, the sand and gravel pit would fill with water and the site would be restored in accordance with a scheme as required under current restoration conditions attached to current planning permissions.

The stagnation and cessation of production from the sand and gravel pit would mean that MFQ contribution to all land-won aggregates quarried in the Killorglin area would diminish, cease and then subsequently be closed. The 'Do Nothing' scenario does not contribute to meeting aggregate demand in the Killorglin area and will inevitably require the development of an alternative extraction site or sourcing from a more distant location.

The current number of jobs based at the pit is 38, and with the proposed extension, more job vacancies are imminent. Not only will jobs be required for operations at the sand and gravel pit when extension area is operational, but also for construction of the preliminary works for the extension. Thus, the increase of job vacancies on site is catalysed by proposed works which will in turn improve the local economy.

In reality, MFQ will focus on managing the extraction and associated production as profitably as possible. The 'Do Nothing' Scenario is not an option as jobs would begin to taper off from 2022. Ultimately, this would result in the long-term loss of a number of direct and indirect jobs and the reduction of the associated financial benefits introduced into the local economy by the presence of a sand and gravel pit.

Furthermore, MFQ would not be able to pit at this location again. This is because once working stops at 'Riordan's' Pit within the Rangue site, the plant will be removed, de-watering would stop and the void would fill with water. It would then be very costly to reopen the sand and gravel pit in future due to the cost of de-watering the whole void from its filled state, as well as the cost of reinstalling plant and other infrastructure. Therefore, the 'Do Nothing' scenario is not a viable option.

15.2 Alternative to Primary Aggregates

There are two alternatives to primary aggregates – recycled aggregates and secondary aggregates, which can suffice for use in the extractive industry. However, both are not capable of fully replacing primary aggregates as there can never be a guarantee of supply of material of suitable quality to meet specific demand.

15.3 Alternative Sources within Co Kerry Area

MFQ operate other pit sites within Co Kerry, which supply their products throughout the County and to border counties. The site at Rangue is the head office and the additional sand and gravel pits operated by MFQ are located at Caragh Lake (also in Killorglin), Killarney, Cahersiveen and Bunadereen.

However, the firm is unaware of any potential sand and gravel pit land in the Rangue and Knocknaboola area other than the land at Knocknaboola for which planning permission is being sought.

Alternative sand and gravel pits in other parts of Kerry were sought by the company; although all of them are too distant to the ready-mix concrete and these sites have faced challenges within the sand and gravel pit industry.

A history of these sites is provided below:

- Dromnakilly, Dromid, Waterville: The land was suitable for extraction but after preliminary discussions with Kerry County Council the roads were deemed to be substandard for transportation. The firm withdrew from the purchase discussions without purchasing the land.

- Canuig, Dromid, Waterville: At this location land was offered for sale which contained suitable reserves of aggregates. Preliminary discussions took place with members of the Planning Section and Roads, Safety and Transportation and these concluded that the location was unsuitable for a working sand and gravel pit. The firm withdrew from the purchase negotiations without purchasing the land.

- Gortahoosh, Killarney (Reference 94/1689): At this location an agreement was reached with the landowner to seek Planning Permission prior to purchasing the land. Kerry County Council considered the Planning Application under reference 94/1689 and granted Permission but the grant was appealed to An Bord Pleanala and was refused on that appeal mainly due to the roads being considered unsuitable. The new N72 road was then built but Planning Permission for residential development was granted on the site where a large reserve of aggregates was known to exist. The Department of the Environment hasn't got a tradition of zoning land for aggregates.

- Edenburn, Tralee: This is an area of limestone reserves and the firm commissioned an Environmental Impact Statement and applied for Planning Permission for extraction. Permission was refused because of the alleged inadequacy of the road infrastructure when the firm had already bought the land.

- Raheen, Fermoyle, Ballinskelligs (Reference QY 111): This land contained a Pre 1963 Sandstone Rock Pit which opened onto a reasonable quality local road. With these advantages apparent, the firm purchased the land and registered the pit under Section 261 of the Planning Act of 2000. The Registration was considered under Reference QY 111 and Permission to pit one load per year was granted by Kerry County Council while, at the same time, environmental Conditions were imposed on the resulting operation. For several economic and practical reasons this amounted to a refusal of permission to pit and the land was rendered valueless for extraction the fact that it has almost no agricultural value, as it is steep and has little vegetation over the solid rock.

- Minish, Killarney (Reference 94/1767): At this location another reserve of sand and gravel existed close by the quality primary road, N72, from Cork to Killarney. The company bought the land, had an Environmental Impact Statement prepared, and applied for Planning Permission. Kerry County

Council granted permission under reference 94/1767, although it was appealed by An Bord Pleanala and permission was refused. The Board's reason for refusal was not, on this occasion, due to the quality of the roads but the perceived nuisance that pit traffic would cause to the residents.

- Caheragh, Castleisland: This site is situated on a good road leading from Castleisland to Ballydesmond and on to Cork. Close by a pit has been in operation for decades on the same limestone rock seam, so the company bought the land. John A Woods/Roadstone had earlier acquired an option to buy contiguous land for their nationally important extraction operations and its Planning Application was submitted prior to the one of this firm.

- Ballahacommane, Killarney (ABP-307835-20): The firm's Killarney pit was never an alternative to its pit in Rangue but, rather, an addition to it from which aggregates could be sold in the Killarney area. Besides that, the sand in Killarney is of the best quality and that is sold throughout the county and also in parts of Cork and Limerick. Nonetheless, aggregates from the Ballahacommane Pit could be used to supply the factory site at Rangue and, in that sense, is an alternative. However, the Killarney pit's planning permission was also refused by An Bord Pleanala on the grounds that adverse visual impact could not be ruled out.

Evidently, there are other areas of reserve in Co. Kerry, albeit virtually all unsuitable. This is due to the fact that extraction sites are not available in a county of mountains, lakes and rivers that is considered the most scenic and has more than its share of preserved areas.

From the perspectives of environmental costs of increased travel and the corresponding financial costs, none of the aggregate reserves mentioned above, even if granted planning permission, would be a viable alternative to extraction at Knocknaboola to supply raw aggregates to the factory site at Rangue where all infrastructure including the rarely found ESB substation is in place.

The competent extension area as proposed forms a logical extension to the existed permitted working, which has been successfully established for decades. Also, each sand and gravel pit owned by MFQ are located strategically across Kerry to safeguard a responsive delivery service to all surrounding areas. Thus, operations continuing at Rangue, Kilorglin are again favourable for this reason.

Chapter Sixteen – Interactions

16.1 Introduction

With regards to the existing and proposed development, all predictable noteworthy impacts along with actions enforced to mitigate these have been outlined in the relevant EIAR chapters. Albeit, any development with potential significant environmental implications also has potential for interaction amongst these impacts. Therefore, the interaction of impacts on the surrounding environment should be outlined within the EIAR.

The interactions between the numerous environmental factors have been highlighted in each chapter accordingly, from chapter 5 – 13, where necessary. For example, the interaction of noise and vibration is detailed in Chapter 8.

The environmental elements which could hypothetically be implicated of this type and at this location have been acknowledged as follows:

- Implications on land use and amenity;
- Effects on local sensitive receptors;
- Impacts on Biodiversity and potential loss of natural heritage and wildlife habitats
- Impacts on soils, geology and hydrogeology
- Impacts on hydrology
- Impacts on Air Quality in conjunction with nuisances posed by dust emissions
- Nuisance potentially caused by noise and vibrations
- Effects on local archaeology
- Alterations to landscape and visual
- Implications on material assets

The potential interactions between each of the environmental attributes are listed below.

16.2 Biodiversity

The prospective interactions connected with the proposed landscape proposals are addressed in Chapter 5 (biodiversity) and Chapter 13 (Landscape & Visual).

16.3 Water

The possible impacts of the continued use of the factory site along with the proposed extension of sand and gravel pit in relation to water and the potential interaction with other environmental factors are discussed in Chapter 5 (biodiversity), Chapter 6 (soils, geology, hydrogeology) and Chapter 7 (Hydrology).

16.4 Noise & Vibration

The interaction between noise/vibration and population and human health is discussed in the pertinent chapters of the EIAR.

The Noise and Vibration section of this EIAR (Chapter 8), indicates that with the enforcing of mitigation measures, such as the erection of 3m berms around the site perimeter in conjunction with general

measures to be implemented. For instance, construction will not occur before 08:00 or continue after 18:00 and plant used onsite will be maintained in accordance with manufacturer specifications.

16.5 Air

The interaction of Climate (Chapter 13), Air Quality (Chapter 9) and Population and Human Health (Chapter 11) are addressed in the relevant chapters of the EIAR.

The Air Quality Chapter presented in Chapter 9, indicates that the impact of atmospheric emissions resulting from the proposed sand and gravel pit development is predicted to be imperceptible. Mitigation measures are detailed in section 9.8, which will be deployed to control dust and PM_{10} emissions.

16.6 Archaeology

The proposed development area is an existing sand and gravel pit (soon to expire) and factory/ processing that has previously been under Planning Application Registration No. PL 08.125728 and PL 08.125729. .

Archaeological testing was conducted and can be reviewed in Chapter 10. It was noted that no archaeological finds, features or deposits were uncovered within the confines of the excavated trenches which were located across the entire extraction area. The overall archaeological potential of the site is regarded as low.

16.7 Population & Human Health

Human Health should be considered in the context of the relevant environmental topics addressed by the EIAR. Additionally, effects on human health should be considered in relation to relevant pathways (such as air, noise and water) and should be deliberated in the context of accepted standards for exposure and risk.

The EIAR has addressed that the quarry would operate within acceptable limits for noise and dust and potential effects on soil and water would be limited or circumvented completely where possible through good practice and mitigation measures to prevent accidental spillages of fuel etc. Water would be discharged from the site in accordance with existing discharge licence.

Furthermore, from many locations, changes to landscape such as the extension of the sand and gravel pit at Knocknaboola, would not be visible and would be insignificant.

16.8 Traffic & Transport

The future operations of the sand and gravel pit and factory will have imperceptible impacts on traffic and transport. Mitigation measures have been detailed in the EIAR pertinent to traffic & transports interaction with the surrounding environment. For example, a limited number of employees driving to site during peak hours etc. Potential interactions associated with traffic movements are further detailed within Chapter 12 of this EIAR.

16.9 Landscape & Visual

The prospective interactions with Biodiversity are addressed in Chapter 5 (Biodiversity) and Chapter 14 (Landscape & Visual).

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Rangue & Knocknaboola, Killorglin, Co. Kerry

Proposed Continuation of Use and Extension of Extraction Operations

Environmental Impact Assessment Report (EIAR)

Volume II – Appendices

December 2021

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OES Consulting
Liber House, Tralee, Co. Kerry
Crescent Building, Northwood, Santry, Co. Dublin
Osborne Promenade, Warrenpoint, Co. Down

MF Quirke & Sons UC

Rangue & Knocknaboola, Killorglin, Co. Kerry

Proposed Continuation of Use and Extension of Extraction Operations

Volume II - Attachments

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Attachment 1

Natura Impact Statement

DixonBrosnan
environmental consultants

Report in Support of Appropriate Assessment (AA) Screening and Natura Impact Statement (NIS)

Continued operation and proposed extension to a sand and gravel pit at Rangue and Knockaboola, Co. Kerry

On Behalf of
M.F. Quirke & Sons
December 2021

www.dixonbrosnan.com

Project	Report in Support of Appropriate Assessment (AA) Screening and Natura Impact Statement (NIS) for continued operation and proposed extension to a sand and gravel pit at Rangue and Knockaboola, Co. Kerry	
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03/11/2021	First Draft	Carl Dixon BSc MSc
16/12/2021	Issue to client	Sorcha Sheehy BSc PhD

DixonBrosnan Lios Ri Na hAoine, 9 Redemption Road, Cork.
Tel 086 851 1437| carl@dixonbrosnan.com | www.dixonbrosnan.com

Table of Contents

1. Introduction

1.1 Background

The information in this report has been compiled by DixonBrosnan Environmental Consultants, on behalf of the applicant. It provides information on and assesses the potential for the continuation of use of the existing facility which is located in the townland of Rangue and the proposed extension extraction site located within the contiguous townland of Knocknaboola, to impact on any Natura 2000 sites within its zone of influence. The information in this report forms part of and should be read in conjunction with the planning application documentation being submitted to Kerry County Council in connection with the proposed development. The proposed development consists of the continued operation of an existing quarry processing area at Rangue, Killorglin, Co. Kerry and for a planned extension to that quarry in the townlands of Rangue and Knocknaboola, Killorglin, Co. Kerry.

The Birds Directive (2009/147/EC) and the Habitats Directive (92/43/EEC) put an obligation on EU Member States to establish the Natura 2000 network of sites of highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites comprises Special Areas of Conservation (SACs, including candidate SACs) and Special Protection Areas (SPAs, including proposed SPAs). SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and other regularly occurring migratory birds and their habitats. The annexed habitats and species for which each site is selected correspond to the qualifying interests of the sites and from these the conservation objectives of the site are derived. The Birds and Habitats Directives set out various procedures and obligations in relation to nature conservation management in Member States in general, and of the Natura 2000 sites and their habitats and species in particular. A key protection mechanism is the requirement to consider the possible nature conservation implications of any plan or project on the Natura 2000 site network before any decision is made to allow that plan or project to proceed. Not only is every new plan or project captured by this requirement but each plan or project, when being considered for approval at any stage, must take into consideration the possible effects it may have in combination with other plans and projects when going through the process known as Appropriate Assessment (AA).

The obligation to undertake Appropriate Assessment (AA) derives from Article 6(3) and 6(4) of the Habitats Directive, and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3) is concerned with the strict protection of sites, while Article 6(4) is the procedure for allowing derogation from this strict protection in certain restricted circumstances. As set out in Section 177U of the Planning and Development Act 2000 as amended, a screening for appropriate assessment of an application for consent for the proposed development must be carried out by the competent authority to assess, in view of best scientific knowledge, if the proposed development, individually or in combination with another plan or project is likely to have a significant effect on any European site. Each step in the assessment process precedes and provides a basis for other steps. The results at each step must be documented and recorded carefully so there is full traceability and transparency of the decisions made.

1.2 Aim of Report

The purpose of this report is to inform the AA process as required under the Habitats Directive (92/43/EEC) in instances where a plan or project may give rise to significant impacts on a Natura 2000 site. This report aims to inform the Appropriate Assessment process in determining whether the development, both alone and in combination with other plans or projects, are likely to have a significant impact on the Natura 2000 sites in the study area, in the context of their conservation objectives and specifically on the habitats and species for which the sites have been designated.

This report has been prepared with regard to the following guidance documents, where relevant.

- *Managing Natura 2000 Sites: The Provision of Article 6 of the Habitats Directive 92/43/EEC* (European Commission (EC), 2018);
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodical Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (European Commission (EC), 2001);
- *Guidance Document on Article 6(4) of the Habitats Directive 92/43/EEC* (European Commission, (EC) 2007);
- *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities* (Department of Environment, Heritage and Local Government, 2010 revision);
- *Appropriate Assessment under Article 6 of the Habitats Directive; Guidance for Planning Authorities. Circular NPW 1/10 and PSSP 2/10* (Department of Environment, Heritage and Local Government, 2010);
- *Guidelines for Good Practice Appropriate Assessment of Plans under Article 6(3) Habitats Directive* (International Workshop on Assessment of Plans under the Habitats Directive, 2011);
- *Communication from the Commission on the precautionary principle. European Commission* (2000);
- *Practice Note PN01 Appropriate Assessment Screening for Development* Management Office of the Planning Regulator (2021) *Assessment of plans & projects in relation to N2K sites – Methodological Guidance* (EC 2021);
- *Guidance document on the strict protection of animal species of Community interest under the Habitats Directive* (EC 2021);
- *Case C-258/11, Peter Sweetman and Others v An Bord Pleanála;*
- *Case C-164/17, Edel Grace and Peter Sweetman v An Bord Pleanála;*
- *Case C-323/17 People Over Wind and Peter Sweetman v Coillte Teoranta;*

- *Case C-461/17 Brian Holohan and Others v An Bord Pleanála ;*
- *Joined Cases C-293/17 and C-294/17. Coöperatie Mobilisation for the Environment UA and Others v College van gedeputeerde staten van Limburg and Others;*
- *O Grianna & Ors -v- An Bord Pleanála [2015] IEHC 248 (16 April 2015);*
- *Kelly -v- An Bord Pleanála & others 225;la [2014] IEHC 400 (25 July 2014)* and
- *CJEU Case C 164/17 Edel Grace Peter Sweetman v An Bord Pleanála.*

1.3 Report Contributors

This report was prepared by Carl Dixon MSc (Ecological Monitoring) and Dr. Sorcha Sheehy PhD (Ecology/ornithology). Fieldwork was conducted by Mark Donnelly BSc (Forestry) and Cian Gill MSc (Ecological Monitoring).

Carl Dixon MSc (Ecology) is a senior ecologist who has over 20 years' experience in ecological and water quality assessments. Carl Dixon holds an Honours Degree (BSc) in Ecology and a Masters (MSc) in Ecological Monitoring from UCC. He is a senior ecologist who has over 25 years' experience in ecological assessment. Prior to setting up DixonBrosnan Environmental Consultants in 2000, Carl set up and ran Core Environmental Services which included Rural Environmental Protection Scheme (REPS) planning for landowners and ecological assessments. Carl has particular experience in freshwater ecology including electrofishing fish stock assessments and water quality assessments. He also has considerable experience in habitat mapping and mammal ecology including survey work and reporting in relation to badgers and bats. Other competencies include surveys for invasive species and bird surveys. Carl has extensive experience with regards to EIAR and NIS mitigation and impact assessment. He has particular experience in large-scale industrial developments with extensive experience in complex assessments as part of multi-disciplinary teams. Such projects include gas pipelines, incinerators, electrical cable routes, oil refineries and quarries.

Dr. Sorcha Sheehy PhD (ecology/ornithology) is an experienced ecological consultant specialising in bird behaviour. Sorcha received a BSc in Applied Ecology from UCC and subsequently went on to receive a PhD in behavioural ornithology at UCC. During her PhD research, Sorcha studied bird-aircraft collision with a particular focus on bird behaviour, included field-based behavioural observations at airports, bird cadaver examination and collision classification and the use of radar tracking to model collision risk. Sorcha has worked for over 12 years in a professional ecology role and specialises in the coordination of ecology projects and assessments. She has coordinated and contributed to Habitats Directive Assessments (AA screenings and NIS) and Environmental Impact Assessment Reports (EIAR) for a range of small and large-scale projects with particular expertise in assessing impacts on birds. Notable projects include Arklow Bank Wind Park, Shannon Technology and Energy Park and Waste to Energy Facility Ringaskiddy.

Mark Donnelly (Forestry) holds a BSc. Hons in Forestry from Bangor University, Wales, and is a member of the Institute of Chartered Foresters. He worked as an arboricultural consultant for the National Trust in Wales for 22 years and was a lecturer in Forest Ecology at Bangor University. In Ireland, he has completed landscape assessments for a range of projects including wind farms, quarries, local authorities, housing developments, roads and pipelines.

Cian Gill MSc (Ecology) is a qualified ecologist with ten years' experience working with wildlife and ecology-based NGOs and public bodies in Ireland, the UK and the US. Past projects include invasive species planning for the city of Rosemount, Minnesota, and the Under The Sea project for Essex Wildlife Trust. Recent projects include ecological reports for Cork-based housing and private developments.

2. Regulatory Context and Appropriate Assessment Procedure

2.1 Regulatory Context

The Habitats Directive (Council Directive 92/43/EEC on the *Conservation of Natural Habitats and of Wild Fauna and Flora*) aims to maintain or restore the favourable conservation status of habitats and species of community interest across Europe. The requirements of these directives are transposed into Irish law through the European Communities (Birds and Natural Habitats Regulations; S.I. No. 477 of 2011).

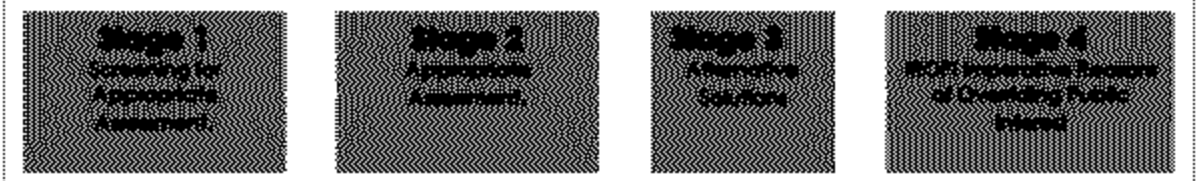
Under the Directive a network of sites of nature conservation importance have been identified by each Member State as containing specified habitats or species requiring to be maintained or returned to favourable conservation status. In Ireland the network consists of SACs and SPAs, and also candidate sites, which form the Natura 2000 network.

Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the *Conservation of Natural Habitats and of Wild Fauna and Flora* (as amended) (hereafter 'the Habitats Directive') requires that, any plan or project not directly connected with or necessary to the management of a designated site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. A competent authority (e.g. the EPA or Local Authority) can only agree to a plan or project after having determined that it will not adversely affect the integrity of the site concerned.

The possibility of a significant effect on a designated or "European" site has generated the need for an appropriate assessment to be carried out by the competent authority for the purposes of Article 6(3). A Stage Two Appropriate Assessment is required if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site. The first (Screening) Stage for appropriate assessment operates merely to determine whether a (Stage Two) Appropriate Assessment must be undertaken on the implications of the plan or project for the conservation objectives of relevant European sites.

2.2 Appropriate Assessment Procedure

The assessment requirements of Article 6(3) establish a stage-by-stage approach. This assessment follows the stages outlined in the 2001 European Commission publications "Assessment of plans and projects significantly affecting Natura 2000 sites: methodological guidance on the provisions of Articles 6(3) and 6(4) of the Habitats Directive 92/43/EEC" (2001) and Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Draft) Office for Official Publications of the European Communities, Luxembourg (EC, 2015);



The stages are as follows:

Stage One: Screening — the process which identifies any appreciable impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;

Stage Two: Appropriate assessment — the consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts;

Stage Three: Assessment of alternative solutions: The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site. It is confirmed that no reliance is placed by the developer on Stage Three in the context of this application for development consent;

Stage Four: Assessment where no alternative solutions exist and where adverse impacts remain — an assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed (it is important to note that this guidance does not deal with the assessment of imperative reasons of overriding public interest). Again, for the avoidance of doubt, it is confirmed that no reliance is placed by the developer on Stage Four in the context of this application for development consent.

It is the responsibility of the competent authority, in this instance Kerry County Council, to make a decision on whether or not the proposed development should be approved, taking into consideration any potential impact upon any Natura 2000 site within its zone of influence.

3. Receiving Environment

3.1 Existing site

Michael F. Quirke and Sons (M.F.Q) operate a sand and gravel pit, known as the Quirke Rangue Sand and gravel pit at Rangue, approximately 2.5km southwest of Killorglin, Co. Kerry (**Figure 1**). The current land ownership area is 31.2ha. The proposed extension extraction site is approximately 36 ha in size.

The existing sand and gravel pit and processing site is located on the north side of the Glannagilliagh local road which links Killorglin with Caragh Village, approximately 3.2kms south west of Killorglin town (Figure 1). The site is accessed via a private road which runs northwards from the local road into the main production area and serves to access existing

office buildings and processing plant. The processing area is linked to the existing sand and gravel pit in the western section of the site via an underpass which runs under a local road separating the western sand and gravel pit from the main processing area.

Land use in the surrounding landscape is predominantly agricultural. There are several residential dwellings along the northern boundary of the extension area. Land cover in the extension area is a mixture of dry heath and bog, which has been cut away (for turf) in the past. A small watercourse – Glashacoomnafanida Stream – runs along the eastern perimeter and ultimately drains to Castlemaine Harbour. It is noted that this stream is referred to as the Douglas River by the EPA. However, the local name Glashacoomnafanida Stream will be used for this report.

M. F. Quirke and Sons have been engaged in extraction operations at Rangue, Killorglin, for almost fifty years. The extraction site at Rangue currently operates under planning PL 08.125729. For operations to continue at Rangue and Knocknaboola, future planning application comprises many separate but connected activities. The general areas of the sand and gravel pit is described in Table 1.

Table 1. General Areas of the Sand and Gravel Pit

Area	General Use	Area (ha)	Open Areas (ha)
Existing Aggregation Production factory	Aggregate processing; concrete making, block making, importing of raw materials from contiguous sites, R&D of aggregate products, garage works including metal fabrication, weighbridge, wheel washing and sales and distribution of processed aggregates.	18.5	18.5
Riordan's Sand and Gravel Pit	Transport of aggregate from Riordan's site to the factory opposite for processing. Activities at Riordan's site will cease in 2022 and the proposed Knocknaboola site will thus act as replacement.	11	11
Proposed sand and gravel Pit at Knocknaboola	To be used for extraction of sand and gravel over an area of 16.75ha	16.75	16.75

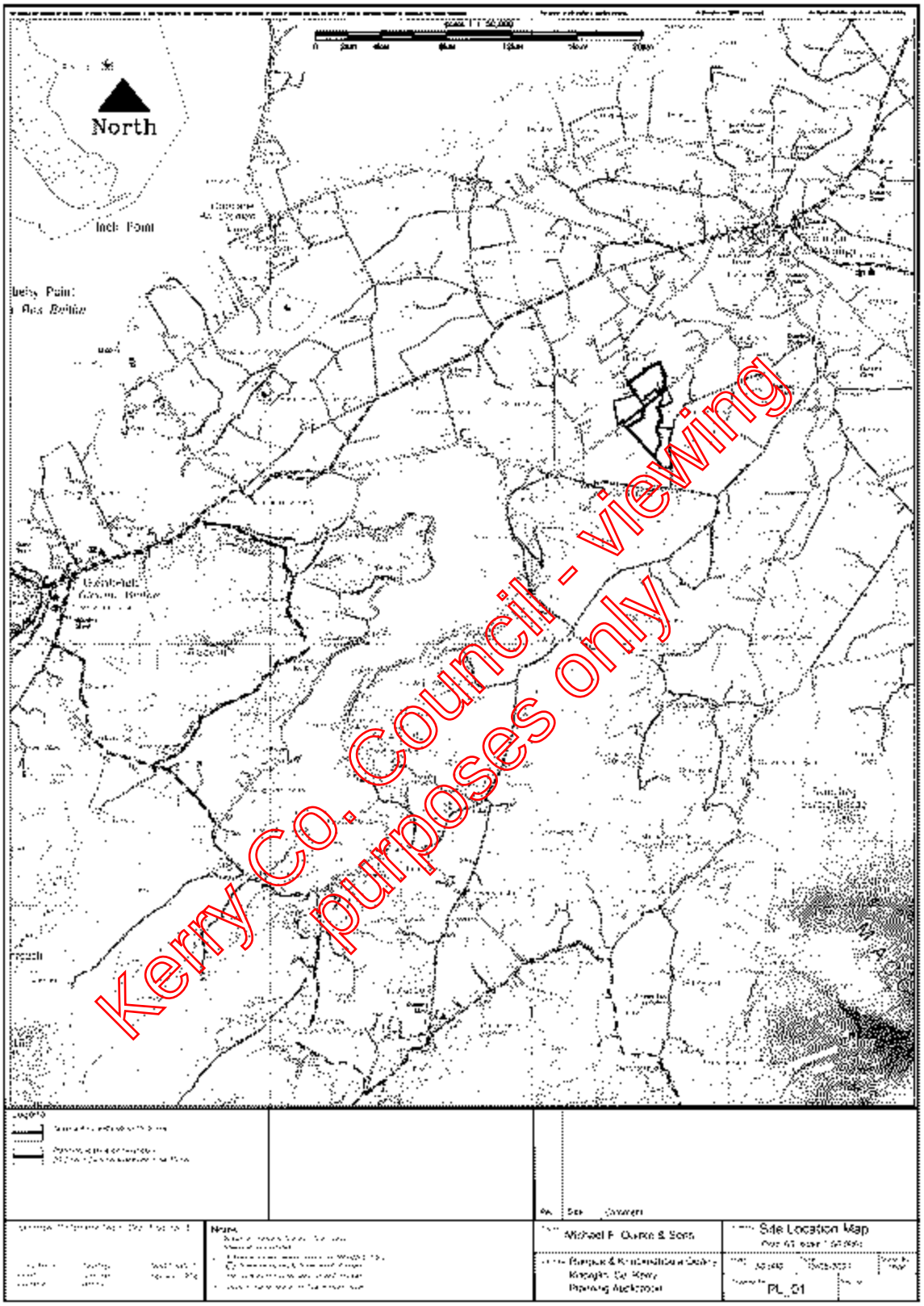


Figure 1. Location of proposed development site (red line boundary) | Source Michael O' Connor

3.2 Proposed Development

3.2.1 Overview of Proposed Development

The proposed development continuation of use for existing factory site in the townland of Rangue and proposed sand and gravel pit extension on adjacent lands, in order to replace Riordans sand and gravel Pit. The new proposed sand and gravel pit extension is situated in the townland of Knocknaboola. The proposal also involves construction of a temporary entrance from the Caragh Lake road to the Knocknaboola site to be used for a period of 12 months. Additionally, the construction of a tunnel/underpass is sought beneath the Caragh Lake Road (L-40210) to facilitate the transportation of aggregates from the Knocknaboola site to the factory site for further processing of aggregates, as well as manufacture and sale of concrete and concrete blocks.

There will be no changes of production at the factory site and the layout of all plant and settling ponds will remain as they have over the duration of the present planning permission.

The output being sought in this new planning application is 100,000 cubic metres per annum, giving a daily extraction in the range of 500-700 tonnes per day. There will be no intensification of use, no foreseeable difference in the percolation of water through the settling ponds and no foreseeable difference in the emissions of noise or dust at the processing area. With this output per annum the lifetime of the new extension area is expected to be 20 years (16.3 years to exhaustion at full extraction). The proposed development will also include an application for primary crushing and screening to take place in the extension site.

3.2.2 Need for the Development

MFQ clients include OPW, Bam Contractors, Moriarty, Eamon Costello, Liebherr and Rhatigan and this quarry provides vital resources for local and regional infrastructure. The facility also provides local employment. The proposed development includes the continued operation of the existing factory site at Rangue and the closure of one raw aggregate extraction site and opening of another. This planning application is necessary because the old planning permissions are soon to expire and aggregate is near exhaustion at the Rangue/Riordan Pit site. The remaining small reserves and stockpiles of aggregates will be sold off from the Rangue site when the new Knocknaboola site opens and subsequently the Rangue site will be restored in accordance with the original planning particulars as per the reinstatement plan granted under planning permission no. 00/3746.

3.2.3 Description of Extraction Activity

The proposed development includes the continued operation of the existing factory site at Rangue and the opening of a new extraction area in Knocknaboola. This section describes each site individually.

Factory site Description

The existing factory site is located off the Caragh Lake Road (L-4021) in the townland of Rangue, approximately 2.5km southwest of Killorglin. The Caragh Lake Road is to the south of the factory and sand and gravel pit traffic enters from local road L-7504 which runs along its western boundary. This local road separates the factory site from the present aggregate extraction site and it is proposed to continue extraction there until the aggregates are

exhausted or until the present planning permission (reference PL 08. 125728) expires – whichever is earliest.

The MFQ factory site occupies an area of 18.5 Ha, none of which is used for the extraction of raw aggregates, as little viable aggregates remain. The area consists of naturally regenerated grassland, woodland and lagoons, and this combination of habitats is of value for local wildlife.

Raw aggregate is crushed, screened and washed at the site as soon as it is imported from the sand and gravel pit and stockpiles are built up for further use in the production process. Washed aggregates will be retained for use in the production of concrete and concrete blocks.

The blocks production process includes a large concrete apron for storage, drying and maturing of concrete blocks and is an integral part of the process. Once blocks have been adequately cured, they are stored onsite until taken by delivery trucks for distribution.

Contiguous with these activities on the factory site is a large garage which is capable of admitting 360-degree excavators, front end loaders, forklift trucks and road trucks. The company's Head Office is situated beside the garage and this is the administration hub for the entire company.

Processing of raw aggregate description in the factory site

An articulated dump truck transports raw aggregates to the factory site. The aggregate is then tipped onto a grading screen for separation, crushing and screening. Larger stones are separated from the smaller materials for later crushing into various commercially desirable stone sizes. The smaller aggregates are washed to remove the smallest components while the process is further adjusted to produce a specified type of concreting gravel. The washed and waste materials enter the lagoon system and are settled out in a system of ponds until nothing but clear water remains. These ponds are in a closed loop system.

This system of processing and pond use has been in use for decades including the entire duration of the present planning permission, PL 08.125728, and it is not intended to change the system in any way. The layout of all plant and settling ponds will remain as they have been over the duration of the present planning permission. The processed aggregates that have been produced to a concreting specification are then stockpiled for use in the manufacture of ready-mix concrete for concrete block manufacture.

Raw aggregate extraction and production in Knocknaboola

Overburden is quite shallow at Knocknaboola and it will be transported for the construction of berms at the site. Primary screening will take place on site and this partially processed aggregate will be sold directly to customers, mainly for trunking purposes. Mobile screening plant will be used during this first phase of development and it is this phase that will facilitate the construction of an underpass beneath the Caragh Lake Road.

The aggregate at Knocknaboola consists of sand and gravel and it will be quarried using a 360-degree excavator. As sand and gravel the pit moves into full production the major portion of the aggregate will be loaded into a dump truck, using a 360-degree excavator, and transported to the factory site via the tunnel/underpass for further washing, crushing and screening.

Overall extraction activity and HGV traffic at Rangue and Knocknaboola

When the Rangue factory site and aggregate production site were granted planning permissions in 2002, the situation with regard to Heavy Goods Vehicle traffic was quite different. Permission was granted for the sand and gravel pit in one site, known as Riordan's site, and to transport the aggregate across the local road, L-7504, to the factory site for processing. The HGV traffic count was much greater at this time due to the permitted operation of the John A Wood facility.

Process Water Management

There are a number of settlement ponds within the existing processing site. The settlement ponds take the used wash water from the onsite aggregate washing plant. Suspended solids are then settled out by slowing the water flow through the lagoons. The fine silts and sands are removed from the ponds on a regular basis in order to maintain flows. There are no surface water discharges off-site from these lagoons. Some water percolates back into the ground but the majority is redirected back to the supply lagoon for reuse following removal of suspended solids by settlement.

Drainage Arrangements

The sand and gravel Pit is effectively a pit operated at a lower level compared to the surrounding lands. Therefore, it is ring drained to prevent surface water ingress from surrounding lands into it. The ring drains are located on the perimeter of the working areas and are essentially drainage ditches which eventually discharge into the surrounding agricultural drainage network and from there on to the nearest natural watercourses.

Wastewater Generation

A small volume of wastewater is generated on site from the welfare facilities present. This is currently treated via a septic tank and soakaway, the applicant is proposing to replace this with a new wastewater treatment system in accordance with the EPA Code of Practice.

Electricity and Telecommunications

Electricity is supplied by public mains to the office units, to provide power for the IT and telecommunications. This power also powers the connections to the nearby weighbridge and lighting at the office units. Telecommunication lines are present at the main office block, providing telephones and internet access.

Potable Water Supply

Potable water on site is supplied from the mains water supply.

Fuel Storage

Diesel fuel is stored on site within a 110% concrete bund.

Waste Generated

Wastes arising from site activities include soil and sub soil clearance, and the silts from the settlement ponds. Both of these wastes are stockpiled on site for future reuse in land

rehabilitation works. All aggregate extracted can be processed on site to create a commercial product. Low volumes of waste are generated within the site, primarily sourced from welfare facilities and plant maintenance. The wastes potentially generated within the Pit are tabulated below and itemised by European Waste Catalogue Codes (EWC).

Access

The site is accessed via two entrances, both semi private roads off the N70, Ring of Kerry, national road to the north. There is a southern entrance from the L-4021 and no HGV traffic shall use this entrance. There is also a western entrance from the L-7505, whereby HGV traffic can use.

The existing processing site is accessed via both the L-4021 and L-7505, depending on the vehicle type entering, and leads into the main production area and serves to access existing office buildings and processing plant.

The processing area is linked to the existing sand and gravel pit area (Riordan's Pit) in the western sections of the site via an underpass which runs under a local road which separates the western pit from the main processing area.

A temporary entrance will be constructed from the Caragh Lake road to the Knocknaboola extension site. This new, temporary entrance will be used only for 12 months during the construction of the underpass.

Routes within the Pit itself are hard-standing, produced from the movement of heavy vehicles across paths on a regular basis. These offer safe access from the weighbridge to the processing plant and out to the relevant extraction faces. Safe routes around settlement and drainage lagoons are designated by these tracks.

Welfare Facilities

Welfare facilities in the office building include a canteen, toilet, hand basin and shower.

Employees

Approximately 38 employees work permanently on site with the ability to engage extra road hauliers during times of peak demand.

Hours of Business

The sand and gravel pit's traditional and permitted hours of business have been from 7.00 am to 7.00 pm Monday to Friday and 7.00 am to 4.00 pm on Saturdays and it is closed on Sundays and Bank Holidays and closed for a fort-night at Christmas. In practice however, no employee works these hours since the recession hit the industry in 2008. The usual working hours are now from 8.00 am to 6.00 pm but customers demand earlier and later deliveries in which case empty trucks return to the pit after the other sand and gravel pit workers have gone home.

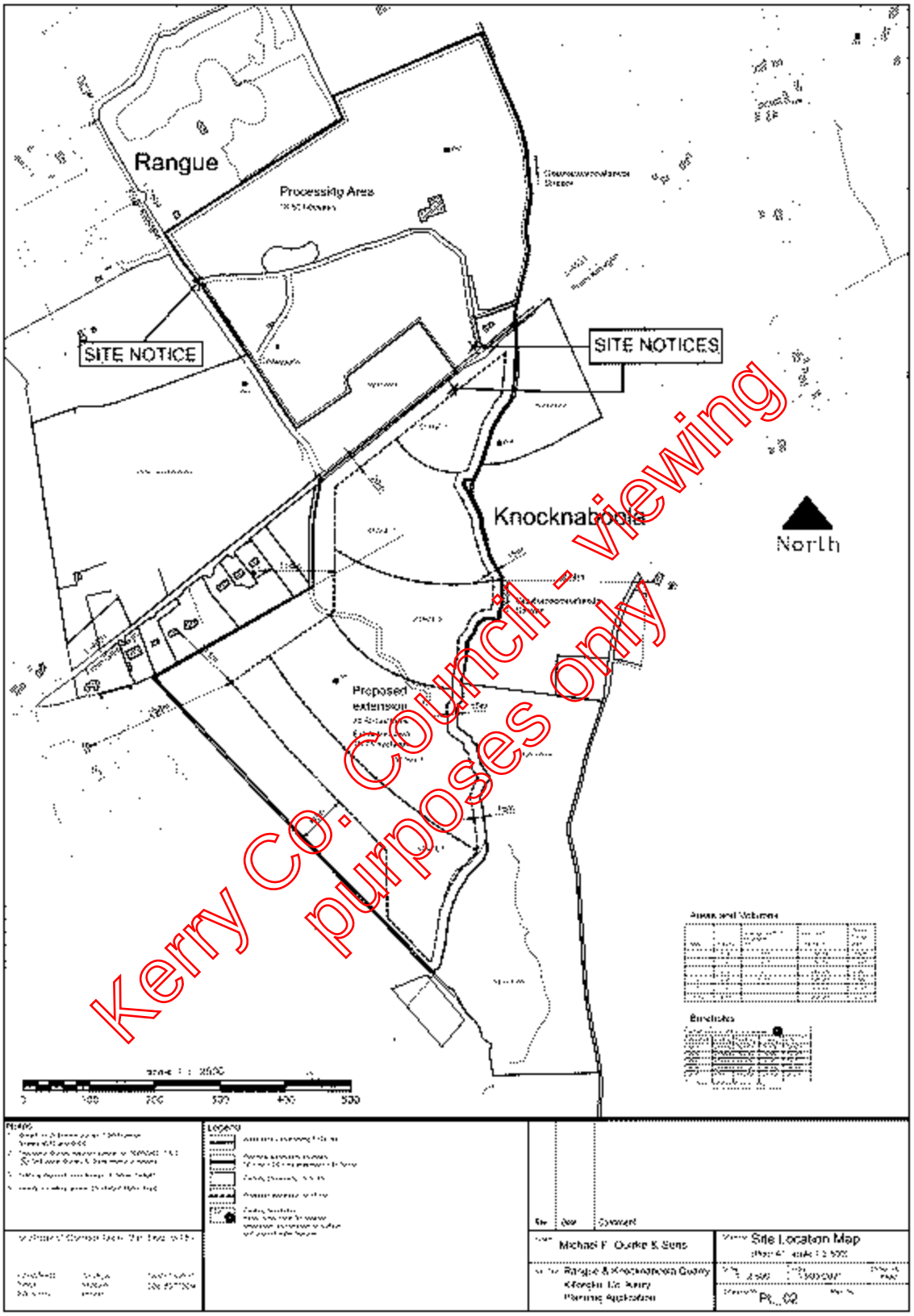


Figure 2. Existing processing are and proposed extension | Source Michael O'Connor

4. Stage 1- Screening for Appropriate Assessment

4.1 Introduction

This section contains the information required for the competent authority to undertake screening for AA for the proposed development.

The aims of this section are to:

- Determine whether the proposed development is directly connected with, or necessary to, the conservation management of any Natura 2000 Sites;
- Provide information on, and assess the potential for the proposed development to significantly effect on Natura 2000 Sites (also known as European sites); and
- Determine whether the proposed development, alone or in combination with other projects, is likely to have significant effects on Natura 2000 sites in view of their conservation objectives.

The proposed development is not directly connected with, or necessary to the conservation management of any Natura 2000 sites.

4.2 Zone of Influence

The Zone of Influence (ZoI) comprises the area within which the proposed development may potentially affect the conservation objectives (or qualifying interests) of a Natura 2000 site. There is no recommended zone of influence, and guidance from the National Parks and Wildlife Service (NPWS) recommends that the distance should be evaluated on a case-by-case basis with reference to the nature, size and location of the project, the sensitivities of the ecological receptors, and the potential for in-combination effects (cumulative).

In ecological and environmental impact assessment, for an effect to occur there must be a risk enabled by having a source (e.g. construction works at a proposed development site), a 'receptor' (e.g. SAC or other ecologically sensitive feature), and a pathway between the source and the receptor (e.g. a watercourse which connects the proposed development site to the SAC, *ex situ* foraging habitat for SCI birds). A 'receptor' is defined as the Special Conservation Interest (SCI) of SPAs or Qualifying Interest (QI) of SACs for which conservation objectives have been set for the European sites being screened.

Consideration is therefore given to the source-pathway-receptor linkage and associated risks between the proposed development and Natura 2000 sites. For a significant effect to occur there needs to be an identified risk whereby a source (e.g. contaminant or pollutant arising from construction activities) affects a particular receptor (i.e. Natura 2000 site) through a particular pathway (e.g. a watercourse which connects the proposed development with the Natura 2000 site).

The identification of risk does not automatically mean that an effect will occur, nor that it will be significant. The identification of these risks means that there is a possibility of environmental or ecological damage occurring. The level and significance of the effect depends upon the nature of the consequence, likelihood of the risk and characteristics of the receptor.

The precautionary principle is applied for the purposes of screening to ensure that consideration and pre-emptive action is undertaken where there is a lack of scientific evidence. It is noted that mitigation measures are not taken into account in the AA screening assessment process.

4.3 Desktop Review

A desktop review facilitates the identification of the baseline ecological conditions and key ecological issues relating to Natura 2000 sites and facilitates an evaluation assessment of potential in-combination impacts. Sources of information used for this report include reports prepared for the Killorglin (Rangue) area and information from statutory and non-statutory bodies. The following sources of information and relevant documentation were utilised:

- National Parks & Wildlife Service (NPWS) - www.npws.ie;
- Environmental Protection Agency (EPA) – www.epa.ie;
- National Biodiversity Data Centre (NBDC) – www.biodiversityireland.ie;
- EPA catchments data centre – catchments.ie
- *National Biodiversity Action Plan 2017-2021;*
- *Kerry County Development Plan 2015-2021;*
- *Kerry County Council Biodiversity and Heritage Plan 2008-2012;*
- Bat Conservation Ireland - http://www.batconservationireland.org;
- Birdwatch Ireland - http://www.birdwatchireland.ie/;
- British Trust for Ornithology (BTO) www.BTO.org;
- *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011);
- *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment* (August, 2018);
- *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (Draft August 2017);
- *Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)* European Union, 2017.
- *Guidance on integrating climate changes and biodiversity into environmental impact assessment* (EU Commission, 2013)

4.4 Natura 2000 Sites within Zone of Influence

In accordance with the European Commission Methodological Guidance (EC 2018), a list of Natura 2000 sites that can be potentially affected by the proposed development has been compiled. All candidate SAC's (cSAC) and SPAs sites within the zone of influence (ZoI) proposed development have been identified in **Table 2** and shown in **Figure 3**.

The proposed development site is not located within any SAC, cSAC or SPA. The site is potentially hydrologically connected to two of the Natura 2000 sites listed in **Table 1** i.e., Castlemaine Harbour SAC and Castlemaine Harbour SPA. The Glashacoomnafanida Stream flows along the eastern boundary of the proposed extension extraction site and existing factory and processing site and discharges into Castlemaine Harbour approximately 5.2km downstream of the site. Surface water runoff during the construction or operational phase could potentially impact on water quality within the Glashacoomnafanida Stream and subsequently impact water quality within the Castlemaine Harbour SAC and Castlemaine Harbour SPA. Qualifying species from these Natura 2000 sites could potentially forage on or near the existing factory and processing site and/or proposed extension extraction site. Qualifying species could be impacted by disturbance in *ex situ* habitats during the construction or operation phase. Further investigation is required to determine if increased silt and hydrocarbons in surface water run-off during the construction and operation and disturbance impacts could impact on the Castlemaine Harbour SAC and Castlemaine Harbour SPA.

Caragh Lake, which forms part of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC is located approximately 2.3km southwest of the proposed development site. There is no surface water connection between Caragh Lake and the proposed development site. The regional groundwater flow direction is anticipated to be from elevated ground to the south of the existing factory and processing site towards the River Laune to the northeast and this was confirmed by interrogation of groundwater level data collected at the proposed development site (**Appendix 4**). Therefore, there will be no potential impacts on water quality or habitats within the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC due to the proposed development. Qualifying species from the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC could potentially use lands within the proposed works area for foraging. Therefore, further assessment is provided in this report to determine if the proposed development could impact on the conservation objectives of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. Further information on these sites is provided below. Full site synopses are included in **Appendix 1.**

Due to the distances involved and/or the lack of hydrological or any other connections no potential impact on Lough Yganavan and Lough Nambrackdarrig SAC and Slieve Mish Mountains SAC have been identified. The habitats within the proposed development site do not provide critical foraging habitat for SCI species of the Iveragh Peninsula SPA and Dingle Peninsula SPA and therefore given their distance from proposed development site, no potential impacts have been identified. While it is noted that Greenland White-fronted Goose *Anser albifrons flavirostris* favour bog habitats such as those within the extension area, the proposed development site is significantly outside the core range for this species (i.e., 5-8km based on SNH 2016). Given the distance from the proposed development site, no significant impact on the SCIs of the Killarney National Park SPA have been identified.

As highlighted later in this report (**Section 4.7.3**) Hen Harrier were recorded overflying the site on two occasions. No nesting Hen Harrier were recorded within the existing factory and proposed extension extraction site or proposed extension extraction site. The closest Hen Harrier SPA is the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA, which is located approximately 28km northeast of the site. Breeding Hen Harriers in Ireland have been reported to travel over 11km from an active nest, via GPS tracking (Irwin *et al.* 2012), and males in Scotland have been observed travelling up to 9km from nests (Arroyo *et al.* 2014). However, typical foraging ranges are reported to be much smaller and the intensity with which suitable foraging areas are used declines with distance from the nest or roost site to which individuals return (Arroyo *et al.* 2014). Therefore, even based on the most conservative distances, the proposed development site is not within the range of Hen Harriers breeding within the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA and this SPA is considered outside the zone of influence of the proposed development. It is noted that potential impacts on the proposed development on Hen Harrier are discussed in the Environmental Impact Assessment Report (EIAR) submitted with this application.

Table 2. Designated sites and their distance from proposed development site

Site SAC	Site Code	Distance at Closest Point and potential source-pathway-receptor link	QIs/SCIs
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC	000365	2.3km SW. A source-pathway-receptor link exists between the source (proposed development) and the receptors (Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC) via a potential pathway (disturbance to qualifying species during construction or operation).	See **Table 5** and **Table 6**
Castlemaine Harbour SAC	000343	2.6km N. A source-pathway-receptor link exists between the source (proposed development) and the receptors (Castlemaine Harbour SAC) via a potential pathway (impacts on water quality, spread of invasive species and disturbance to qualifying species during construction or operation).	See **Table 2** and **Table 3**

Site	Site Code	Distance at Closest Point and potential source-pathway-receptor link	QIs/SCIs
Lough Yganavan and Lough Nambrackdarrig SAC	000370	3.6km NW. There is no hydrological connection to this SAC and no impact pathway to qualifying habitats. Given the distance from this site and the small range of Kerry Slug, no impact pathway on this QI has been identified. No potential pathway for impact	**Habitats** 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)* 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) **Species** 1024 Kerry Slug (*Geomalacus maculosus*)
Slieve Mish Mountains SAC	002185	9.5km N. No potential impact pathway exists. There is no hydrological connection to this SAC and no impact pathway for qualifying habitats or species. No potential pathway for impact	**Habitats** 4010 Northern Atlantic wet heaths with Erica tetralix 4030 European dry heaths 4060 Alpine and Boreal heaths 8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) 8210 Calcareous rocky slopes with chasmophytic vegetation 8220 Siliceous rocky slopes with chasmophytic vegetation
SPA			

Site	Site Code	Distance at Closest Point and potential source-pathway-receptor link	QIs/SCIs
Castlemaine Harbour SPA	004029	3.8km N. A source-pathway-receptor link exists between the source (proposed development) and the receptors (Castlemaine Harbour SPA) via a potential pathway (impacts on water quality disturbance to qualifying species during construction or operation).	**See Table 4**
Iveragh Peninsula SPA	004154	12.0km SSW. The habitats within the proposed development site do not provide critical foraging habitat for SCI species of this SPA. Kittiwake, Guillemot and Fulmar breed and forage within coastal habitats which are absent from the proposed development site. Peregrine Falcons are a highly adaptable species which nest in a wide range of habitats, including cities. Peregrines do not hold exclusive home ranges (Newton, 1979; Ratcliffe, 1993); their hunting ranges are extensive and overlap with those of neighbouring pairs. However, most large prey is taken within 3 km of the eyrie. Chough roosts tend to be located on sea cliffs and will typically forage within 5-10km from these roosts. Chough foraging typically shifts from the maritime grasslands used during the breeding season to heathlands and then onto improved grasslands during the winter where these are available within their range (Trewby *et al.* 2006). Given the distance from proposed development site no potential pathway for impact has been identified.	**Birds** A103 Peregrine (*Falco peregrinus*) A188 Kittiwake (*Rissa tridactyla*) A199 Guillemot (*Uria aalge*) A009 Fulmar (*Fulmarus glacialis*) A346 Chough (*Pyrrhocorax pyrrhocorax*)

Site	Site Code	Distance at Closest Point and potential source-pathway-receptor link	QIs/SCIs
Dingle Peninsula SPA	004153	13.0km NW. The habitats within the proposed development site do not provide critical foraging habitat for SCI species of this SPA. Peregrine Falcons are a highly adaptable species which nest in a wide range of habitats, including cities. Peregrines do not hold exclusive home ranges (Newton, 1979; Ratcliffe, 1993); their hunting ranges are extensive and overlap with those of neighbouring pairs. However, most large prey is taken within 3km of the eyrie Chough roosts tend to be located on sea cliffs and will typically forage within 5-10km from these roosts. Chough foraging typically shifts from the maritime grasslands used during the breeding season to heathlands and then onto improved grasslands during the winter where these are available within their range (Trewby *et al.* 2008). Fulmar breed and forage within coastal habitats which are absent from the proposed development site. Given the distance from proposed development site no potential pathway for impact has been identified.	**Birds** A346 Chough (*Pyrrhocorax pyrrhocorax*) A103 Peregrine (*Falco peregrinus*) A009 Fulmar (*Fulmarus glacialis*)

Site	Site Code	Distance at Closest Point and potential source-pathway-receptor link	QIs/SCIs
Killarney National Park SPA	004038	14.3km SW. It is noted that although Greenland White-fronted Goose favour bog habitats such as those within the extension area, the proposed development site is significantly outside the core range for this species (i.e. 5-8km based on SNH 2016). Merlin nesting pairs are found up to 4.5 km apart and nesting territories tend to be regularly spaced in areas with many potential nest sites (Cramp & Simmons, 1980). In Scotland, Merlin require at least 60% moorland within 4km of nest sites for territories to remain viable (Orchel, 1992). Based on the available literature, the proposed development site is considerably outside the territorial range of Merlin within the Killarney National Park SPA. Given the distance from proposed development site no potential pathway for impact has been identified.	**Birds** A098 Merlin (*Falco columbarius*) A395 Greenland White-fronted Goose (*Anser albifrons flavirostris*)

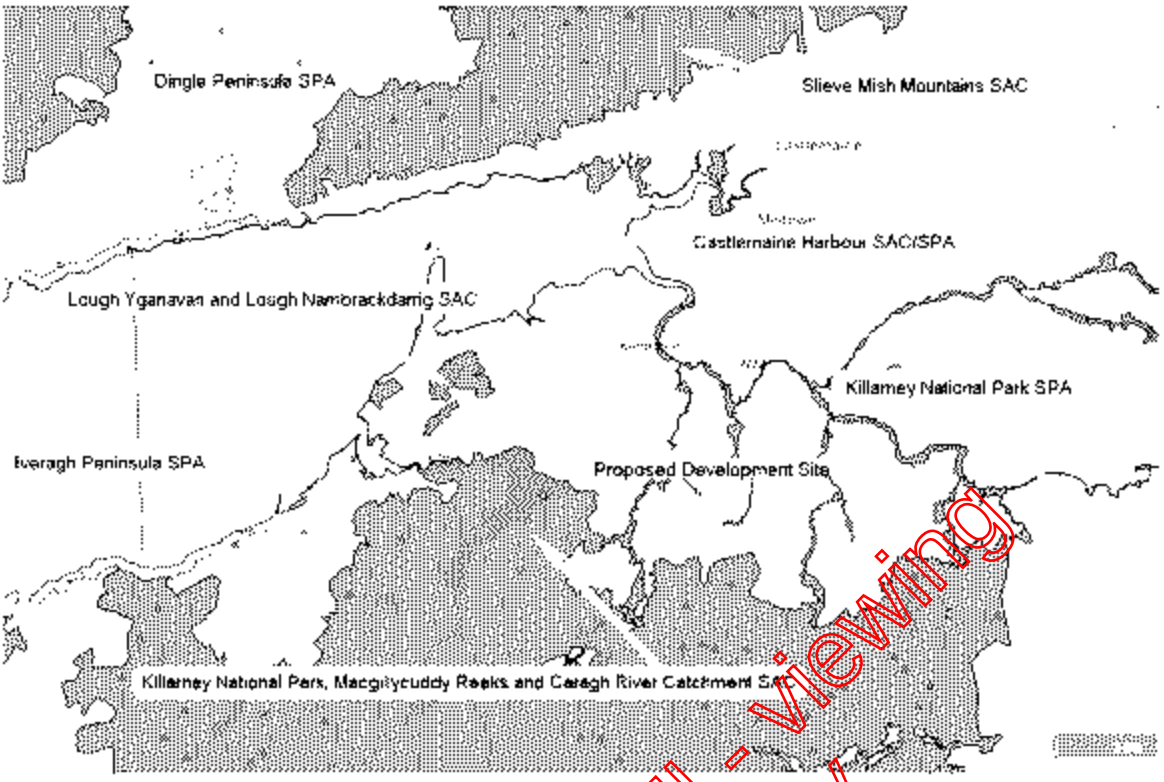


Figure 3.. Natura 2000 sites within zone of influence proposed development site | Source EPA Envision Mapping | Not to scale

4.5 Natura 2000 Site – Site Synopses, qualifying interests and conservation objectives

4.5.1 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC

Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC is the largest terrestrial SAC site in Ireland and encompasses the mountains and lakes of the Iveragh Peninsula and the Paps range. It is the most mountainous region of Ireland, and includes the highest peak Carrauntoohil at 1039m. The underlying rock is almost entirely Old Red Sandstone, although carboniferous limestone occurs on the east side of Lough Leane. Glacial processes have shaped the sandstone into dramatic ridges and valleys, including the well wooded Killarney valley. A wide range of semi-natural habitats are present, along with some improved land and forestry in the Caragh River catchment. Generally, the proximity of the site to the Atlantic in the south-west ensures a strong oceanic influence.

The SAC is of great ecological importance. It includes the most extensive oakwoods in the country, with some of the best bryophyte communities in Europe; Ireland's only sizable stand of Yew; excellent examples of blanket bog, alluvial woodland; good quality oligotrophic lakes, some of which support rare glacial relicts; unpolluted rivers with aquatic vegetation and rare invertebrates and fish; and several other annexed habitats. The site also supports 12 Annex II species of flora and fauna, six Annex I bird species and at least 33 Irish Red Data Book species. Many rare bryophytes and invertebrates are also present, several at their only known Irish locations. A full site synopsis for this Natura 2000 site is included as **Appendix 1** of this report.

4.5.2 Castlemaine Harbour SAC

Castlemaine Harbour SAC is a large site located on the south-east corner of the Dingle Peninsula, Co. Kerry. It consists of the whole inner section of Dingle Bay, i.e. Castlemaine Harbour, the spits of Inch and White Strand/Rosbehy and a little of the coastline to the west. The River Maine, almost to Castlemaine, and much of the River Laune catchment, including the Gaddagh, Gweestion, Glanooragh, Cottoner's River and the River Loe, are also included within the site.

Inch Spit holds a fine sand dune system. It is one of the largest and best remaining dune systems in the country. A smaller spit, with a similar diversity of dune types, occurs at Rosbehy on the southern shore. The coastline is fringed in many places by saltmarsh. Upper saltmarsh communities extend inland, along estuarine channels, where they are mixed with freshwater communities. West of Inch, cliffs of glacial drift occur. Much of the site consists of intertidal sand and mudflats, supporting a number of soft sediment communities, including beds of eelgrass (mostly *Zostera noltii*) in some places. A subtidal mixed sediment community complex is also present in the channel between Rossbehy Point and Inch Point. The rivers and their associated habitats also make up a considerable portion of the site. These associated habitats include wet grassland, woodland, scrub and bog/heath. In the valley up-river of Killorglin, is an interesting area of alluvial wet woodland, dominated by Alder (*Alnus glutinosa*) and willows (*Salix* spp.).

While small in area, this is one of the few examples in Ireland of woodland on riverine alluvium dominated by native tree species. Five plants listed in the Irish Red Data Book have been recorded at this site: Sea-kale (*Crambe maritima*), Corn Cockle (*Agrostemma githago*), Sea Pea (*Lathyrus japonicus* subsp. *maritimus*), Pennyroyal (*Mentha pulegium*) and Irish Lady's-tresses (*Spiranthes romanzoffiana*). The three last-named are legally protected under the Flora (Protection) Order, 1999, as is the rare bryophyte, Petalwort (*Petalophyllum ralfsii*).

The vicinity of Castlemaine Harbour is also important as one of few areas in Ireland where the Natterjack Toad naturally occurs. This amphibian is listed in the Irish Red Data Book and on Annex IV of the E.U. Habitats Directive. The site also supports a small colony of Common Seal, while two Lamprey species have been recorded in the Laune river catchment. The Laune catchment is used by Otter *Lutra lutra* and is also an important Salmon system with nurseries, riffles pools and glides. Castlemaine Harbour is a very important site for passage and wintering waterfowl.

Castlemaine Harbour is of major ecological importance. It contains a range of coastal habitats of excellent quality, including many that are listed on Annex I of the E.U. Habitats Directive, and two which are listed with priority status (fixed dunes and alluvial forests). It also includes long stretches of river and stream which are excellent habitats for Salmon, Lamprey and Otter. Inch dunes are recognised as among the finest in the country, with particularly well-developed dune slacks. A full site synopsis for this Natura 2000 site is included as **Appendix 1** of this report.

4.5.3 Castlemaine Harbour SPA

Castlemaine Harbour SPA is one of the most important sites for wintering waterfowl in the south-west. It provides habitats for an excellent diversity of waterbirds, including divers and seaduck. Castlemaine Harbour SPA holds a Light-bellied Brent Goose population of

international importance as well as populations of national importance of an additional sixteen species. Of particular note is that five species that occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Red-throated Diver, Great Northern Diver, Golden Plover, Bar-tailed Godwit and Chough. The site includes a Nature Reserve and two Wildfowl Sanctuaries.

Castlemaine Harbour SPA is an important site for passage and wintering waterfowl and supports species of internationally important numbers and species with populations of national importance. A full site synopsis for this Natura 2000 site is included as **Appendix 1** of this report.

4.6 Natura 2000 sites – Features of interests and conservation objectives

The EU Habitats Directive contains a list of habitats (Annex I) and species (Annex II) for which SACs must be established by Member States. Similarly, the EU Birds Directive contains lists of important bird species (Annex I) and other migratory bird species for which SPAs must be established. Those that are known to occur at a site are referred to as 'qualifying interests' and are listed in the Natura 2000 forms which are lodged with the EU Commission by each Member State. A 'qualifying interest' is one of the factors (such as the species or habitat that is present) for which the site merits designation. The National Parks and Wildlife Service (NPWS) are responsible for the designation of SACs and SPAs in Ireland. The conservation objectives for the site are detailed in:

NPWS (2011) Conservation objectives for Castlemaine Harbour SAC 000343 Castlemaine Harbour SPA 004029. Version 2.0. Department of Culture, Heritage and the Gaeltacht.

NPWS (2017) Conservation Objectives: Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network. European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status sites designated as Special Areas of Conservation and Special Protection Areas. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. Favourable conservation status of a habitat is achieved when its natural range, and area it covers within that range, is stable or increasing, and the ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when population data on the species concerned indicate that it is maintaining itself, and the natural range of the species is neither being reduced or likely to be reduced for the foreseeable future, and there is, and will

probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis. The species and habitats listed as qualifying interests for the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC are included in **Table 3 to Table 7.**

Table 3. Qualifying habitats for Castlemaine Harbour SAC

Habitat code	Habitat	Conservation objective
[1130]	Estuaries	Maintain
[1140]	Tidal Mudflats and Sandflats	Maintain
[1210]	Annual Vegetation of Drift Lines	Maintain
[1220]	Perennial Vegetation of Stony Banks	Maintain
[1310]	Salicornia and other annuals colonising mud and sand	Maintain
[1330]	Atlantic Salt Meadows	Maintain
[1410]	Mediterranean Salt Meadows	Maintain
[2110]	Embryonic Shifting Dunes	Maintain
[2120]	Marram Dunes (White Dunes)	Maintain
[2130]	Fixed Dunes (Grey Dunes)*	Restore
[2170]	Dunes with Creeping Willow	Maintain
[2190]	Humid Dune Slacks	Maintain
[91E0]	Alluvial Forests*	Restore

Restore = Restore favourable conservation condition, Maintain = Restore favourable conservation condition

Table 4. Qualifying Species for Castlemaine Harbour SAC

Species code	Species	Scientific name	Conservation objective
[1095]	Sea Lamprey	*Petromyzon marinus*	Maintain
[1099]	River Lamprey	*Lampetra fluviatilis*	Maintain
[1106]	Atlantic Salmon	*Salmo salar*	Maintain
[1355]	Otter	*Lutra lutra*	Restore
[1395]	Petalwort	*Petalophyllum ralfsii*	Maintain

Restore = Restore favourable conservation condition, Maintain = Restore favourable conservation condition

Table 5. Qualifying species for Castlemaine Harbour SPA

Species code	Species	Scientific name	Conservation objective
A001	Red-throated diver	*Gavia stellata*	Maintain
A017	Cormorant	*Phalacrocorax carbo*	Maintain
A046	Light-bellied brent goose	*Branta bernicla hrota*	Maintain
A050	Wigeon	*Anas Penelope*	Maintain
A053	Mallard	*Anas platyrhynchos*	Maintain
A054	Pintail	*Anas acuta*	Maintain
A062	Scaup	*Aythya marila*	Maintain
A065	Common scoter	*Melanitta nigra*	Maintain
A130	Oystercatcher	*Haematopus ostralegus*	Maintain
A137	Ringed plover	*Charadrius hiaticul*	Maintain
A144	Sanderling	*Calidris alba*	Maintain
A157	Bar-tailed godwit	*Limosa lapponica*	Maintain
A162	Redshank	*Tringa tetanus*	Maintain
A164	Greenshank	*Tringa nebularia*	Maintain
A169	Turnstone	*Arenaria interpres*	Maintain
A346	Chough	*Pyrrhocorax pyrrhocorax*	Maintain
A999	*Wetlands & waterbirds*		Maintain

Maintain = Restore favourable conservation condition

Table 6. Qualifying habitats for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC

Habitat Code	Habitat	Conservation objective
[3110]	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	Restore
[3130]	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*	Restore
[3260]	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Maintain
[4010]	Northern Atlantic wet heaths with *Erica tetralix*	Restore
[4030]	European dry heaths	Restore
[4060]	Alpine and Boreal heaths	Restore
[5130]	*Juniperus communis* formations on heaths or calcareous grasslands	Maintain
[6130]	Calaminarian grasslands of the *Violetalia calaminariae*	Maintain
[6410]	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	Restore

Habitat Code	Habitat	Conservation objective
[7130]	Blanket bogs (* if active bog)	Restore
[7150]	Depressions on peat substrates of the *Rhynchosporion*	Restore
[91A0]	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Restore
[91E0]	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Restore
[91J0]	*Taxus baccata* woods of the British Isles	Restore

Restore = Restore favourable conservation condition, Maintain = Restore favourable conservation condition

Table 7.. Qualifying species for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC

Species code	Species	Scientific name	Conservation objective
[1024]	Kerry Slug	*Geomalacus maculosus*	Maintain
[1029]	Freshwater Pearl Mussel	*Margaritifera margaritifera*	Restore
[1065]	Marsh Fritillary	*Euphydryas aurinia*	Restore
[1095]	Sea Lamprey	*Petromyzon marinus*	Maintain
[1096]	Brook Lamprey	*Lampetra planeri*	Maintain
[1099]	River Lamprey	*Lampetra fluviatilis*	Maintain
[1106]	Salmon	*Salmo salar*	Maintain
[1303]	Lesser Horseshoe Bat	*Rhinolophus hipposideros*	Maintain
[1355]	Otter	*Lutra lutra*	Maintain
[1421]	Killarney Fern	*Trichomanes speciosum*	Maintain
[1833]	Slender Naiad	*Najas flexilis*	Maintain
[5046]	Killarney Shad	*Alosa fallax killarnensis*	Restore

Restore = Restore favourable conservation condition, Maintain = Restore favourable conservation condition

To acknowledge the importance of Ireland's wetlands to wintering waterbirds, "Wetland and Waterbirds" may be included as a SCI for some SPAs that have been designated for wintering waterbirds and that contain a wetland site of significant importance to one or more of the species of Special Conservation Interest. Thus, a further objective is to maintain or restore the favourable conservation condition of the wetland habitat within the Castlemaine Harbour SPA as a resource for the regularly-occurring migratory waterbirds that utilise these habitats.

4.7 Baseline Data

4.7.1 Habitats

Habitat surveys were carried out on the 27th of September 2020, 11th of April, 8th of May, 22nd of June and 1st November 2021. Habitat mapping was carried out in line with the methodology outlined in the Heritage Council Publication, *Best Practice Guidance for Habitat*

Survey and Mapping (Heritage Council, 2011). The terrestrial and aquatic habitats within and adjacent to the proposed development site were classified using the classification scheme outlined in the Heritage council publication *A Guide to Habitats in Ireland* (Fossitt, 2000) and cross referenced with Annex I Habitats where required.

A current overview of habitats recorded within the site is shown in **Figure 4** and **Figure 5** and the habitats recorded on site are described in **Table 7** and **Table 8**. Site photographs are shown in **Appendix 3.** A species from site surveys is included in **Appendix 5.**

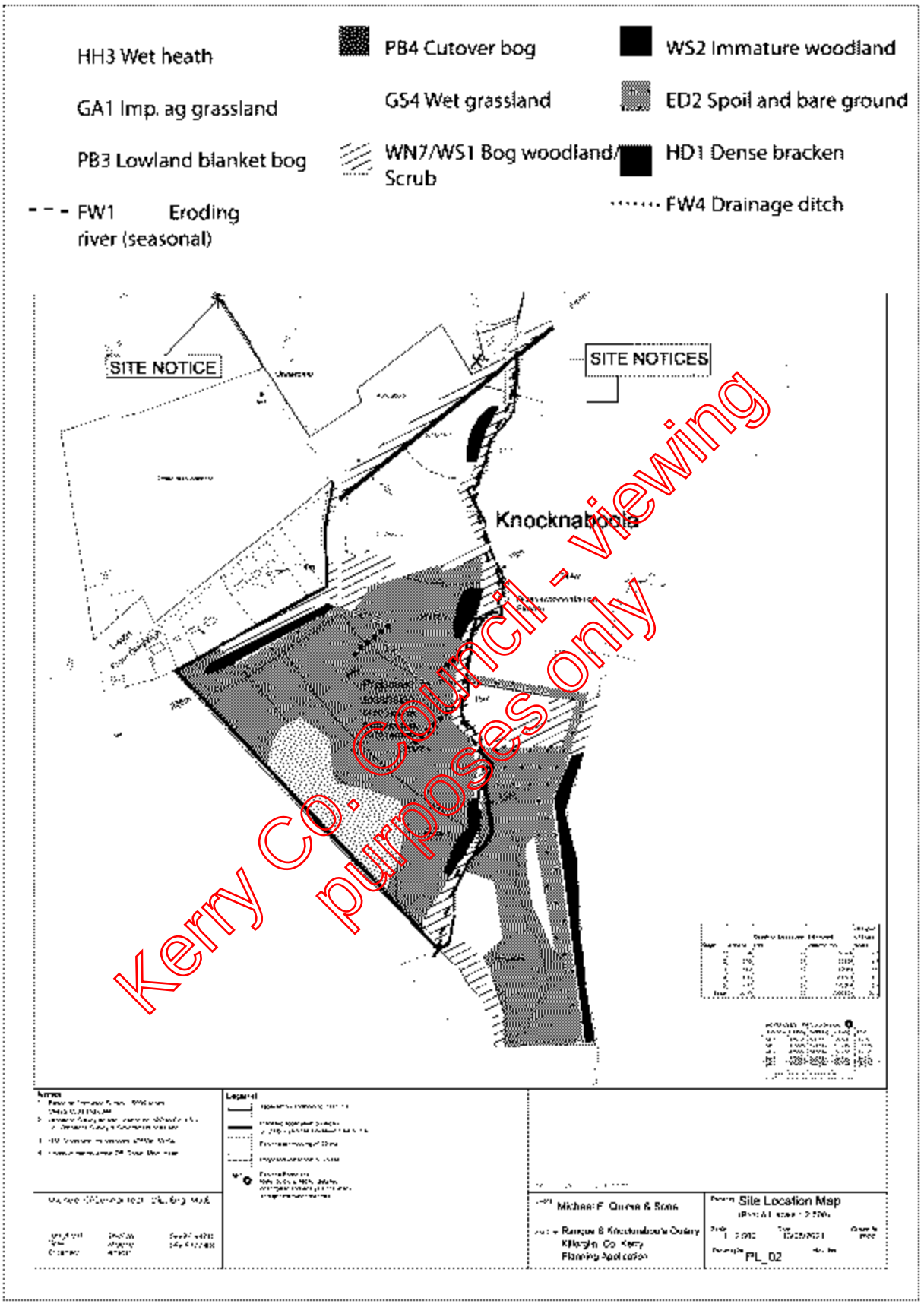


Figure 4.. Habitats recorded within extension area

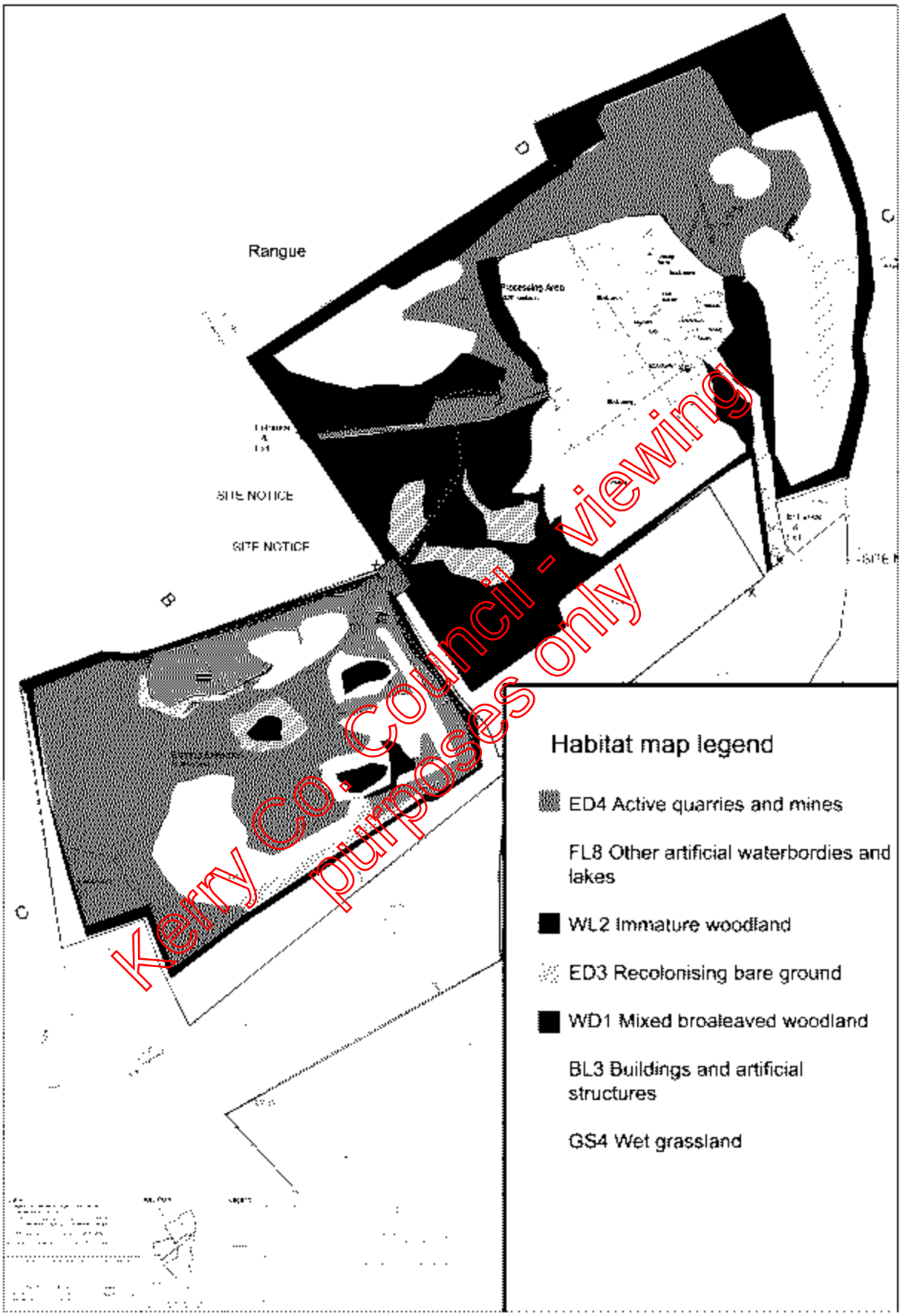


Figure 5. Habitat maps within existing sand and gravel pit

Table 7. Habitats recorded within extension area and their relative value

Habitat	Habitat description
Drainage ditches FW4	The site has drainage ditches running north to northeast into the Glashacoommafanida Stream on the eastern boundary of the proposed development site (See **Figure 4**). These drains drain the cutover bog and are of varying ages. Although some sections may dry up seasonally, the presence of aquatic vegetation indicates that some flow or standing water remains in the channels under these conditions. Species recorded within this habitat include Pond Bogweed *Potamogeton polygonifolius* and Lesser Bladderwort *Utricularia minor*. This habitat does not have links to Annex I habitats and is not a qualifying species for Natura 2000 sites within the zone of influence.
Eroding river FW1	The Glashacoommafanida Stream runs along the eastern boundary of the site. The gradient here is shallow and there are some areas of fine sediment deposition. This stream dries out seasonally but the well-defined channel persists throughout the year. During dry periods there may also be shallow pools of standing water. There are few vascular plants, however the liverworts *Pellia epiphylla*, *Nardia scalaris and Lepidozia reptans* were recorded. FW1 has links to the Annex I habitat Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260) which is a qualifying habitat for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. The Glashacoommafanida Stream dries up during periods of low rainfall and does not come within this habitat classification.
Improved agricultural grassland GA1 (outside redline boundary)	An area of grazed grassland, most of which has been reclaimed from wet heath habitat, is located to the northeast of the proposed development area on the eastern side of the Glashacoommafanida Stream. This area has been reseeded but parts remain wet and dominated by Soft Rush *Juncus effusus*. Other common species recorded within this habitat include Perennial Rye Grass *Lolium perenne*, Vivpiporous Fescue *Festuca vivipara*, Sheep's Sorrel *Rumex acetosa* and Redshank *Persicaria maculosa* This habitat does not have links to Annex I habitats and is not a qualifying species for Natura 2000 sites within the zone of influence.
Wet grassland GS4 (outside redline boundary)	An area of wet grassland is located to the southeast of the site which has developed on an area that was previously cutover bog. This area is ungrazed and is developing pockets of scrub and immature woodland around the margins, particularly along its western boundary with the stream. Grass species recorded here include Crested Dogs Tail *Cynosurus cristatus*, Purple Moor Grass *Molina caerulea* and Yorkshire Fog *Holcus lanatus*. Broadleaved plants include Devil's Bit Scabious *Succisa pratensis*, Angelica *Angelica* sp. and Meadowsweet *Filipendula ulmaria*. Species associated bog habitats include Royal Fern *Osmunda regalis* with drier areas colonised by scrub including Bog Myrtle *Myrica gale* and Western Gorse *Ulex gallii*. This habitat has links to the Annex I habitat Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410) which is a qualifying habitat for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. However this area is not a significant example of this habitat type.
Wet heath HH3	There are three areas of this habitat within the landownership boundary but to the east of the proposed development and one larger area of this habitat within the proposed development area. The wet heath habitat within the proposed development boundary is characterised by Cross Leaved Heath *Erica tetralix*, Ling *Calluna vulgaris*, and Purple Moor Grass. Other species include Deer Grass *Muhlenbergia rigens* with areas of Bog Myrtle and with Common Cotton Grass *Eriophorum angustifolium* and Bog

Habitat	Habitat description
	Asphodel *Narthecium ossifragum* in wetter areas. Sphagnum moss species present including *Sphagnum papillosum* and *Sphagnum capillifolium*. Other species include *Cladonia portentosa*, *Racomitrium lanuginosum*, *Polytrichum commune* and *Atrichum undulatum*. This habitat corresponds to the Annex I habitat, 'northern Atlantic wet heaths with Erica tetralix (4010)' which is a qualifying habitat for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.
Dense bracken HD1	Dense bracken *Pteridium* sp. has developed on isolated patches of dryer ground along the Glashacoomnafanida Stream on the eastern site boundary. This habitat does not have links to Annex I habitats and is not a qualifying species for Natura 2000 sites within the zone of influence.
Lowland blanket bog PB3	A large area of this habitat (approx. 3.2ha) within the extension area forms part of a larger area of approximately 10ha of relatively intact blanket bog habitat on adjoining lands to the west. Peat depths are shown in **Figure 7** below. This area is ungrazed. The dominant species cover in this area is dwarf shrubs, including Ling and Cross Leaved Heath with localised Bog Myrtle. Black Bog Rush *Schoenus vulgaris* is also present. Broadleaved herbs include Marsh Lousewort *Pedicularis palustris* and Round Leaved Sundew *Drosera rotundifolia*. Scattered pools contain Bog Bean *Menyanthes trifoliata* and White Beaked Sedge *Rhynchospora alba*. Within this habitat there are pockets of the annexed, sub-habitat, 'depressions on peat substrates of the Rhynchosporion (7150) which is dominated by White Beaked Sedge. Blanket bogs that are still capable of peat formation correspond to the priority habitat, 'blanket bogs (*if active bog) (7130)'. The annexed habitat, 'depressions on peat substrates of the Rhynchosporion (7150)' occurs in pockets as a sub-habitat of blanket bog. 7130 and 7150 are qualifying habitats for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.
Cutover bog PB4	This includes areas of former wet heath and lowland blanket bog. Purple Moor Grass *Molinia caerulea* and Bog Myrtle are still present on more recently cut areas. Areas of cutover blanket bogs are characterised by mosaics of bare peat and revegetated areas including peat gullies and scattered pools with Water Lobelia *Rhynchospora alba* and White Beaked Sedge. Cotton Grass is abundant in wet areas. Intermediate areas between blanket bog and wet heath are colonized by Jointed Rush *Juncus articulatus* and Common Spike Rush *Eleocharis palustris*. Also present are Mat Grass *Nardus stricta*, Deer Grass, Star Sedge *Carex echinata*, Green Ribbed Sedge *Carex binervis*, Heath Rush *Juncus squarrosus* and Carnation Sedge *Carex panicea*. There are drier areas of ground within the cutover bog with Bell Heather and occasional Western Gorse. Within this habitat there are pockets of the annexed, sub-habitat, 'depressions on peat substrates of the Rhynchosporion (7150) which is dominated by White Beaked Sedge. 7150 is a qualifying habitats for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.
Bog woodland WN7/Scrub WS1	This habitat has established along the eastern and northern site boundaries and along drainage ditches and on scattered dry mounds in cutover bog. Trees are primarily immature or semi-mature and are dominated by Downy Birch *Betula pubescens* and Grey Willow *Salix spp.* Holly and Rowan are also present. Ground layer and understorey species include Bracken, Bramble, Purple Moor Grass, Royal Fern and Bog Myrtle. There are isolated patches of *Rhododendron ponticum*. Transitional scrub vegetation is located on the periphery of woodland/wet heath. Species include Gorse, Bramble and Grey Willow *Salix spp.*

Habitat	Habitat description
	Bog woodland has links with Annex I priority habitat, "bog woodland (91D0)'. This classification refers to woodland of intact raised bog, examples of this priority habitat are very rare in Ireland and this is not a significant example of this habitat type.
Immature woodland WS2	Newly planted hardwood species i.e. Alder, Sessile Oak *Quercus petraea*. Scots Pine *Pinus sylvestris* and Sitka Spruce *Picea sitchensis* are located on or close to the northern boundary of the proposed development area. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence.
Spoil and bare ground ED2	This habitat includes areas of disturbed ground (not associated with peat extraction) and track surfaces. It also includes linear excavations to the east of the proposed development area which were excavated under a previous planning application for a drainage ditch (See DixonBrosnan 2020) . This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence

Table 8. Habitats recorded within the existing quarry

Habitat	Habitat description
Mixed broadleaved/conifer woodland WD2	This has been primarily planted along the periphery of the existing quarry to provide a visual screen and to minimise potential impacts from dust. Species noted include Alder, Balsam Poplar *Populus balsamifera*, Silver Birch *Betula pendula* and Lodgepole Pine *Pinus contorta*. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence
Immature Woodland WS2/Scrub WS1	This habitat has developed naturally on unused areas of the site which are not disturbed. Species noted include Grey Willow, Gorse, Downey Birch and common herbaceous species including Broad Leaved Willowherb *Epilobium montanum*, White Clover *Trifolium repens*, Self-Heal *Prunella vulgaris* and Coltsfoot *Tussilago farfara*. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence
Recolonising Bare ground ED3	This is a common habitat type which includes the periphery of yards and roads and which supports a wide variety of early secessional species. Generally, these areas have been undisturbed for 1-2 years. Occurs on the periphery of wetland areas also. Species noted include Common Century *Centaurium erythraea*, Yellow Bartsia *Parentucellia viscosa*, Scarlet Pimpernel *Anagallis arvensis*, Broad Leaved Dock *Rumex obtusifolius* and Creeping Thistle *Circium arvense*. The uncommon plant Small Cudweed *Logfia minima* occurs within this habitat type. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence
Other artificial lakes and ponds FL8	This includes lagoons which were created for surface water run-off from the quarry or have developed naturally. They have been colonised by a range of plants and provide habitats of local value. Species noted include Bulrush *Typha* sp., Water Plantain *Alisma* sp., Water Horsetail *Equisetum fluviatile*, Purple Loosestrife *Lythrum salicaria*

Habitat	Habitat description
	and Common Reed *Phragmites* sp. This habitat supports Mute Swan who breed within the site. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence
Buildings and artificial surfaces BL3	Low value habitat largely devoid of vegetation which includes tracks, roads and yards. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence
Active quarries and mines ED4	Includes the active areas of extraction within the existing quarry. Noted that Sand Martin nest in areas which are less actively managed. *Gunnera glandulifera* was also recorded in this area. This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence
Wet Grassland GS4	This habitat has developed on the periphery of a lagoon in the north eastern section of the site. Species noted include Purple Loosestrife, Angelica, Water Forget Me Not *Myosotis* sp. and Water Mint. *Mentha aquatica* This habitat does not have links to Annex I habitats and is not a qualifying habitat for Natura 2000 sites within the zone of influence

4.7.1.1 Peat Depth Survey

A peat depth survey was completed on the 16th April 2021 by Parkmore Environmental Services Ltd (PES). The aim of the survey was to establish the depth of peat overlying the mineral soil at the proposed extension site at Knocknaboola. Peat depths were probed at an approximate 50m grid spacing across the proposed extension site. A ranging rod was pushed through the peat until refusal at 129 separate locations. It is assumed that refusal indicates the base of the peat.

The vast majority of the site is underlain by peat depths of less than 0.3m (**Figure 5**). There are areas of the site where there is no peat cover, particularly on the elevated hillock on the south-eastern part of the proposed extension. The thickest depth of peat is present on the southern portion of the site, where a maximum depth of 6.1m of peat was recorded (this area is not within the proposed extraction area). The site (and bog) is heavily drained, with numerous shallow drains discharging to the Glashacoomnafanida stream, along the eastern boundary of the site.

A histogram displaying the frequency of peat depths encountered is presented in **Figure 6** and clearly displays that the majority of depth probes are less than 0.3m deep. Peat depth contours are presented in **Figure 7**.

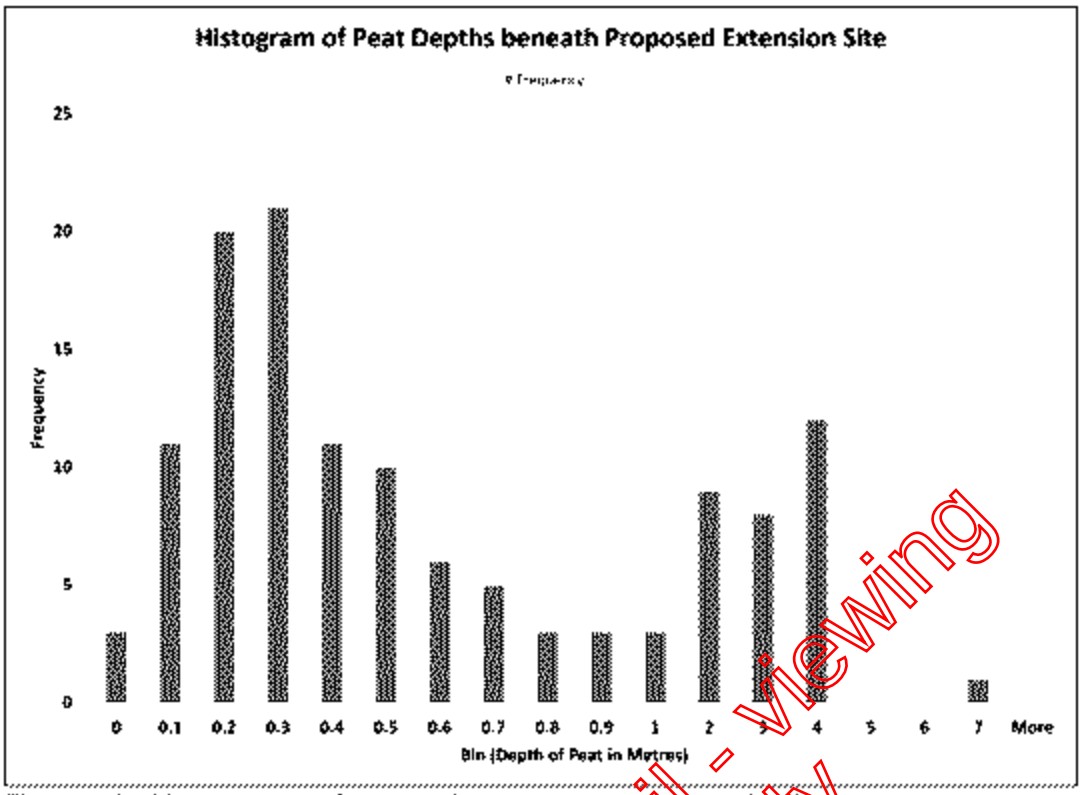


Figure 6. Histogram of probed peat depth beneath the proposed extension at Knocknaboola | Source Parkmore Environmental Services Ltd (PES)

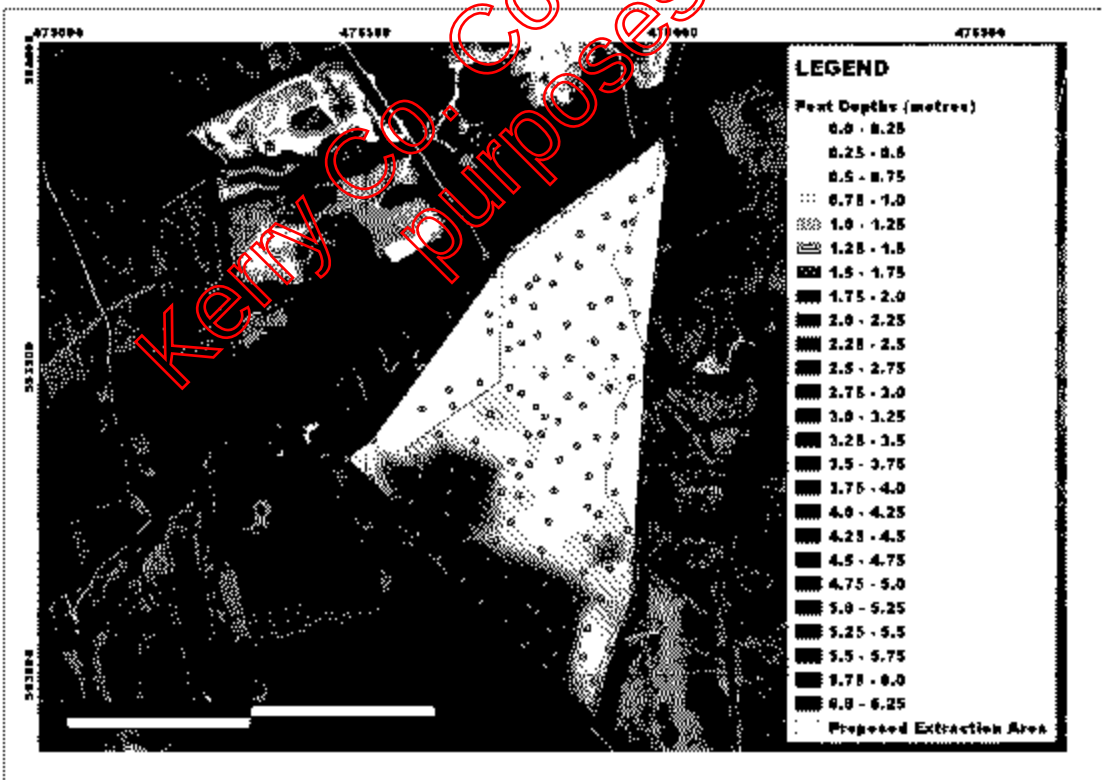


Figure 7. Peat Depth Contours beneath proposed extension | Source Parkmore Environmental Services Ltd (PES)

4.7.2 Mammals

Bats

The National Biodiversity Data Centre's (NBDC) online database provides data on the distribution of species within 10km grid squares. The site of the proposed development lies within 10km grid square (hectad) V79 of Ordnance Survey Ireland's National Grid System. A review of existing bat records within a 10km radius of the study site (NBDC) showed that the bat species listed in Error! Reference source not found. **9** have been recorded within hectad V 79.

Table 9. Bat species recorded within grid square V79

Common name	Scientific name	Presence
Lesser Noctule	*Nyctalus leisleri*	Absent
Pipistrelle	*Pipistrellus pipistrellus sensu lato*	Present
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Absent
Daubenton's Bat	*Myotis daubentonii*	Present
Natterer's Bat	*Myotis nattereri*	Absent
Brown Long-eared Bat	*Plecotus auritus*	Present
Whiskered Bat	*Myotis mystacinus*	Absent
Lesser Horseshoe	*Rhinolophus hipposideros*	Present
Nathusius's Pipistrelle	*Pipistrellus nathusii*	Absent

Source NBDC 07/10/21

Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is the only species of bat listed on Annex II of the Habitats Directive (Directive 92/43/EEC) and is a qualifying species for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. The closest NBDC record for Lesser Horseshoe Bat is located approximately 1.1km southwest of the site (an individual recorded on 01/08/2002). DixonBrosnan carried out a preliminary ecological assessment of an area of farmland to the west of the proposed development site for a separate planning application in 2014. A small colony of Lesser Horseshoe Bat was recorded in a derelict cottage approximately 1.5km northwest of the proposed development site (**Figure 8**). Subsequently a further bat survey was carried out at the cottage by Conor Kelleher on October 9, 2016. Mr. Kelleher concluded the following:

"... building is not being used as a breeding site by Lesser Horseshoe Bats as a maternity colony was not present during the site visit, instead, the structure is currently being used as an occasional summer roost and as a transitional roosting site by a small number of Lesser Horseshoe Bats in the spring and autumn seasons and, possibly, as a hibernation site during the winter months".

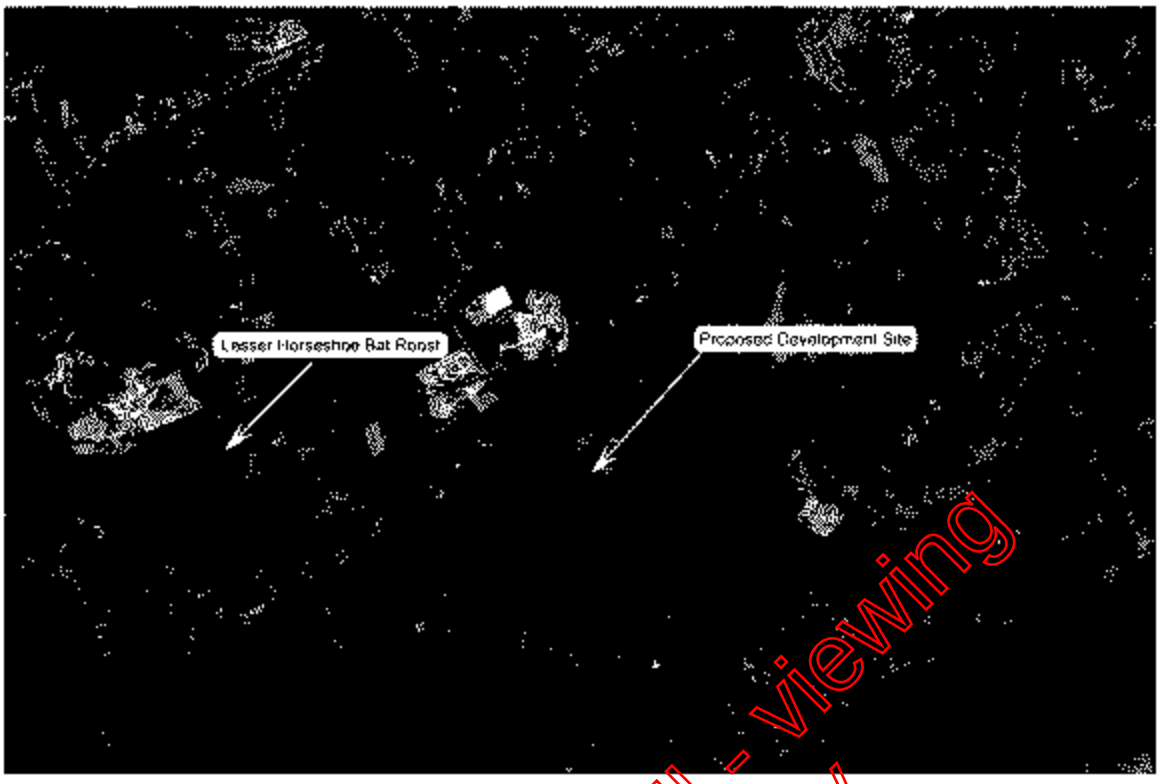


Figure 8. Location of derelict cottage with Lesser Horseshoe Bat colony in the vicinity of the proposed development site (approximate extension area boundary)

Night-time bat emergence surveys and transect surveys as well as daytime building surveys and were carried out within the extension area on 8th of May, 13th of May and 6th of June 2021 using a Batbox Duet bat detector and Echo Meter Touch 2 PRO bat detector.

There are no buildings within the extension area and the trees within the site do not provide features i.e. cracks and crevices, to support roosting bats. The lands within the site boundary are considered of low suitability as potential bat roosts (Potential Roost Feature (PRF)) under the guidelines set out in '*Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd end)*' (Collins 2016).

Bats spend much of the winter in torpor at hibernation sites although they will rouse on warmer nights to drink, forage and expel waste products. Bats can change hibercula depending on weather conditions. In general winter roosting sites have a constant temperature and high humidity (Collins, 2016) and are often in basements or underground cellars. There are no buildings or trees within the proposed extension extraction site and no potential winter roosting habitat for bats will be affected. There is no significant summer or winter roosting habitat for bats within the existing site.

Within the proposed extension extraction site no bats were recorded on the 8th of May 2021. Twenty Soprano Pipistrelle were recorded on the 13th of May 2021. These bats arrived from an area to north of the site. They began foraging over the boundary habitats on the northern and eastern boundary of the proposed extension area before moving to forage over the cutover bog at the centre of the site. A similar foraging pattern was observed on the 6th of June 2021, however higher numbers of Soprano Pipistrelle i.e. approximately 30 bats, were recorded during this survey. No Lesser Horseshoe Bats were recorded at the proposed development site.

Otter

A review of existing records showed that Otter or signs of Otter have been recorded on 14 occasions within tetrad V79, the most recent being in July 2014. Otter is known to occur within the Laune sub-catchment and Castlemaine Harbour as well as within Caragh Lake, located 2.4km to the west of the proposed development site. The closest NBDC record is at a stream below Lough Nafanida approximately 1.4km south-southwest of the proposed extension extraction site.

In Ireland, the territory of female otters is approximately up to 7.5 ± 1.5km in length and the territory of male otters 13.2 ± 5.3km (O'Neill *et al.* 2008). Otters do occur within the catchment and therefore there is the potential for Otter to move through or feed within the local streams connected to the site. However, no signs of Otter were noted during site surveys.

4.7.3 Birds

Breeding bird surveys were carried out at the proposed extension extraction site and existing factory and proposed extension extraction site site in 14th of April, 21st April and 22nd of May 2021. A number of breeding birds of conservation concern recorded during the site surveys as listed in Table . A total of 15 bird species were recorded during breeding bird surveys. Green List species e.g. Blackbird *Turdus merula*, Robin *Erithacus rubecula*, Wren *Troglodytes troglodytes* and Great tit *Parus major* were recorded primarily along the site boundaries. The species recorded within the existing factory and proposed extension extraction boundary are common species which are habituated to the disturbance associated with the extraction works. Mute Swan *Cygnus olor*, Moorhen *Galligo chloropus* and Mallard *Anas platyrhynchos* use the sedimentation ponds within the existing factory and proposed extension extraction site. It is noted the Mallard is a SCI for Castlemaine Harbour SPA.

Several Amber and Red List species were recorded at the proposed extension extraction site. One red list species i.e. Meadow Pipit *Anthus pratensis* was recorded breeding at the proposed extension extraction site . The red list species Snipe *Gallinago gallinago* was recorded at the proposed extension extraction site during winter surveys (27th September 2020), however no signs of this species were recorded during breeding bird surveys. Three Amber List species were recorded i.e Skylark *Alauda arvensis*, Willow warbler *Phylloscopus trochilus* and Swallow *Hirundo rustica* at the proposed extension extraction site . A number of the species recorded during site surveys i.e. Skylark, Snipe and Meadow Pipit are under threat due to intensification of agricultural practices as they rely on less intensively managed agricultural grassland. The wet grassland and bog/heath habitats within the proposed development site provide valuable habitat for these species. As noted above Snipe were not recorded during the breeding bird surveys. However, they could potentially breed in wet grassland habitats within the proposed development site. Snipe have recently been moved from Amber List to the Red List species of conservation concern due to a significant drop in their breeding numbers.

One Annex I species, Hen Harrier, was recorded during site surveys. This species was recorded overflying the site on two site visits i.e. 14th April and 21st of April 2021. This included a sighting of a single ringtail (14th April) and two birds (sex and age not confirmed) (21st April). Following these sightings, vantage point surveys were conducted from three vantage points surrounding the proposed extension extraction site to determine if Hen Harrier were breeding

on or in the vicinity (Error! Reference source not found.). No further sightings of Hen Harrier w ere made during the subsequent vantage point surveys. It was therefore concluded that while the proposed extension extraction site was within the foraging range of Hen Harrier, the site was not being used as a nesting site. Hen Harrier are likely to forage on Skylark and Meadow Pipit which breed within the proposed development site. It is noted that although the NBDC has records of Hen Harrier within V79, these are roving records during the winter months. There are no records of breeding Hen Harrier in the vicinity of the proposed development site and the closest Hen Harrier SPA is the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA which is located approximately 28km northeast of the site. Ruddock et al. (2016), recorded no breeding pairs within West Kerry during the 2015 national Hen Harrier survey.

Table 10. Birds of Conservation Concern Recorded during Site Surveys

Species		Breeding Status	Estimated number of territories within Site boundary	Conservation Status: Annex I of Birds Directive or Red/Amber List*
Blackbird	*Turdus merula*	Possible	3	
Blackcap	*Sylvia atricapilla*	Possible	2+	
Cuckoo	*Cuculus canorus*	Possible	Nil (one bird recorded)	
Dunnock	*Prunella modularis*	Possible	2	
Goldcrest	*Regulus regulus*	Possible	1	Amber
Goldfinch	*Spinus tristis*	Possible	1	
Hen Harrier	*Circus cyaneus*	Non breeding	Overflying	Annex I; Amber List
Hooded Crow	*Corvus cornix*	Non breeding	Overflying	
Mallard	*Anas platyrhynchos*	Possible	1	Amber List
Meadow pipit	*Anthus pratensis*	Possible	Several	Red List
Moorhen	*Gallinula chloropus*	Possible	1	
Mute Swan	*Cygnus olor*	Possible	1	Amber List
Robin	*Erithacus rubecula*	Possible	3	
Skylark	*Alauda arvensis*	Confirmed	3	Amber List
Snipe	*Gallinago gallinago*	Non breeding (winter)	1	Red list
Stonechat	*Saxicola rubicola*	Possible	1	
Swallow	*Hirundo rustica*	Confirmed	2	Amber List
Willow warbler	*Phylloscopus trochilus*	Probable	10+	Amber List
Wren	*Troglodytes troglodytes*	Possible	3	

4.7.4 Invasive Species

The Birds and Natural Habitats Regulations 2011 (SI 477 of 2011), Section 49(2) prohibits the introduction and dispersal of species listed in the Third Schedule, which includes Japanese Knotweed (*Fallopia japonica*), as follows: *"any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow [….] shall be guilty of an offence."*

A search for invasive species in the NBDC records within 2km of the proposed development site i.e. 2km grid squares V79R and V79L, was also carried out. There are no records on invasive species within the vicinity of the proposed development site.

A survey for invasive species was carried out in conjunction with habitat surveys and any observations of invasive species made during other surveys were recorded. The non-native and invasive species Rhododendron (*Rhododendron ponticum*) was recorded within bog woodland WN7/Scrub WS1 habitat. This species is listed is a Third Schedule species under SI 477 of 2011. Giant Rhubarb (*Gunnera glandulifera*) was also recorded in a scattered distribution within the existing pit. Both species is listed are Third Schedule species under SI 477 of 2011. These species has been shown to have an adverse impact on landscape quality and native biodiversity or infrastructure.

Under the right ecological condition, Rhododendron can become highly invasive and once Rhododendron has invaded an area, few native plants survive. Within the Killarney National Park this species causes severe ecological issues. Rhododendron can regenerate via seeds, suckers or rootlets. It forms extensive dense thickets which cast a very deep shade, leading in woodland to loss of ground flora, epiphytic bryophytes and lichens, modifying the fauna and preventing regeneration of trees. In addition to the effect of shade, it may produce biochemicals which can affect other plants, inhibiting the germination or seedling establishment of other species. There is also evidence for the prevention of mycorrhizal development in the roots of seedlings of competing plant species. *R. ponticum* is identified as a serious threat to upland oakwood. It is also identified as a threat for several lower plants and fungi including *Acrobolbus wilsonii, Arthothelium macounii, Lejeunea mandonii.* The characteristics of this species are illustrated in **Figure 9**.

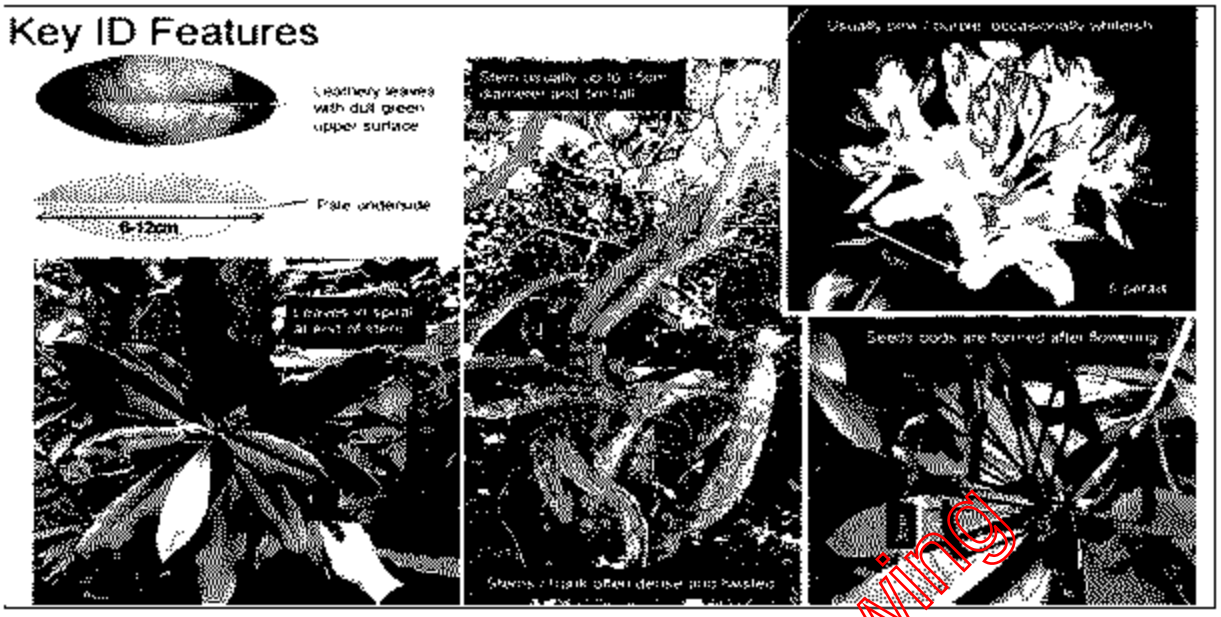


Figure 9. Key features of Rhododendron.

Giant Rhubarb is a large perennial plant that is an introduced species that has become invasive in the west of Ireland. It can grow up to 2 m tall, with leaves of up to 2 m in diameter. It is a rhizatomous plant with the rhizomes of mature plants can be up to 1.5-2 m long growing above ground. It is deciduous with the leaves dying off in autumn (October) leaving the large brown rhizomes exposed. Growth starts in early spring (March), prior to the emergence of native species. It can reproduce by both sexual (seed) and asexual (vegetative) means. Inflorescence development occurs early in the spring, with the fruits maturing in late summer/early autumn. Large numbers (up to 250,000 seeds per mature plant) of drupe like, red or orange seeds are produced. Small fragments of the rhizome have the potential to establish new plants. The characteristics of this species is shown in **Figure 5**.

Giant Rhubarb threatens indigenous biodiversity. Once established, it can quickly develop large and dense colonies and due to its wide leaf span, it can have a dramatic impact on the local biodiversity by light exclusion and halt natural succession. On rivers it causes erosion to banks, exposing them to fast running water after die-back in winter. Giant Rhubarb growth may also lead to the blockage of drainage channels and increase risk of flooding. The plant is shade tolerant so it may colonise in a variety of landscapes e.g. grassland, waterways, roadsides, quarries, bog, heath, coastal cliffs and especially old former agricultural fields.

The likely vectors of spread for Giant Rhubarb are waterways, birds, and by anthropogenic activities such as the clearing of ditches, road building, and movement of soils for housing development. As Giant Rhubarb is found to thrive in quarries it can easily spread into new areas through the transport of aggregates. The majority of the seeds are dispersed near the parent plant, but some may be transported along waterways or are possibly eaten by birds, which can further aid seed dispersal. Giant Rhubarb can also regenerate from root fragments, leaf cuttings and rhizomes. Once a small fragment of rhizome becomes established, it can extend by 15cm a year.

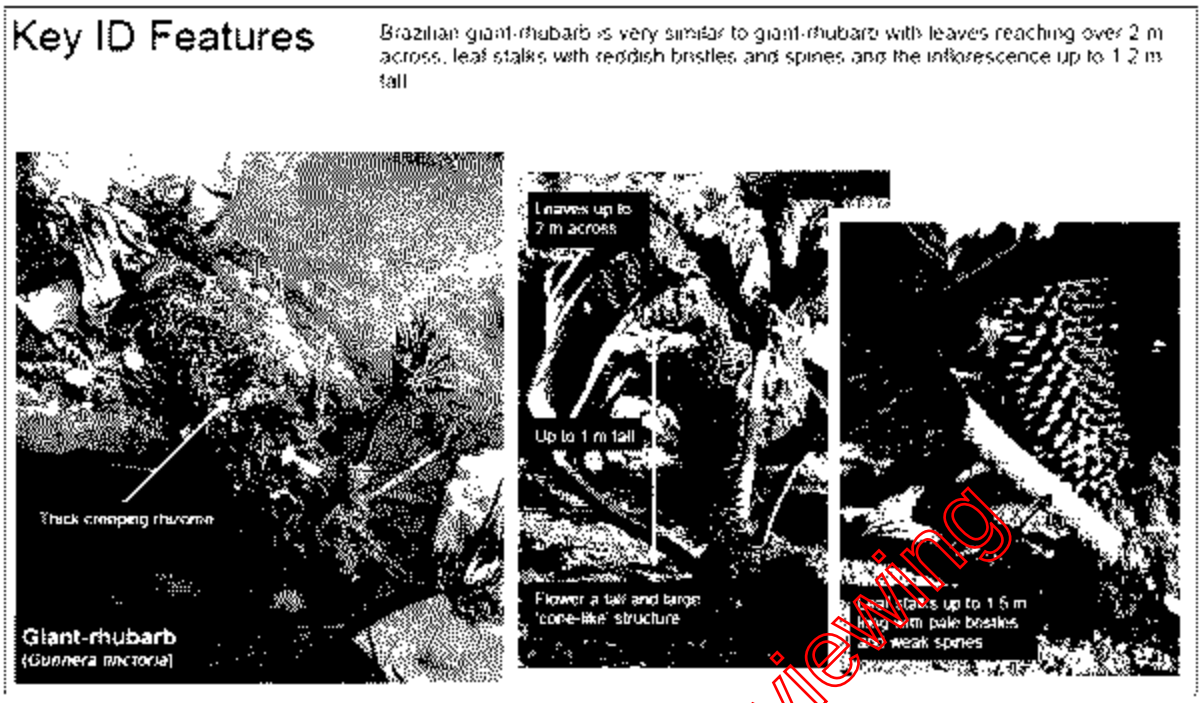


Figure 5.Key Features of Giant Rhubarb

4.7.5 Kerry Slug

NBDC did not return any records for any Kerry Slug within 2km of the proposed development site (V79R and V79L).

Kerry Slug is a protected species throughout its range of southwest Ireland and the north of the Iberian Peninsula. Within Ireland it is protected under the Wildlife Act, 1976 (as amended), and is also protected under Annex II and Annex IV of EU Habitats Directive [Council Directive 92/43/EEC] and seven Special Areas of Conservation (SACs) have been designated for its protection in Ireland, including the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

In West Cork and Kerry, Kerry Slug occurs in three general habitat types. These are deciduous woodland (usually *Quercus* spp. dominated), blanket bog or unimproved oligotrophic open moor and lake shores (NPWS 2010; Platts & Speight 1988). Within these habitats, the species tends only be present if there is outcropping of Devonian Old Red Sandstone (NPWS 2010), humid conditions and lichen, liverwort and/or mosses for the species to shelter in and feed on (Platts & Speight 1988). The degree to which this species would utilise the proposed extension extraction site would depend to a large degree on the amount of exposed bedrock available for feeding. An assessment of the habitats on site indicates that there is very little bedrock within the cutover bog/wet heath habitat and this area is not of value for this species. No Kerry Slug were recorded within the proposed development site. The habitat value for Kerry Slug within the proposed extension area are not of significant value for Kerry Slug due to the paucity of rocky outcrops which would provide suitable feeding areas for this species A range of other relatively common invertebrates utilise cutover bog/wet heath and grassland/scrub habitats.

4.7.6 Marsh Fritillary

NBDC did not return any records for Marsh Fritillary within 2km of the proposed development site (V79R and V79L).

The wet grassland within the proposed development site is ungrazed and Devil's Bit Scabious Succisa pratensis, which is the main food source for this species, was recorded within the proposed extension area. However, no Marsh Fritillary were recorded during site surveys. Marsh Fritillary is protected under the EU Habitats Directive [92/43/EEC] and is a qualifying interest for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

4.7.7 Water Quality data

The regional hydrology at the proposed development is dominated by both the River Laune, which is located c. 3.1km north-east and downgradient of the proposed extension at Knocknaboola; and Castlemaine Harbour, which is located c. 3.8km north north-west and downgradient of the existing factory and processing site at Rangue. Both the River Laune and Castlemaine Harbour are part of the Castlemaine Harbour SAC (**Figure 10**).

The River Laune, which is the principal river draining into Castlemaine Harbour, meanders from Lough Leane, which is located 14.3km east south-east of the proposed extension and immediately southwest of Killarney, through Beaufort and Killorglin, before flowing into Castlemaine Harbour c. 2.5km north of Killorglin. There is no direct surface water connection between the existing sandpit at Rangue and the proposed extension at Knocknaboola and the River Laune.

There are a number of small streams in proximity to the proposed development which are described below:

- The Upper Keal Stream that rises c. 530m southwest of the south-western boundary of Riordan's extension. This stream joins the Glashacoomnafanida (Feighahuthig) stream at the N70, c. 3.25km northwest of the pit at Rangue. The catchment area of this stream is c. 2.25km^2. This stream is to the southwest and upgradient of Riordan's site, which is not within the catchment of this Upper Keal stream. Therefore, the continued operation of the Rangue pit, and the proposed extension at Knocknaboola will have no impact on this stream. This stream will not be considered further in this report.

- The Glashacoomnafanida (Feighahuthig) stream rises at Lough Nafanida, at an elevation of approximately 100m AOD, c. 2.14km south of the entrance to the Rangue pit. It flows northwards along the eastern boundary of the proposed extension at Knocknaboola and the eastern boundary of the Rangue pit. The elevation of the stream bed along the boundary of the proposed extension and the Rangue pit ranges between c. 37m AOD in the south to c. 20m AOD in the north. A review of historical maps indicates that the channel of this stream once disappeared into a small oval shaped marshy area about 400m north of the Rangue site before re-emerging about 250m further north. The Glashacoomnafanida Stream is called the Feighahuthig stream downstream of this marshy area.

This stream becomes the Keal stream when it receives the discharge from the Upper Keal stream at the N70, c. 3.26km northwest of the Rangue pit. The catchment area to the N70 is c. 4.5km^2.

- A third small stream, called the Knocknaboola stream in this report, rises 500m south of Lough Nafanida, at an elevation of c. 100m AOD. This stream is located c. 1.5km east of, and in a separate topographic catchment to the proposed extension at Knocknaboola, and is not considered further in this report.

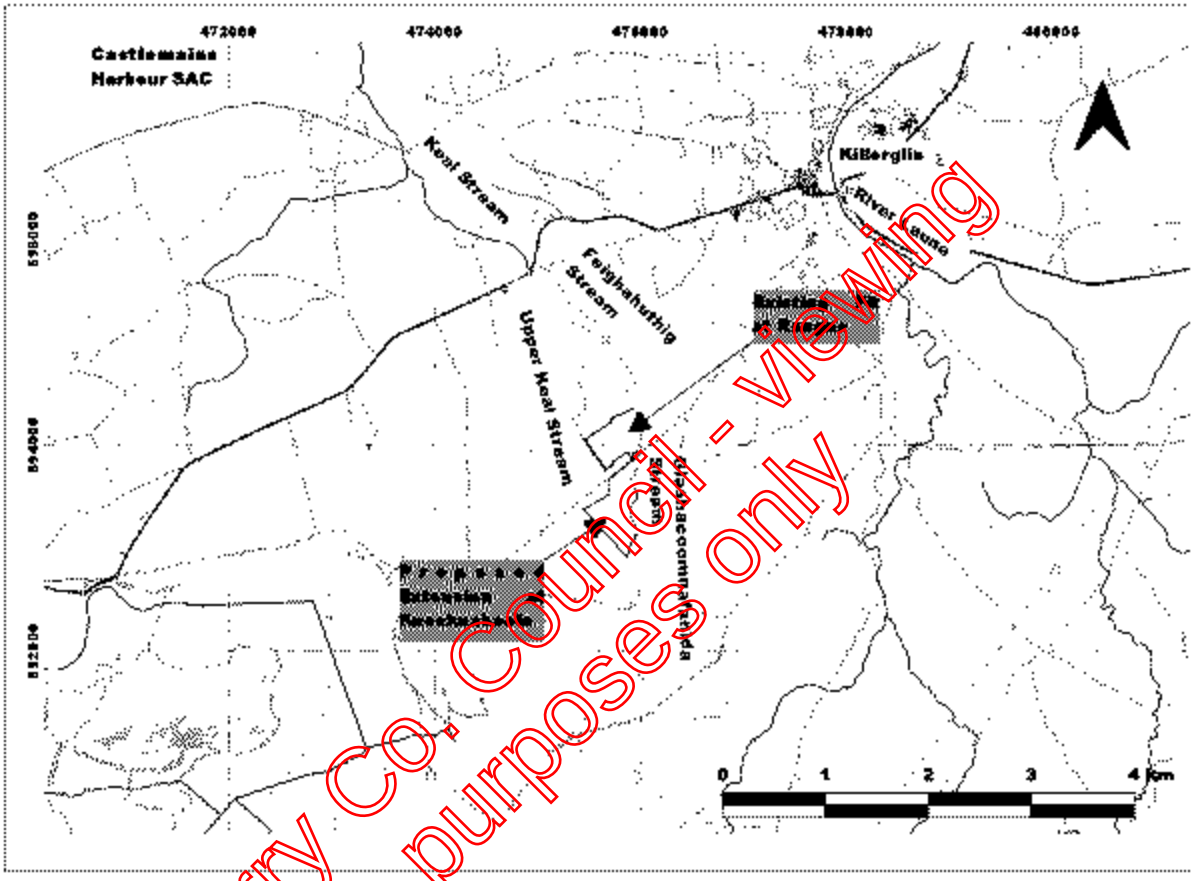


Figure 10. Regional hydrology | Source Parkmore Environmental Services Ltd (PES)

The groundwater table is up to 9.05m below the ground-level in Borehole (BH4), located 16m east of the Glashacoomnafanida Stream to the east of the proposed extension at Knocknaboola (Refer to **Figure 10**). Therefore all of the streams/drainage ditches are perched and are likely to be losing (and where perched water tables exist, gaining) varying amounts of water to ground as the stream flows across permeable overburden. The local hydrology is dominated by the Glashacoomnafanida Stream.

A shallow drainage ditch runs along the southern boundary of the Rangue sandpit. This man-made drain was installed to intercept surface water runoff from the neighbouring lands to the south. No flow has been observed in this drain during site visits undertaken as part of this investigation, except for pumped water from the floor of the pit at Rangue. The pumped water flows underneath the entrance road and discharges to the Glashacoomnafanida Stream at the south-eastern corner of the site.

A shallow drainage ditch was also excavated along the northern boundary of the Rangue sandpit. This drain has been installed to intercept surface water runoff from the neighbouring lands to the north.

The proposed sand and gravel pit extension at Knocknaboola is heavily drained, with numerous shallow drains discharging to the Glashacoomnafanida stream, which flows in a northerly direction along the eastern boundary of the site.

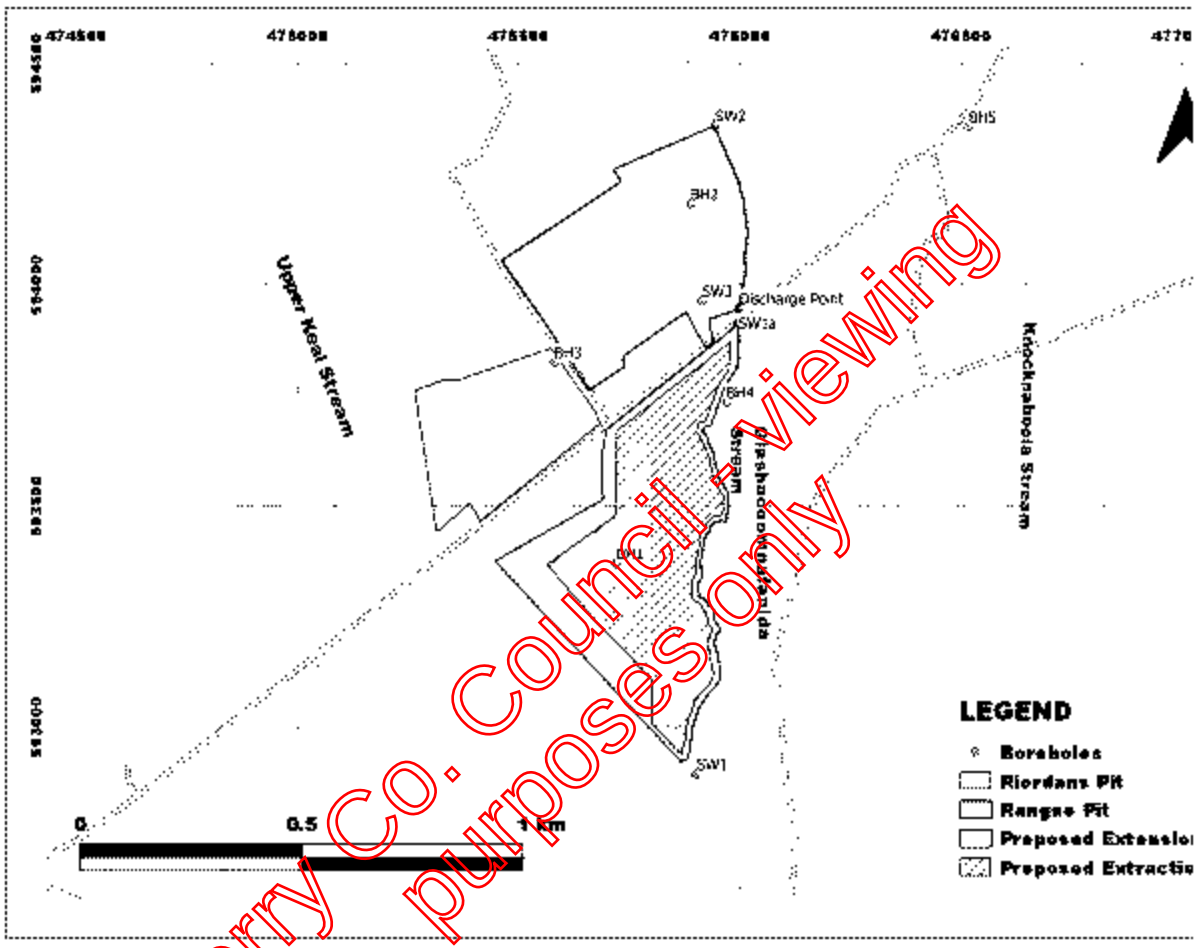


Figure 11. Local Hydrology | Source Parkmore Environmental Services Ltd (PES)

Local Hydrology - Flows

Site specific flow measurements were recorded in the Glashacoomnafanida Stream upstream of the proposed extension and downstream of the existing discharge point at Rangue in March, April, May and July 2021.

Upstream of the proposed extension, the flow varied from less than 1 litre/second on the 24th July 2021 to 9 litres/second on the 17th May 2021. The flow was previously recorded in early August 2000 at between 2 and 3 litres per second (EDA, 2000).

Downstream of the discharge point along the eastern boundary of the Rangue pit, the flow varied between 2 litres/second on the 16th April 2021 and 59 litres/second on the 17th May 2021. The increase in flow between the upstream and downstream measurement points is as a result of runoff from the lands at Knocknaboola; however the high discharge measured at

the downstream location on the 17th May is a result of discharge of water from the pit at Rangue.

The low flows measured in April and July 2021, both gauged after extended dry periods, are likely to be less than the 95% (flow which is equaled or exceeded 95% of the time). The low flows encountered after extended dry periods indicate there is no baseflow entering the stream, and discharge in the stream is driven by rainfall runoff, which is expected given the stream is perched more than 9m above the underlying overburden water level.

In very dry weather it is reported that the Glashacoomnafanida Stream dries up. This was not observed during the monitoring period in 2021. However, 700m downstream of the Rangue pit, where the Feighahuthig stream (called the Glashacoomnafanida Stream as it passed the Rangue pit) flows beneath the L7504, no flow was noted on the 24th July 2021 and only standing water was visible in parts of the stream bed. This indicates that water from the base of the stream sinks into the underlying permeable strata between the sand and gravel pit site and the bridge.

A summary of surface water flow measurements is presented in **Figure 12**.

Figure 12. Summary of Stream Flows Measured between March and July 2021

Glashacoomnafanida Stream Flow Measurements		
	SW1	SW2
	Upstream of Extension	Downstream of Discharge Point
Date	Litres/Second	Litres/Second
05/03/2021	0.0033	0.008
16/04/2021	0.0019	0.002
17/05/2021	0.0089	0.059
24/07/2021	0.0008	0.005

Source OES

Local Hydrology – Water Framework Directive and Quality

Under the Water Framework Directive (Directive 2000/60/EC) all surface water catchments have been characterised and assigned an overall status based principally on chemical and ecological status. The status of river water bodies can range from Bad-Poor-Moderate-Good-High. The objective of the Water Framework Directive is to restore poor quality water bodies to at least 'Good' status and prevent deterioration of 'Good' status water bodies, by 2027.

Ireland has been divided into 46 large catchments, 583 sub-catchments and 4829 smaller water bodies. The existing sandpit and proposed extension both lie within the catchment to the Douglas_010 waterbody (referred to in this report as Glashacoomnafanida stream), which is part of the Laune_SC_030 sub-catchment of the Laune-Maine-Dingle catchment (hydrometric area 22). They all form part of the South Western River Basin District.

A review of the Catchments.ie website indicates that the Douglas_010 waterbody status is under review (it has no assigned ecological status, and no record of water chemistry is available from the catchments.ie site; hence no status has been assigned). The risk of the

Douglas_010 waterbody not meeting the requirements of the WFD is classified as unassigned. The main significant pressure identified on the waterbody is from agricultural, industry and extractive industry processes.

The Douglas_010 waterbody discharges into Castlemaine Harbour c. 3.8km northwest and downstream of the existing factory and processing site at Rangue. Castlemaine Harbour is assigned an overall 'Good' status and is considered "not at risk" under the 3rd cycle of the Water Framework Directive. The objective for the SWB is to protect the 'Good' status condition.

A summary of the WFD status and objectives is presented in **Table 11**.

Table 11. Summary of WFD status and objectives

Water Body Management Unit	Chemical Surface Water Status	Overall Ecological Status	Overall Status	Overall Risk Result	Overall Objective
Glashacoomnafanida Stream (Douglas_010 Waterbody)	Not Assigned	Not Assigned	Not Assigned	Review	Review
Castlemaine Harbour IE_SW_230_0200	Good	Good	Good	Not at Risk	Protect

No surface water quality data has been collected from the Glashacoomnafanida Stream as part of the WFD monitoring. Surface water grab samples were collected from 3 locations as part of this site investigation, namely:

- SW1, upgradient of the proposed extension at Knocknaboola;
- SW2, downstream of the discharge point at Rangue; and
- SW3, the sand and gravel pit discharge at Rangue

The results of analysis are presented in **Table 12**. Monitoring results are compared with a number of standards as listed below:

Limits set out in the EPA Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals) under surface water;

- *Limits set out in European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009) for the purposes of assessing the status of surface waters in Ireland; and;*
- *Limits set out in European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 (S.I. No. 294 of 1989).*

Table 12. Surface Water Quality Results

PARAMETER	UNITS	SW1	SW1	SW1a	SW2	SW2	SW2	SW3	SW3	EPA ELV's for Extractive Industry	S.I. 272 Environmental Objectives (SW) Regulations 2009	S.I. 294 EC (Quality of Surface Water intended for the Abstraction for Drinking Water Regulations) 1988	
Location		Upstream		Upstream of Rangue	Downstream			Discharge					
Grid Reference (ITM)		475802, 583886		475988, 583914	476544, 584363			475926, 583965					
Date		16/04/2021	14/05/2021	1/8/200	16/04/2021	14/05/2021	01/08/2000	14/05/2021	01/08/2000				
Sampled By		PES	PES	EDA	PES	PES	EDA	PES	EDA			A1 Waters	A2 Waters
Physico-Chemical Parameters													
pH	pH Units	6.4	5.9	5.9	6.1	7.20	6.20	7.20	6.80	<9	4.5 < pH < 9 (Soft Water)	5.5-8.5	5.5-9
Electrical Conductivity	µS/cm	93	82	92.5	90	180	113	219	213	-	-		-
Temperature	°C	11	12.7	-	9.7	12.8	-	13.1		-	Not greater than 1.5°C rise outside mixing zone	25	25
CHEMICAL PARAMETERS													
Ammonia	mg/l N	<0.02	<0.02	0.3	0.12	<0.02	0.13	<0.02	0.03	-	High Status ≤0.040 (mean) or ≤0.090 (95%ile) Good Status ≤0.065 (mean) or ≤0.140 (95%ile)	0.2	4
Nitrate as N	mg/l N	<0.25	<0.25	0.03	<0.25	<0.25	0.17	<0.25	0.92	11*	-	11*	11*
Nitrite as N	mg/l	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	-	-		0.03**	
Ortho-Phosphate (MRP)	mg/l P	<0.01	<0.01	-	0.02	<0.01	-	<0.01		-	High Status ≤0.025 (mean) or ≤0.045 (95%ile) Good Status ≤0.035 (mean) or ≤0.075 (95%ile)	-	-
Total Phosphorus	mg/l P	<0.04	<0.04	<0.02	0.05	<0.04	<0.02	<0.04	<0.02	-	-		-
Suspended Solids	mg/l	<4	<4	4	6	<4	6	<4	3.5	35	-	50	-
BOD	mg/l	-	1.3	1.8	-	2.2	1.8	1.5	1.7	25	High Status ≤1.3 (mean) or ≤2.2 (95%ile) Good Status ≤1.5 (mean) or ≤2.6 (95%ile)	5	5
Chloride	mg/l	27.7	23.2	36	26.8	28.8	71	30	35	-	-	250	250
Total Nitrogen	mg/l	0.5	0.5	-	0.7	0.5		<0.5		-	-	1	2
Potassium	mg/l	-	-	2.7	-	-	3.1	-	3.3	-	-	-	-
Iron	mg/l	-	-	0.14	-	-	0.08	-	0.16	-	-	0.2	2
Total Organic Carbon	mg/l	4.9	7.4		10.4	6.5		3.8		-	-	-	-
Manganese	mg/l	-	-	0.03	-	-	0.02	-	0.03	-	-	0.05	0.3
Hydrocarbons													
Hydrocarbons	ug/l	<10	<10	-	<17	<10	-	<10	-	5000	-	-	-

* 50mg/l NO3 limit value converted to N

Legend
PES = Patterson Environmental Services Ltd
µS/cm = microsiemens per centimetre
mg/l = milligrams per litre
- = No analysis or Environmental Objective

Patterson Environmental Services Ltd.
Kilcoggin
Shanagolden.
Co. Limerick.

Surface water quality in the Glashacoomnafanida Stream along the eastern boundary of the proposed extension and further downstream along the eastern boundary of the pit at Rangue is excellent. The chemical analysis indicates this surface water body is at "High Status" under the Water Framework Directive, with both Ammonia, Orthophosphate and Biological Oxygen Demand (BOD) levels within less than the limits required by S.I. 272 2009. All parameters monitored were within the EPA Emission Limit Values (ELVs) for the Extraction Industry, and the Quality of Surface Water intended for the Abstraction of Drinking Water Regulations.

Surface water quality in the discharge water is also excellent. The total suspended solids (TSS) content of the discharge water was 3.5 mg/l, which is within the ELV of 35 mg/l for quarries, and the discharge licence limit of 30 mg/l.

During high flows it is expected that the total suspended solids concentration of the stream will increase given that the stream crosses a catchment underlain by sand and gravel overburden, and erosion and deposition are characteristics of an upland river environment.

The results of this analysis compare favourably with results from previous analysis, indicating no deterioration of surface water quality as a result of ongoing extraction activities at the Rangue pit.

4.8 Potential Impact of Proposed Development on Castlemaine Harbour SAC and Castlemaine Harbour SPA, Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC

4.8.1 Impacts from loss of habitat

Any habitat loss of Natura 2000 sites or deterioration in habitat quality would reduce the extent of habitat available for QI/SCI species. This could potentially decrease the viability of existing QI habitats and increase the pressure on existing habitat and may result in further deterioration.

The proposed development is not located within a designated site. As the proposed development site is located outside the boundary of any Natura 2000 sites, direct impacts on these habitats are outside the remit on this report. Impacts on these habitats are discussed in the EIAR which accompanies this application.

Surveys did not record Lesser Horseshoe Bat activity and no signs of Otter were recorded in the vicinity of the proposed development site. Although the loss of habitats within the extension area could impact on potential feeding habitat for qualifying species, there is no evidence to indicate that the proposed extension extraction site is of significant value for these species. No impact on these species is predicted to occur from loss of *ex situ* foraging habitat.

The habitats within the proposed development area are utilised by a range of bird species. Ponds within the existing pit are used by Mallard, a SCI species for the Castlemaine Harbour SPA. These ponds will be maintained as part of the current application. However, no habitat of significant value for species listed as SCIs for the Castlemaine Harbour SPA (or other SPAs) will be affected.

Therefore, there will no significant impact on the conservation objectives of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and Castlemaine

Harbour SPA as a result of habitat loss or fragmentation and this has been screened out from further assessment.

4.8.2 Impacts from surface water and groundwater runoff

Surface water from the existing sand and gravel pit and the proposed extension extraction site flow into the Glashacoomnafanida Stream. The Glashacoomnafanida Stream, which flows along the eastern boundary of the extension area and existing quarry, discharges into Castlemaine Harbour SAC and SPA. The proposed development could also potentially impact on baseflows into the Glashacoomnafanida Stream. Therefore the proposed development has the potential to impact on water quality within the Castlemaine Harbour SAC and Castlemaine Harbour SPA, as well as qualifying species which use aquatic habitats. The conservation objectives of Castlemaine Harbour SAC and Castlemaine Harbour SPA may be impacted by surface water runoff during construction and operation. Further investigation is required to determine if changes in water quality have the potential to impact on qualifying interests within Castlemaine Harbour SAC and Castlemaine Harbour SPA. Potential surface water impacts on the Castlemaine Harbour SAC and Castlemaine Harbour SPA are screened in for further assessment in the Stage 2 NIS.

As discussed in **Section 4.7.7** above, the proposed development site is not hydrologically connected to any other stream or watercourse. The regional groundwater flow direction is northeast. Therefore, there is no hydrological or hydrogeological pathway between the proposed development site and the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. However, given the mobile nature of some aquatic qualifying species for this SAC i.e. Sea Lamprey *Petromyzon marinus*, River Lamprey *Lampetra fluviatilis*, Atlantic Salmon *Salmo salar* and Otter *Lutra lutra* it is considered prudent to further investigate any potential impacts on these species given the proximity of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC to the proposed development site. Therefore, potential surface water impacts on these QIs are screened in for further assessment in the Stage 2 NIS.

4.8.3 Impacts from disturbance

Potentially increased noise and disturbance associated with the site works could cause disturbance/displacement of terrestrial fauna. If of sufficient severity, there could be impacts on reproductive success. The proposed development is potentially located within the zone of influence of Castlemaine Harbour SAC and Castlemaine Harbour SPA, Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and terrestrial QI/SCI species may forage or breed within or near the proposed development site.

The conservation objectives of these Natura 2000 sites could potentially be impacted by increased noise and disturbance during the construction and operational phase of the proposed development. Therefore, potential noise and disturbance impacts on the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC are screened in for further assessment in the Stage 2 NIS.

It is noted that the proposed development is highly unlikely to give rise to perceptible groundborne vibration, and vibration is not typically associated with sand and gravel pits. No instream works are proposed. Therefore, no disturbance impacts on aquatic qualifying

receptors i.e., Freshwater Pearl Mussel, Sea Lamprey, River Lamprey, Atlantic Salmon, Killarney Shad will occur.

4.8.4 Impacts from spread of invasive species

The Third Schedule invasive species *Rhododendron ponticum* was recorded within the proposed extension extraction site. The spread of invasive species during construction/operation could potentially impact on the conservation objectives of nearby Natura 2000 sites. Therefore, the impacts of the spread of invasive species on the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC are screened in for further assessment in the Stage 2 NIS.

4.8.5 In-combination Impacts

In-combination (cumulative) impacts refer to a series of individual impacts that may, in combination, produce a significant effect. The underlying intention of this in- combination provision is to take account of in-combination impacts from existing or proposed plans and projects and these will often only occur over time.

Land use in the area surrounding the proposed development site is largely agricultural. However, there are two other distinct extraction industry businesses located within 3km of the site (See **Table 24** for detail). These quarries as well as other developments in combination with the proposed development could potentially lead to in-combination impacts within the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. Therefore, potential in-combination impacts on the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC are screened in for further assessment in the Stage 2 NIS.

4.9 Screening of Relevant Natura 2000 Sites and Qualifying Interests/Special Conservation Interests

4.9.1 AA Screening Overview

Potential impacts have been identified for the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. Screening conclusions with regards to the qualifying species and habitats for relevant Natura 2000 sites are provided in **Table 13**. No significant effects on the conservation objectives of other Natura 2000 sites will occur. Sites/QIs/SCIs that are screened in for further assessment are highlighted in bold.

Table 13. Screening conclusions

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In/Out
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [3130] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	Surface waters and groundwater in the vicinity of the proposed development site flow north towards Castlemaine Harbour and there is no surface water connection between the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and the proposed development site. Therefore, no potential impacts on these QI habitats have been identified.	Screened Out

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In/Out
	• Northern Atlantic wet heaths with *Erica tetralix* [4010] • European dry heaths [4030] • Alpine and Boreal heaths [4060] • *Juniperus communis* formations on heaths or calcareous grasslands [5130] • Calaminarian grasslands of the *Violetalia calaminariae* [6130] • *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] • Blanket bogs (* if active bog) [7130] • Depressions on peat substrates of the *Rhynchosporion* [7150] • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* [91E0] • *Taxus baccata* woods of the British Isles [91J0]	The proposed development is not located within the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. Therefore, no potential impacts on these terrestrial habitats have been identified.	Screened Out

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In/Out
	• *Trichomanes speciosum* (Killarney Fern) [1421]	Killarney Fern belongs to the Filmy Fern family (*Hymenophyllaceae*). Killarney fern generally requires specific habitat requirements which are found in dripping caves, cliffs, crevices and gullies by waterfalls, crevices in woodland, and occasionally on the floor of damp woodland - all deeply shaded humid habitats. No potential impact on this species has been identified.	Screened Out
	• *Geomalacus maculosus* (Kerry Slug) [1024] • *Euphydryas aurinia* (Marsh Fritillary) [1065]	No evidence of these species was recorded during site surveys and the proposed development site is not located within the SAC. Thus, no potential impacts on these terrestrial species have been identified.	Screened Out
	• ***Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303]**	A small colony of Lesser Horseshoe Bat was recorded in a small, derelict cottage located 1.5km northwest of the proposed extension extraction site . Disturbance to foraging and commuting habitat within the site could potentially have negative impacts on this species.	**Screened In**

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In/Out
	• *Alosa fallax killarnensis* (Killarney Shad) [5046]	Killarney Shad is unique to Lough Leane, located approximately 10 km from the proposed extension. There is no hydrological link between the proposed development site and Lough Leane. Therefore, there will be no impact on this species as a result of the proposed development	Screened Out
	• *Najas flexilis* (Slender Naiad) [1833]	Records for *Najas flexilis* exist for seven lakes in the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC including Caragh Lake. There is no direct hydrological link between Caragh Lake. Surface waters adjacent to the site flow north towards Castlemaine Harbour and there is no surface water connection between the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and the proposed development site. Therefore, no potential effects on this QI species have been identified.	Screened Out
	• *Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]*	Rivers which support this species are located upstream of the proposed development site and there is no potential hydrological pathway to these sites. Surface waters adjacent to the site flow north towards Castlemaine Harbour and there is no surface water connection between the Killarney National Park,	

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In/Out
		Macgillycuddy's Reeks and Caragh River Catchment SAC and the proposed development site. Therefore, no potential impacts on this QI species have been identified.	
	• ***Petromyzon marinus* (Sea Lamprey) [1095]** • ***Lampetra fluviatilis* (River Lamprey) [1099]** • ***Salmo salar* (Salmon) [1106]** • ***Lutra lutra* (Otter) [1355]**	These species can occur within freshwater or estuarine habitats and thus could be affected by impacts on water quality. Impacts on prey availability along with noise and disturbance could impact on Otter. As noted in **section 4.7.2**, there is no hydrological (or hydrogeological) pathway between the proposed development site and the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. However, given the mobile nature of these species it is considered prudent to further investigate any potential impacts on these species given the proximity between the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and the proposed development site.	**Screened In**

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In/Out
	• *Lampetra planeri* (Brook Lamprey) [1096]	The Brook Lamprey is the smallest of the three-lamprey species native to Ireland and it is the only one of the three species that is non-parasitic and spends all its life in freshwater (Maitland & Campbell 1992). This species is confined to freshwater habitats and there is no pathway for impact on this species	Screened out
Castlemaine Harbour SAC	• **Estuaries [1130]** • **Tidal Mudflats & Sandflats [1140]** • ***Salicornia* mud [1310]** • **Atlantic salt meadows [1330]** • **Mediterranean salt meadows [1410]**	These estuarine habitats are located within the Castlemaine Harbour downstream of the proposed development site and are potentially connected to the proposed development site via the Glashacommafanlda Stream. Potential impacts on these habitats could occur due to surface water impacts during the construction and operational phase.	**Screened in**
	• Annual vegetation on drift lines [1210] • Perennial vegetation on stony banks [1220] • Embryonic Shifting Dunes [2110] • Marram Dunes (White Dunes) [2120] • Fixed Dunes (Grey Dunes)* [2130] • Dunes with Creeping Willow [2170] • Humid Dune Slacks [2190] • Petalwort *Petalophyllum ralfsii* [1395]	These habitats/species are located within the Inch and Rosbehy areas of the SAC are located over 8km NW of the proposed development site. Given this distance involved, the dilution available in Castlemaine Harbour and the largely terrestrial nature of these habitats there will be no impact on these habitats/species as a result of the proposed development.	Screened out

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In/Out
	• [91E0] Alluvial Forests*	The proposed development is not located within the Castlemaine Harbour SAC. The closest example of this habitat is located over 3.5km away and upgradient of the proposed development site. There is no hydrological pathway for the proposed development to impact on this habitat. Therefore, no potential impacts on this habitat have been identified.	Screened out
	• **Sea Lamprey *Petromyzon marinus* [1095]** • **River Lamprey *Lampetra fluviatilis* [1099]** • **Atlantic Salmon *Salmo salar* [1106]** • **Otter *Lutra lutra* [1355]**	These species inhabit and/or migrate through freshwater and thus could be effected by impacts on water quality. The proposed development is hydrologically connected to the SAC. Impacts on prey availability along with noise and disturbance could impact on Otter foraging within or in the vicinity of the proposed development site. Therefore, the proposed development could potentially impact on these qualifying species via changes in water quality and disturbance impacts during the construction and operational phase.	**Screened in**
Castlemaine Harbour SPA	• **Light-bellied brent goose *Branta bernicla hrota* [A046]** • **Wigeon *Anas Penelope* [A050]** • **Mallard *Anas platyrhynchos* [A053]** • **Pintail *Anas acuta* [A054]** • **Scaup *Aythya marila* [A062]** • **Common scoter *Melanitta nigra* [A065]** • **Oystercatcher *Haematopus ostralegus* [A130]** • **Ringed plover *Charadrius hiaticul* [A137]**	The estuarine habitats within which these species forage, are located in Castlemaine Harbour downstream of the proposed development site. The habitats used by these species are hydrologically connected to the proposed development site via the Glashacoomnafanida stream. Potential impacts on these SCIs could occur due to surface water impacts during the construction and operational phase.	**Screened in**

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In/Out
	• **Sanderling *Calidris alba* [A144]** • **Bar-tailed godwit *Limosa lapponica* [A157]** • **Redshank *Tringa tetanus* [A162]** • **Greenshank *Tringa nebularia* [A164]** • **Turnstone *Arenaria interpres* [A169]** • **Wetlands & waterbirds**	Habitats within the proposed development site could potentially provide *ex situ* foraging habitat for these species. Therefore, the proposed development could potentially impact on these SCIs via noise and disturbance impacts during construction and operation.	
	• **Red-throated diver *Gavia stellate* [A001]** • **Cormorant *Phalacrocorax carbo* [A017]**	These are piscivorous species. Therefore, their food source, i.e. fish, could be affected by impacts on water quality. Increased suspended solids can reduce water clarity and visibility, impairing the ability to find food. Potential impacts on these SCIs could occur due to surface water impacts during the construction and operational phase.	**Screened In**
	• **Chough *Pyrrhocorax pyrrhocorax* [A346]**	Chough do not breed within the SPA, but they are regularly observed on the sand dunes at Inch and Rosbehy where they feed and socialise (Trewby *et al.* 2006). Habitats within the proposed development site could potentially provide ex situ foraging habitat to these species. Therefore, the proposed development could potentially impact on these SCIs via noise and disturbance impacts during construction and operation.	**Screened In**

4.9.2 Screening conclusion

The aims of this screening section of this report were as follows:

- Determine whether the proposed development, alone or in combination with other projects, is likely to have significant effects on Natura 2000 sites in view of their conservation objectives.
- Provide information on and assess the potential for the proposed development to significantly impact on Natura 2000 Sites (also known as European sites).
- Determine whether the proposed development is directly connected with, or necessary to the conservation management of any Natura 2000 sites.

It has been objectively concluded that:

- The proposed development is not directly connected with, or necessary to the conservation management of any Natura 2000 sites.
- On the basis of objective information, the possibility of significant effects from the proposed development on European sites cannot be ruled out. There is potential for the proposed development to significantly impact the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC via impacts on water quality and disturbance to qualifying interests.
- The proposed development, alone or in combination with other projects could potentially impact on the conservation objectives of Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

On the basis of objective information and in view of best scientific knowledge, the possibility of significant effects from the proposed project on a European site, Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, cannot be ruled out and therefore an Appropriate Assessment is required.

The NIS has been prepared to inform and assist Kerry County Council, to assess, in view of best scientific knowledge, if the proposed development, individually or in combination with another plan or project is likely to have a significant effect on the European site.

5. Natura Impact Statement (NIS)

5.1 Introduction

Sections 3 and 4 of this report are relevant to informing the Natura Impact Statement (NIS) in that the proposed development and receiving environment is described in sufficient detail. In **Section 4**, the Zone of Influence (ZoI) of the proposed development and the European sites within the ZoI were identified. Likely significant effects on the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC were identified in **Section 4**. This NIS now examines and analyses, in light of the best scientific knowledge, with respect to this Natura 2000 site within the zone of influence of the proposed development, the potential effect sources and pathways, how these could impact on the SCI species and whether the predicted effects would adversely affect the integrity of the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

Mitigation measures are set out within the NIS and ensure that any effects on the conservation objectives of the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC will be avoided during the proposed development such that there will be no risk of adverse effects on the Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

5.2 Status of Special Conservation Interests (SCIs) for Castlemaine Harbour SAC, Castlemaine Harbour SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC

5.2.1 Lamprey species (*Petromyzon marinus, Lampetra fluviatilis*)

River Lamprey exhibits an anadromous life cycle (i.e. where anadromous fish spend most of their adult lives in salt-water and migrate to freshwater rivers and lakes to reproduce). The Sea Lamprey is the largest of the Irish lampreys. Sea Lamprey are listed in Appendix II, while River Lamprey is listed in both Appendices II and IV of the Habitats Directive. All three species are listed in Appendix III of the Berne Convention.

Maitland and Campbell (1992) list the threats to lamprey as water pollution, barriers to migration and habitat degradation. In Ireland the single biggest factor limiting the distribution of anadromous lamprey are upstream barriers. Although the data available to data are limited, the impact of artificial barriers on the distribution of lampreys on a number of major rivers is evident.

All three lamprey species are listed as qualifying interests for Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, while Sea Lamprey and River Lamprey are listed for Castlemaine Harbour SAC. Conservation objectives for Lamprey species within the Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC and Castlemaine Harbour SAC are outlined in **Table 14**.

Table 14. Conservation objectives for Lamprey species within the Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC and Castlemaine Harbour SAC

Species	Attribute	Measure	Target
Sea Lamprey (in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC & Castlemaine Harbour SAC)	Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary (all sites)
	Population structure of juveniles	Number of age/size groups	At least three age/size groups present (all sites)
	Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m² (all sites)
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds (all sites)
	Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 10% of sample sites positive (Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC)/More than 50% of sample positive (Castlemaine Harbour SAC)
River Lamprey (in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC & Castlemaine Harbour SAC)	Distribution	% of river accessible	Access to all water courses down to first order streams (Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC). Greater than 75% of main stem length accessible from estuary (Castlemaine Harbour SAC)
	Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present (Both sites)
	Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 5/m² (Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC). Mean catchment juvenile density of brook/river lamprey at least 2/m² (Castlemaine Harbour SAC)
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds (Both sites)
	Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive (Both sites).

5.2.2 Atlantic salmon (*Salmo salar*)

Atlantic Salmon is anadromous migratory fish and a QI for the Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC and Castlemaine Harbour SAC. Adult fish migrate from the sea to river/stream spawning areas, where the young fish live out their juvenile life stages before migrating as adults to the sea. A Water Framework Directive Fish Surveillance Monitoring Programme, 2011 (Kelly, 2012) recorded salmon within Castlemaine Harbour. Conservation objectives for Atlantic Salmon within the Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC and Castlemaine Harbour SAC are outlined in **Table 15**.

Table 15. Conservation objectives for Atlantic Salmon within the Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC and Castlemaine Harbour SAC

Attribute	Measure	Target
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary (Both sites)
Adult spawning fish Number	Number	Conservation Limit (CL) for each system consistently exceeded (Both sites)
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling (Both sites)
Out-migrating smolt abundance	Number	No significant decline (Both sites)
Number and distribution of redds	Number and Occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes (Both sites)
Water quality	EPA Q value	At least Q3 at all sites sampled by EPA (Both sites)

5.2.3 Otter

Otters, along with their breeding and resting places are protected under the provisions of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act, 2000. Otters have additional protection because of their *inclusion* in Annex II and Annex IV of the Habitats Direct which is transposed into Irish law in the European Communities (Natural Habitats) Regulations (S.I 94 of 1997), as amended. Otters are also listed as requiring strict protection in Appendix II of the Berne Convention on the *Conservation of European Wildlife and Natural Habitats* and are included in the Convention on International Trade of Endangered species (CITES)). Although rare in parts of Europe, they are widely distributed in the Irish countryside in both marine and freshwater habitats.

This species is a qualifying interest for the Castlemaine SAC and Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC. There is no specific data on Otter population size in Castlemaine Harbour although they are known to be present throughout the area (Bailey and Rochford, 2006). The same survey found several Otter records throughout the Caragh River Catchment.

Conservation objectives for Otter within the Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC and Castlemaine Harbour SAC are outlined in **Table 16**. It is

noted that the proposed development site is not located within the 250m Otter buffer zones mapped for the SAC.

Table 16. Conservation objectives for Otter within the Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC and Castlemaine Harbour SAC

Attribute	Measure	Target
Distribution	Percentage positive survey sites	No significant decline (Both sites)
Extent of terrestrial habitat	Hectares	No significant decline (Both sites). Area mapped and calculated as 1,936.8ha along river banks /lake shoreline/ around ponds (Killarney National Park, Macgillycuddy's Reeks). Area mapped and calculated as 162ha above high water mark (HWM); 193ha along river Banks (Castlemaine Harbour SAC)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 1,246.2km, Length mapped and calculated as 104km (Castlemaine Harbour SAC)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 2,710.3ha (Killarney National Park, Macgillycuddy's Reeks).
Extent of marine habitats	Hectares	Area mapped and calculated as 812ha (Castlemaine Harbour SAC).
Couching sites and holts	Number	No significant decline (Both sites)
Fish biomass available	Kilograms	No significant decline (Both sites)
Barriers to connectivity	Number	No significant increase (Both sites)

5.2.4 Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

Lesser Horseshoe Bat is mainly found in counties on Ireland's western seaboard Mayo, Galway, Clare, Limerick, Kerry and Cork although its strongholds are found in Kerry/west Cork and in Clare. This species is a QI for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. The species is protected by European legislation through its listing on Annex II and Annex IV of the EU Habitats Directive (Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora). As Lesser Horseshoe Bat is Ireland's only Annex II listed bat species, this means that its population requires special protection measures and designation of Special Areas of Conservation within the Natura 2000 network. These designations are usually roost or hibernacula centered and focus on large roosting sites for the species, usually with >50 individuals in winter or >100 individuals in summer.

Lesser Horseshoe Bats forage on flying insects within predominately 'cluttered' habitats, such as dense vegetation in deciduous woodland and riparian vegetation normally within a couple of kilometres of their roosts. The bats rely on linear landscape features (e.g. treelines, stonewalls and hedgerows) to navigate and commute from roosts to feeding sites and they are reluctant to fly out in the open (Schofield, 2008).

Table 17. Conservation objectives for Lesser Horseshoe Bat within the Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC

Attribute	Measure	Target
Population per roost	Number	Minimum number of 182 bats in winter for Roost ID 623; minimum number of 127 in winter and 358 in summer for Roost ID 505; minimum number of 176 in winter and 315 in summer for Roost ID 296; minimum number of 218 in summer for Roost ID 615
Winter roosts	Condition	No decline
Summer roosts	Condition	No decline
Number of auxiliary roosts	Number and condition	No decline
Extent of potential foraging habitat	Hectares	No significant decline
Linear features	Kilometres	No significant loss, within 2.5km of qualifying roosts.

Summer roosting sites are often in the attics of old or derelict buildings. The bats are faithful to a roost site and will return to the same site each year. Hibernation sites are typically caves, souterrains, cellars and icehouses (Kelleher, 2004). Lesser Horseshoe Bats tend to forage in summer in broadleaved woodland and around riparian vegetation (Bontadina *et al.*, 2002; Biggane, 2003). In 2016, the Bat Conservation Trust (BCT) carried out a review of literature pertaining to mean and maximum bat foraging distances (BCT, 2016). In their review, a Core Sustenance Zone (CSZ) refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. For the BCT review, Lesser Horseshoe Bat data was available from 83 radio-tracked individuals from four separate studies. The weighted average maximum foraging distance Lesser Horseshoe Bats was 2.02km. The BCT noted that for Annex II species there is justification for increasing the CSZ to reflect use of the landscape by all bats in a population. Some researchers have found that Lesser Horseshoe Bats normally forage in woodlands/scrub within 2.5km of their roosts (Bontadina *et al.*, 2002); thus, for each roost, a 2.5km zone is considered an appropriate distance to foraging areas for the purpose of the current site specific conservation objectives (SSCO). The 2.5km zone around each known roost is mapped and potential foraging grounds within the zone are identified and mapped for each SAC using the Forestry Inventory and Planning System (FIPS) (2007/2012) spatial dataset. The target is that there is no significant decline in potential foraging habitat within 2.5km of qualifying roosts. The proposed development site is outside the 2.5km buffer zone for Lesser Horseshoe Bat roosts within the Killarney National Park, Macgillycuddy's Reeks, Caragh River Catchment SAC.

Figures of 100 bats for summer roosts and 50 bats for winter roosts were set as the minimum qualifying standards (MQS) when SACs were being selected for Lesser Horseshoe Bat. The closest recorded Lesser Horseshoe Bat NBDC records is approximately 1km southwest of the proposed development site in August 2002 (NBDC 2021). This is a small colony and would not meet the criteria for a qualifying Lesser Horseshoe Bat roost.

5.2.5 Estuaries [1130]

The habitat Estuaries [1130] defined by the Interpretation Manual of European Union Habitats - EUR28 as follows:

"Downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. River estuaries are coastal inlets where, unlike 'large shallow inlets and bays' there is generally a substantial freshwater influence. The mixing of freshwater and sea water and the reduced current flows in the shelter of the estuary lead to deposition of fine sediments, often forming extensive intertidal sand and mud flats. Where the tidal currents are faster than flood tides, most sediments deposit to form a delta at the mouth of the estuary.".

Estuaries are habitat complexes which comprise an interdependent mosaic of subtidal and intertidal habitats, which are closely associated with surrounding terrestrial habitats. Many of these habitats, such as Mudflats and sandflats not covered by sea water at low tide [1140], saltmarshes, Sandbanks which are slightly covered by sea water all the time [1110] and Reefs [1170], are identified as Annex I habitat types in their own right.

Estuaries are considered to be the transitional water body area as defined by the EPA under the Water Framework Directive. The position of estuaries at the foot of the watershed and their open connection to the sea makes them subject to almost continuous input of nutrients (Neilson & Cronin, 1981). Although estuaries cycle large quantities of nutrients, these same nutrients if put in excessive amounts can be highly detrimental to estuarine and coastal ecosystems (Neilson & Cronin, 1981).

Within Castlemaine Harbour SAC, estuarine habitat is estimated at 5696ha (NPWS 2011). The nearest estuarine habitat is located approximately 4.1km downstream of the proposed development site (NPWS 2011). Specific conservation targets for this habitat with the Castlemaine Harbour SAC are outlined in **Table 18**.

Table 18. Conservation objectives for Estuaries (1130)

Attribute	Measure	Target
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes
Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Intertidal muddy fine sand community complex; Fine to muddy fine sand with polychaetes community complex; Intertidal sand with Nephtys cirrosa community; and Mixed sediment community complex.

5.2.6 Mudflats and sandflats not covered by seawater at low tide (1140)

The Castlemaine Harbour SAC is designated for the marine Annex I qualifying interest Mudflats and sandflats (1140) not covered by seawater at low tide. The Interpretation Manual of European Union Habitats - EUR28 defines the habitat as '*Sands and muds of the coasts of the oceans, their connected seas and associated lagoons, not covered by sea water at low tide, devoid of vascular plants, usually coated by blue algae and diatoms. They are of particular importance as feeding grounds for wildfowl and waders. The diverse intertidal communities of invertebrates and algae that occupy them can be used to define subdivisions of 11.27, eelgrass communities that may be exposed for a few hours in the course of every tide have been listed under 11.3, brackish water vegetation of permanent pools by use of those of 11.4.*'

The estimated area of this habitat within the SAC is 4287ha. The closest example of this habitat is located approximately 5.1km downstream of the proposed development site (NPWS 2011). The specific conservation objectives for this qualifying habitat within Castlemaine Harbour SAC are outlined in **Table 19**.

Table 19. Conservation objectives for Mudflats and sandflats not covered by seawater at low tide 1140

Attribute	Measure	Target
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes
Community distribution	Hectares	Maintain the extent of the *Zostera*-dominated and the Barnea candida communities, subject to natural processes.
Zostera shoot density	Shoots/m2	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes
Barnea candida density	Individuals/m2	Conserve the high quality of the *Barnea candida* community, subject to natural Processes
Community distribution	Hectares	Conserve the following community complexes in a natural condition: Fine sands with *Pygospio elegans* and *Corophium volutator* community complex; and Intertidal sand dominated by -polychaetes community complex

5.2.7 Salicornia and other annuals colonising mud and sand

This pioneer saltmarsh vegetation colonises intertidal mud and sandflats in areas protected from strong wave action and is an important precursor to the development of more stable saltmarsh vegetation. It develops at the lower reaches of saltmarshes where the vegetation is frequently flooded by the tide, and can also colonise open creek sides, depressions or pans within saltmarshes, as well as disturbed areas of upper saltmarshes. The overall objective for '*Salicornia* and other annuals colonising mud and sand' in the Castlemaine Harbour SAC is to 'maintain the favourable conservation condition'. The specific conservation objectives for this qualifying habitat within Castlemaine Harbour SAC are outlined in **Table 20**. The closest mapped example of this habitat is located approximately 11.5km southwest of the proposed development site (NWPS 2011).

Table 20. Conservation objectives for Salicornia and other annuals colonising mud and sand [1310]

Attribute	Measure	Target
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Inch - 1.24ha and Rosbehy
Habitat distribution	Occurrence	No decline, subject to natural processes
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonation including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward
Vegetation structure: vegetation cover.	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).
Vegetation structure: negative indicator species: *Spartina anglica*	Hectares	No significant expansion of *Spartina anglica*. No new sites for this species and an annual spread of less than 1% where it is

5.2.8 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) and Mediterranean salt meadows (Juncetalia maritimi)

Saltmarshes are stands of vegetation that occur along sheltered coasts, mainly on mud or sand, and are flooded periodically by the sea. They are restricted to the area between mid-neap tide level and high-water spring tide level.

Extensive areas of saltmarsh are known to occur at Inch, Cromane and Rosbehy, with smaller areas at Whitegate-Fybagh and scattered throughout the site. Mediterranean salt meadows are the most common and widely distributed habitat, while Atlantic salt meadows and Salicornia mudflats are less frequent. There should be no decline or change in the distribution of these saltmarsh habitats, unless it is the result of natural processes, including erosion, accretion and succession.

The overall objective for 'Atlantic salt meadows' and 'Mediterranean salt meadows' in the Castlemaine Harbour SAC is to 'restore the favourable conservation condition'. Specific conservation targets are outlined in **Table 21**. The closest example of this habitat is located approximately 5.1km downstream of the proposed development site (NPWS 2011).

Table 21. Conservation objectives for Atlantic Salt Meadows [1330] and Mediterranean Salt Meadows [1410]

Attribute	Measure	Target
Habitat area Atlantic salt meadows	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Inch - 9.48ha, Rosbehy - 7.29ha, Whitegate- Fybagh - 2.72ha, Cromane - 13.97ha.
Habitat area Mediterranean salt meadows	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Inch - 29.11ha. Rosbehy - 16.10ha, Cromane - 29.31ha and Whitegate- Fybagh - 2.72ha
Habitat distribution (Both)	Occurrence	No decline, subject to natural processes
Physical structure: sediment supply (Both)	Presence/absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: flooding regime (Both)	Hectares flooded; frequency	Maintain natural tidal regime
Physical structure: creeks and pans (Both)	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Vegetation structure: zonation (Both)	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: vegetation height (Both)	Centimetres	Maintain structural variation within sward
Vegetation structure: vegetation cover (Both)	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated
Vegetation composition: typical species and sub-communities (Both)	Percentage cover at a representative sample of monitoring stops	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).
Vegetation structure: negative indicator species: *Spartina anglica* (Both)	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur

5.2.9 Castlemaine Harbour SPA - SCI Birds

Castlemaine Harbour SPA is a large coastal site occupying the innermost part of Dingle Bay. The site extends from the lower tidal reaches of the River Maine and River Laune, to a point some 5km west of the Inch and Rosbehy peninsulas. The average width of the estuary is 4 to 5km although it is about 11km at the outer limit. The site comprises the estuaries of the River Maine and the River Laune, both substantial rivers, but a number of other rivers, e.g. the Caragh and the Emlagh also flow into the site, together with numerous small streams.

Conservation objectives for SPA sites are aimed at maintaining bird populations through the protection of habitats supporting them and against negative impacts of disturbance. Therefore conservation objectives are determined, not only waterbird populations, but importantly, for the biotic and non-biotic components of the site that underpin the long-term maintenance of the waterbirds abundance, distribution and range. To this end, conservation objectives are defined for attributes relating to waterbird species populations, and for attributes related to the maintenance and protection of habitats that support them. The specific conservation

objectives for species listed as conservation interests for the Castlemaine Harbour SPA (**Table 22**) are to maintain a favourable conservation condition of the non-breeding/breeding waterbirds and to maintain the favourable conservation condition of the wetland habitat at Castlemaine Harbour SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

These species are listed as SCIs for the Castlemaine Harbour SPA for the following reasons:

1. The site regularly supports 1% or more of the biogeographical population of Light-bellied Brent Goose (*Branta bernicla hrota*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 694 individuals. Further to the species assessment, Castlemaine Harbour was selected because it is one of the most suitable sites in the country for the conservation of this species[3]

2. The site regularly supports 1% or more of the all-Ireland population of Wigeon (*Anas penelope*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 6,819 individuals. Further to the species assessment, Castlemaine Harbour was selected because it is one of the most suitable sites in the country for the conservation of this species.

3. The site regularly supports 1% or more of the all-Ireland population of Pintail (*Anas acuta*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 145 individuals. Further to the species assessment, Castlemaine Harbour was selected because it is one of the most suitable sites in the country for the conservation of this species.

4. The site regularly supports 1% or more of the all-Ireland population of Common Scoter (*Melanitta nigra*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 3,637 individuals. Further to the species assessment, Castlemaine Harbour was selected because it is one of the most suitable sites in the country for the conservation of this species.

5. The site regularly supports 1% or more of the all-Ireland population of the Annex I species Red-throated Diver (*Gavia stellata*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 56 individuals. Further to the species assessment, Castlemaine Harbour was selected because it is one of the most suitable sites in the country for the conservation of this species.

6. The site regularly supports 1% or more of the all-Ireland population of Ringed Plover (*Charadrius hiaticula*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 206 individuals. Further to the species assessment, Castlemaine Harbour was selected because it is one of the most suitable sites in the country for the conservation of this species.

7. The site regularly supports 1% or more of the all-Ireland population of Sanderling (*Calidris alba*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 335 individuals. Further to the species assessment, Castlemaine Harbour was selected because it is one of the most suitable sites in the country for the conservation of this species.

8. The site regularly supports 1% or more of the all-Ireland population of the Annex I species Bar-tailed Godwit (*Limosa lapponica*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 397 individuals. Further to the species assessment, Castlemaine Harbour was selected because it is one of the most suitable sites in the country for the conservation of this species.

9. The site regularly supports 1% or more of the all-Ireland population of the Annex I species Chough (*Pyrrhocorax pyrrhocorax*). In winter, Castlemaine Harbour SPA supports 40 - 64 Chough (counts from winter 2002/03 and 2003/04 respectively) which exceeds the All-Ireland 1% threshold for this species. Further to the species assessment, Castlemaine Harbour was selected because it is one of the most suitable sites in the country for the conservation of this species.

The following species are identified as additional Special Conservation Interests (SCIs) for Castlemaine Harbour SPA:

- Mallard (*Anas platyrynchos*),
- Scaup (*Aythya marila*),
- Cormorant (*Phalacrocorax carbo*),
- Oystercatcher (*Haematopus ostralegus*),
- Greenshank (Tringa nebularia),
- Redshank (*Tringa totanus*),
- Turnstone (*Arenaria interpres*).

Table 22. Conservation objectives for SCIs of Castlemaine Harbour SPA

Species/Habitats	Attribute	Measure	Target
Red-throated Diver (*Gavia stellata*) [A001] Cormorant (*Phalacrocorax carbo*) [A017] Light-bellied Brent Goose (*Branta*	Population trend	Percentage change	Long term population trend stable or increasing

Species/Habitats	Attribute	Measure	Target
bernicla hrota) [A046] Wigeon (*Anas penelope*) [A050] Mallard (*Anas platyrhynchos*) [A053] Pintail (*Anas acuta*) [A054] Scaup (*Aythya marila*) [A062] Common Scoter (*Melanitta nigra*) [A065] Oystercatcher (*Haematopus ostralegus*) [A130] Ringed Plover (*Charadrius hiaticula*) [A137] Sanderling (*Calidris alba*) [A144] Bar-tailed Godwit (*Limosa lapponica*) [A157] Redshank (*Tringa totanus*) [A162] Greenshank (*Tringa nebularia*) [A164] Turnstone (*Arenaria interpres*) [A169] Chough (*Pyrrhocorax pyrrhocorax*) [A346] Wetland and Waterbirds [A999]	Distribution	Number and range of areas used by waterbirds	No significant decrease in the range, timing or intensity of use of areas by each species, other than that occurring from natural patterns of variation
	Distribution: breeding colonies	Number; location; area (hectares)	No significant decline
	Prey biomass available	Kilogrammes	No significant decline
	Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase
	Disturbance at the breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding common tern population

Species/Habitats	Attribute	Measure	Target
Wetlands	Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the areas of 7472, 3983 and 322 hectares for subtidal, intertidal, and supratidal habitats respectively, other than that occurring from natural patterns of variation.

The Irish Wetland Bird Survey (I-WeBS) was initiated in the Republic of Ireland in the winter of 1994/95. The survey is coordinated by the I-WeBS Office based at BirdWatch Ireland, under contract to the NPWS. The primary objective of I-WeBS is to monitor the numbers and distribution of waterbird populations wintering in the Republic of Ireland, and the survey focuses on wintering waterbirds, as opposed to autumn and spring migrants. I-WeBS survey results from Castlemaine Harbour from 2008/2009 to 2017/2018 are shown in **Table 23**. Based on the most recent I-WeBS data i.e. 5 year mean, that all SCI species numbers wihtin the SPA remain at international/national significance as outlined in NPWS (2011), with the exception of Common Scoter. The site no longer regularly supports nationally important numbers of this species. Common Scoter is a Red List Bird of Conservation Concern in Ireland (BOCCI) (Gilbert *et al.* 2021).

Table 23. I-WeBS results 2008/2009 to 2017/2018 (SCI species for Castlemaine Harbour SPA highlighted in bold)

Species	1% national	1% international	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	Mean
Mute Swan	90.00	100.00		4*	8	16	18	13	4		4	4	5
Whooper Swan	150.00	340.00			13								0
Light-bellied Brent Goose	**350.00**	**400.00**	**1359**	**753***	**1350**	**1278**	**1284**	**1091**	**1169**	**904**	**978**	**1491**	**1107**
Shelduck	100.00	2500.00	137	61*	217	238	104	15	62	66	94	63	60
Wigeon	**560.00**	**14000.00**	**443**	**298***	**3038**	**761**	**2128**	**4007**	**4774**	**3880**	**7936**	**1092**	**4338**
Gadwall	20.00	1200.00					5	9					2
Teal	360.00	5000.00	168	173*	367	84	207	197	45	263	307	83	179
Mallard	**280.00**	**53000.00**	**189**	**224***	**495**	**357**	**444**	**360**	**283**	**436**	**237**	**117**	**287**
Pintail	**20.00**	**600.00**	**99**	**6***	**46**	**120**	**45**	**122**	**110**	**56**	**97**	**88**	**95**
Shoveler	20.00	650.00		10*									0
Pochard	110.00	2000.00			1		1		5				1
Tufted Duck	270.00	8900.00					10	1	7				2
Scaup	**25.00**	**3100.00**	**22**				**45**	**2**					**0**
Long-tailed Duck												1	0
Common Scoter	**110.00**	**7500.00**	**146**	**560***	**448**	**300**	**685**		**14**	**50**	**18**	**230**	**62**
Goldeneye	40.00	11400.00	1			1						1	0
Red-breasted Merganser	25.00	860.00	8	1*	9	2	3	3	7	8	1	4	5
Unidentified Duck			500										0
Red-throated Diver	**20.00**	**3000.00**			**13**	**3**	**4**	**4**					**1**
Black-throated Diver				1*									0
Great Northern Diver	20.00	50.00	20	12*	2	15	29		3	3	2	2	2
Little Grebe	20.00	4700.00	1										0

Species	1% national	1% international	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	Mean
Great Crested Grebe	30.00	6300.00			9								0
Slavonian Grebe				6*									0
Cormorant	**110.00**	**1200.00**	**23**	**48***	**67**	**59**	**99**	**10**	**34**	**48**	**77**	**16**	**37**
Shag					31	2	18			4			1
Little Egret	20.00	1100.00	11	18*	53	24	36	35	53	37	22	22	34
Grey Heron	25.00	5000.00	9	9*	13	7	3	6	6	3	5	4	5
Glossy Ibis								1					0
Spoonbill			1	1*		1	1						0
Oystercatcher	**610.00**	**8200.00**	**806**	**1354***	**1030**	**757**	**570**	**506**	**787**	**570**	**960**	**407**	**646**
Ringed Plover	**120.00**	**540.00**	**59**	**189***	**100**	**103**	**197**	**27**	**258**	**60**	**65**	**38**	**90**
Golden Plover	920.00	9300.00		89*	4	600	600		10				2
Grey Plover	30.00	2000.00			73	96	41	45	30		46		24
Lapwing	850.00	72300.00	503	731*	310	1003	361	462	237	391	738	67	379
Knot	160.00	5300.00	34	273*	409	322	342	41	244	276	191		150
Sanderling	**85.00**	**2000.00**	**210**	**452***	**505**	**400**	**727**	**350**	**300**		**345**	**420**	**283**
Curlew Sandpiper							4						0
Dunlin	460.00	13300.00	1483	411*	1424	3499	471	485	636	400	905	150	515
Ruff											1		0
Snipe			1	1*	11		2	31	2	3	4		8
Woodcock					1								0
Black-tailed Godwit	200.00	1100.00		41*	22	230	240	51	133	6	78	12	56
Bar-tailed Godwit	**170.00**	**1500.00**	**211**	**221***	**250**	**115**	**332**	**288**	**437**	**405**	**317**	**60**	**301**
Curlew	350.00	7600.00	498	367*	977	619	670	363	350	428	399	80	324
Common Sandpiper					4								0

Species	1% national	1% international	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	Mean
Spotted Redshank							4						0
Greenshank	**20.00**	**3300.00**	**12**	**9***	**43**	**8**	**26**	**2**	**123**	**21**	**32**	**7**	**37**
Redshank	**240.00**	**2400.00**	**498**	**383***	**651**	**413**	**854**	**617**	**968**	**758**	**510**	**356**	**683**
Turnstone	**95.00**	**1400.00**	**53**	**41***	**90**	**135**	**122**	**3**	**24**	**15**	**11**		**11**
Unidentified wader sp.											2		0
Black-headed Gull			430	95*	320	188	200	498	350	272	120		248
Common Gull					67	82	23	5	1	4	12		4
Lesser Black-backed Gull			150	46*	31	344	68			5	3	31	8
Herring Gull			83	41*	188	321	250	14	26	89	5		27
Great Black-backed Gull			18	3*	4	5	26	7	4		9		4
Kingfisher					31								0

5.3 Assessment of Potential Impacts

All potential impacts relate to potential surface water runoff, the spread of invasive species and disturbance effects during the construction and operational phase. Based on the *Managing Natura 2000 Sites: The Provision of Article 6 of the Habitats Directive 92/43/EEC* (European Commission (EC), 2018 and CIEEM guidelines '*Guidelines for Ecological Impact Assessment*' (CIEEM, 2019) impacts are listed as significant using a combination of professional judgement and criteria or standards where available, if impacts have the potential to have a significant impact on the ecological integrity on the habitats and species for which the site is designated.

The potential impacts associated with the proposed development are discussed in the following section with respect to their likelihood to have significant impacts on Natura 2000 sites.

As part of the assessment direct, indirect and cumulative impacts were considered. Direct impacts refer to habitat loss or fragmentation arising from land take requirements for development. Indirect and secondary impacts do not have a straight-line route between cause and effect, and it is potentially more challenging to ensure that all the possible indirect impacts of the project/plan - in combination with other plans and projects have been established.

As part of the assessment the potential for impacts associated with the development were reviewed as outlined below:

- Impacts from noise and disturbance on qualifying species
- Impacts on water quality and aquatic ecology
- Impact from spread of invasive species
- Cumulative Impacts

5.3.1 Impacts from lighting, noise and disturbance on qualifying species

Noise and disturbance associated with the construction and operation of the sand and gravel pit and proposed extension extraction site could cause disturbance/displacement of fauna. If of sufficient severity, there could be impacts on reproductive success. It is noted that the existing sand and gravel pit is already subject to noise disturbance and therefore the impacts discussed below are largely confined to the extension area.

Otter, which is listed on Annex II of the Habitats Directive, is a qualifying interest for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and Castlemaine Harbour SAC. Otter is generally considered to be a nocturnal or crepuscular species, i.e. individuals are predominantly active at night, with peaks in activity shortly after dusk at just before dawn (Chanin 2003; OPW 2006). Therefore, apart from their breeding and resting sites, Otters are not considered to be sensitive to noise and light impacts during daylight hours. Furthermore, the occurrence of Otters in Irish towns and cities suggests that this species is able to habituate to human activities. Noise/vibration and light arising from construction or operational activities have the potential to cause disturbance to Otters, leading to reduced connectivity between areas upstream and downstream of the proposed development. Given the nocturnal or crepuscular nature of this species, the significance of

any effects resulting from noise and lighting impacts depends on the daily programming and total duration of the construction/operational activities. Otter is known to occur within the Laune sub-catchment and Castlemaine Harbour as well as within Caragh Lake, located 2.4km to the west of the proposed development site. It is probable that Otter occurs within the within the lower sections of the Glashacoomnafanida Stream. The Glashacoomnafanida Stream where it adjoins the proposed development site dries up during drier weather and thus will not support the permanent fish stocks on which Otter feed. Otter could potentially forage on Common Frog *Rana temporaria* which were recorded within the proposed extension extraction site. However, no Otter holts or signs of Otter were noted during the site survey.

Lesser Horseshoe Bat is listed on Annex II of the Habitats Directive, is a qualifying interest for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. As noted in **Section 4.7.2**, the closest known roost of this species is located 1.1km from the proposed development site. Given the distance from the site, there will be no disturbance impacts to the roosting site. However, construction or operational activities could potentially disrupt commuting routes outside the proposed development site. Lesser Horseshoe Bats have been found to avoid commuting along routes lit with artificial light at levels as low as 3.7 lux emanating from energy efficient LED lights (Stone *et al.*, 2012). Other lamp types producing light at similar levels have also been found to prevent commuting (Stone *et al.*, 2009). Foraging areas that become lit at night may be abandoned, thus potentially increasing energetic costs for bats and reducing reproductive success at a population level (Schofield, 2008; Stone, 2013).

The proposed construction activities will result in an increase in noise and disturbance, however it will not be significant in the context of Otter's ability to move away from and/or adapt to short-term disturbance. Noise levels during the construction phase and during operation will be compliant with licenced limits. The 55 dB LAeq 1 h currently applies to the applicant's existing operation (Ref. 00/93744 and 00/93746). The 55 dB daytime LAeq 1 h limit is considered the most suitable criterion with respect to the operational phase of the proposed development, applicable externally at offsite receptors during daytime working hours. The criterion applies to all noise emissions expected from the applicant's development, including emissions from the operations area and from the proposed extension extraction site combined. British Standard BS 5228 sets out a procedure which may be used to determine the impacts of construction noise at surrounding receptors. This is considered relevant to the proposed initial construction works to enable the development. The procedure involves setting threshold values based on ambient LAeq T levels. The standard recommends that, during the construction phase, total noise levels including construction emissions should not exceed these levels. On the basis of guidance given in the standard, a limit of 65 dB is considered appropriate, applicable at receptors, and over a one hour period. This applies to temporary construction works.

Construction works will take place during normal working hours which will avoid the largely nocturnal foraging habits of Otter and the foraging period of Lesser Horseshoe Bat. During operation, the permitted hours of business will be from 7.00 am to 7.00 pm Monday to Friday and 7.00 am to 4.00 pm on Saturdays. Mitigation measures will ensure that noise levels during construction and operation will be within licenced limits (Refer to **Section 6.3**).

Lighting mitigation measures have also been outlined for the construction and operational phase to avoid disturbance to boundary habitats (**Section 6.4**). This will prevent light spillage

onto potential commuting routes for Lesser Horseshoe Bat outside the proposed development site. Therefore, no significant impacts on Lesser Horseshoe Bat are predicted to occur.

There is no evidence to indicate that the proposed extension extraction site is utilised by Otter or Lesser Horseshoe Bat and the habitats to be affected are similar to large areas of similar habitat in the surrounding area. Mitigation measures outlined below will ensure that disturbance impacts outside the proposed development site are minimised and mitigation measures will ensure that there is no significant effect on qualifying species due to noise and disturbance is during the construction phase. Likewise given the existing noise environment and the operational noise and lighting control measures, no significant effect from increased noise and disturbance will occur during the operational phase of the development. Therefore, no impact from the proposed development on the qualifying interests or conservation objectives for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and Castlemaine Harbour SAC as a result of noise/disturbance is predicted to occur.

5.3.2 Impacts on Water Quality

Potential impacts on aquatic habitats which can arise from this type of development include increased silt levels in surface water run-off or peat spillage and inadvertent spillages of hydrocarbons from fuel and hydraulic fluid. Inappropriate treatment of wastewater from staff facilities could impact on nutrient levels in surface water and groundwater receptors. The Glashacoomnafanida Stream which adjoins the existing sand and gravel pit ultimately discharges into Castlemaine Harbour.

Hydrocarbons

Inadvertent spillages of hydrocarbon and/or other chemical substances during construction could introduce toxic chemicals into the aquatic environment via direct means, surface water run-off or groundwater contamination. Some hydrocarbons exhibit an affinity for sediments and thus become entrapped in deposits from which they are only released by vigorous erosion or turbulence. Oil products may contain various highly toxic substances, such as benzene, toluene, naphthenic acids and xylene which are to some extent soluble in water; these penetrate into the fish and can have a direct toxic effect. The lighter oil fractions (including kerosene, petrol, benzene, toluene and xylene) are much more toxic to fish than the heavy fractions (heavy paraffins and tars). In the case of turbulent waters, the oil becomes dispersed as droplets into the water. In such cases, the gills of fish can become mechanically contaminated and their respiratory capacity reduced.

Refueling and fuel storage during construction and operation will be conducted in line with mitigation measures outlined in **section 6.2.2.** These measures have been specified to minimise the risk of such spills occurring and measures have been specified to effectively deal with such spills were they to occur. Mitigation measures associated with the proposed development should ensure that the underlying groundwater will continue to be of a high quality and will therefore not impact on the quality of downgradient surface water bodies, where it provides groundwater baseflow. No impact on water quality from hydrocarbons or other chemical spills is predicted to occur and thus no impact on the aquatic qualifying interests and conservation objectives for qualifying interests is predicted to occur.

Silt

If of sufficient severity, adult fish could theoretically be affected by increased silt levels as gills may become damaged by exposure to elevated suspended solids levels. Excessive siltation can cause eggs and fry to be smothered. If of sufficient severity, aquatic invertebrates may be smothered by excessive deposits of silt from suspended solids. In areas of stony substrate, silt deposits may result in a change in the macro-invertebrate species composition, favouring less diverse assemblages and impacting on sensitive species. Aquatic plant communities may also be affected by increased siltation. Submerged plants may be stunted and photosynthesis may be reduced. Such run-off if severe could potentially impact on water quality and thus could impact on aquatic qualifying species for the Killarney National Killarney, Macgillycuddy's Reeks and Caragh River Catchment SAC and Castlemaine Harbour SAC. Elevated silt levels can impact in particular on Atlantic Salmon and Sea Lamprey, and River Lamprey which use the freshwater and/or estuarine habitats downstream of the proposed development site. Significant impacts on fish stocks could impact on piscivorous species such as Cormorant and Otter within Castlemaine Harbour SAC and Castlemaine Harbour SPA due to a reduction in prey availability. Also, suspended solids can reduce water clarity and visibility, impairing the ability of fish and piscivorous birds and mammals to find food.

Aquatic plant communities may also be affected by increased siltation. Submerged plants may be stunted and photosynthesis may be reduced. It is noted however that due to the dilution provided in the estuarine environment and naturally fluctuating levels of silt, impacts are only likely to arise from extremely severe levels of siltation.

During operation sediment laden water discharges to a series of settlement lagoons, linked in series, in the western portion of the existing site. Water drains from one lagoon to another, before being re-circulated to the sand washing plant. The fines that settle out in these lagoons are regularly removed and allowed to dry before disposal in the worked areas of the pit. Water is intermittently pumped from the southern pond to a small pond/drain beside and west of the southern entrance road. This drain is part of a surface drain that has been constructed around the southern boundary of the site. The pumped water flows underneath the entrance road and discharges to the Glashacoomnafanida Stream at the south-eastern corner of the site.

There are two abstraction pumps in the southern pond, a high yielding pump which discharges directly to the small pond beside the southern entrance gate; and, a lower yielding pump, which pumps to the header tank at the concrete batching plant, and subsequently to the small pond beside the southern entrance gate; both pumps cannot be used at the same time. Flow gauging completed on the 17th May indicates between 0.009 and 0.046 m^3/hour discharges to the Glashacoomnafanida stream when the pumps are active. A trade effluent discharge licence (Licence No. W61) from Kerry County Council covers the discharge from the pond to the adjoining stream.

No extraction of aggregate will take place beneath the water table at the proposed extension at Knocknaboola and therefore no dewatering will be required on that site. It will continue to be necessary to pump groundwater from the southern pond at the Rangue site in order to control the water table level in the winter, and intermittently during rainfall events in the summer, and to provide water for concrete production. The volume of abstraction is relatively small, and the associated drawdown will not extend much beyond the boundaries of the pit. It is noted that Licence No. W61 which covers this discharge and has been in place since 1989

has had no pollution incidences. Given water has to be pumped from the pit floor, there is no risk of an accidental discharge (breakout) from the site to surface water.

A range of standard mitigation procedures will be employed during construction and operation to minimise the potential for impacts on water quality. These mitigation methods will effectively prevent any minor impacts from silt on surface water or ground water.

Given the design of the project and the implementation of mitigation measures, no impact on water quality and thus on the aquatic qualifying interests and conservation objectives for qualifying interests is predicted to occur.

Peat Slippage

Site works could destabilise upgradient peat lands and cause a peat-slide, and lead to the clogging of the Glashacoomnafanida stream with mobilised peat. This has the potential to lead to significant siltation effects within the Glashacoomnafanida stream and Castlemaine Harbour SAC and Castlemaine Harbour SPA located downstream of the proposed development site. Potential impacts on silt on the qualifying interests of these Natura 2000 sites are discussed in detail above (Refer to **Silt**).

During the extension area works, a soil berm will be constructed surrounding the entire extension at Knocknaboola. The soil berm along the southwestern boundary will be constructed to prevent any potential peat slide from upgradient lands. An upgradient interceptor drain will allow runoff from the upgradient peat lands discharge to the Glashacoomnafanida stream, whilst maintaining existing drainage in the peatlands to allow peat harvesting to continue along the southern margins of the site, where turbary rights continue to be exercised. Existing drainage, which flows in a southwest to northeast direction, along the western boundary of the extension will be maintained, above the proposed underpass access tunnel. Silt traps will be constructed within the drainage channel to allow suspended solids to settle before surface water discharges to the Glashacoomnafanida stream.

The proposed soil berm, drainage works along the southern boundary of the proposed extension, and the low topographic gradient means there is a low risk of any peat slide occurring. Given the low risk of peat slippage and the mitigation measures proposed to prevent surface water impacts, there will be no significant impact on Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and Castlemaine Harbour SAC or Castlemaine Harbour SPA.

Wastewater discharge

Sewage wastewater effluent generated from the toilets and canteen located beside the offices at the Rangue site discharges to a septic tank and soak pit located along the southwestern boundary of the site. The hydraulic population equivalence of the quarry is 2.9, and the organic P.E. is 5.2. A site characterisation assessment was carried out to investigate the suitability of the treatment system to treat and dispose of sewage wastewater generated from the toilet and welfare facilities on site, to ground. The site suitability assessment found that the site is suitable for the installation of a tertiary treatment system, constructed and installed incompliance with the EPA CoP, 2021. The existing wastewater treatment and disposal

system is not installed in compliance with the EPA Code of Practice, Wastewater Treatment and Disposal Systems serving Single Houses, 2021 and will need to be replaced.

Given the limited scale of the discharge and the proposed tertiary treatment proposed no significant impact on groundwater or surface water is predicted to occur and there will be no significant impact on Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and Castlemaine Harbour SAC or Castlemaine Harbour SPA from wastewater discharges.

Baseflows

Impacts on baseflows could arise via reduced baseflow to the Glashacoomnafanida Stream resulting from extraction of aggregate and removal of the perched water table. No extraction of aggregate will take place beneath the water table at the proposed extension at Knocknaboola; therefore no dewatering will be required on that site.

The proposed extension is largely covered in highly drained and degraded cutaway blanket peat. Peat depths across the majority of the site are less than 0.3m. Active peat harvesting takes place along the southern boundary of the site, where peat depths are greatest (a maximum depth of 6.1m was recorded along the southern boundary of the site). Extraction from beneath the proposed extension, is likely to alter the local hydrological regime. Land use change will reduce the rainfall runoff rates from the proposed extension area and increase the proportion of rainfall percolating to groundwater. Given the hydrogeological setting of the existing site and proposed extension (moderate vulnerability, overlain by peat), where 4% of effective rainfall is expected to percolate to groundwater prior to the proposed development, this reduction in rainfall runoff from a relatively small catchment area will not significantly impact the Castlemaine Harbour SAC. Indeed, any increase in groundwater storage will result in an increase in baseflow to downgradient surface water bodies in hydraulic connection with the underlying aquifer, such as the River Laune which forms part of the Castlemaine Harbour SAC.

Mitigation measures associated with the proposed development will ensure that the underlying groundwater will continue to be of a high quality and will therefore not impact on the quality of downgradient surface water bodies, where it provides groundwater baseflow. There will no significant impact on the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and Castlemaine Harbour SAC or Castlemaine Harbour SPA as a result impacts on baseflows.

5.3.3 Spread of Invasive Species

The non-native third schedule species Rhododendron and Giant Rhubarb were recorded within the proposed development site. These species are listed is a Third Schedule species under SI 477 of 2011. These species may have an adverse impact on landscape quality and native biodiversity or infrastructure and is an identified threat to the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

Mitigation measures outlined in **Section 6.5** of this NIS will be implemented during the construction and operational stages of the proposed development. These measures will ensure that the spread of invasive species does not affect the integrity of the Killarney National

Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and Castlemaine Harbour SAC or Castlemaine Harbour SPA.

5.3.4 In-combination Impacts

In-combination impacts refer to a series of individually impacts that may, in combination, produce a significant impact. The underlying intention of this in combination provision is to take account of cumulative impacts from existing or proposed plans and projects and these will often only occur over time.

The Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, Castlemaine Harbour SAC and Castlemaine Harbour SPA cover large areas of land and and potential high impact threats include silviculture and forestry, urbanised areas, human habitation, walking, horse-riding, non-motorised vehicles, grazing, invasive non-native species and natural biotic and abiotic competition.

The Kerry County Development Plan 2015-2021 notes the following in regard to extractive industry;

"*The extractive industry provides essential raw materials for the construction industry as well as providing employment and economic growth in the local and regional economy. The continual supply of aggregates, including recycled construction and demolition material is necessary for continual economic growth; which is an integral requirement for the implementation of the National Development Plan, Transport 21 and private sector development.*"

Relevant objectives include the following;

"(NR-4) Facilitate the sustainable development of the extractive industry and seek to ensure the ongoing availability of an adequate supply of aggregates for the construction industry, while ensuring environmental protection, through the implementation of the objectives and Development Management, Guidelines and Standards of this Plan".

Wastewater is discharged from a number of dwellings, farms and local industries within Killorglin, as well as its hinterland to rivers and groundwater within the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and Castlemaine Harbour SAC or Castlemaine Harbour SPA. Other impacts on water quality identified for this catchment include agriculture. Agriculture remains the dominant land use and intensive agriculture and can have significant impacts on aquatic ecology by increasing nutrients and sediment loads.

Other developments near the site and potential cumulative impacts are identified in **Table 24**. A range of mitigation measures will be implemented during construction and operation to effectively prevent impacts on water quality. As no impacts associated with this project on qualifying interests or conservation objectives have been identified, no significant cumulative impacts are likely to occur.

Table 24. Other developments near site and potential cumulative impacts

Plans and Projects	Key Policies/Issues/Objectives Directly Related to the Conservation of the Natura 2000 Network	Impact
River Basin Management Plan 2018-2021	The project should comply with the environmental objectives of the Irish RBMP which are to be achieved generally by 2021. Ensure full compliance with relevant EU legislation Prevent deterioration Meeting the objectives for designated protected areas Protect high status waters Implement targeted actions and pilot schemes in focus sub-catchments aimed at: targeting water bodies close to meeting their objective and addressing more complex issues which will build knowledge for the third cycle.	The implementation and compliance with key environmental policies, issues and objectives of this management plan will result in positive in-combination effects to European sites. The implementation of this plan will have a positive impact for the biodiversity. It will not contribute to in-combination or cumulative impacts with the proposed development.
Inland Fisheries Ireland Corporate Plan 2016 -2020	To ensure that Ireland's fish populations are managed and protected to ensure their conservation status remains favourable. That they provide a basis for a sustainable world class recreational angling product. and that pristine aquatic habitats are also enjoyed for other recreational uses. To develop and improve fish habitats and ensure that the conditions required for fish populations to thrive are sustained and protected. To grow the number of anglers and ensure the needs of IFI's other key stakeholders are being met in a sustainable conservation focused manner. EU (Quality of Salmonid Waters) Regulations 1988. All works during development and operation of the project must aim to conserve fish and other species of fauna and flora habitat; biodiversity of inland fisheries and ecosystems and protect spawning salmon and trout.	The implementation and compliance with key environmental issues and objectives of this corporate plan will result in positive in-combination effects to European sites. The implementation of this corporate plan will have a positive impact for biodiversity of inland fisheries and ecosystems. It will not contribute to in-combination or cumulative impacts with the proposed project.
Irish Water Capital Investment Plan 2014-2016	Proposals to upgrade and secure water services and water treatment services countrywide.	Likely net positive impact due to water conservation and more effective treatment of water.
Water Services Strategic Plan (WSSP, 2015)	Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and biodiversity requirements through reducing: Habitat loss and disturbance from new / upgraded infrastructure; Species disturbance; Changes to water quality or quantity; and Nutrient enrichment /eutrophication.	The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new

Plans and Projects	Key Policies/Issues/Objectives Directly Related to the Conservation of the Natura 2000 Network	Impact
		builds within the Irish Water owned assets. The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.
NPWS Conservation Management Plans	Conservation Management Plans have not been fully prepared for the European sites being assessed. However, a Management Plan for Killarney National Park (2005-2009) and conservation objectives along with supporting documents (i.e. *Najas flexilis* (Willd.), blanket bogs and associated habitats and Lesser Horseshoe Bat) have been established for the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (Site Code 000365)	The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site. The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. The resultant effects of conservation objectives are a net positive and there is no potential for in combination effects on European sites.
WWTP discharges	Killarney WWTP (D0037) is the primary wastewater treatment facility discharging into the waters of Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. Killorglin WWTP (D0182-01) is a secondary wastewater treatment plant which discharges into the River Laune part of the Castlemaine Harbour SAC	Discharges from municipal WWTPs are required to meet water quality standards. Irish Water Capital Investment Plan 2014-2016 proposes to upgrade water treatment services countrywide (see above). The long-term

Plans and Projects	Key Policies/Issues/Objectives Directly Related to the Conservation of the Natura 2000 Network	Impact
		cumulative impact is predicted to be negligible.
Quarries	Two other distinct quarry businesses are identified within 3 km of the site. The nearest quarry is located 1.5 Km west of the Quarry, in the townland of Glounagillagh. A second quarry business is identified approximately 1.7 Km east southeast in the townland of Ownagarry.	Extractive site that discharge process water into a watercourse require a discharge licence under Section 4 of the Local Government (Water Pollution) Act 1977. Uncontrolled discharges of polluting matter to such media are an offence under the Act's Section 3. There will be no surface water discharges associated with the proposed development. The long-term cumulative impact is predicted to be negligible
Other developments	The Kerry County Development Plan Housing Strategy aligns with the population and housing targets set out in the Regional Planning Guidelines for the South West 2010-2022. The current population of Kerry County taken from Census 2011 is 145,502 with a projected population target of 158,322 persons by 2021. In order to achieve this population and household target the additional housing requirement for Kerry is 3118 units. A central requirement in the development of these units is the prioritisation of critical infrastructure investment.	Future developments will only be granted permission where discharges from same meet with relevant water quality standards. The long-term cumulative impact is predicted to be negligible.

6. Mitigation Measures

The mitigation measures have been drawn up in line with current best practice and include an avoidance of sensitive habitats at the design stage. It is clear that the mitigation measures are designed to achieve a lowering or reducing of the risk of impact to acceptable levels. The risk that the mitigation measures will not function effectively in preventing significant ecological impacts is low. The likely success of the proposed mitigation measures is high. The following mitigation measures will be implemented.

6.1 Construction Phase Mitigation Measures

Construction best practice measures (of relevance in respect of any potential ecological impacts) will be implemented throughout the project, including the preparation and implementation of detailed method statements. The works will incorporate the relevant elements of the guidelines outlined below:

- NRA (2010) *Guidelines for the Management of Noxious Weeds and Non- Native Invasive Plant Species on National Roads*. National Roads Authority, Dublin.

- Murphy, D. (2004) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*. Eastern Regional Fisheries Board, Dublin.
- IFI (2016) *Guidelines on protection of fisheries during construction Works in and adjacent to waters* (IFI, 2016)
- H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors (C532)*. CIRIA.
- E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects. Technical guidance (C648). CIRIA*.
- E. Murnane et al., (2006) *Control of water pollution from linear construction projects. Site guide (C649). CIRIA*.

All personnel involved with the project will receive an on-site induction relating to operations and the environmentally sensitive nature of the Glashacoomnafanna Stream and Natura 2000 sites and to re-emphasize the precautions that are required as well as the precautionary measures to be implemented. All staff and subcontractors have the responsibility to:

- Work to agreed plans, methods and procedures to eliminate and minimise environmental impacts,
- Understand the importance of avoiding pollution on-site, including noise and dust, and how to respond in the event of an incident to avoid or limit environmental impact;
- Respond in the event of an incident to avoid or limit environmental impact;
- Report all incidents immediately to their line manager;
- Monitor the workplace for potential environmental risks and alert the immediate line manager if any are observed; and
- Co-operate as required, with site inspections.

6.2 Protection of Water Quality

Mitigation measures are required during the construction and operation phases to reduce and possibly eliminate the impacts on the hydrology and hydrogeology outlined above. Mitigation measures are listed below.

6.2.1 Soils and Geology

Mitigation measures are required during the operational phase of the proposed quarry extension to reduce and possibly eliminate the impacts on the soils, geology, hydrology and hydrogeology outlined above.

A quarry restoration plan has been prepared for the existing quarry and the proposed extension. Restoration of the proposed extension will be completed in a phased and progressive basis. Phase 1 of the proposed excavation will be restored as phase 2 of the proposed excavation will take place.

A mineral soil berm will be constructed surrounding the entire extension at Knocknaboola. The mineral soil berm along the southwestern boundary will be constructed to retain the upgradient wetlands. An upgradient interceptor drain will allow runoff from the upgradient peat lands discharge to the Glashacoomnafanida stream. Existing drainage, which flows in a southwest to northeast direction, along the western boundary of the extension will be maintained, above the proposed underpass access tunnel. Silt traps will be constructed within the drainage channel to allow suspended solids to settle before surface water discharges to the Glashacoomnafanida stream. The proposed soil berm, drainage works along the southern boundary of the proposed extension, and the low topographic gradient means there is a low risk of any peat slide occurring.

Consideration has been given to soil and subsoil management. Peat and subsoil stripped to obtain access to the sand and gravel resource will either be utilised directly for construction of peripheral screening berms, for progressive restoration, or placed in temporary overburden storage areas for use in future restoration. The storage areas will be vegetated as soon as is possible, to reduce both visual impact and erosion.

The beneficial re-use of material excavated at the site will avoid the unnecessary disposal of spoil in landfill. Peat and overburden stripped from the site will be re-used to reinstate areas of the existing quarry which are no longer in use, as well as in the construction of earthen screen berms.

The overburden from the proposed extension will only be stripped as required in order to limit the length of time the soil is exposed and reduce the risk of erosion and subsequent siltation of runoff.

Where possible, land will be stripped in dry weather to reduce nutrient loss and reduce the generation of silt runoff. Soils will not be moved in unusually dry and windy weather conditions.

Measures will be taken to minimize the sediment generation during storage of soils. Soils will not be stockpiled at elevated locations on the site but transported to lower elevations within the existing pit at Rangue.

All temporary storage mounds will have slope angles not greater than 1:1.5 and will be revegetated as quickly as possible to avoid soil erosion by air and water.

As the quarry is being worked, other areas will be reinstated in order to reduce surface runoff and prevent generation of suspended solids.

The quarrying of sands and gravels to produce aggregates will involve the excavation and removal of the quaternary deposits within the designated extraction area. Whilst the material cannot be replaced, the extraction of these deposits will offer an opportunity for future geological study of these quaternary deposits that may lead to a better understanding of past geological processes on a local and a regional scale.

To prevent contamination of the ground beneath the existing pit at Rangue, hazardous materials (oils, fuels, chemicals etc) should be used and stored in an appropriate manner and in accordance with professional guidelines such as for example "Control of Water Pollution from Construction sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001), and "Oils storage guidelines, Best Practice Guide" (Enterprise Ireland, BPGCS005). Storage and

refuelling areas should be designed to be sufficiently impermeable to prevent the infiltration of any spillage, leakage or runoff into the ground. Spillage kits and action plans for their use should be available throughout the works.

An incident spillage plan shall be prepared to provide guidance on response to emergency situations, such as the accidental spillage of oil, fuel, raw or hazardous material(s) as a result of leakage from, or refuelling of, plant and machinery on the subject site, or resulting from an accident involving vehicles transporting material(s) to and from the site.

No fuels or hydrocarbons to be stored on the proposed extension site. The only potential pollution activity within the proposed extension will be the refuelling of plant and machinery using tanker trucks. Re-fuelling of vehicles must take place in a designated, properly bunded area on the neighbouring, Rangue site.

The final land restoration scheme will allow the site to be returned to a condition whereby there will be negligible residual impact on the surrounding environment following the removal of sand and gravel from the proposed extension.

6.2.2 Hydrology and Hydrogeology

Mitigation measures are required during the construction and operation phases to reduce and possibly eliminate the impacts on the hydrology and hydrogeology outlined above. Mitigation measures are listed below:

An upgradient interceptor drain will allow runoff from the upgradient peat lands discharge to the Glashacoomnafanida stream, whilst maintaining existing drainage in the peatlands. Existing drainage, which flows in a southwest to northeast direction, along the northwestern boundary of the extension will be maintained. Silt traps will be constructed within the drainage channels to allow suspended solids to settle before surface water discharges to the Glashacoomnafanida stream. The mineral soil berm, which along the southwestern boundary will be constructed to prevent peat slippage, drainage works along the southwestern boundary of the proposed extension, and the low topographic gradient means there is a low risk of any peat slide occurring.

The beneficial re-use of material excavated at the site will avoid the unnecessary disposal of soil in landfill. Peat and overburden stripped from the site will be re-used to reinstate areas of the existing quarry which are no longer in use, as well as in the construction of earthen screen berms.

The overburden from the proposed extension will only be stripped as required in order to limit the length of time the soil is exposed and reduce the risk of erosion and subsequent siltation of runoff.

Where possible, land will be stripped in dry weather to reduce nutrient loss, sustain soil condition and reduce the generation of silt runoff.

Measures will be taken to minimize the sediment generation during storage of soils. Soils will not be stockpiles at elevated locations on the site but transported to lower elevations within the existing pit at Rangue.

As the quarry is being worked, other areas will be reinstated in order to reduce surface runoff and prevent generation of suspended solids.

Water which is pumped off site is subject to the condition of Discharge Licence W61. The vast ponds on site are sufficient to ensure the suspended load of the discharge water complies with the requirements of the discharge licence (i.e. TSS of less than 30). In fact, analysis of the discharge water indicates the suspended load is normally less than 4mg/l TSS.

Water used in aggregate processing is pumped from the northern pond to a header tank. From here it is pumped to the aggregate washing facility, which consists of a wet cyclone system, which removes the majority of silt and clay from the wash water. After processing, sediment laden water discharges to a series of elongate settlement lagoons, linked in series, in the western portion of the site. Water drains from one lagoon to another, before being re-circulated to the sand washing plant (some water drains back to the northern pond). The fines that settle out in these lagoons are regularly removed and allowed to dry before disposal in the worked areas of the pit.

A soil berm will be constructed around the perimeter of the proposed extraction area at Knocknaboola. A silt fence must be installed between the Glashacoomnafanida stream and the berm. The combination of these two mitigation measures will prevent silt laden runoff from entering the Glashacoomnafanida stream and migrating off site.

A buffer of zone of 15 metres will be maintained between the proposed excavation and the Glashacoomnafanida steam. The combination of the buffer zone and the berm will minimize the potential seepage of water from the stream into the pit and subsequently to deep groundwater.

Runoff from the access roadway, and existing roads, to be directed towards silt traps, prior to discharging to the floor of the proposed sandpit at Knocknaboola. This will minimize the risk of silt laden runoff from migrating offsite.

No excavation of aggregate is to occur within 1m of the groundwater table (i.e. no excavation to take place below 22.5m AOD to the south of the proposed extension, or below 20.5mAOD in the south). This will minimize the risk to groundwater quality from accidental spillages of contaminants at the base of the excavation, and allowing suspended solids filter out of percolating waters.

No site facilities (offices, toilets etc.) to be located on the proposed extension; all facilities will continue to operate at the pre-existing Rangue sandpit;

The existing septic tank and soak pit are to be decommissioned and replaced with a secondary wastewater treatment and disposal system, with EN12566 certification, and a tertiary polishing filter constructed in compliance with the EPA Code of Practice 2021. This will reduce the impact on groundwater quality at the Rangue site, by improving the quality of wastewater effluent discharging to ground.

No storage of fuel, lubrication oils, or chemicals on the proposed extension site. These materials will be stored at the existing Rangue sandpit oil storage facilities.

To prevent contamination of surface or ground waters, hazardous materials on the Rangue sandpit (oils, fuels, chemicals etc.) should be used and stored in an appropriate manner and

in accordance with professional guidelines such as for example "Control of Water Pollution from Construction sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001), and "Oils storage guidelines. Best Practice Guide" (Enterprise Ireland, BPGCS005). All quarrying works will be completed in line with the recommendations of this publication and this will serve to mitigate against any pollution occurring;

An incident spillage plan shall be prepared to provide guidance on response to emergency situations, such as the accidental spillage of oil, fuel, as a result of leakage from plant or machinery, or resulting from an accident involving vehicles transporting material(s) to and from the subject site.

Emergency Scenario: An emergency spill plan will be drawn up for the site, taking account of environmental considerations.

6.2.3 Oil Storage/Refuelling:

Site compounds, parking and plant storage areas will comprise concrete hard standing. Any spillages/leaks will be directed through an oil/water interceptor thereby reducing avoiding direct discharge to groundwater or surface water.

Storage and refueling areas should be designed to be sufficiently impermeable to prevent the infiltration of any spillage, leakage or runoff into the ground. Spillage kits and action plans for their use should be available throughout the works.

All oil stored on site for quarry vehicles will be kept in a locked and bunded area and the drainage or overflow from the bund will be directed to an oil/water interceptor.

Generators, pumps and similar plant will be placed on drip trays to prevent contamination by oil.

All site vehicles and plant used will be refueled in a properly bunded area. Drainage from this area will be directed to an oil/water interceptor.

All temporary fuel tanks will also be located in a suitably bunded area and all tanks will be double skinned. In addition, oil adsorbent materials will be kept on site in close proximity to any fuel storage tanks or bowsers during site construction and operations works.

The oil/water interceptor will be monitored on a regular basis to ensure it is working correctly.

All deliveries to onsite oil storage tanks will be supervised.

Records will be kept of delivery dates and volumes.

Oil tank bunds will have a capacity of tank volume plus 10 percent at a minimum.

Steel tanks will be protected from corrosion.

Waste oil will be stored in a bunded facility and will be collected regularly for disposal by a licenced contractor. All waste oil quantities disposed of will be recorded and certs of disposal retained on file.

A procedure will be drawn up which will be adhered to during refueling of onsite vehicles. This will include the following:

Fuel will be delivered to plant on site by dedicated tanker or in a delivery bowser dedicated to that purpose.

In the case of a bowser, the driver or supervising foreman will check the delivery bowser daily for leakage.

The driver will be issued with, and will carry at all times, absorbent sheets and granules to collect any spillages that may accidently occur.

Where the nozzle of a fuel pump cannot be placed into the tank of a machine then a funnel will be used.

Refueling will take place in a designated, properly bunded area only.

Every piece of equipment associated with the storage of fuel on site will be designed and installed to recognized British Standards codes.

All valves should be of steel construction and the open and close positions should be clearly marked.

Rainwater will be removed from bunds which will incorporate a sump to facilitate this.

Publications such as PPG – Above Ground Storage Tanks will be used as Guidance in addition to the above.

6.3 Noise

6.3.1 Construction phase

Noise levels at surrounding receptors due to construction operations, combined with ongoing operations at the existing quarry, will not exceed the 65dB criterion at any time. Where construction noise emissions are audible, they will occur for several days or several weeks, depending on the activity. No specific mitigation measures are required. The following general measures have been agreed with the applicant:

- Residents at the dwelling adjacent to the site entrance will be notified in advance of construction works associated with the proposed haul road and underpass, and berm construction at the northeast corner.
- Construction operations at the haul road, underpass and northeast corner will not occur before 08:00 or continue after 18:00.

6.3.2 Operation phase

No specific mitigation measures have been identified, apart from the erection of 3 m berms around the site perimeter, and the introduction of screening only from the end of phase 2 onwards. The following general measures will be implemented:

- Plant used onsite will be maintained in accordance with manufacturer specifications.
- Exhaust silencers will be maintained in a satisfactory condition.
- Communication through plant horns will be prohibited.

- Unnecessary revving of truck engines will be prohibited.
- Site haul roads will be maintained in a satisfactory condition, and free from surface defects that may generate rattles in empty truck bodies.
- The current noise monitoring programme will be continued and will be modified to take into account the cessation of Riordan's pit activity, and the commencement of extraction at the extension. This will ensure compliance with criteria set out in conditions attached to planning permission.

6.4 Lighting

Lighting during construction will follow mitigation measures outlined by Bat Conservation Ireland in *Bats & Lighting Guidance Notes for: Planners, engineers, architects and developers* (2010). Site lighting would typically be provided by tower mounted metal halide floodlights. The floodlights would be cowled and angled downwards to minimise spillage to surrounding properties and adjoining habitats. The following measures will be applied in relation to site lighting:

Lighting will be provided with the minimum luminosity sufficient for safety and security purposes. Where practicable, precautions will be taken to avoid shadows cast by the site hoarding on surrounding footpaths, roads and amenity areas;

Motion sensor lighting and low energy consumption fittings will be installed to reduce usage and energy consumption; and

Lighting will be positioned and directed as not to unnecessarily intrude on adjacent buildings and land uses, ecological receptors and structures used by protected species, nor to cause distraction or confusion to passing motorists, river users or navigation lights for air or water traffic.

6.5 Invasive Species

To prevent Rhododendron, Giant Rhubarb or other invasive species being spread around the site or being inadvertently being brought into the site, the contractor will be required to inspect vehicles before using them on site. Herbicides will only be used in line with manufacturers recommendations and shall take into account the need to avoid impacts on aquatic receptors or adjoining habitats.

A survey for invasive species will be carried out prior to the commencement of works. This is to confirm the extent of infestations as identified by invasive species surveys to date, and to determine whether any new infestations have established in the intervening period.

Prior notification will be given to all contractors that parts of the site are contaminated with Rhododendron and Giant Rhubarb and that they must adhere to this protocol to avoid the spread of the plant within and more importantly, outside of the works area. This includes any site investigation works in advance of commencement of excavation works.

All stands of Rhododendron and Giant Rhubarb will be clearly delineated with hazard tape in a manner visible to machine operators prior to the commencement of works.

Appropriate signage will be put in place to deter any entrance by people or machinery into the areas within which the Rhododendron and Giant Rhubarb is growing.

Only vehicles required for the works within the contaminated works area should be brought on site and the number of visits minimised as much as practicable. Vehicle movements within this area should be kept a minimum. A specialised wash down area will be created for machinery and footwear. All machinery and equipment (including footwear) should be power washed prior to leaving the contaminated works area within this wash down area. They should also be visually checked for clods of soil, bits of vegetation etc. and particular care is required with tracked machinery. This wash down area will be located in close proximity to existing stands and the wash down area will be included in the post-works treatment programme for Rhododendron.

If and where contaminated soil or heaps of high-risk invasive species (i.e. Rhododendron/ Giant Rhubarb) are to be stockpiled, the area will be clearly marked out on site. These areas will not be within 20m of any watercourse or flood zone.

Post development any Amber Listed invasive species remaining on the site will be treated via a standard herbicide programme.

The following mitigation measures will be implemented to prevent the spread of Rhododendron during the construction phase.

Management of Rhododendron

The eradication of Rhododendron from an infested habitat can only be carried out effectively by understanding the ecology of the species and by strategically planning the clearance work. In order to rid a habitat of Rhododendron, a number of steps should be followed, including cutting all standing Rhododendron and killing the stumps by uprooting or herbicide treatment. All habitats cleared of Rhododendron must be regularly and systematically re-visited to remove any seedlings that have germinated and become established. Appropriate guidelines are provided in *The Control of Rhododendron in Native Woodlands (Native Woodland Scheme Information Note No. 3)* and Higgins, G.T. (2008) *Rhododendron ponticum: A guide to management on nature conservation sites. Irish Wildlife Manuals, No. 33.*

Cutting and removal

The first operation in clearing Rhododendron is the cutting of individual stems with hand or chainsaws. Stems will be cut as close to the ground as possible. The cut material will be removed from the area to allow for effective follow-up work. If the terrain and layout of the woodland are suitable, the material can be used to build a "dead hedge" around the area as a barrier to exclude grazing animals. Burning under the supervision of personnel with fire experience is another option. Rhododendron material can be burnt green immediately after being cut. Fires should be carefully located so as not to damage any trees or other vegetation close by, and old tyres or diesel should not be used. If burning is not an immediate option, the cut material can be piled neatly outside the treated area, allowing them to be dismantled easily to facilitate burning at a later stage (ideally 1-2 years later).

Where burning is envisaged, contact will be made with the Local Authority to obtain permission. Flailing is another method of Rhododendron clearance. This involves the flailing

of the thickets down to ground level, using a mechanical flail head mounted on a tracked machine. Although not suitable on all sites, especially those that are steeply sloping or very wet, it is a very effective as it mulches the material upon contact.

Killing Rhododendron

Some method of killing must be used as Rhododendron invariably grows back vigorously when cut. The following approaches can be considered:

Digging out

Digging the stumps out of the ground is an effective way of killing Rhododendron. Its effectiveness is maximized by removing all viable roots. Digging out can be carried out manually or, if the terrain allows, by machine (e.g. a tractor and chain). To prevent regrowth, as much soil as possible should be knocked off the root system, and the stumps should be turned upside down to expose the roots to the air and to allow the rain to wash off any remaining soil. Stumps that are dug out should be burnt along with the cut material.

This method avoids any use of herbicides. However, the impact to tree root systems and the potential for soil compaction and disturbance caused by the use of machinery in certain habitats means that this option will only be implemented under ecological supervision to minimise inadvertent disturbance of habitats.

Direct stump treatment

Rhododendron kill can be achieved by direct stump treatment, whereby freshly cut stumps are painted or spot sprayed with a herbicide solution. Ideally this should be carried out when rain is not imminent, to avoid the solution from being washed off. Stems are cut as close to the ground as possible, and the fresh stump surfaces treated with herbicide immediately, i.e. within minutes. A vegetable dye is used to clearly identify which stumps have been treated. Painting of stumps with glyphosate solutions (25-100%) was found to be 100% effective when carried out between May and March, at an experimental site in Scotland (Tabbush and Williamson, 1987). This method is regarded as being most effective outside the time of spring sap flow. The following are herbicides (including application rates, methods and timing) used in the control of Rhododendron by stump treatment (after Willoughby and Dewar (1995)).

Glyphosate: Apply 'Roundup' in a 20% solution in water to all freshly cut stump surfaces using one of the following: a knapsack sprayer at low pressure; a forestry spot gun fitted with a solid stream nozzle; a cleaning saw fitted with a suitable spray attachment; or a paint brush. Best results can be obtained during the period October to February.

Tryclopyr: Apply 'Garlon 4' in an 8% solution in water using one of the following: a knapsack sprayer at low pressure; a forestry spot gun fitted with a solid stream nozzle; a cleaning saw fitted with a suitable spray attachment; or a paint brush. Apply at any time between cutting and the appearance of new growth.

Ammonium sulphamate: Apply as a 40% solution between April and September. Optimum control resulting from treatments applied between June and September. Surfactant additives are not appropriate for stump application. It is important to ensure that all cut surfaces are treated. In Ireland, trials in Killarney using stump treatment resulted in extremely successful

kill rates among a range of plant sizes throughout all months of the year. Chemical concentrations from 10% to 20% have been used effectively and further trials are ongoing.

A major advantage of stump treatment is that all initial clearance work can be carried out in a single sweep. Also, as the application of the herbicide is carried out with a handheld applicator, spray drift is avoided and the impact to the surrounding non-target area is minimal. In addition, small volumes of herbicide are used. Although stump treatments can result in total kill, regrowth from the cut stumps can occur. This regrowth is usually slow and stunted. Carefully timed foliar application of herbicide to the regrowth will subsequently achieve full kill.

Spraying of regrowth and large seedlings

Stumps and large seedlings (less than 1.5 m in height) can be effectively killed by spraying the regrowth with a suitable herbicide. Success is dependent on the plants being dry at the time of herbicide application and remaining dry for a sufficient time thereafter to allow the herbicide to be absorbed into the plant (at least 6 hours, preferably longer). The addition of a surfactant (e.g. Mixture B) can increase the rate of herbicide absorption and reduce the amount of 'dry-time' required after foliar herbicide application. Surfactants are often more environmentally damaging than the herbicides themselves and must be used with great care, especially adjacent to aquatic habitats. Spraying should be carried out in near windless conditions, to maximise herbicide contact and absorbance of the chemical into the plant. Conversely, spraying in windy conditions should be avoided at all costs, as this will lead to herbicide drift, resulting in 'collateral damage' which will kill nearby native flora, including herbaceous species and young regenerating trees. This delays the establishment of a ground cover and facilitates further Rhododendron establishment.

It is important to ensure at all times that chemical solutions do not enter watercourses, as this can have a severe impact on the aquatic habitat and on aquatic life. At all times, adhere to best practice regarding safety and environmental protection, as set out in the manufacturer's guidelines, Ward (1998), and the Forest Service Forestry and Water Quality Guidelines and Forest Protection Guidelines. As spraying is not 100% effective, some plants may require two or more applications before they are killed. Since cut stumps generally produce multiple shoots of regrowth, delaying the spraying for more than three years after the initial stump cutting can actually result in the infestation becoming even more severe. At this stage, the regrowth is likely to be too tall to be sprayed effectively, forming dense impenetrable thickets. Regrowth is also likely to flower more vigorously than naturally regenerated Rhododendron.

Stem injection

Stem injection, using the 'drill and drop' method (Edwards, 2006), can be used for the control of established Rhododendron bushes, where access to the main stem is possible and where the stem is large enough for a hole to be drilled into it. One of the main advantages of this technique is that it facilitates the controlled application of herbicide to target plants, thereby reducing damage to other flora adjacent to treated bushes. It is a particularly useful method on difficult, sloping terrain, where other methods may be impractical.

A handheld cordless drill with several re-chargeable batteries and a spot gun are the only tools required. A 25% solution of glyphosate (i.e. 1:3 mix with water) is recommended. No additives are required. Applications during March, April and October have been successful in giving complete control of target bushes. Treated bushes can be left standing on site to rot. However,

bear in mind that standing, dead Rhododendron may persist for 10 to 15 years, is unsightly and can inhibit access to the woodland for management operations. Therefore, it may be better to cut and remove the treated bushes at a later date.

The effectiveness of control should be assessed initially every 12 months following the treatment. The main steps involved in stem injection are as follows.

1. Stems to be treated should be greater than 3 cm in diameter. In order to maximise the potential of killing the entire plant, choose a position on the stem as close to the main root system as possible, and at least below the lowest fork.

2. Drill as vertically as possible into the stem to create a hole that will hold the herbicide solution. The drill bit used should be 11-16 mm in diameter, depending on the stem diameter. There is no upper limit to the size of stem that can be treated.

3. Apply the herbicide to the hole immediately after drilling. The recommended amount is 2ml of herbicide solution per stem. Do not allow the herbicide to overflow from the hole. The use of a forestry spot gun with a calibrated 10ml chamber is recommended, as this allows for the accurate application of a calibrated 2ml of herbicide per hole.

4. It is recommended that each plant be marked immediately after treatment, to track progress. Treated plants can be marked with a spray of coloured paint or by attaching coloured biodegradable tape.

5. Applications can be made in light rain, provided that rainwater is not running down the stem into the application hole and washing the herbicide solution out into the surrounding area.

6. Bush death should occur between 9 and 31 months, depending on application date and bush size.

Outline methodology Rhododendron

1. The exact treatment details will be outlined in a detailed management plant prepared by the treatment contractor and supervising ecologist will be finalized prior to the commencement of treatment. The following principles/guidelines will be implemented.

2. The entire site and adjacent area will be surveyed and the level of infestation assessed and mapped prior to the commencement of treatment works.

3. The age, condition and any previous treatments of all stands will be noted and mapped.

4. Areas to be treated will be prioritized. However, the objective is complete removal within the applicant's landholding.

5. A Rhododendron Management Plan will be prepared by the contractor with input from the supervising ecologist. The plan will encompass the entire site and include projections over a suitable timeframe. All work to be carried out in the area should be mapped and clearly dated and detailed in an accompanying schedule, along with a timeframe for follow-up work.

6. Treatment options will follow the following guideline methods:

Young plants - single stemmed, typically < 10 years old & up to 1m tall

- These plants will be cut off as close to the ground as possible (with secateurs or pruning saw) and the stem treated with herbicide.
- Plants may be pulled by hand, if necessary, loosening the adjacent soil with a mattock or pick axe.
- Foliage will be treated with herbicide.

Isolated plants, typically >10 years old

The plant may be cut down to the stump, as low to the ground as possible and the stump treated with herbicide.

If access to the base of the main stems is possible, stem application of herbicide may be used.

If low growing enough (usually less than 1.5m) foliage may be sprayed with herbicide.

The plant may be cut to the ground/low stump and regrowth later treated with herbicide.

The plants may be cut to c. 40cm above ground, each stem broken off from the root and the root treated with herbicide (New method under trial, see p. 28).

If chemical treatments are not an option, the only alternative method of killing to rootstock is stump extraction. This may be done manually (using a mattock) or mechanically.

Mature stands of dense Rhododendron

The plant may be cut down to the stump, as low to the ground as possible and the stump may be treated with herbicide.

If access to the base of the main stems is possible, stem application of herbicide may be used.

The plant may be cut to the ground/low stump and regrowth later (after c. 18 months) treated with herbicide.

The plant may be cut to the ground/low stump and regrowth later knocked off and the stump collar treated with herbicide.

If chemical treatments are not an option, the only alternative method of killing the rootstock is stump extraction. This may be done manually (using a mattock) or mechanically, but the use of heavy machinery on nature conservation sites is often inadvisable.

7. In all sites, follow-up work will be necessary to ensure that any small plants or seedlings which were either missed on the previous visit or have entered the site subsequently from adjacent seed sources, are removed before they reach the flowering age (10-12 years). Ideally remove them when they are c. 0.5 m tall. At this stage, they are more easily seen, and any young seedlings likely to die naturally through desiccation will have done so. The systematic checking for reinfestation is necessary if the area is to be maintained free of seed-producing Rhododendron. Also, reinfestation brought about by poor follow-up will negate the considerable time and cost invested in the initial clearance.

8. The use of track mounted machinery can offer a relatively fast approach to Rhododendron clearance by this method. A fork or bucket can extract either entire standing plants or stumps.

This method is not suitable where vehicular access to a site is very difficult, where very steep slopes require clearance and where terrain (e.g. boulders) hinders the movement of machinery around the clearance site. In addition, the disturbance caused by heavy machinery to soil and to tree roots requires consideration and there is also potential for damage to standing trees, although a good operator can often avoid this. Extraction of the rootstock by this method gives good kill, although some regrowth from root fragments may require further treatment. Given that the applicant has access to suitable machinery this is preferred option on areas within the proposed extension area. How usage of this method on areas within the landholding outside the proposed extension area need to be carefully evaluated based on up to date survey results to ensure inadvertent damage of adjacent habitats is minimized.

9. The treatment programme will be carried out by a suitably qualified person who has experience of treating invasive species and will be carried out in line with the herbicide manufacturer's instructions. Site hygiene protocols to prevent spread of this species will be specified by the management plan and will be strictly enforced.

Management of Giant Rhubarb

G. tinctoria is an introduced species that has become invasive in the west of Ireland. Although the exact date of its introduction to Ireland is unknown, Praeger first recorded it in the wild in Ireland in 1939 on Achill Island. Pollen analysis suggests that it could have been present on Achill Island for 70-100 years (Hickey and Osborne 1998). This species is currently considered invasive on the west of Ireland. It is not yet invasive in other areas of the country due possibly to climatic and environmental conditions. Of particular concern are impacts associated with peat bog and waterside vegetation as large dense colonies can rapidly dominate and displace important native species. Methods for control are outlined in Armstrong, C., Osborne, B., Kelly, J. and Maguire, C.M. 2009. Giant Rhubarb (Gunnera tinctoria) Invasive Species Action Plan. Prepared for NIEA and NPWS as part of Invasive Species Ireland.

Treatment options

Mechanical control

Due to the size of *G. tinctoria* and its potential to reproduce from small fragments, physical removal has largely been over-looked as a possible means of control. There is the added problem of the disposal of the material removed. However, it should not be dismissed as a potential means of control. Physical removal using spades is clearly a viable option for small plants, or where a small number of plants are present, plant material missed in the first removal can be monitored and subsequently removed. With the appropriate machinery and manpower large areas could be cleared quickly.

When physical removal is used on a large scale it will leave a "blank canvas" and this must be accounted for during the planning stages, as the area may become susceptible to reinvasion by G. tinctoria or a variety of other unwanted species. It may be necessary to implement a restoration protocol for the cleared site after physical removal. Managers should be aware of and compliant with relevant waste legislation.

Chemical control

Chemical control can be effective in treating large areas and is generally considered efficient and cost effective (Motooka et al., 2002, Carlile 2006). The major drawback of using chemicals is the impacts they can have on the environment, affecting not only the target species but other species in the neighbouring area.

Methods and timing of application

The timing of herbicide application is an important factor for any successful control measures. Plants treated early in the growing season (March-May) had little impact in preventing the growth of G. tinctoria. Initially plants showed evidence of leaf necrosis, but soon new healthy leaves were produced and grew to the same proportions as untreated plants. Plants treated at the end of the growing season (Aug-Sept) showed no re-growth after one year, but after two years re-growth was observed. Despite no leaf or flower growth the rhizomes do remain in the ground. The presence of a viable rhizome indicates a potential for regrowth and subsequent reapplications of herbicide will be required. Spraying is generally carried out using a backpack sprayer and all leaves are thoroughly sprayed until the point of "run-off", using the manufacturers recommended concentrations. Spraying must be carried out on still, cool, dry days. Rainfall soon after application may wash the herbicide off the leaves, a common feature of the climatic conditions in this area and reapplication would be necessary.

Protective clothing and a mask must be used at all times when handling herbicides. The cut and paint method involves cutting the petiole (the leaf stalk) at the base and immediately applying the herbicide on to the cut surface using a brush or sponge.

This has been the method of choice in large monostands on Achill, due to the size of the plants effective spraying using a backpack sprayer would prove difficult and potentially dangerous to the persons carrying out the spraying. Large stands of G. tinctoria can be very difficult to access, and by cutting the petioles it clears the area and allows further access into the sites. This method is also cost-effective as small quantities of herbicide are involved. Injection of herbicides involves using a drill to make small wells in the rhizome that are then filled with herbicide. Several wells should be made along the rhizome as translocation can be slow and the herbicide may only penetrate small sections of the rhizome. This method is more labour intensive, but the effects on the neighbouring environment are minimised.

Outline methodology Giant Rhubarb

1. A pre-treatment survey will be carried out to establish accurate baseline distribution.

2. It is noted that this species is not as problematic as Rhododendron or Japanese knotweed and is limited to one location at present. Nonetheless the objective is removal within the landholding.

3. Given it its limited distribution and the applicants access to farm machinery mechanical removal with deep burial is considered the preferred option.

4. Gunnera has a rhizome which can easily be broken into pieces that have the potential to re-sprout. Care must be taken not to leave any fragments behind.

5 Monitoring will be carried out as specified in final invasive species management plant to ensure that any regrowth is recorded and removed.

7. Conclusions

The AA screening concluded, on the basis of objective information and in view of best scientific knowledge, the possibility of significant effects from the proposed project on European sites could not be ruled out and therefore an Appropriate Assessment was required. The AA screening concluded that there was potential for the proposed development to significantly impact the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, Castlemaine Harbour SAC and Castlemaine Harbour SPA, via surface water runoff and disturbance impacts during construction and operation.

The NIS has been prepared to inform and assist Kerry County Council to assess, in view of best scientific knowledge, if the proposed development, individually or in combination with another plan or project is likely to have a significant effect on the European sites, Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, Castlemaine Harbour SAC and Castlemaine Harbour SPA.

This NIS has examined and analysed, in light of the best scientific knowledge, with respect to Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, Castlemaine Harbour SAC and Castlemaine Harbour SPA within the potential zone of influence of the proposed development, the potential effect pathways, how these could impact on qualifying species and habitats and whether the predicted effects would adversely affect the integrity of Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, Castlemaine Harbour SAC and Castlemaine Harbour SPA.

Mitigation measures are set out in **Section 6** of the NIS and they ensure that any effects on the conservation objectives of Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, Castlemaine Harbour SAC and Castlemaine Harbour SPA will be avoided during the proposed development such that there will be no risk of adverse effects on the integrity of these European sites.

It has been objectively concluded following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted effects from the proposed development and with the implementation of the mitigation measures proposed, that the construction and operation of the proposed development will not adversely affect (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans or projects. There is no reasonable scientific doubt in relation to this conclusion. The competent authority will make the final determination in this regard.

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Appendices

Appendix 1 Site synopses

Castlemaine Harbour SAC Site Code: 000343

This is a large site located on the south-east corner of the Dingle Peninsula, Co. Kerry. It consists of the whole inner section of Dingle Bay, i.e. Castlemaine Harbour, the spits of Inch and White Strand/Rosbehy and a little of the coastline to the west. The River Maine, almost to Castlemaine, and much of the River Laune catchment, including the Gaddagh, Gweestion, Glancoragh, Cottoner's River and the River Loe, are also included within the site. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes): [1130] Estuaries [1140] Tidal Mudflats and Sandflats [1210] Annual Vegetation of Drift Lines [1220] Perennial Vegetation of Stony Banks [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts [1310] Salicornia Mud [1330] Atlantic Salt Meadows [1410] Mediterranean Salt Meadows [2110] Embryonic Shifting Dunes [2120] Marram Dunes (White Dunes) [2130] Fixed Dunes (Grey Dunes)* [2170] Dunes with Creeping Willow [2190] Humid Dune Slacks [91E0] Alluvial Forests* [1095] Sea Lamprey (Petromyzon marinus) [1099] River Lamprey (Lampetra fluviatilis) [1106] Atlantic Salmon (Salmo salar) [1355] Otter (Lutra lutra) [1395] Petalwort (Petalophyllum ralfsii) Inch Spit holds a fine sand dune system. It is one of the largest and best remaining dune systems in the country. Fore dunes are found on the western side of Rosbehy and Inch. In these younger, mobile dunes, Marram (Ammophila arenaria) is common, with Groundsel (Senecio vulgaris), Sea Rocket (Cakile maritima) and Dandelion Version date: 10.12.2015 2 of 4 000343_Rev15.Docx (Taraxacum agg.) also present. Other characteristic species include Sand Couch (Elymus farctus), Lyme-grass (Leymus arenarius) and Sea Spurge (Euphorbia paralias). Fixed dune, a priority habitat under the E.U. Habitats Directive, is well-represented at the site, and in particular towards the tip of Inch Spit. Such areas support species such as Lady's Bedstraw (Galium verum), Common Bird's-foot-trefoil (Lotus corniculatus), Wild Thyme (Thymus praecox), Kidney Vetch (Anthyllis vulneraria), Wild Pansy (Viola tricolor), Biting Stonecrop (Sedum acre), Common Centuary (Centaurium erythraea), Thyme-leaved Sandwort (Arenaria serpyllifolia) and Common Whitlowgrass (Erophila verna), among others. There is also a rich lichen and bryophyte flora. The slightly damper conditions which prevail in dune slacks support Creeping Bent (Agrostis stolonifera), Crested Dog's-tail (Cynosurus cristatus), Glaucous Sedge (Carex flacca), Creeping Willow (Salix repens) and Jointed Rush (Juncus articulatus). The rare bryophyte Petalwort (Petalophyllum ralfsii), which is listed on Annex II of the E.U. Habitats Directive, has been recorded in this system. A smaller spit, with a similar diversity of dune types, occurs at Rosbehy on the southern shore, from where Yellow Centaury (Cicendia filiformis) and Knotted Pearlwort (Sagina nodosa) have been recorded from a dune slack along with other, more common, species. The sand spits, and also the Coomore peninsula, are underlain by shingle and in places the shingle is exposed and supports a characteristic flora. Species present include Lyme-grass and Sea Sandwort (Honkenya peploides). Strandline communities are well-developed along Inch spit, with the exception of the north-western end where recreational pressure is high. Typical species of the strandline include Prickly Saltwort (Salsola kali), Sea Rocket, oraches (Atriplex spp.) and Sea Sandwort. Two Red Data Book plants, Sea Pea (Lathyrus japonicus subsp. maritimus) and Sea-kale (Crambe maritima), are found associated with the shingle and strandline communities. The coastline is fringed in many places by saltmarsh. The vegetation here includes Thrift (Armeria maritima), Common Saltmarsh-grass (Puccinellia maritima), Sea Aster (Aster tripolium), Sea Rush (Juncus maritimus) and Sea Plantain (Plantago maritima). Upper saltmarsh communities extend inland, along estuarine channels, where they are mixed with freshwater communities. Sea Club-rush (Scirpus maritimus) and Common Reed (Phragmites australis) occur at these locations. Common Cord-grass (Spartina anglica) has colonised the lower part of the saltmarsh at Inch and extends out onto the open mudflat. Glassworts (Salicornia spp.) occur in association with saltmarsh. West of Inch, cliffs of glacial drift occur, which support such plants as Ivy (Hedera helix), Red Fescue (Festuca rubra), Heather (Calluna vulgaris), Thrift, Sea Plantain, Sea Mayweed (Matricaria maritima), Kidney Vetch and Honeysuckle (Lonicera periclymenum). Along the cliff-tops there is coastal grassland with species such as Sweet Vernal-grass (Anthoxanthum odoratum), Cock's-foot (Dactylis glomerata) and Wood Sage (Teucrium scorodonia). Much of the site consists of intertidal sand and mudflats, supporting a number of soft sediment communities, including beds of eelgrass (mostly Zostera noltii) in some Version date: 10.12.2015 3 of 4 000343_Rev15.Docx places. A subtidal mixed sediment community complex is also present in the channel between Rossbehy Point and Inch Point. The rivers and their associated habitats also make up a considerable portion of the site. These associated habitats include wet grassland, woodland, scrub and bog/heath. In the valley up-river of Killorglin, is an interesting area of alluvial wet woodland, dominated by Alder (Alnus glutinosa) and willows (Salix spp.). The vegetation is quite diverse, and there are spectacular tussocks of Greater Tussocksedge (Carex paniculata). Other species which occur include Ash (Fraxinus excelsior), Wild Angelica (Angelica sylvestris),

Cuckooflower (Cardamine pratensis), Meadowsweet (Filipendula ulmaria), Common Nettle (Urtica dioica), Remote Sedge (Carex remota) and a range of bryophytes. While small in area, this is one of the few examples in Ireland of woodland on riverine alluvium dominated by native tree species. Five plants listed in the Irish Red Data Book have been recorded at this site: Sea-kale, Corn Cockle (Agrostemma githago), Sea Pea, Pennyroyal (Mentha pulegium) and Irish Lady's-tresses (Spiranthes romanzoffiana). The three last-named are legally protected under the Flora (Protection) Order, 1999, as is the rare bryophyte, Petalwort. Other scarce species which occur here are Yellow Bartsia (Parentucellia viscosa), Laxflowered Sea-lavender (Limonium humile) and Blue-eyed-grass (Sisyrinchium bermudiana). The vicinity of Castlemaine Harbour is also important as one of few areas in Ireland (all of which are in Co. Kerry) where the Natterjack Toad naturally occurs. This amphibian is listed in the Irish Red Data Book and on Annex IV of the E.U. Habitats Directive. The site also supports a small colony of Common Seal, while two Lamprey species have been recorded in the Laune river catchment. The Laune catchment is used by Otter and is also an important Salmon system with nurseries, riffles pools and glides. Castlemaine Harbour is a very important site for passage and wintering waterfowl. The following figures are derived from counts between 1994/5 and 1996/7. One species occurs here in internationally important numbers - Brent Goose (734) - with 16 species having populations of national importance: Cormorant (215), Shelduck (129), Pintail (167), Scaup (138), Wigeon (3,513), Red-breasted Merganser (51), Oystercatcher (1,539), Ringed Plover (330), Golden Plover (1,940), Grey Plover (122), Knot (347), Sanderling (207), Dunlin (1,360), Redshank (299), Greenshank (26) and Turnstone (296). Castlemaine Harbour is of major ecological importance. It contains a range of coastal habitats of excellent quality, including many that are listed on Annex I of the E.U. Habitats Directive, and two which are listed with priority status (fixed dunes and alluvial forests). It also includes long stretches of river and stream which are excellent habitats for Salmon, Lamprey and Otter. Inch dunes are recognised as among the finest in the country, with particularly well-developed dune slacks. The Version date: 10.12.2015 4 of 4 000343_Rev1.Docx site supports internationally important waterfowl populations, rare plant species, the rare Natterjack Toad, as well as populations of several animal species that are listed on Annex II of the E.U. Habitats Directive. Part of the site is designated a Special Protection Area (SPA) and is listed as a site under the Ramsar Convention. Part of Castlemaine Harbour is a Statutory Nature Reserve, while Inch and Rosbehy are Wildfowl Sanctuaries.

CASTLEMAINE HARBOUR SPA SITE CODE: 004029

Castlemaine Harbour SPA is a large coastal site occupying the innermost part of Dingle Bay. It extends from the lower tidal reaches of the River Maine and River Laune to west of the Inch and Rosbehy peninsulas (c. 16 km from east to west). The average width of the estuary is 4-5 km though it is c. 11 km wide at the outer limit. The site comprises the estuaries of the River Maine and the River Laune, both substantial rivers, and has extensive areas of intertidal sand and mud flats. A number of other rivers, e.g. the Caragh and the Emlagh, flow into the site, as well as numerous small streams. Conditions in the bay are very sheltered due to the presence of three protruding sand spits on its seaward side. These spits overly gravel bars. Two of the spits, Rosbehy and Inch, are included within the site. Salt marshes fringe much of the shoreline. A very large dune system occurs on the Inch peninsula. A substantial area of shallow marine water is included in the site. The intertidal flats are mostly muds or muddy sands and have high densities of polychaete worms such as Ragworm (Hediste diversicolor) and Lugworm (Arenicola marina), along with a good variety of bivalves and molluscs. Eelgrass (Zostera spp.) is common in places. The introduced Common Cord-grass (Spartina anglica) is found in sheltered areas of the intertidal flats and has colonised the lower part of the saltmarsh at Inch. Salt marsh vegetation includes Thrift (Armeria maritima), Common Saltmarsh-grass (Puccinellia maritima), Sea Aster (Aster tripolium), Sea Rush (Juncus maritimus) and Sea Plantain (Plantago maritima). The sand dune system at Inch is the largest and arguably the best remaining intact dune system in the country and includes large areas of embryo dunes, Marram (Ammophila arenaria) dunes and fixed dunes, as well as dune slacks. The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Red-throated Diver, Cormorant, Light-bellied Brent Goose, Wigeon, Mallard, Pintail, Scaup, Common Scoter, Oystercatcher, Ringed Plover, Sanderling, Bar-tailed Godwit, Redshank, Greenshank, Turnstone and Chough. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds. Castlemaine Harbour SPA is one of the most important sites for wintering waterfowl in the south-west. It provides habitats for an excellent diversity of waterbirds, including divers and seaduck. It is of international importance for its Light-bellied Brent Goose population (694) - figures given are mean peaks for the five winters 1995/96-1999/2000, as well as nationally important populations of a further fourteen waterbird species, i.e. Red-throated Diver (56), Cormorant (136), Wigeon (6,819), Mallard (487), Pintail (145), Scaup (74), Common Scoter (3,637), Oystercatcher (1,035), Ringed Plover (206), Sanderling (335), Bar-tailed Godwit (397), Redshank (341), Greenshank (46) and Turnstone (144). The population of Wigeon is of note, being

7.6% of the all-Ireland total, while that of Sanderling is over 5%. Other species which occur include Great Northern Diver (22), Shelduck (90), Teal (287), Redbreasted Merganser (29), Golden Plover (972), Grey Plover (46), Knot (199), Dunlin (933), Curlew (474) and Black-headed Gull (538). The site provides good quality habitat for the feeding and roosting requirements of the various bird species which winter here. Whilst not breeding within the site, Chough occur in nationally important numbers and are regularly found on the sand dunes at Inch where they feed and socialise; during the autumn in 2002/03 and 2003/04 the dunes at Inch held flocks of up to 40 and 64 birds respectively. Castlemaine Harbour SPA is a very important ornithological site, with one species, Light-bellied Brent Goose, occurring in numbers of international importance. In addition, it supports nationally important populations of a further fifteen species. Of particular note is that five species that occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Red-throated Diver, Great Northern Diver, Golden Plover, Bar-tailed Godwit and Chough. Castlemaine Harbour is a Ramsar Convention site and parts of Castlemaine Harbour SPA are designated as a Statutory Nature Reserve and as Wildfowl Sanctuaries.

Site Name: Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC

Site Code: 000365

This very large site encompasses the mountains, rivers and lakes of the Iveragh Peninsula and the Paps Mountains which stretch eastward from Killarney towards Millstreet. The majority of the site is in Co. Kerry, with a small portion in Co. Cork. This is the most mountainous region in Ireland and includes Carrauntoohil, the highest peak in the country at 1,039 m. The underlying geology is almost entirely Old Red Sandstone, although Carboniferous limestone occurs on the eastern shores of Lough Leane, and rhyolitic lavas occur above Lough Guitane. The dramatic sandstone ridges and valleys have been shaped by glacial processes and many of the lakes are impounded by glacial moraines. Located close to the Atlantic in the south- west of Ireland, the site is subject to strong oceanic influences. Generally, Lusitanian flora and fauna is well-represented, while the high peaks and cliffs support arctic- alpine relicts.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[3110] Oligotrophic Waters containing very few minerals [3130] Oligotrophic to Mesotrophic Standing Waters
[3260] Floating River Vegetation
[4010] Wet Heath

[4030] Dry Heath
[4060] Alpine and Subalpine Heaths [5130] Juniper Scrub
[6130] Calaminarian Grassland [6410] *Molinia* Meadows
[7130] Blanket Bogs (Active)*
[7150] Rhynchosporion Vegetation [91A0] Old Oak Woodlands
[91E0] Alluvial Forests*
[91J0] Yew Woodlands*

[1024] Kerry Slug (*Geomalacus maculosus*)
[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1065] Marsh Fritillary (*Euphydryas aurinia*)
[1095] Sea Lamprey (*Petromyzon marinus*)

[1096] Brook Lamprey (*Lampetra planeri*)
[1099] River Lamprey (*Lampetra fluviatilis*)
[1103] Twaite Shad (*Alosa fallax*)
[1106] Atlantic Salmon (*Salmo salar*)
[1303] Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

[1355] Otter (*Lutra lutra*)

[1421] Killarney Fern (*Trichomanes speciosum*)

[1833] Slender Naiad (*Najas flexilis*)

The Oak woodlands, occurring mostly around the Killarney lakes, are the habitat for which the area is perhaps best known. They form the most extensive area of native woodland remaining in Ireland and include Derrycunihy Wood, described as perhaps the most natural Sessile Oak (*Quercus petraea*) wood in the country. The woods

are typically dominated by Sessile Oak, with an understorey of Holly (*Ilex aquifolium*). The Strawberry-tree (*Arbutus unedo*) is a notable component of the woods and there are scattered areas of Yew (*Taxus baccata*). The herb layer is not particularly species-rich, but the woods support perhaps the best developed Atlantic bryophyte community in Europe. Several rare species are present including *Lejeunea flava*, *Cyclodictyon laetivirens*, *Daltonia splachnoides*, *Sematophyllum demissum* and *Radula carringtonii*.

The only sizeable Yew woodland in Ireland is found on the limestone of the Muckross peninsula. Here, some of the trees are up to 200 years old. The dense shade beneath the tree results in few herbs in the ground flora, but the bryophyte layer is well-developed and almost continuous.

Wet woodland, or carr, occurring on the low-lying limestone areas within the floodplain of Lough Leane, forms one of the most extensive areas of this woodland type in Ireland. The dominant canopy species are Alder (*Alnus glutinosa*), willows (*Salix* spp.), Ash (*Fraxinus excelsior*) and Downy Birch (*Betula pubescens*), while the field layer is dominated by Remote Sedge (*Carex remota*) and Creeping Bent (*Agrostis stolonifera*).

Adding to the diversity of the woodland component of this site are a number of mixed woodlands, including those of Ross Island which support one of the richest herb layers of the Killarney woods.

The most common habitat types within the overall site are blanket bog, heath and upland grassland. The heath and grassland generally occur on areas with shallow peat and on the mineral soils of the steep mountain sides, while the blanket bog occurs on the more gentle slopes, plateaux and other level ground. Often the habitats occur in a mosaic, with exposed rock frequently occurring.

A variety of blanket bog types are represented from lowland valley to mountain blanket bog. Some of the best include: Cummeragh River Bog Nature Reserve, a

domed bog which is perhaps the most southern intact blanket bog in the country; Ballygisheen, which contains one of the most extensive areas of intact lowland blanket bog in Co. Kerry; Coomacheo/Caherbarnagh, which combine to form the largest mountain blanket bog in the south-west; Elfin Bog Nature Reserve, a classic example of a bog intermediate between a raised and blanket bog; Mangerton Bog, an upland bog which grades into an unusual lichen heath seen at no other site; and Oolagh East, a quaking basin mire. Generally, the bogs have a characteristic flora. The Lusitanian species, Large-flowered Butterwort (*Pinguicula grandiflora*), is common. The bogs also support a number of unusual species, including mosses (*Sphagnum pulchrum*, *S. fuscum*, *S. platyphyllum*, *S. strictum*, *S. contortum* and *Calliergon stramineum*), liverworts (*Cladopodiella francisci* and *Calypogeia azurea*) and lichens (*Cladonia mediterranea*, *C. macilenta*, *C. rangiferina*, *C. arbuscula* and *Cetraria islandica*).

Rhynchosporion vegetation is confined to wet areas within the lowland blanket bogs, with one of the best areas for the habitat being to the north-east of the Ballygisheen Pass. On a portion of this bog there is an extensive area of quaking flats and pools dominated by the bog mosses *Sphagnum cuspidatum* and *S. auriculatum*. These areas have a typically species-poor flora which includes Bogbean (*Menyanthes trifoliata*), White Beak-sedge (*Rhynchospora alba*), Bog Asphodel (*Narthecium ossifragum*), Common Cottongrass (*Eriophorum angustifolium*) and Great Sundew (*Drosera anglica*). Brown Beak-sedge (*R. fusca*), a locally rare plant of wet bog pools, is occasional within the site. Although the habitat is best developed in very wet areas of intact bog, it may also occur in wet areas of regenerating cutover blanket bog.

Wet heath often occurs in association with blanket bog and features Cross-leaved Heath (*Erica tetralix*). Dry heath is more frequent in this site, and is dominated by Heather (*Calluna vulgaris*), Bell Heather (*Erica cinerea*) and Western Gorse (*Ulex gallii*), with occasional Bilberry (*Vaccinium myrtillus*). This habitat is well-developed on the Paps Mountains. Elsewhere it is often over-grazed, with upland grassland becoming more frequent. Some of the highest ridges support alpine heath (referable to the *Lycopodium alpinum - Racomitrium lanuginosum* association). Widespread plant species of the alpine heath include Bog-myrtle (*Vaccinium myrtillus*), Crowberry (*Empetrum nigrum*) and Fir Clubmoss (*Huperzia selago*), while species such as Juniper (*Juniperus communis* subsp. *nana*) and Dwarf Willow (*Salix herbacea*) have a much more restricted distribution.

The site contains many lakes, but these can be broadly divided into two types: small upland corrie lakes and larger lowland lakes. Examples of the first type are Lough Murtagh and Lough Gortavehy in the Paps Mountains. They are oligotrophic and typically species-poor, with Quillwort (*Isoetes lacustris*), Water Lobelia (ç and Shoreweed (*Littorella uniflora*) occurring most commonly. The lowland lakes are mostly oligotrophic, although Lough Leane, the largest freshwater body in the region, has become somewhat mesotrophic as a result of pollution from Killarney town. These lowland lakes tend to be more species-rich than those at higher altitudes, with additional species such as Awlwort (*Subularia aquatica*), Six- stamened Waterwort (*Elatine hexandra*) and Alternate Water-milfoil (*Myriophyllum alterniflorum*). Good examples include Lough Caragh, Upper Lake and Muckross Lake.

The rivers associated with these lakes are also of importance. The Caragh is relatively unpolluted from headwater to estuary, a rare phenomenon in Europe. The Flesk runs over Old Red Sandstone in its upper reaches and limestone as it nears Lough Leane. Both rivers support floating and submerged vegetation and rare invertebrates. Rocks around the smaller mountain streams often support a lush vegetation of ferns and bryophytes, most notably at Torc Waterfall.

Other habitats of note include: Juniper scrub found on islands in the Upper Lake and on dry ridges in nearby Newfoundland Bog; damp meadows, with Purple Moor- grass (*Molinia caerulea*), supporting scarce species such as Whorled Caraway (*Carum verticillatum*) and Ivy-leaved Bellflower (*Wahlenbergia hederacea*); and Calaminarian grasslands, associated with the old copper mines on Ross Island, with species such as Sea Campion (*Silene vulgaris* subsp. *maritima*) and Thrift (*Armena maritima*).

A large number of plant and animal species of interest occur within the site. For example, two plant species listed on Annex II of the E.U. Habitats Directive occur. Slender Naiad (*Najas flexilis*) is found in some of the lakes at the site. The Killarney Fern (*Trichomanes speciosum*) is another listed and well-known rarity. An additional twenty-two Red Data Book plant species have been recorded, but only twelve of these have been seen recently. These are Pillwort (*Pilularia globulifera*), Kerry Lily (*Simethis planifolia*), Irish Lady's-tresses (*Spiranthes romanzoffiana*), Slender Cottongrass (*Eriophorum gracile*), Small Cudweed (*Logfia minima*), Betony (*Stachys officinalis*), Heath Cudweed (*Omalotheca sylvatica*), Alder Buckthorn (*Frangula alnus*), Alpine Saw-wort (*Saussurea alpina*), Hoary Whitlowgrass (*Draba incana*), Smooth Brome (*Bromus racemosus*) and Holly Fern (*Polystichum lonchitis*). The first seven of these species are legally protected under the Flora (Protection) Order, 1999, as are Slender Naiad and Killarney Fern.

Additional plant species of interest include a fern (*Dryopteris affinis* subsp. *stillupensis*) and a Whitebeam (*Sorbus anglica*), both at their only Irish locations.

The site is very important for oceanic bryophytes, particularly the woodland species. It also contains good representative examples of the Northern Atlantic Hepatic Mat community and other oceanic montane communities. Killarney Oak woods and mountains have been nominated as a site of international importance for bryophytes.

The Killarney Woods are notable for the number of rare species of Myxomycete fungus that have been recorded, namely *Collaria arcyrionema*, *Craterium muscorum*, *Tubifera microcarpa* (only known Irish site), *C. rufa*, *C. violacea*, *Diderma chondrioderma*, *D. lucidum*, *D. ochraceum*, *Fuligo muscorum* and *Licea marginata*.

The site has six bird species which are listed on Annex I of the E.U. Birds Directive. A small flock of Greenland White-fronted Goose, which winters on the boglands within the National Park, is now the only regular flock in the south-west. The site has one of the highest concentrations of breeding Peregrines in the country, as well as some breeding Merlin. Chough is found both in the coastal and inland areas of the site, with possibly up to 30 pairs breeding. Kingfisher is a species associated with the lakes and rivers, especially in the National Park and probably breeds. Finally, a few pairs of Common Tern breed within the site.

The woodlands provide habitat for a variety of breeding birds, most notably Garden Warbler, Blackcap, and probably a few pairs each of the rare Redstart and Wood Warbler. Lough Leane is a site for wintering wildfowl with the following average counts for the two winters 1995/96 and 1996/97: Teal (208), Mallard (350), Pochard (81), Tufted Duck (323) and Coot (169).

The site supports most of the Irish mammal species. Of particular note is the occurrence of two E.U. Habitats Directive Annex II species: Lesser Horseshoe Bat, with a total population of about 300 individuals distributed at several locations, including both nursery and hibernation sites, and Otter. Perhaps the best known mammals of the Killarney National Park are the Red Deer, which form the only remaining native herd in Ireland, comprised of around 600 animals. Sika Deer also occur. Pine Marten is another notable species.

The site is valuable for its rare fish species, five of which are listed on Annex II of the E.U. Habitats Directive: Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Sea Lamprey (*Petromyzon marinus*), Atlantic Salmon (*Salmo salar*) and Killarney Shad (*Alosa fallax killarnensis*). The Killarney Shad is a unique land-locked subspecies confined to the Killarney lakes. Also of note is the glacial relict, Arctic Char (*Salvelinus alpinus*), a Red Data Book species, a unique form of which is found in Lough Coomasaharn.

There are numerous rare invertebrates within the site. These include three E.U. Habitats Directive Annex II species: Kerry Slug (*Geomalacus maculosus*), the Freshwater Pearl Mussel (*Margaritifera margaritifera*) and the Marsh Fritillary (*Euphydryas aurinia*). The Kerry Slug and Pearl Mussel populations are of particular importance in a national context. Other species of note include: three chironomids of international importance found in the

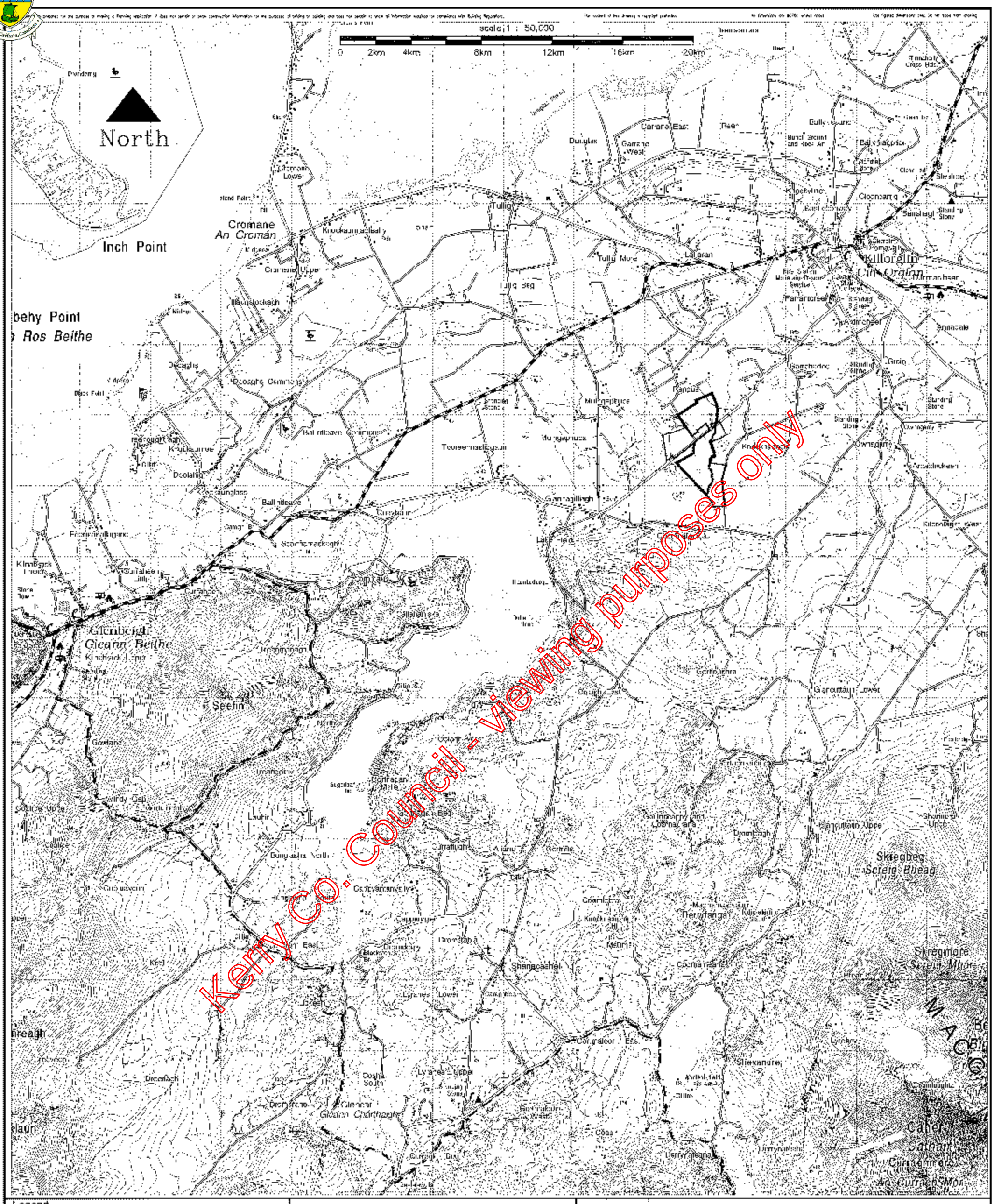
River Flesk; a wood ant (*Formica lugubris*) at one of only four Irish sites; a snail (*Limnaea involuta*), in Lough Crincaum, at its only known location; two dragonflies (*Cordulea aenea* and *Somatochlora arctica*), the former at one of only two known sites in Ireland and the latter at its only known Irish location; and several other aquatic and woodland species at their only known Irish locations.

The main land use within the site is grazing by sheep. In and around the National Park deer grazing is also common. The extensive grazing has caused damage to many of the terrestrial habitats, resulting in degradation of heath and blanket bogs and prevention of woodland regeneration. In the upland habitats the erosion caused by grazing is exacerbated by the exposed nature of the terrain. Apart from grazing, the woodlands are particularly threatened by Rhododendron (*Rhododendron ponticum*) invasion: approximately two thirds of the Oak woodlands are affected, although a Rhododendron removal programme is underway in the National Park. The Yew wood has been adversely affected by heavy grazing for many years, but it is intended to control this in the near future by erection of a deer fence. The bogs are sensitive to grazing and are also threatened by turbary, burning and afforestation. Most of the lakes are very acid-sensitive and therefore vulnerable to afforestation within the catchment areas. Lough Leane has been subject to some eutrophication, although water quality appears to have improved since phosphates were removed from the sewage in 1985.

A management plan was drawn up for the Killarney National Park in 1991. The park is managed primarily for conservation purposes although recreation is also provided for.

Overall, the site is of high ecological value because of the diversity, quality and extensiveness of many of the habitats, and impressive list of rare species of flora and fauna. In recognition of its importance the Killarney National Park has been designated a World Biosphere Reserve.

Appendix 2. Site drawings



Legend

Applicant's Landholding 70.00 Ha

Planning application boundary
18.5 Ha + 24.5 Ha extension = 43.00 Ha

Rev	Date	Comment

Michael O'Connor Tech. Dip. Eng. M.I.E.I.
Longfield, Firies, Killarney
Tel/Fax: 0669164910
Mobile: 0866337804
email:

Notes:
1. Based on Ordnance Survey 1:5000 series Sheets 6053 and 6054
2. Ordnance Survey Ireland Licence no. 5000276Z_I & 2
   © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 470806, 590841
4. Levels in metres above OS Datum Malin Head

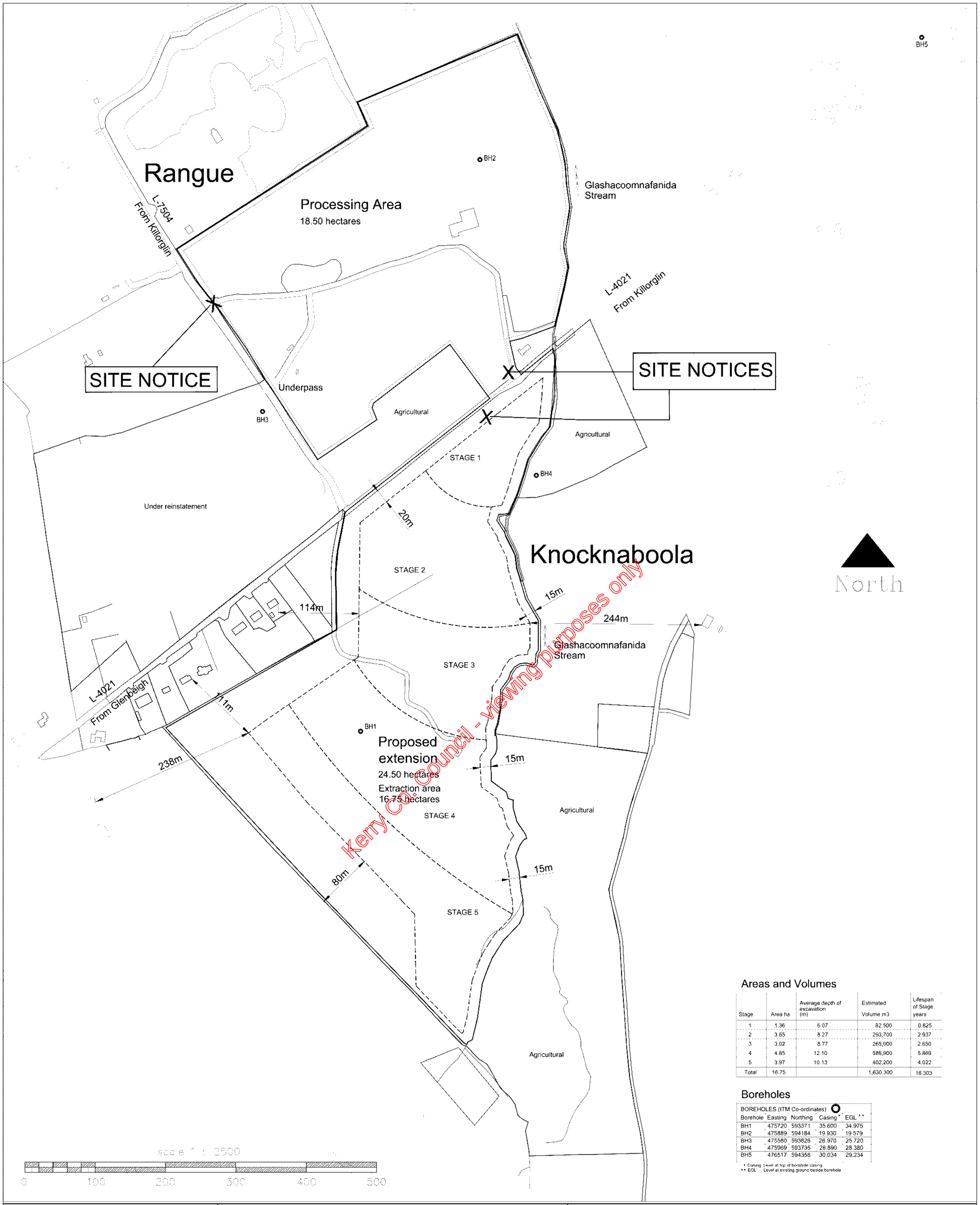
Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Location Map
(Print A3_scale 1:50,000)

Scale	Date	Drawn By
1 : 50,000	13/05/2021	moc

Drawing Nr: PL_01 Rev No:



Areas and Volumes

Stage	Area ha	Average depth of excavation (m)	Estimated Volume m3	Lifespan of Stage years
1	1.36	6.07	82,500	0.825
2	3.55	8.27	293,700	2.937
3	3.02	8.77	265,000	2.650
4	4.85	12.10	586,900	5.869
5	3.97	10.13	402,200	4.022
Total	16.75		1,630,300	16.303

Boreholes

BOREHOLES (ITM Co-ordinates)				
Borehole	Easting	Northing	Casing *	EGL **
BH1	475720	593371	35.600	34.975
BH2	475889	594184	19.930	19.579
BH3	475580	593826	26.970	25.720
BH4	475969	593735	28.890	28.380
BH5	476517	594358	30.034	29.234

* Casing Level at top of borehole casing
** EGL Level at existing ground beside borehole

Notes:

1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary 18.5 Ha + 24.5 Ha extension = 43.00 Ha
- Existing processing 18.50 Ha
- Proposed extraction 16.75 Ha
- BH2 Existing Boreholes Refer to the EIAR for detailed description and analysis of surface and ground water features

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Rev	Date	Comment

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Location Map
(Print A1_scale 1:2,500)

Scale: 1 : 2,500 | Date: 13/05/2021 | Drawn By: moc

Drawing Nr. PL_02 | Rev. No.

scale : 1 : 1,000

0 20 40 60 80 100 150 200

North

Rangue

Knocknaboola

Processing Area
18.50 hectares

Proposed extension
24.5 hectares

Existing mature screen-planting

Reinstated Pond

Water

Stream

Glashacoomnafanida Stream

Glashacoomnafanida Stream

water level

Kiosk No. 2

Kiosk No. 1

BH2

BH3

BH4

Loading Ramp

Washing & Screening Plant

Block curing

ESB sub-stn

Diesel

Repairs/admin shed

Hoppers

Silo

Parking

SEPTIC TANK

Block storage

Weighbridge

Access road

Road

Discharge Point

V93 DN44

Entrance & Exit

SITE NOTICE

SITE NOTICES

Underpass

Reinstated

Agricultural

Under reinstatement

Drain

Ruin

72m

V93 TE84

V93 K7C5

V93 K579

From Killorglin L-7504

From Glenbeigh L-4021

A

B

C

D

27.0

28.0

29.0

30.0

31.0

32.0

33.0

34.0

35.0

36.0

37.0

38.0

39.0

Notes:

1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2
   © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Key Plan

PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary
  18.5 Ha + 24.5 Ha extension = 43.00 Ha
- Existing processing 18.50 Ha
- Proposed extraction 16.75 Ha
- 33.10 Existing spot level in metres AOD
- 33.10 Proposed spot level in metres AOD
- 33.0 Existing contours at 1 metre intervals
- 33.0 Proposed contours at 2 metre intervals
- Excavated materials and areas under reinstatement
- Existing berm/screen-planting
- Proposed berm
  3 metres high, 13 metres wide along western, northern and eastern perimeters of proposed quarry extension
- Proposed silt fence
- BH2 Existing Boreholes
  Refer to the Environmental Impact Assessment Report (EIAR) for detailed description and analysis of surface and ground water features
- Surface water
- P1 - P2 SITE STRUCTURES
  P1 - P2 Portacabins
  C1 - C13 C1 - C13 Steel containers

Rev	Date	Comment

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - EXISTING
(Print A0_scale 1:1,000)

Scale: 1 : 1,000
Date: 13/05/2021
Drawn By: moc

Drawing Nr. PL_03a
Rev. No.

23-03-2022
08:00:48

SITE NOTICE

North

Water

Parking

Discharge Point

Stream

V93 DN44

Entrance & Exit

Underpass

Reinstated

27.0

SITE NOTICES

BH3

Agricultural

Existing mature screen-planting

Water

Water

Agricultu

28.0

29.0

BH4

Under reinstatement

Water

Drain

Knocknaboola

30.0

31.0

32.0

35.0

34.0

33.0

36.0

V93 TE84

72m

Ruin

V93 K7C5

L-4021 From Glenbeigh

Glashacoomnafanida Stream

V93 K579

BH1

Proposed extension
24.5 hectares

38.0

39.0

40.0

41.0

V93 X6R0

38m

Agricultural

Glashacoomnafanida Stream

Agricultural

scale 1 : 1,000

0 20 40 60 80 100 150 200

Notes:

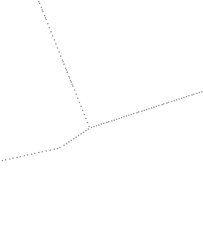
1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Key Plan



PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary 18.5 Ha + 24.5 Ha extension = 43.00 Ha
- Existing processing 18.50 Ha
- Proposed extraction 16.75 Ha
- 33.10 Existing spot level in metres AOD
- 33.10 Proposed spot level in metres AOD
- 33.0 Existing contours at 1 metre intervals
- 33.0 Proposed contours at 2 metre intervals
- Excavated materials and areas under reinstatement
- Existing berm/screen-planting
- Proposed berm 3 metres high, 13 metres wide along western, northern and eastern perimeters of proposed quarry extension
- Proposed silt fence
- BH2 Existing Boreholes Refer to the Environmental Impact Assessment Report (EIAR) for detailed description and analysis of surface and ground water features
- Surface water
- P1 - P2 / C1 - C13 SITE STRUCTURES P1 - P2 Portacabins C1 - C13 Steel containers

Rev	Date	Comment

Client: Michael F. Quirke & Sons

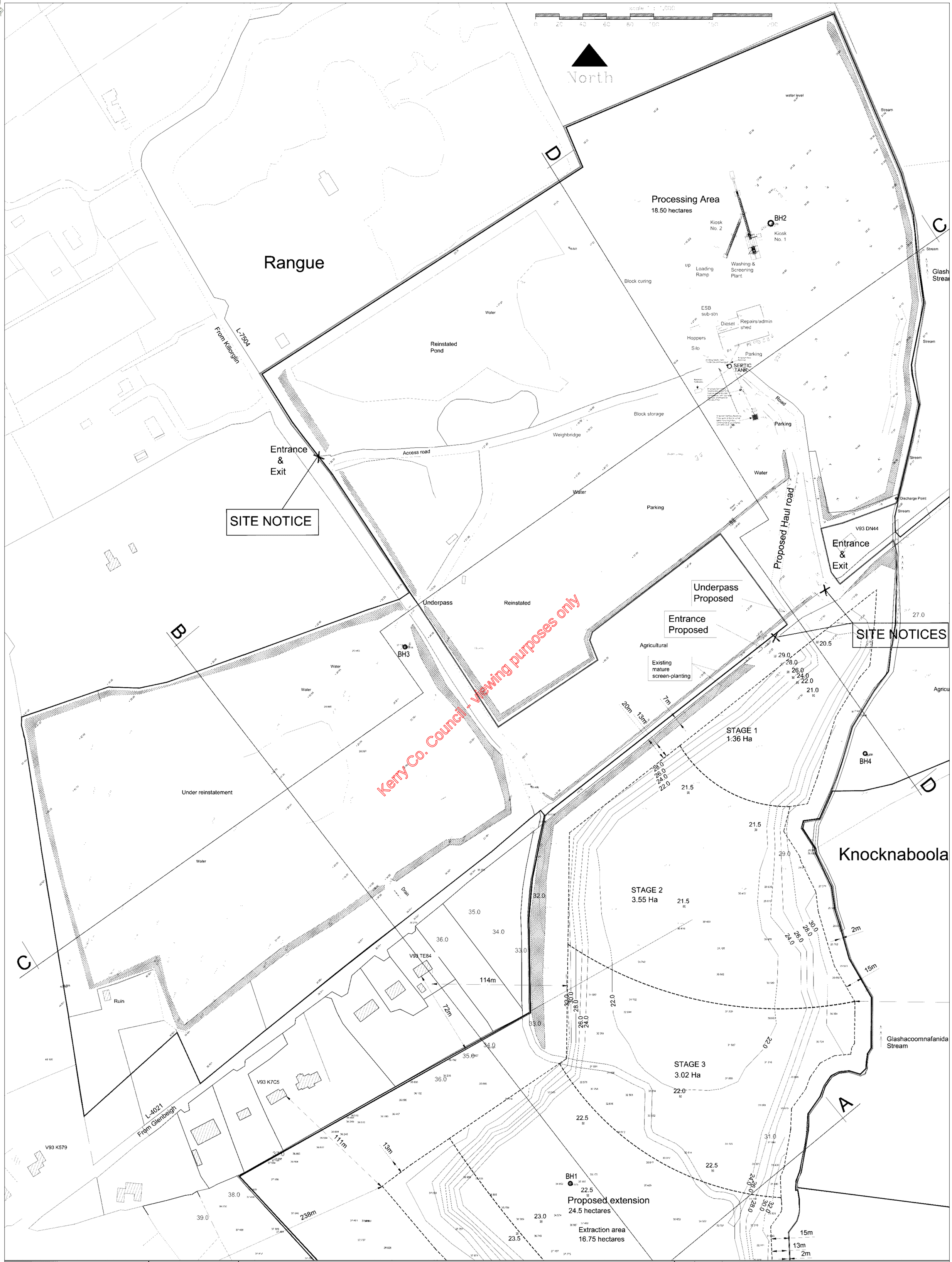
Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - EXISTING
(Print A0_scale 1:1,000)

Scale: 1 : 1,000 Date: 13/05/2021 Drawn By: moc

Drawing Nr PL_03b Rev. No.

23-03-2022 08:00:48



Notes:

1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Key Plan

PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
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- 33.0 Proposed contours at 2 metre intervals
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- Surface water
- P1 - P2 SITE STRUCTURES P1 - P2 Portacabins
- C1 - C13 C1 - C13 Steel containers

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

22-03-2022 08:00:48

Rev	Date	Comment

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - PROPOSED
(Print A0_scale 1:1,000)

Scale: 1 : 1,000 Date: 13/05/2021 Drawn By: moc

Drawing Nr. PL_04a Rev. No.

SITE NOTICE

North

SITE NOTICES

Water

Parking

Discharge Point

Stream

V93 DN44

Entrance & Exit

Proposed Haul road

Underpass

Reinstated

Underpass Proposed

Entrance Proposed

Agricultural

Existing mature screen-planting

BH3

BH4

BH1

Water

Under reinstatement

Drain

Ruin

V93 TE84

V93 K7C5

V93 K579

V93 X6R0

L-4021 From Glenbeigh

Knocknaboola

Glashacoomnafanida Stream

Agricultural

STAGE 1
1.36 Ha

STAGE 2
3.55 Ha

STAGE 3
3.02 Ha

STAGE 4
4.85 Ha

STAGE 5
3.97 Ha

Proposed extension
24.5 hectares

Extraction area
16.75 hectares

20m
13m
7m
2m
15m
72m
114m
111m
238m
80m

scale # 1 : 1,000

0 20 40 60 80 100 150 200

Notes:

1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2
   © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

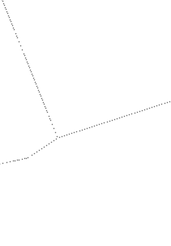
Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

22-03-2022 08:00:48

Key Plan



PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary 18.5 Ha + 24.5 Ha extension = 43.00 Ha
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- 33.10 Proposed spot level in metres AOD
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- 33.0 Proposed contours at 2 metre intervals
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- Proposed silt fence
- BH2 Existing Boreholes Refer to the Environmental Impact Assessment Report (EIAR) for detailed description and analysis of surface and ground water features
- Surface water
- P1 - P2 SITE STRUCTURES P1 - P2 Portacabins C1 - C13 Steel containers C1 - C13

Rev	Date	Comment

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - PROPOSED
(Print A0_scale 1:1,000)

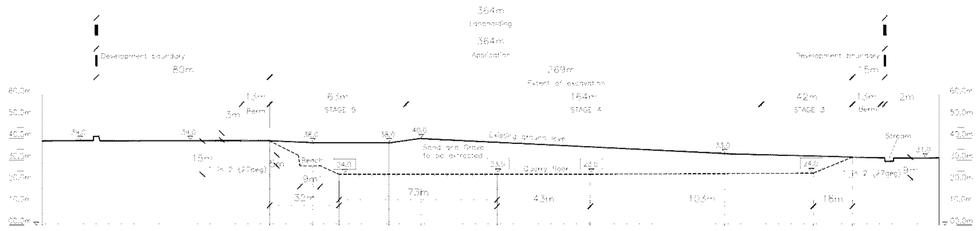
Scale: 1 : 1,000

Date: 13/05/2021

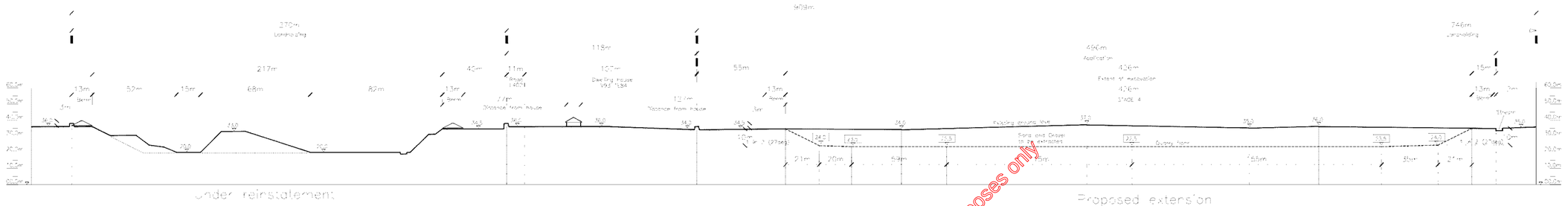
Drawn By: moc

Drawing Nr. PL_04b

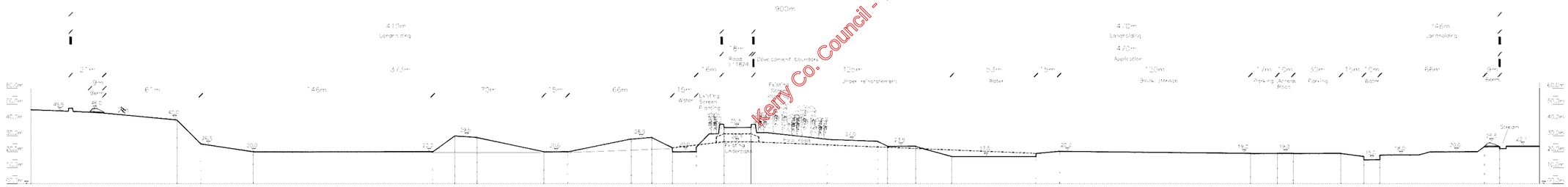
Rev. No.



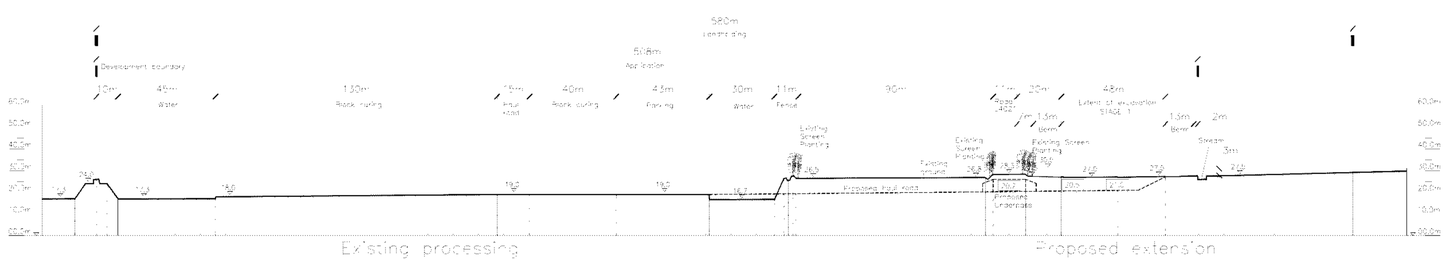
Section A–A Proposed extension S/W to N/E
scale 1:1000 on A0



Section B–B Under reinstatement and Proposed extension N/W to S/E
scale 1:1000 on A0



Section C–C Under reinstatement and Existing processing S/W to N/E
scale 1:1000 on A0

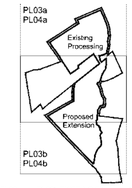


Section D–D Existing processing and Proposed extension N/W to S/E
scale 1:1000 on A0

Notes:

1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Key Plan



PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary 18.5 Ha + 24.5 Ha extension = 43.00 Ha
- Existing processing 18.50 Ha
- Proposed extraction 16.75 Ha
- 34.2 — Existing spot level in metres AOD
- 34.2 — Proposed spot level in metres AOD
- 33.0 — Existing contours at 1 metre intervals
- 33.0 — Proposed contours at 2 metre intervals
- Excavated materials and areas under reinstatement
- Existing berm/screen planting
- Proposed berm 3 metres high, 13 metres wide along western, northern and eastern perimeters of proposed quarry extension
- Proposed silt fence
- BH2 — Existing Boreholes Refer to the Environmental Impact Assessment Report (EIAR) for detailed description and analysis of surface and ground water features
- Surface water

Rev.	Date	Comment

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Sections
(Print A0_scale 1:1,000)

Scale: 1 : 1,000
Date: 13/05/2021
Drawn By: moc

Drawing Nr. PL_05
Rev. No.

North

D

C

BH2

Kiosk No. 2

Kiosk No. 1

Kiosk

Loading Ramp

up

Loading Ramp

Washing & Screening Plant

Processing Area
18.50 hectares

34m

Block curing
3,434 sq.m

101m

ESB sub-stn

Re-fueling

Diesel

Repairs/Admin shed

Hoppers

Silo

Parking

Admin

Proposed New Manhole

Existing Septic Tank (To Be Decommissioned)

Septic Tank

Reported Soakaway

Proposed Secondary Wastewater Treatment System with EN12566 Certification, with pumped discharge of effluent to Tertiary Filter

Proposed Tertiary Polishing Filter such as Constructed Sand Polishing Filter, consrtucted in accordance with EPA, CoP, 2021

Access road

Parking

Weighbridge

Weighbridge

Block storage
5,040 sq.m

126m

40m

Water pump

Parking

Water

Water

Parking

Drain

Trees

Proposed Haul road

Access road

Drain

Stream

Glashacoomnafanida Stream

Stream

Stream

Stream

Discharge Point

L-4021 From Killorglin

V93 DN44

Entrance & Exit

Underpass proposed

Entrance Proposed

Excluded

Existing mature screen-planting

Drain

Trees

Drain

Trees

7m

27.0

SITE NOTICES

29.0

27.0

20.5

21.0

+27.50

+27.50

water level 19.97

18.32

18.22

23.32

27.00

24.32

20.72

24.92

22.82

21.82

21.82

20.70

scale 1 : 500

0 20 40 80 120 160 200

Notes:

1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Key Plan

PL03a PL04a

Existing Processing

Proposed Extension

PL03b PL04b

PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary 18.5 Ha + 24.5 Ha extension = 43.00 Ha
- Existing processing 18.50 Ha
- Proposed extraction 16.75 Ha
- 33.10 Existing spot level in metres AOD
- 33.10 Proposed spot level in metres AOD
- 33.25 Existing contours at 1 metre intervals
- 33.0 Proposed contours at 2 metre intervals
- Excavated materials and areas under reinstatement
- Existing berm/screen-planting
- Proposed berm 3 metres high, 13 metres wide along western, northern and eastern perimeters of proposed quarry extension
- Proposed silt fence
- BH2 Existing Boreholes Refer to the Environmental Impact Assessment Report (EIAR) for detailed description and analysis of surface and ground water features
- Surface water
- P1 - P2 SITE STRUCTURES P1 - P2 Portacabins
- C1 - C13 C1 - C13 Steel containers

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Rev	Date	Comment

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - PROCESSING
(Print A0_scale 1:500)

Scale: 1 : 500 | Date: 13/05/2021 | Drawn By: moc

Drawing Nr. PL_06 | Rev. No.

North

D

C

BH2

Kiosk No. 2

Kiosk No. 1

Kiosk

Loading Ramp

up

Loading Ramp

Washing & Screening Plant

Processing Area
18.50 hectares

34m

Block curing
3,434 sq.m

101m

ESB sub-stn

Hoppers

Silo

Silo

Re-fueling

Diesel

Repairs/Admin shed

P1

P2

Parking

Admin

Existing Septic Tank (To Be Decommissioned)

Proposed New Manhole

Septic Tank

Reported Soakaway

Proposed Secondary Wastewater Treatment System with EN12566 Certification, with pumped discharge of effluent to Tertiary Filter

Proposed Tertiary Polishing Filter such as Constructed Sand Polishing Filter, consrtucted in accordance with EPA, CoP, 2021

Access road

Parking

Block storage
5,040 sq.m

126m

40m

Weighbridge

Weighbridge

Water pump

Parking

Water

Water

Parking

Drain

Trees

Proposed Haul road

Access road

Drain

Stream

Glashacoomnafanida Stream

Stream

Stream

Stream

Discharge Point

L-4021 From Killorglin

V93 DN44

Entrance & Exit

Underpass proposed

Entrance Proposed

Excluded

Existing mature screen-planting

Drain

Trees

Drain

Trees

27.0

SITE NOTICES

29.0

27.0

20.5

21.0

7m

+27.50

+27.50

water level 19.97

18.32

18.22

23.32

27.00

24.32

20.72

24.92

22.82

21.82

21.82

20.70

Notes:
1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

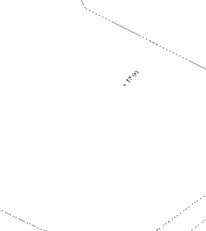
Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

22-03-2022 08:00:48

Key Plan



PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

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- Surface water
- P1 - P2 SITE STRUCTURES P1 - P2 Portacabins
- C1 - C13 C1 - C13 Steel containers

Rev	Date	Comment

Client: Michael F. Quirke & Sons

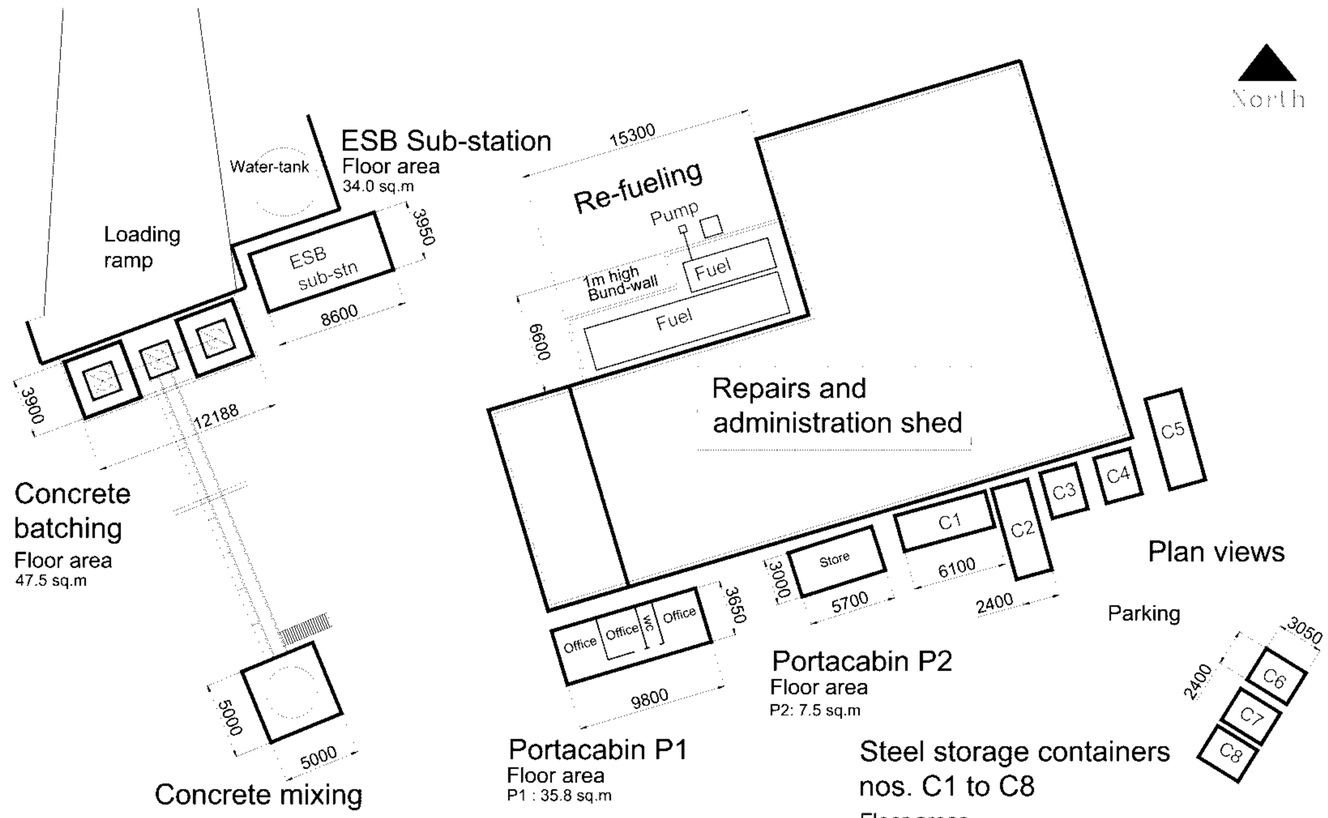
Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - PROCESSING
(Print A0_scale 1:500)

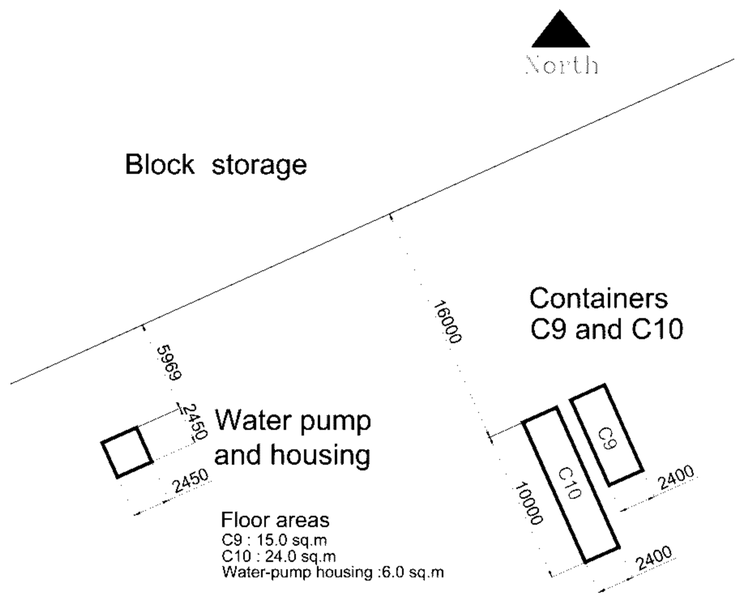
Scale: 1 : 1,000
Date: 13/05/2021
Drawn By: moc

Drawing Nr. PL_06
Rev. No.

Reception, Admin, Repairs shed, Portacabins, Containers, ESB sub-stn, Mixing hoppers, Concrete silo/loading

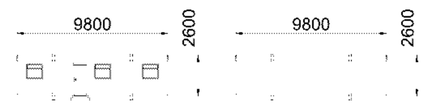


Steel storage containers Nos. C9 and C10 and Water pump/housing located adjacent to the Block-curing slab



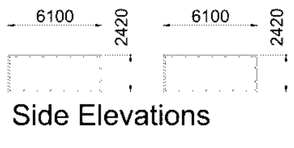
Plan views

Portacabin P1 adjacent to the reception

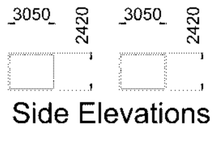


Portacabin P2 adjacent to the repairs shed

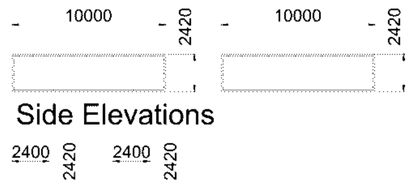
Containers C1, C2, C5, C8, C9, and C13



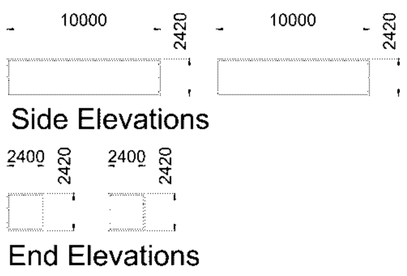
Containers C3, C4, C6, C7 and C8



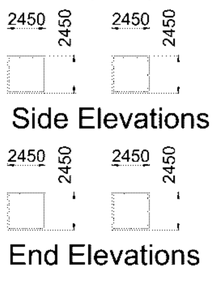
Container C10



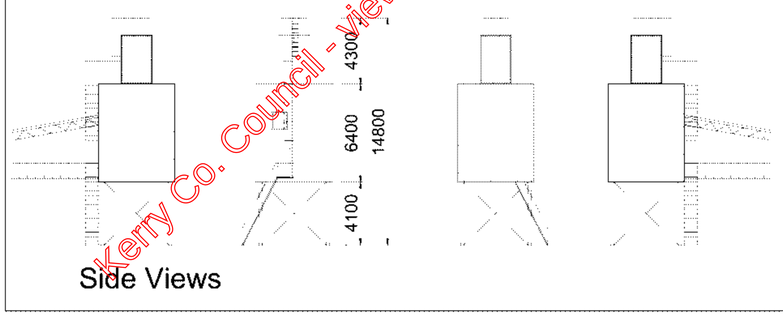
Containers C12 and C13



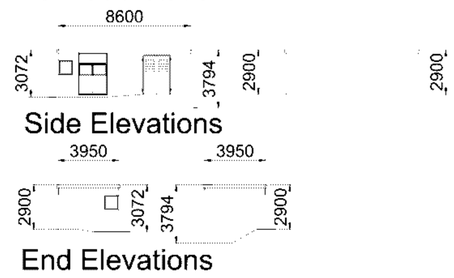
Water pump housing



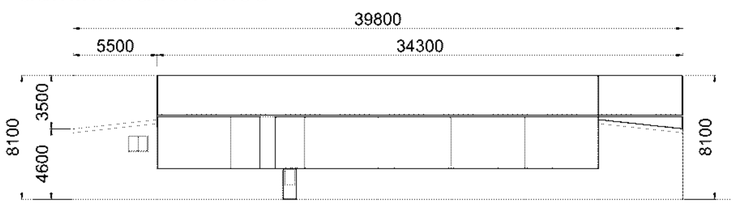
Concrete mixing & loading silo

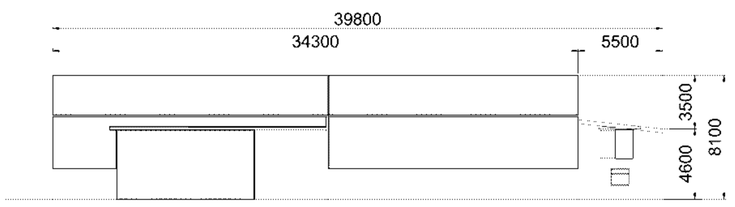


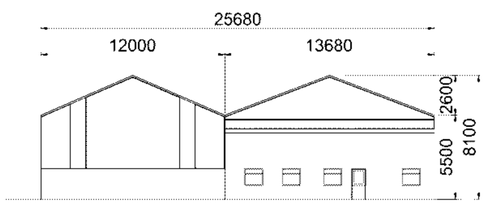
ESB Sub-station

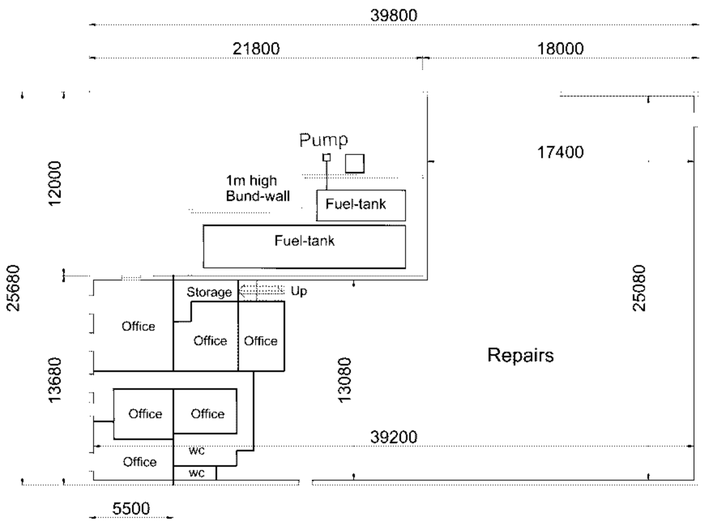


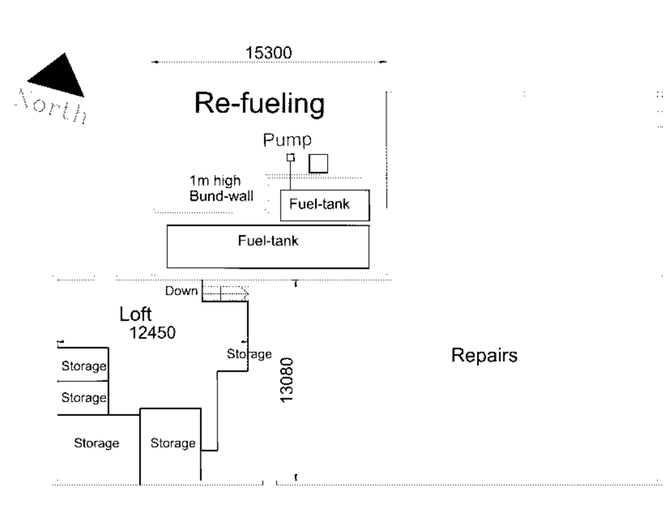
Repairs and administration shed

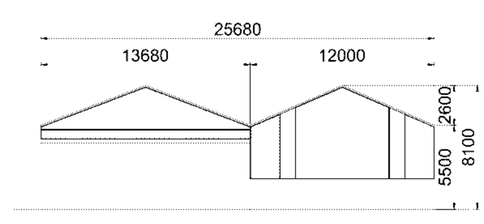










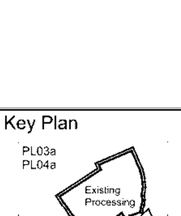


Overall Floor area: 862.7 sq.m

Notes:
1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Michael O'Connor Tech. Dip. Eng. M.I.E.I.
Longfield
Firies
Killarney
Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Key Plan



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- C1 - C13 C1 - C13 Steel containers

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

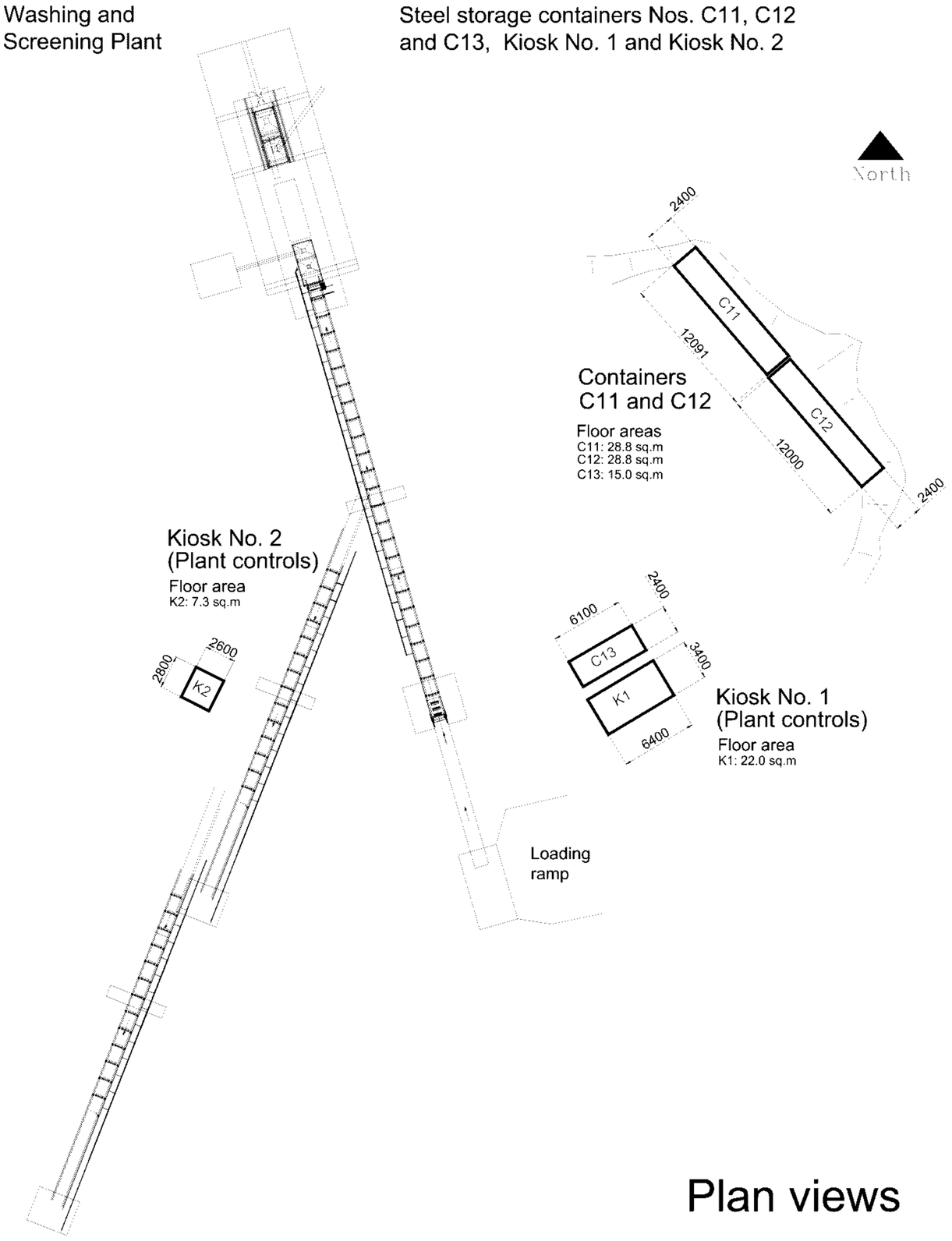
Drawing: Site Structures
(Print A0_scale 1:200)

Scale: 1 : 200
Date: 12/11/2021
Drawn By: moc

Drawing Nr: PL_07a
Rev. No.

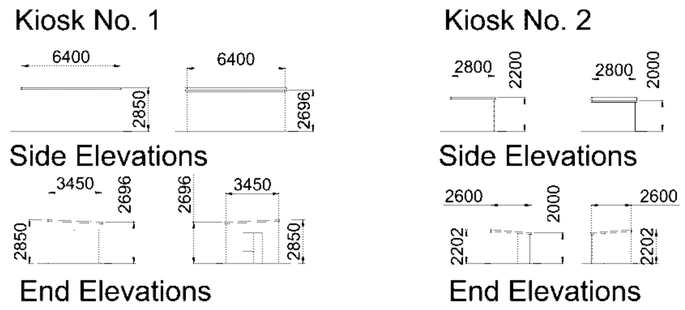
Washing and Screening Plant

Steel storage containers Nos. C11, C12 and C13, Kiosk No. 1 and Kiosk No. 2

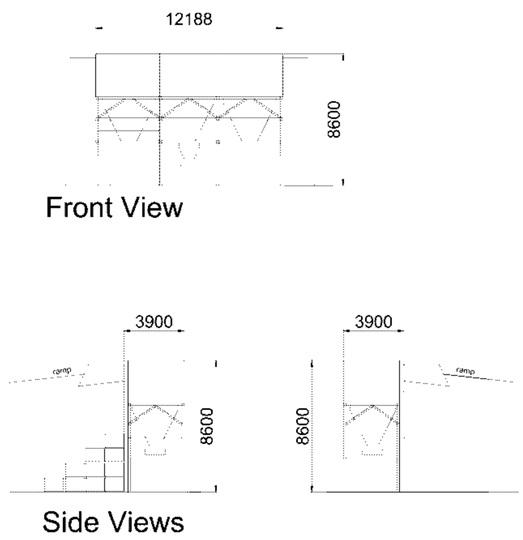


Plan views

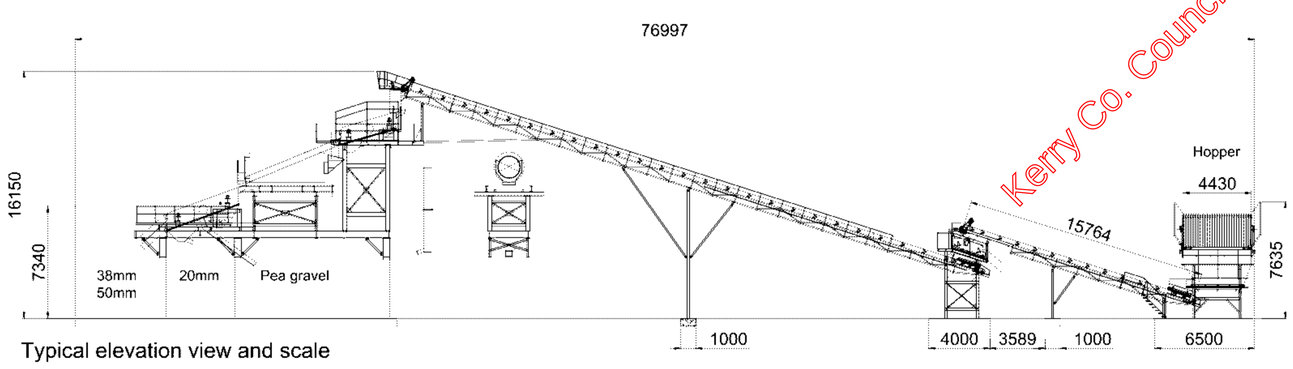
Kiosk No. 1 and Kiosk No. 2



Concrete batching

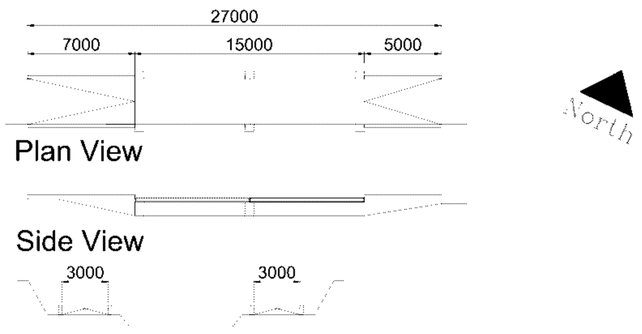


Washing and Screening Plant



Typical elevation view and scale

Weighbridge



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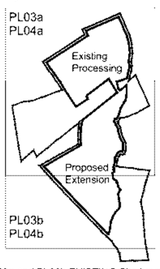
Key Plan



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Rev.	Date	Comment

Client: Michael F. Quirke & Sons

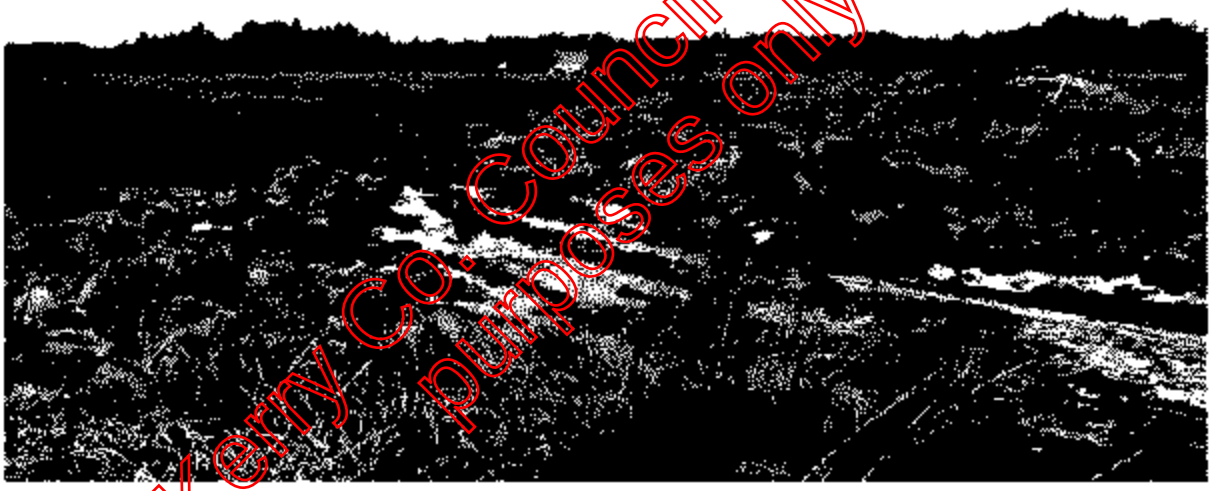
Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Structures
(Print A0_scale 1:200)

Scale: 1 : 200
Date: 12/11/2021
Drawn By: moc
Drawing Nr. PL_07b
Rev. No.

Appendix 3. Site photographs

Photo 1. Peat extraction on edge of lowland blanket bog



Photograph 2. Peat extraction

Photograph 3. Recolonizing wet heath with scrub and fragments of bog woodland

Photograph 4. View from Hen Harrier vantage point A looking north over neighbouring blanket bog towards the survey site.

Photo 5. Peat extraction on the edge of blanket bog

Photo 6. Cutover wet heath with molinia remaining

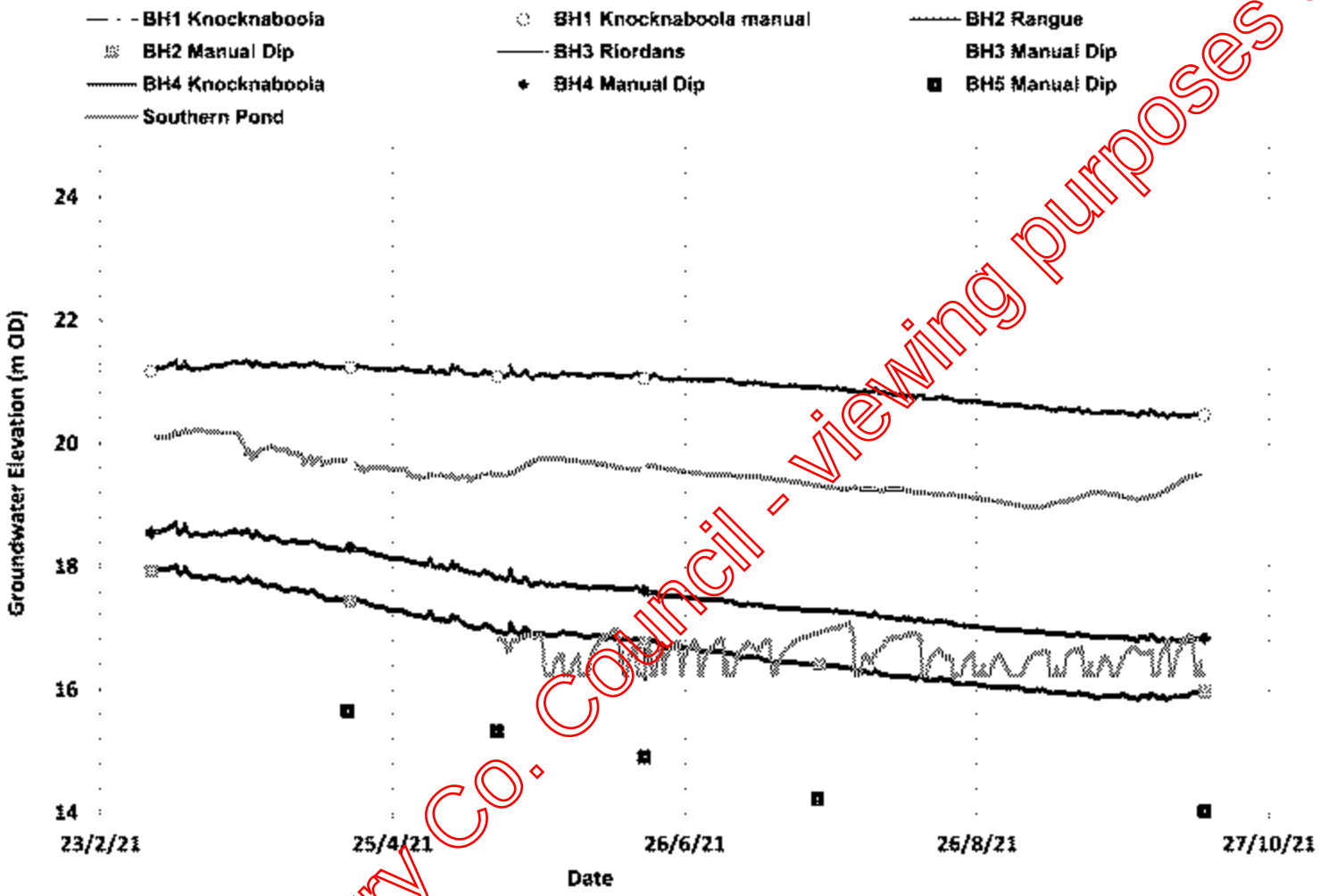
Photo 7. Cutover blanket bog regenerating as wet heath

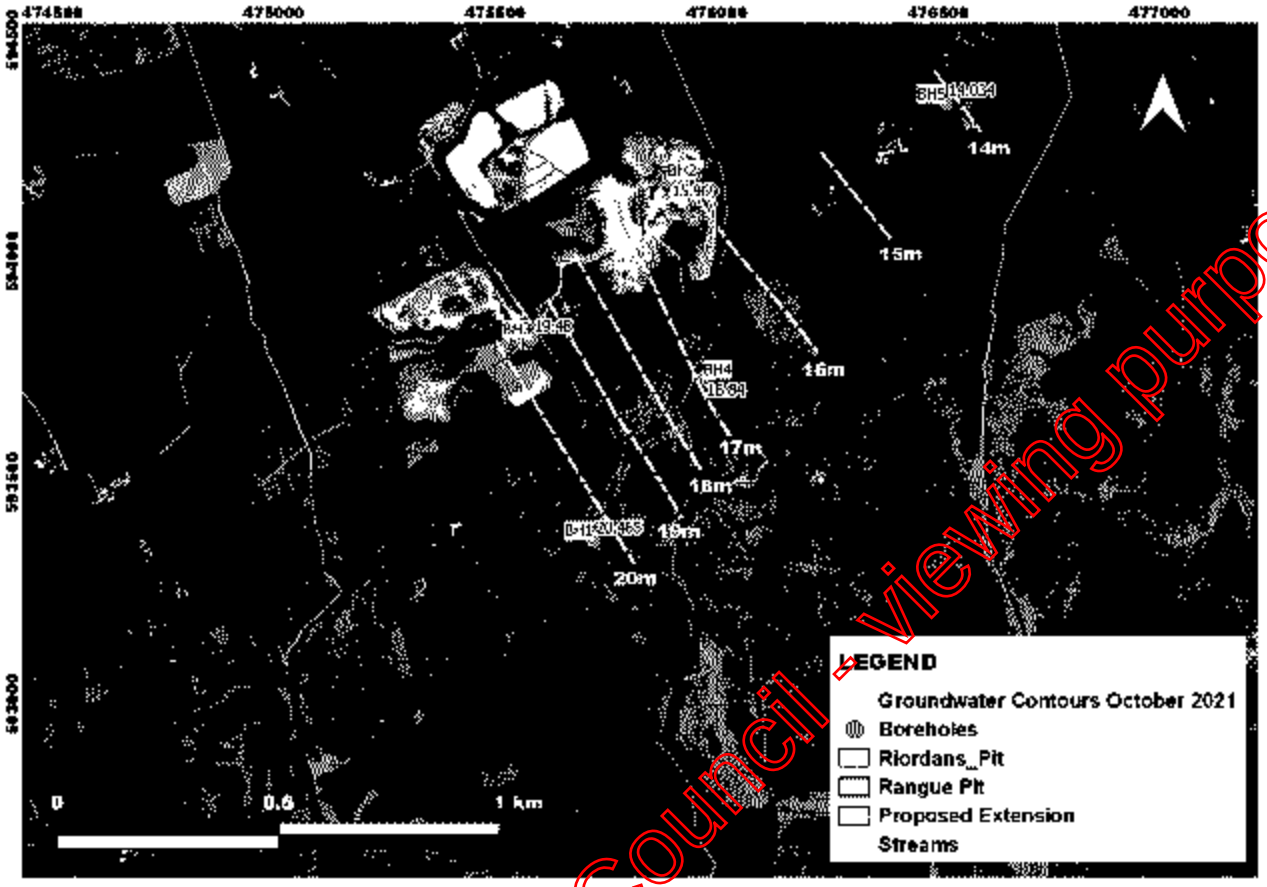
Photo 8. Grassy appearance of intact lowland blanket bog.

Appendix 3. Site Drawings

Appendix 4. Hydrology report

Groundwater Levels, Quirke's Quarry Rangue, March to October 2021





Inferred Groundwater Contours and Groundwater Flow Direction

Appendix 5. Species List

Scientific Name	English Name
Alisma plantago-aquatica	Water Plantain
Alnus glutinosa	Alder
Anagallis arvensis	Scarlett Pimpernel
Angelica sylvestris	Angelica
Bella perennis	Common daisy
Bellis perenne	Daisy
Calluna vulgaris	Heather
Carex binervis	Green Ribbed Sedge
Carex echinata	Star Sedge
Carex panicea	Carnation sedge
Centaurium erythraea	Common Centfary
Coronopus squamatus	Lesser Swine Cress
Crocosmia crocosmiflora	Montbretia
Cynosurus cristatus	Crested Dogs Tail
Dactylorhiza maculata	Heath Spotted Orchid
Drosera rotundifolia	Round Leaved Sundew
Dryopteris filix-mas	Male Fern
Epilobium brunnescens	New Zealand Willowherb
Epilobium montanum	Broad Leaved Willowherb
Equisetum fluviatile	Water Horsetail
Erica cinerea	Bell Heather
Erica tetralix	Cross Leaved Heath
Eriophorum angustifolium	Common Cotton Grass
Festuca vivipara	Viviparous Sheep's-fescue
Filago minima	Small Cudweed
Filipendula ulmaria	Meadow Sweet
Galium saxatile	Heath Bedstraw
Gunnera manicata	Gunnera
Holcus lanatus	Yorkshire Fog

Hypericum tetrapterum	Square-stalked St. John's-wort
Juncus articulatus	Jointed Rush
Juncus effusus	Soft Rush
Juncus squarrosus	Heath Rush
Lolium perenne	Perennial Rye Grass
Lonicera periclymenum	Honeysuckle
Lotus corniculatus	Birds foot trefoil
Lysimachia nemorum	Yellow Pimpernel
Lythrum salicaria	Purple loosestrife
Mentha aquatica	Water Mint
Molinia caerulea	Purple Moor Grass
Myosotis scorpioides	Water Forget me Not
Myrica gale	Bog Myrtle
Narthecium ossifragum	Bog Asphodel
Osmunda regalis	Royal Fern
Parentucellia viscosa	Yellow Bartsia
Pedicularis palustris	Marsh Lousewort
Phalaris arundinacea	Reed Canary Grass
Phragmites australis	Common Reed
Picea sitchensis	Sitka Spruce
Pinus sylvestris	Scots Pine
Plantago lanceolata	Ribwort plantain
Plantago major	Greater plantain
Poa trivialis	Rough Meadow Grass
Polygala serpyllifolia	Heath Milkwort
Potamogeton polygonifolius	Bog Pondweed
Potentilla anserina	Silverweed
Potentilla erecta	Torementil
Prunella vulgaris	Self Heal
Pteridium aquilinum	Bracken

Quercus petraea	Sessile Oak
Ranunculus acris	Meadow Buttercup
Ranunculus flammula	Lesser spearwort
Ranunculus repens	Creeping buttercup
Rhododendron ponticum	RhododendronRhododendron
Rubus fruiticosis	Bramble
Rumex acetosella	Sheep's Sorrel
Sagina apetala	Common Pearlwort
Salix sp.	Willow
Scrophularia auriculata	Water Figwort
Senecio jacobaea	Ragweed
Sonchus oleraceus	Smooth Sow Thistle
Spergula arvensis	Corn Spurrey
Stellaria media	Chickweed
Stellaria media agg.	Chickweed
Succisa pratensis	Devils Bit Scabious
Trichophorum cespitosum	Deer Grass
Trifoilum dubium	Lesser trefoil
Trifolium repens	White clover
Tussilago farfara	Colts Foot
Typha latifolia	Bulrush
Ulex europaeus	European gorse
Ulex gallii	Western Gorse
Vaccinium myrtillus	Bilberry
Veronica beccabunga	Brooklime
Veronica beccabunga	Brooklime
Viola riviniana	Common Dog Violet

Attachment 2

Biodiversity Appendices

Appendix 12.3. NRA 2009 Guidelines

Examples of valuation at different geographical scales

Ecological valuation: Examples
International Importance: • 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation and Proposed Special Protection Area (pSPA). • Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). • Features essential to maintaining the coherence of the Natura 2000 Network.[1] • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations (assessed to be important at the national level) [2] of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. • Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). • Biosphere Reserve (UNESCO Man & The Biosphere Programme). • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). • Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • Biogenetic Reserve under the Council of Europe. • European Diploma Site under the Council of Europe. • Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).[3]
National Importance: • Site designated or proposed as a Natural Heritage Area (NHA). • Statutory Nature Reserve. • Refuge for Fauna and Flora protected under the Wildlife Acts. • National Park. • Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park. • Resident or regularly occurring populations (assessed to be important at the national level)[4] of the following: :. Species protected under the Wildlife Acts; and/or :: Species listed on the relevant Red Data list. • Site containing 'viable areas'[5] of the habitat types listed in Annex I of the Habitats Directive.

Local Importance (higher value):

- **Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP. If this has been prepared;**
- **Resident or regularly occurring populations (assessed to be important at the Local level)[9] of the following:**
  - **Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;**
  - **Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;**
  - **Species protected under the Wildlife Acts; and/or**
  - **Species listed on the relevant Red Data list.**
- **Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;**
- **Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.**

Local Importance (lower value):

- **Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;**
- **Sites or features containing non-native species that are of some importance in maintaining habitat links.**

1 See Articles 3 and 10 of the Habitats Directive.

2 It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle

3 Note that such waters are designated based on their water capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*)

4 It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

5 A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity, in terms of species composition, and ecological processes and function would be maintained in the face of stochastic change (for example, as a result of climatic variation)

6 It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective

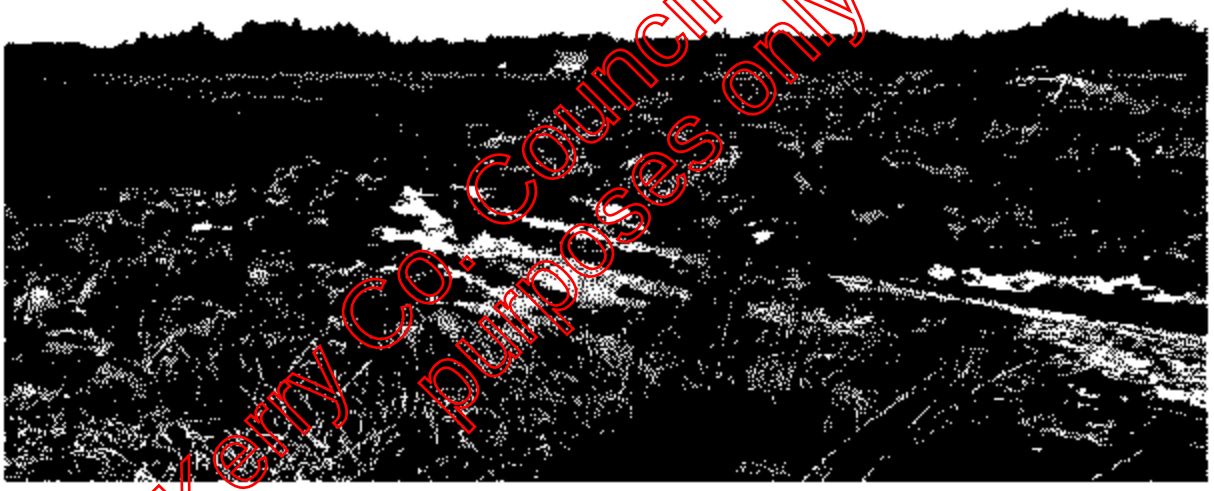
7 It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

8 BAP: Biodiversity Action Plan

9 It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle

Appendix 5.2 Site photographs

Photo 1. Peat extraction on edge of lowland blanket bog



Photograph 2. Peat extraction

Photograph 3. Recolonizing wet heath with scrub and fragments of bog woodland

Photograph 4. View from Hen Harrier vantage point A looking north over neighbouring blanket bog towards the survey site.

Photo 5. Peat extraction on the edge of blanket bog

Photo 6. Cutover wet heath with molinia remaining

Photo 7. Cutover blanket bog regenerating as wet heath

Photo 8. Grassy appearance of intact lowland blanket bog.

Scientific Name	English Name
Alisma plantago-aquatica	Water Plantain
Alnus glutinosa	Alder
Anagallis arvensis	Scarlett Pimpernel
Angelica sylvestris	Angelica
Bella perennis	Common daisy
Bellis perenne	Daisy
Calluna vulgaris	Heather
Carex binervis	Green Ribbed Sedge
Carex echinata	Star Sedge
Carex panicea	Carnation sedge
Centaurium erythraea	Common Centfary
Coronopus squamatus	Lesser Swine Cress
Crocosmia crocosmiflora	Montbretia
Cynosurus cristatus	Crested Dogs Tail
Dactylorhiza maculata	Heath Spotted Orchid
Drosera rotundifolia	Round Leaved Sundew
Dryopteris filix-mas	Male Fern
Epilobium brunnescens	New Zealand Willowherb
Epilobium montanum	Broad Leaved Willowherb
Equisetum fluviatile	Water Horsetail
Erica cinerea	Bell Heather
Erica tetralix	Cross Leaved Heath
Eriophorum angustifolium	Common Cotton Grass
Festuca vivipara	Viviparous Sheep's-fescue
Filago minima	Small Cudweed
Filipendula ulmaria	Meadow Sweet
Galium saxatile	Heath Bedstraw
Gunnera manicata	Gunnera
Holcus lanatus	Yorkshire Fog

Hypericum tetrapterum	Square-stalked St. John's-wort
Juncus articulatus	Jointed Rush
Juncus effusus	Soft Rush
Juncus squarrosus	Heath Rush
Lolium perenne	Perennial Rye Grass
Lonicera periclymenum	Honeysuckle
Lotus corniculatus	Birds foot trefoil
Lysimachia nemorum	Yellow Pimpernel
Lythrum salicaria	Purple loosestrife
Mentha aquatica	Water Mint
Molinia caerulea	Purple Moor Grass
Myosotis scorpioides	Water Forget me Not
Myrica gale	Bog Myrtle
Narthecium ossifragum	Bog Asphodel
Osmunda regalis	Royal Fern
Parentucellia viscosa	Yellow Bartsia
Pedicularis palustris	Marsh Lousewort
Phalaris arundinacea	Reed Canary Grass
Phragmites australis	Common Reed
Picea sitchensis	Sitka Spruce
Pinus sylvestris	Scots Pine
Plantago lanceolata	Ribwort plantain
Plantago major	Greater plantain
Poa trivialis	Rough Meadow Grass
Polygala serpyllifolia	Heath Milkwort
Potamogeton polygonifolius	Bog Pondweed
Potentilla anserina	Silverweed
Potentilla erecta	Torementil
Prunella vulgaris	Self Heal
Pteridium aquilinum	Bracken

Quercus petraea	Sessile Oak
Ranunculus acris	Meadow Buttercup
Ranunculus flammula	Lesser spearwort
Ranunculus repens	Creeping buttercup
Rhododendron ponticum	RhododendronRhododendron
Rubus fruiticosis	Bramble
Rumex acetosella	Sheep's Sorrel
Sagina apetala	Common Pearlwort
Salix sp.	Willow
Scrophularia auriculata	Water Figwort
Senecio jacobaea	Ragweed
Sonchus oleraceus	Smooth Sow Thistle
Spergula arvensis	Corn Spurrey
Stellaria media	Chickweed
Stellaria media agg.	Chickweed
Succisa pratensis	Devils Bit Scabious
Trichophorum cespitosum	Deer Grass
Trifoilum dubium	Lesser trefoil
Trifolium repens	White clover
Tussilago farfara	Colts Foot
Typha latifolia	Bulrush
Ulex europaeus	European gorse
Ulex gallii	Western Gorse
Vaccinium myrtillus	Bilberry
Veronica beccabunga	Brooklime
Veronica beccabunga	Brooklime
Viola riviniana	Common Dog Violet

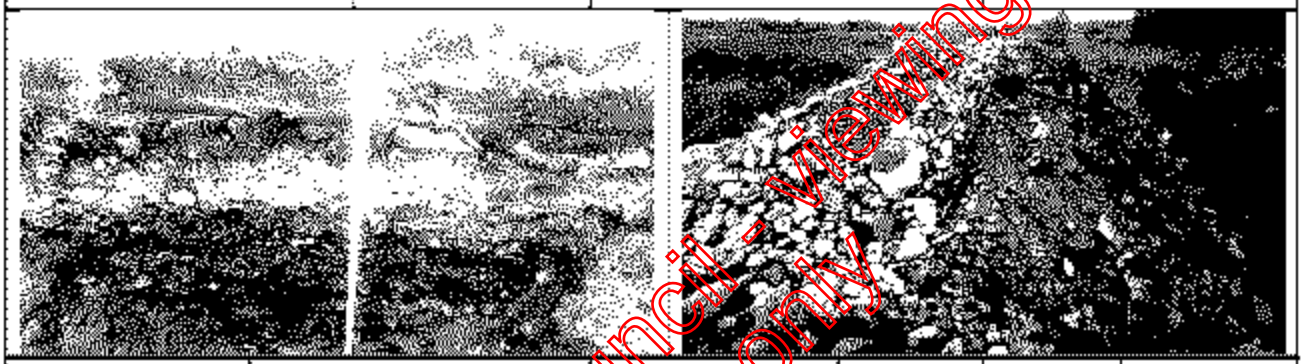
Attachment 3

Land & Water Appendices

Appendices

Appendix A | Test Pit Logs

Trial Hole Number:	TH101	**Date and time of excavation:**	16/6/2021
Depth of trial hole (m)	3.8	**Date and time of examination:**	17/6/2021 16:00
Depth from ground surface to bedrock (m) (if present):	>3.8 (Not Encountered)	**Depth from ground surface to water table (m) (if present):**	>3.8 (Not Encountered)
Co-ordinates (ITM):	475892.7, 593294.6		



Depth below ground surface (m) to the nearest 0.1m	Soil/Subsoil Structure & Classification**	Results of Thread, Ribbon and Dilatancy tests	Density/ Compactness	Colour	Preferential flowpaths
0-0.8	Fibrous PEAT	N/A	Soft	Brown/ Black	None
0.8-1.2	Compact clayey silty FINE SAND	Threads: 1,2,1 Ribbons:10,5,10 Dilatancy Uncertain	Very Compact/Dense	Grey/ Brown	None
1.2-2.6	Coarse GRAVEL in fine cement matrix	Threads: 0 Ribbons:0 Not Dilatant	Very Compact	Red Brown	None
2.6-3.8	Clayey sandy GRAVEL (low permeability)	Threads: 0 Ribbons:0 Not Dilatant	Dense	Brownish Grey	None
3.8	End of Trial Hole				

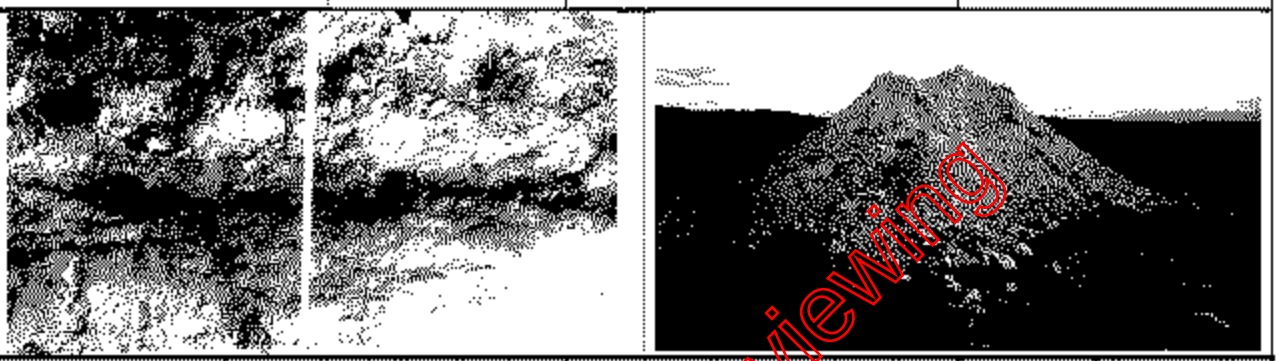
Other information (where relevant)

Depth of water ingress:	Rock Type if present	
Not encountered	Not encountered	

EVALUATION:

- Sand and gravel is dense and well cemented; permeability of the subsoil material is low.
- Some seepage of water into the trial hole from 3.4m

Trial Hole Number:	TH102	**Date and time of excavation:**	16/6/2021
Depth of trial hole (m)	3.1	**Date and time of examination:**	17/6/2021 14:00
Depth from ground surface to bedrock (m) (if present):	>2.7 (Not Encountered)	**Depth from ground surface to water table (m) (if present):**	>2.7 (Not Encountered)
Co-ordinates (ITM):	475737.7, 593368.6		



Depth below ground surface (m) to the nearest 0.1m	Soil/Subsoil Structure & Classification**	Results of Thread, Ribbon and Dilatancy tests	Density/ Compactness	Colour	Preferential flowpaths
0-0.1	PEAT	N/A	Soft	Black	None
0.1-0.7	Fine silty clayey SAND (low permeability)	Threads: 1,2,1 Ribbons:0 Dilatant	Dense/ Compact	Red/ Brown	None
0.7-1.6	Clayey GRAVEL with cobbles and boulders. Iron pan at base. Damp at base.	Threads: 1,2,2 Ribbons:0 Dilatant	Dense	Light Brown	None
1.6-2.7	Fine sandy GRAVEL with rounded cobbles and occasional boulders	Threads. 0 Ribbons:0 Dilatant	Loose	White to light brown	None
2.7	End of Trial Hole				

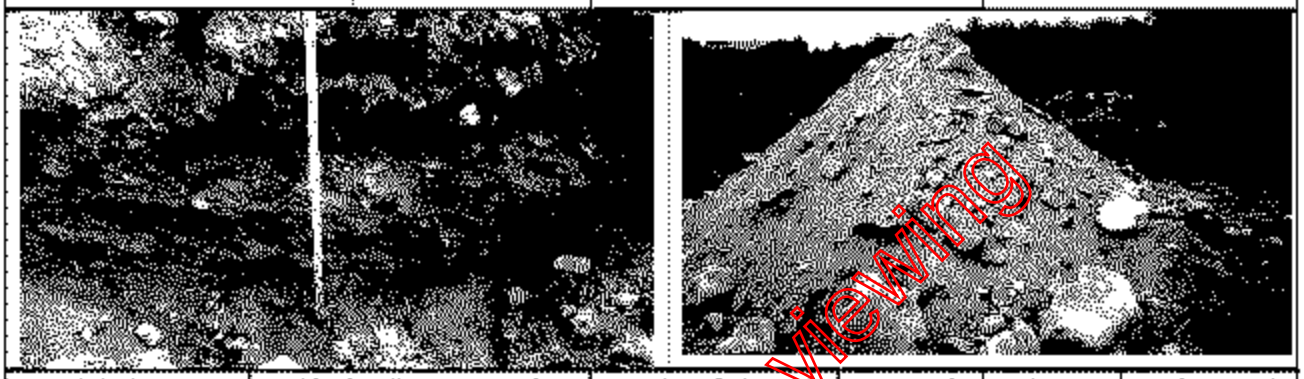
Other information (where relevant)

Depth of water ingress:	Rock Type if present	
Not encountered	Not encountered	

EVALUATION:

- Upper subsoil layers are poorly drained with low permeability
- Iron pan developed at 0.7m
- Perched water seeps over iron pan into gravel beneath
- Sand and gravel is well drained below 1.6m.

Trial Hole Number:	TH103	**Date and time of excavation:**	16/6/2021
Depth of trial hole (m)	2.7	**Date and time of examination:**	17/6/2021 13:30
Depth from ground surface to bedrock (m) (if present):	>2.7 (Not Encountered)	**Depth from ground surface to water table (m) (if present):**	>2.7 (Not Encountered)
Co-ordinates (ITM):	475627.9, 593460.9		



Depth below ground surface (m) to the nearest 0.1m	Soil/Subsoil Structure & Classification**	Results of Thread, Ribbon and Dilatancy tests	Density/ Compactness	Colour	Preferential flowpaths
0-0.1	PEAT	N/A	Soft	Dark Brown/ Black	None
0.1-0.8	Clayey silty fine SAND (Low permeability)	Threads: 1,1,1 Ribbons:0 Dilatant	Very compact/ Dense	Red Brown	None
0.8-0.9	Iron pan	N/A	Hard	Red/ Brown	None
0.9-2.4	Coarse GRAVEL with cobbles in cemented fine clayey sand matrix. Cross cut with loose coarse sandy gravel.	Threads: 1,2,1 Ribbons:0 Dilatant	Compact/Dense	Grey/ White	None
2.4-2.7	Fine SAND with cobbles	Threads: 0 Ribbons:0 Dilatant	Loose	Grey/ White	None
2.7	End of Trial Hole				

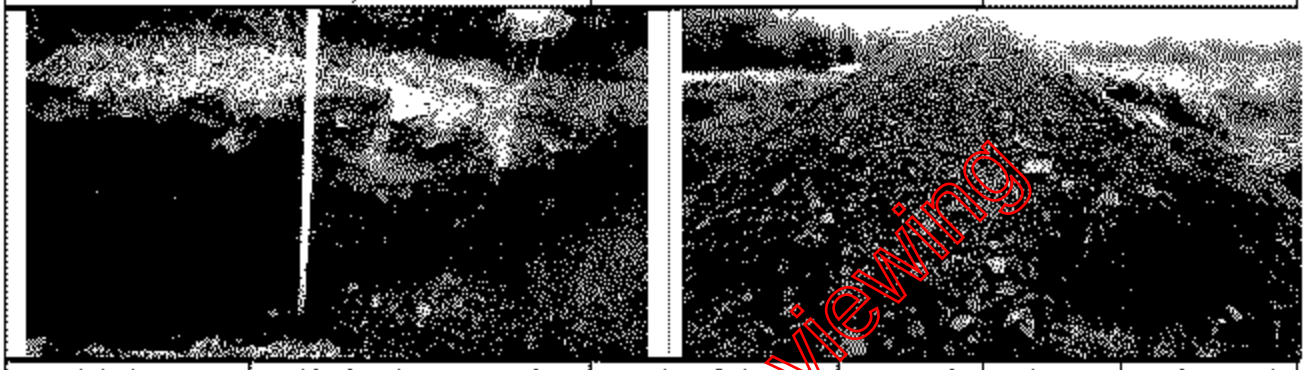
Other information (where relevant)

Depth of water ingress:	Rock Type if present	
Not encountered	Not encountered	

EVALUATION:

- Subsoil above and below iron pan is poorly drained with low permeability
- Loose sand encountered from 2.4m is free draining.

Trial Hole Number:	TH104	**Date and time of excavation:**	16/6/2021
Depth of trial hole (m)	3.0	**Date and time of examination:**	17/6/2021 12:30
Depth from ground surface to bedrock (m) (if present):	>3.0 (Not Encountered)	**Depth from ground surface to water table (m) (if present):**	>3.0
Co-ordinates (ITM):	475826.2, 593739.3		



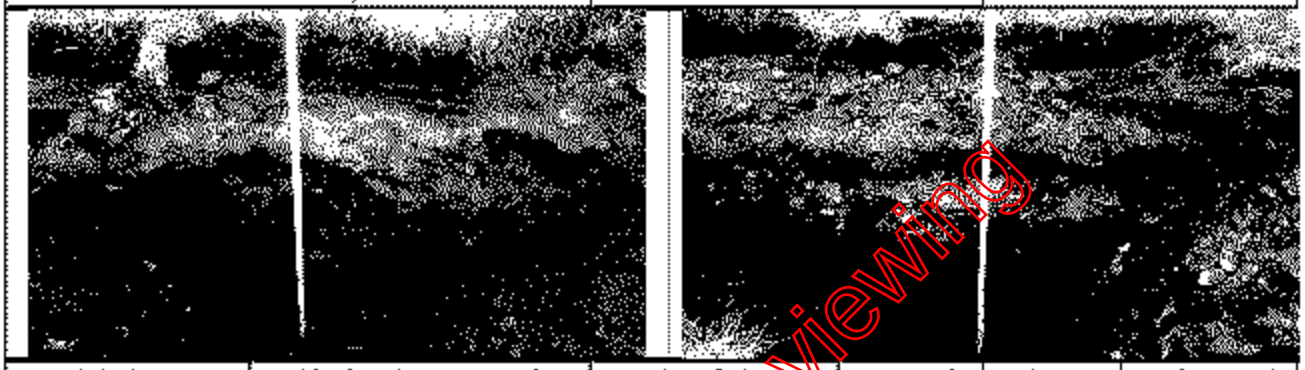
Depth below ground surface (m) to the nearest 0.1m	Soil/Subsoil Structure & Classification**	Results of Thread, Ribbon and Dilatancy tests	Density/ Compactness	Colour	Preferential flowpaths
0-0.3	Fibrous PEAT	N/A	Soft	Black	None
0.3-0.7	Clayey silty fine SAND	Threads: 1,2,1 Ribbons:0 Dilatant	Compact/ Dense	Grey/ Brown	None
0.7-1.2	IRON PAN including gravel clasts in iron cement matrix	Threads: 0,0,0 Ribbons:0 Not Dilatant	Very hard and compact	Red/ Brown	None
1.2-3.0	Coarse SAND and GRAVEL with cobbles	Threads: 0,0,0 Ribbons:0 Dilatant	Loose	Reddish Brown	None
3.0	End of Trial Hole				

Other information (where relevant)		
Depth of water ingress:	Rock Type if present	
0.7m	Not encountered	

EVALUATION:

- Upper subsoil layers are compact and have low permeability.
- Seepage of water from above iron pan into trial hole.
- Sand and gravel subsoil from 1.2m is well draining.

Trial Hole Number:	TH105	**Date and time of excavation:**	16/6/2021
Depth of trial hole (m)	2.8	**Date and time of examination:**	17/6/2021 13:00
Depth from ground surface to bedrock (m) (if present):	>2.8 (Not Encountered)	**Depth from ground surface to water table (m) (if present):**	>2.8 (Not Encountered)
Co-ordinates (ITM):	475887.7, 593521.0		



Depth below ground surface (m) to the nearest 0.1m	Soil/Subsoil Structure & Classification**	Results of Thread, Ribbon and Dilatancy tests	Density/ Compactness	Colour	Preferential flowpaths
0-0.4	Fibrous PEAT	N/A	Soft	Black/ Brown	None
0.4-0.8	Clayey silty fine SAND	Threads: 1-0.1 Ribbons:0 Dilatant	Very Compact/ Dense	Grey/ Brown	None
0.8-0.85	IRON PAN	N/A	Very Hard	Reddish Brown	None
0.85-1.7	Clayey sandy GRAVEL with cobbles	Threads: 0 Ribbons:0 Dilatant	Very Compact/ Dense	Black to dark red	None
1.7-2.8	Coarse GRAVEL with cobbles and occasional boulders	Threads: 0 Ribbons:0 Dilatant	Loose	Red stained	None
2.8	End of Trial Hole at 2.8m				

Other information (where relevant)

Depth of water ingress:	Rock Type if present	
Not encountered	Not encountered	

EVALUATION:

- Upper subsoil layers are compact and have low permeability.
- Seepage of water from above iron pan into trial hole.
- Sand and gravel subsoil from 1.7 m is well draining.

DAILY REPORT

HILLIARD CONTRACTS

ANCHOR/PILING
GROUND ENGINEERING
Listowel, Co. Kerry Ireland
Telephone: 068 21197 · Fax: 068 22476
Email: info@hilliard.ie · www.hilliard.ie

Customer [redacted] QUIRKE & SONS

Address

Site KNOCKANA

Hole No. 4

D 5777

District

Bore Diameter 165 mm

Hor Comp

Commenced

Reinforcement

Vert Comp.

Completed

Logged by

Drill RC 61

Objectives MONITORING WELL

Date 22-04-19

Pile/ Anchor No.	Depth to Rock	Length of Casing	Overall Depth	Other Remarks
1 hole			13.00m	0.00 → 9.00 boulders, gravel
				9.00m → 13.00 gravel, sand
				13.00m → 14.00m sand
				14.00 → 15.00 sandy gravel
				Install PVC blank pipe
				1.00m → 13.00m slotted pipe
				13.00m → 0.00m plain pipe
				12.00m → 13.00m gravel
				13.00m → 12.00m bentonite
				12.00m → 1.00m back fill
				1.00m → 0.30m bentonite
				0.30m → 0.00m cement
				1.00m yealow peg steel cover
				Water from 13.00m

Agents Copy
Agent or Foremans Signature

Drillers Signature

Borehole Log for BH4, Knocknaboola

DAILY REPORT

HILLIARD CONTRACTS

ANCHOR/PILING
GROUND ENGINEERING

Listowel, Co. Kerry, Ireland
Telephone: 068 21837 • Fax: 068 22476
E-mail: info@hilliard.ie • www.hilliard.ie

Customer: Mr Quirke & Sons

Address:

Site: Knocknaboola

Folio No.: 5

D 5778

District:

Bore Diameter: 168 mm

Hor Comp:

Commenced:

Reinforcement:

Vert Comp:

Completed:

Logged by:

Drill: KL - 41

Objectives: Rotary Drilling Well

Date: 23.03.15

Pile/ Anchor No.	Depth to Rock	Length of Casing	Overall Depth	Other Remarks
				Rig move time from first hole to second 08:30 start
Hole 2			17.5m	0.00m → 4.00m boulders, gravel, sand
				4.00m → 17.50m sandy gravel
				Water from 15.00m
				Install 6m blank pipe 15.00m
				15.50m → 13.50m slotted pipe
				13.50m → 12.00m plain pipe
				17.50m → 13.00m gravel
				13.00m → 12.00m bentonite
				12.00m → 1.00m back fill
				1.00m → 0.50m bentonite
				0.50m → 0.00m cement
				1.00m yellow steel cover
				From 15:30 → 12:30 moving time from hole 2 to hole 3 is to Quarry

Agents Copy
Agent or Foremans Signature

Drillers Signature

Borehole Log for BH1, Knocknaboola

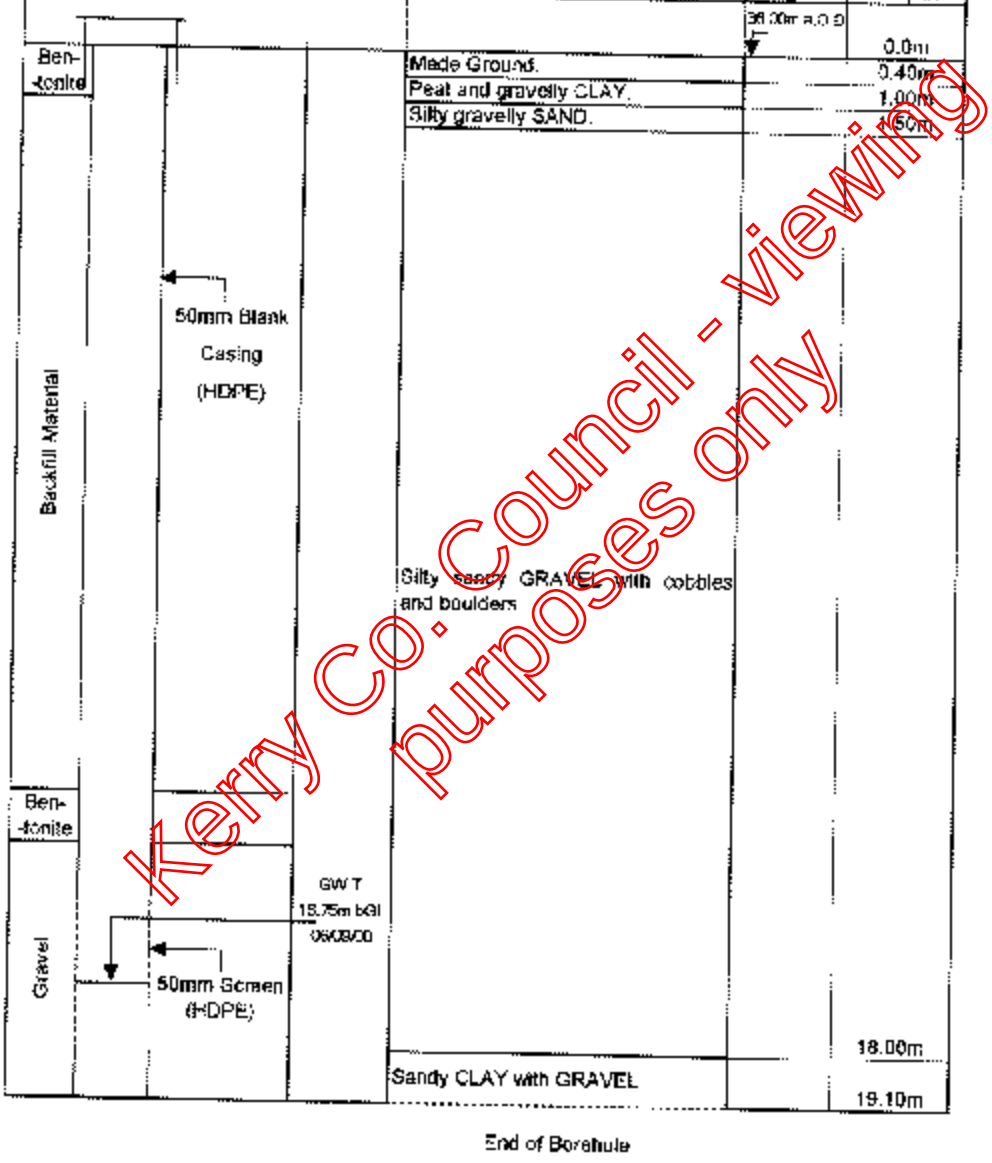
Description of Borehole 2, EDA, 2002

Borehole BH 2 was drilled in the east central part of the pit (Figure 2). The borehole collared into the lower unit (of the pit section) which is described as a dense, silty gravelly sand. Here, this unit is 6m thick. This unit is underlain by at least 2.5m of dense sandy gravel. The particle size analysis (Appendix 4) shows the difference between the silty gravely sand and the sandy gravel. The former is less well sorted and contains 25% of material less than 0.06mm (fine sand grade).

Rangue Quarry, Killorglin, Co Kerry.

EUGENE DALY ASSOCIATES
The Old Cottage,
Drummin Lane,
Glen of the Downs,
Co. Wicklow.
Tel: 01 2876319
Fax: 01 2872645

Borehole No.: R1, Riordan's site
Client: E.G. Petit & Co.
Project: Rangue Quarry
Location: Rangue, Killorglin, Co Kerry.
Start Date: 01/VIII/00 **Completed:** 02/VIII/00
Driller: Hillards
Elevation: 36.00 m a.O.D.
Method Used: Rotary Rig



Boreholes Logs R1

27/09/00 17:42

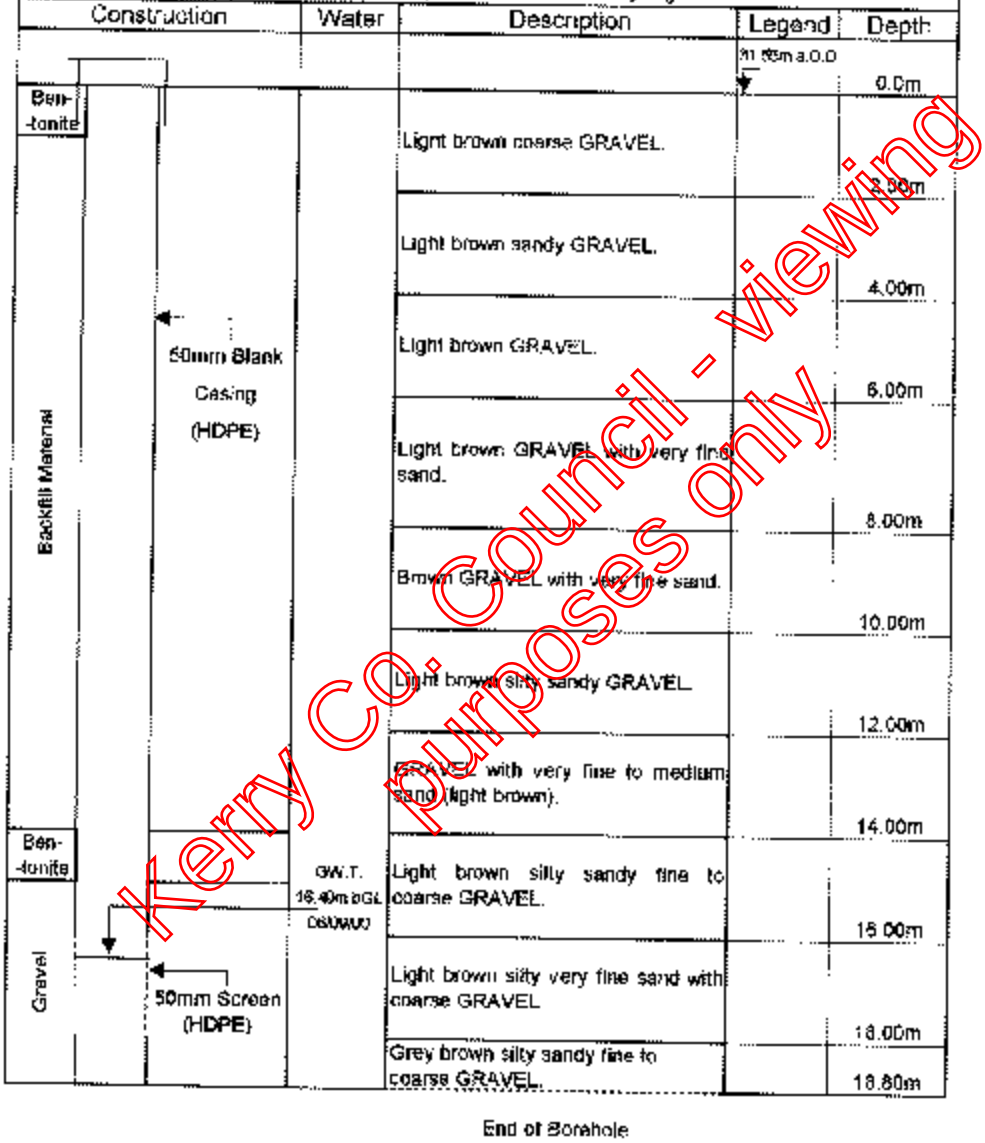
Original Log for Borehole 3 at Riordans

Rangue Quarry, Killorglin, Co Kerry.

EUGENE DALY ASSOCIATES
The Old Cottage,
Drummin Lane,
Glen of the Downs,
Co. Wicklow.

Tel: 01 2876319
Fax: 01 2872645

Borehole No.: R2. Home site
Client: E.G. Pettit & Co.
Project: Rangue Quarry
Location: Rangue, Killorglin, Co Kerry.
Start Date: 03/VIII/00 **Completed:** 03/VIII/00
Driller: Hilliards
Elevation: 31.55m a.O.D.
Method Used: Rotary Rig

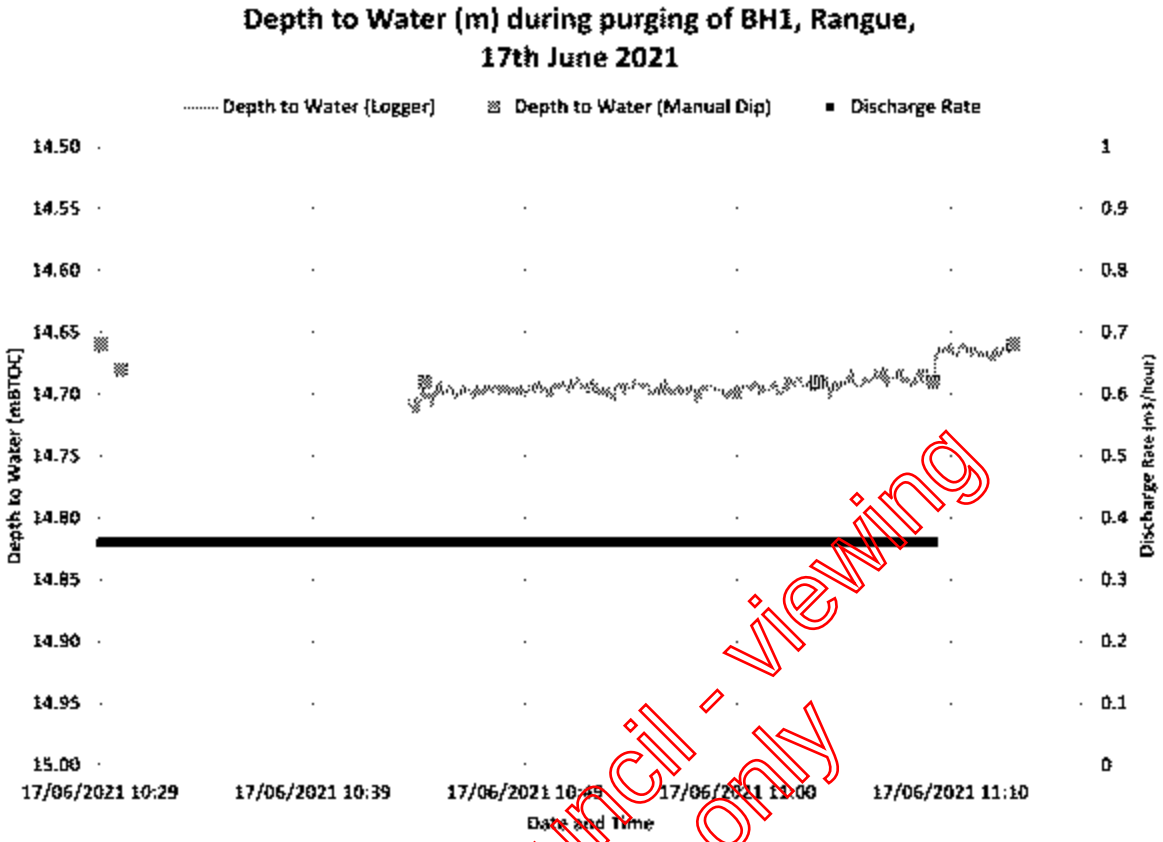


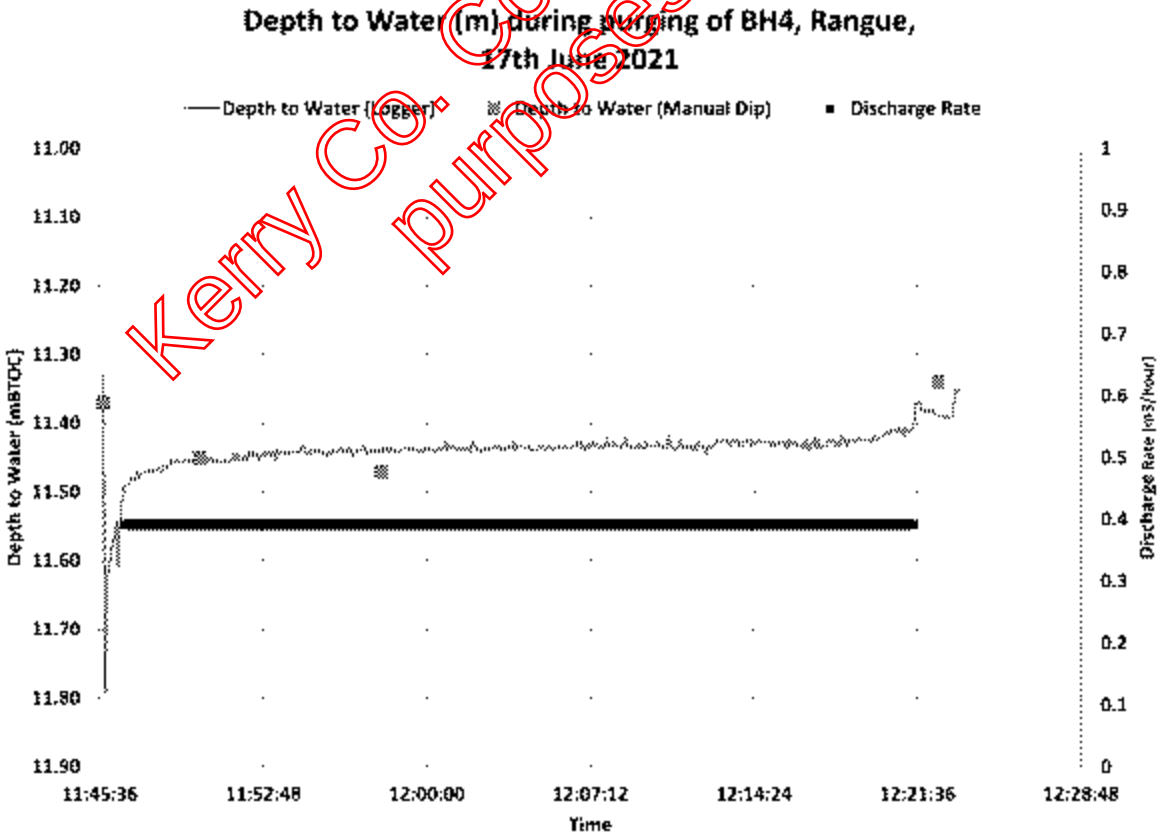
End of Borehole

Boreholes Logs R2

27/09/00 17:42

Original Log for Borehole 5, Home Site.





Borehole 1 Rising Head Test

Static Water Level = **14.66**

Elapsed Time (s)	Depth to Water (m)	Drawdown 's' (m)	s'/s max	Change in Water Level h (m)	h/h_0
0.00	14.69	0.0306	1.00	-0.03	1.00
5.00	14.67	0.0091	0.30	-0.01	0.30
10.00	14.67	0.0091	0.30	-0.01	0.30
15.00	14.66	0.0019	0.06	0.00	0.06
20.00	14.66	0.0019	0.06	0.00	0.06
25.00	14.67	0.0055	0.18	-0.01	0.18
30.00	14.67	0.0055	0.18	-0.01	0.18
35.00	14.66	0.0019	0.06	0.00	0.06
40.00	14.66	0.0019	0.06	0.00	0.06
45.00	14.67	0.0055	0.18	-0.01	0.18
50.00	14.66	-0.0015	-0.05	0.00	-0.05
55.00	14.67	0.0056	0.18	-0.01	0.18
60.00	14.67	0.0092	0.30	-0.01	0.30
65.00	14.67	0.0092	0.30	-0.01	0.30
70.00	14.67	0.0092	0.30	-0.01	0.30
75.00	14.66	0.002	0.07	0.00	0.07
80.00	14.66	0.002	0.07	0.00	0.07
85.00	14.66	0.002	0.07	0.00	0.07

t37 = 3

r = 0.054 m

R = 0.168 m

Le = 4 m

K = r2ln(Le/R)/2Let37

= 3.852E-04 m/s

33.278 m/day

K is the permeability

r_c is the radius of the well casing

Le is the length of the screen

R is the effective radius of the borehole including the gravel pack

And t_{37} is the time when 63% of the recovery is found

(or when change in head/head at the start when t is 0 = $\Delta h/\Delta h0 = 0.37$)

Borehole 4 Rising Head Test

Static Water Level = 11.37

Elapsed Time (s)	Depth to Water (m)	Drawdown 's' (m)	s'/s max	Change in Water Level h (m)	h/h_0
0	11.41	0.0359	1.00	-0.04	1.00
5	11.37	0	0.00	0.00	0.00
10	11.37	0	0.00	0.00	0.00
15	11.37	0	0.00	0.00	0.00
20	11.37	0.0036	0.10	0.00	0.10
25	11.38	0.0144	0.40	-0.01	0.40
30	11.38	0.0108	0.30	-0.01	0.30
35	11.38	0.0144	0.40	-0.01	0.40
40	11.38	0.0108	0.30	-0.01	0.30
45	11.38	0.0144	0.40	-0.01	0.40
50	11.38	0.0108	0.30	-0.01	0.30
55	11.38	0.0144	0.40	-0.01	0.40
60	11.39	0.0179	0.50	-0.02	0.50
65	11.39	0.0179	0.50	-0.02	0.50
70	11.39	0.0179	0.50	-0.02	0.50
75	11.39	0.0179	0.50	-0.02	0.50
80	11.39	0.0215	0.60	-0.02	0.60
85	11.39	0.0179	0.50	-0.02	0.50
90	11.39	0.0215	0.60	-0.02	0.60
95	11.39	0.0216	0.60	-0.02	0.60
100	11.39	0.0216	0.60	-0.02	0.60
105	11.39	0.018	0.50	-0.02	0.50
110	11.35	-0.0214	-0.60	0.02	-0.60
115	11.36	-0.0142	-0.40	0.01	-0.40
120	11.35	-0.0178	-0.50	0.02	-0.50

t37 = 1

r = 0.054 m

R = 0.168 m

Le = 4 m

K = r2ln(Le/R)/2Let37

= 1.155E-03 m/s

99.835 m/day

K is the permeability

r is the radius of the well casing

Le is the length of the screen

R is the effective radius of the borehole including the gravel pack

The average annual rainfall in the Killorglin area is approximately 1,439mm (Dooks, Glenbeigh). Potential runoff it obtained by taking the rainfall over the area and subtracting the actual evapotranspiration/evapotranspiration (AE) from the different types of surface.

Rangue Pit

Actual Evapotranspiration (AE): there are three types of ground surface with their own level of AE. The proportional areas calculated in Table A are approximate.

The area of bare subsoil includes the stockpiles of materials.

The combined actual evaporation/evapotranspiration (AE) is equal to 347.31 mm/year.

Therefore, potential recharge is 1439 – 347.31 = 1,092 mm/year. Over an area of 18.51 Ha, this equates to 202,017 m^3/year.

The predicted average extraction rate over the next 20 years is 100,000 tonnes/year. Assuming a water content of 10 litres per tonne, gives a total export volume of 1000 m^3/year from the pit.

Therefore, it is estimated that a total of 200,884 m^3/year, which is equivalent to 6.37 litres per second, will runoff to the ponds at Rangue

The following are ignored in these calculations:

- Upward seepage of groundwater into the ponds in winter.

Knocknaboola Extension

There are 5 phases of development associated with the proposed extension at Knocknaboola:

- Phase 1: Excavation of sand and gravel from 1.35 Ha
- Phase 2: Excavation of sand and gravel from 3.35Ha
- Phase 3: Excavation of sand and gravel from 3.02 Ha
- Phase 4: Excavation of sand and gravel from 4.85 Ha
- Phase 5: Excavation of sand and gravel from 3.97 Ha

It is assumed that continual re-instatement will take place. Therefore, as a new phase is developed, the completed phase will be reinstated.

Therefore, the phased development will lead to an increase in percolation to groundwater of 0.56 litres per second during phase 1, 1.47 litres per second during phase 2, 1.25 litres per second during phase 3, 2.0 litres per second during phase 4, and 1.64 litres per second during phase 5.

Table A: Water Budget Calculations for Rangue Pit

Surface	Area (Ha)	% of Pit	Actual Evapotranspiration (mm/year)	Combined AE (mm/year)	Rainfall[1] (mm/year)	Potential Rainfall Recharge (mm/year)	Potential Rainfall Recharge (m3/year)	Outflow via Sand exported from site (m3/year)	Potential Runoff (l/s)
Open Water	3.87	20.91	754.28						
Vegetated	4.87	26.32	519.80						
Bare Subsoil & Low Permeability Surface	9.77	52.77	100.00	347.31	1439	1092	202,017	2,400	6.33
Total Area	18.51								

[1] Met Data from Dooks, Glenbeigh

Table B: Water Budget Calculations for Knocknaboola Extension

	Area (Ha)	Rainfall[1] (mm/year)	Vegetated Actual Evapotranspiration[2] (mm/year)	Vegetated Effective Rainfall (mm/year)	Potential Recharge[3] (%)	Vegatated Recharge (l/s)	Bare Subsoil Actual Evapotranspiration[4] (mm/year)	Bare Subsoil Effective Rainfall (mm/year)	Bare Subsoil Recharge (l/s)	Increased Recharge (l/s)
Phase 1	1.36					0.02			0.58	0.56
Phase 2	3.55					0.04			1.51	1.47
Phase 3	3.02	1439	519.8	919.2	4	0.04	100	1339	1.28	1.25
Phase 4	4.85					0.06			2.06	2.00
Phase 5	3.97					0.05			1.69	1.64
Total	16.75					0.20			7.11	6.92

[1] Met Data from Dooks, Glenbeigh

[2] Met Data from Valentia Observatory

[3] GSI

[4] Estimate

Hydrogeological Setting: Moderate vulnerability Sand and Gravel subsoil overlain by Peat

Appendix 7.5 Site Characterisation Report

Mr. Conor Quirke,
M.F. Quirke and Sons
Rangue,
Killorglin,
Co. Kerry

Kilcosgriff,
Shanagolden,
Co. Limerick.
Republic of Ireland.
Tel: 087 2823877
Email: info@parkmore.ie

Parkmore Ref: C001986

11th November 2021

Re: Site Characterisation Assessment at existing quarry pit at Rangue, Killorglin, Co. Kerry

Dear Conor,

Please find attached a copy of the site suitability assessment form for the existing pit at Rangue. The site has been tested in accordance with the EPA Code of Practice (CoP) 2021. The site characterisation report is presented in Appendix 1.

Environmental Setting

The existing pit at Rangue has been operated as a quarry by the current owners for the past 40 years. It is in a rural setting approximately 2.7km southwest of Killorglin, Co. Kerry. The existing pit covers an area of 20.20 Ha. I understand you are looking for permission from Kerry County Council to extend the quarry. The existing pit is to be retained as a quarry processing facility, to process aggregate extracted from the proposed extension at Rangue and Knocknaboola. The existing pit is bound by a minor road to the southwest, a field, dwelling house and the Glannagilliagh road to the southeast, a small stream called the Glashacoomnafanida stream to the east, agricultural grass land to the north and northeast, and a Roadstone gravel pit to the northwest.

According to Teagasc subsoil mapping, shallow, rocky, peaty/non-peaty mineral complexes are present beneath the site. Subsoils are derived from Devonian Sandstones. The sand and gravel pit is located within a zone of high groundwater vulnerability. Bedrock underlying the site is mapped by the Geological Survey of Ireland as being part of the Dinantian Limestone Formation. This bedrock is classified as a regionally important karstified aquifer, with diffuse groundwater flow (Rkd). Vulnerability, Aquifer Classification, Soil, Subsoil and Bedrock maps are presented in Appendix 2.

The nearest surface water body to the site is the Glashacoomnafanida stream, which flows in a northerly direction, along the eastern boundary of the quarry lands. The Glashancoomnafanida stream is the receiving water body to which the quarry has a licence to discharge trade effluent (Licence No: W61).

Wastewater Design Calculations

According to Mr. Conor Quirke, Quarry Manager, there will be a maximum of 16 full time staff working at the quarry, and it is conservatively assumed up to 4 hauliers or visitors will use the toilets in any given day. According to Table 3, EPA 1999, in a factory environment without a canteen[1], a staff member will generate 30 litres wastewater per day and 20 grams BOD_5 per day. This equates to a design flow of 520 litres wastewater per day (the design flow for a single house averages 900 litres per day). The maximum hydraulic population equivalent (PE) of the quarry development is 3.5, and the maximum organic PE is 6. Therefore, the wastewater treatment system will need to cater for a maximum PE of 6, while the percolation area/polishing filter will need to cater for a PE of 3.5. Design wastewater loading calculations are presented in Table 1.

Table 1. Waste water loadings

Occupancy Breakdown	Staff	Litres/person /day	Total Litres	Grams BOD/ person/day	Total Grams BOD/Day
Full Time Stafff	16	30	480	20	320
Hauliers/Visitors	4	10	40	10	40
Total			**520**		**360**
Population Equivalent (PE)			**3.5**		**6.0**

Adult Hydraulic PE @ 150 l/p/d

Adult Organic PE @ 60g BOD/p/d

Groundwater Protection Response

The groundwater response rating for the site is R2[1], meaning the site is suitable for the development of an onsite treatment system such as a septic tank, subject to normal good practice (i.e. system selection, construction, operation and maintenance in accordance with EPA (2021)). Where domestic water supplies are located nearby, particular attention should be given to the depth of subsoil over Groundwater is potential target at risk.

Existing Wastewater Treatment System

The existing wastewater treatment system consists of a septic tank and possible soak pit. The tank and soak pit are not constructed in accordance with the EPA CoP, 2021 and will need to be replaced.

Site Suitability Assessment

Site suitability assessment investigation work (percolation testing) was completed by PES between the 18th June and the 11th August 2021. This work involved excavation of one trial hole on the 18th June 2021 to investigate the nature and thickness of subsoil, and the depth to bedrock and/or the water table beneath the site; and three surface and three subsurface percolation test holes to establish the hydraulic

[1] The "canteen" on site is an room to eat sandwiches, and is not a "canteen" as defined by the EPA (i.e. a kitchen which serves hot food for staff).

assimilative capacity of the subsoil beneath the site in order to determine the suitability of the site to discharge treated wastewater effluent to ground.

Medium dense, silty sandy GRAVEL was encountered within the trial hole to a proven depth of 2.1m below ground level. Groundwater seepage was noted in the base of the trial hole at 2.1m BGL. No mottling of subsoil was noted. Bedrock was not encountered.

Three surface and three subsurface test holes were excavated on the site on the 10th August 2021. The subsurface test holes were set at 400 mm BGL to examine the percolation properties of the subsoil at that depth. All the test holes were pre-soaked on the 10th and 11th August 2021 in accordance with EPA CoP 2021.

Percolation testing of the test holes was carried out on site on the 11th August 2021 in accordance with EPA CoP 2021. The percolation results indicate good percolation in the overburden, with an average surface percolation value of 23 minutes per 25mm, and average subsurface percolation value of 14 minutes per 25mm, confirming the findings of the trial hole examinations. Detailed percolation test results are presented in the Site Characterisation Form (Appendix 1).

Site photographs are presented in Appendix 3. Trial hole and percolation test hole locations and wastewater treatment system drawings are presented in Appendix 4.

Recommendations

The existing septic tank and possible soak pit is not constructed in accordance with the EPA CoP 2021 and must be replaced.

I recommend the installation of a tertiary treatment on this site. Tertiary treatment is proposed as effluent will be polished to the highest possible standard, minimising the impact of wastewater effluent on the receiving environment. Also, tertiary treatment results in the minimum sized footprint of all polishing filter options. Effluent will be treated in a secondary treatment system (6PE), with EN12566 certification, with pumped discharge to constructed sand polishing filter for tertiary treatment before discharge to ground. The sand polishing filter must be constructed in compliance with the EPA CoP, 2021 and the attached drawings (Appendix 4). The gravel distribution bed should be designed for a hydraulic population equivalent of 3.5 and can be installed in the location outlined in the site layout plan attached. For the purposes of this design, a conservative approach has been taken, and the gravel distribution bed has been designed using the surface percolation value of 23 minutes per 25mm rather than the subsurface percolation value of 14 minutes per 25mm. A site specific manufacturer's report is presented in Appendix 5.

These recommendations are in compliance with the EPA CoP 2021, and Wastewater Treatment Manuals, Treatment Systems for Small Business, Leisure Centres and Hotels, EPA 1999, and represent a major improvement on the existing wastewater treatment situation on the site, which will benefit the local groundwater receiving environment.

If you have any queries, please don't hesitate to contact me,

Yours sincerely,

Parkmore Environmental Services Ltd.

RICHARD LANGFORD

BA Geology, MSc Applied Hydrogeology

Appendix 1 Site Characterisation Report

APPENDIX A: SITE CHARACTERISATION FORM

File Reference:

Prefix: First Name: MICHAEL F. QUIRKE & SONS Surname:

Address: RANGUE, KILLORLGIN, CO. KERRY

Site Location and Townland: RANGUE, KILLORGLIN, CO. KERRY, V93XA31

Number of Bedrooms: Maximum Number of Residents: 4

Comments on population equivalent

The hydraulic PE is calculated at 3.5, with an organic PE of 6. This is based on 16 full time staff and 4 visitors or hauliers using the toilet facilities. A design flow calculation is presented in the cover letter report.

Proposed Water Supply:

Mains ✓ Private Well/Borehole ☐ Group Well/Borehole ☐

Soil Type. (Specify Type): Shallow, rocky, peaty/non-peaty mineral complexes (Mainly Acidic) AminSRPT

Subsoil. (Specify Type): Gravels derived from Devonian Sandstones

Bedrock Type: Undifferentiated Limestones of the Dinantian Limestone Formation

Aquifer Category: Regionally Important Rk Locally Important Poor

Vulnerability: Extreme ☐ High ✓ Moderate ☐ Low ☐

Groundwater Body: LAUNE MUCKROSS Status Good

Name of Public/Group Scheme Water Supply within 1 km: NONE

Source Protection Area: ZOC SI SO Groundwater Protection Response: R2[1]

Presence of Significant Sites (Archaeological, Natural & Historical): None within immediate vicinity of the site.

Past experience in the area: Site underlain by permeable sands and gravels. Quarry on site for the past 40 years.

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions)

There is an existing septic tank and soak pit on the site. The tank and soak pit are not constructed and installed in accordance with the EPA CoP 2021 and will need to be replaced.

The groundwater protection response for the site is R21 and based on the appropriate risk assessment, as per GWPS 1999, the development is deemed acceptable subject to normal good practice. Where domestic water supplies are located Nearby, particular attention should be given to the depth of subsoil over Groundwater is potential target at risk.
No site restrictions identified.

Note: Only information available at the desk study stage should be used in this section.

3.1 Visual Assessment

Landscape Position:	EXISTING PIT FLOOR		
Slope:	Steep (>1:5) ☐	Shallow (1:5-1:20) ☐	Relatively Flat (<1:20) ✓
Slope Comment			Sloping gently towards lagoon

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses:

The nearest dwelling is located c. 150m southeast of the proposed polishing filter location. No other dwellings located within 250m of the proposed polishing filter location.

The next nearest dwelling is located 360m to the northeast.

Existing Land Use:

Quarry pit floor

Vegetation Indicators:

No useful vegetation indicators on the quarry floor

Groundwater Flow Direction: Groundwater contours indicate the flow direction is to the north east

Ground Condition:

Firm hard ground.

Site Boundaries:

Study area open to North, south and west with entrance road to the east. The study area is generally open within the confines of the existing pit floor.

3.1 Visual Assessment (contd.)

Roads:

The site is accessed from the Glannagilliagh to Killorglin 3rd class road which runs parallel with the southwestern boundary of the quarry.

Outcrops (Bedrock And/Or Subsoil):

Sand and gravel overburden outcrops along the pit walls within the quarry.

Surface Water Ponding:

There is a surface water lagoon located c. 17m south of the proposed polishing filter. This lagoon is used for surface water management within the quarry pit.

Lakes:

None within 250m of the site

Beaches/Shellfish Areas:

None within 250m of the site

Wetlands:

None within 250m of the site

Karst Features:

None within 250m of the site

Watercourses/Streams:*

The Glasacoomnafanida Stream flows in a northerly direction along the eastern boundary of the existing quarry pit. The stream is located c. 147m east and upgradient of the proposed polishing filter.

*Note and record water level

3.1 Visual Assessment (contd.)

Drainage Ditches:*

There is a shallow ring drain located c. 90m south and upgradient of the proposed polishing filter location.

Springs:*

There are no springs located within 250m of the proposed polishing filter location

Wells:*

There are no known drinking water wells located within 250m of the proposed polishing filter location. The area is served by mains water.

Groundwater monitoring wells are located within the existing pit at Rangue, the neighbouring pit at Riordan's and the proposed quarry extension at Rangue and Knocknaboola. These wells were used to determine groundwater contours in the vicinity of the quarry pit.

Comments:

Integrate the information above in order to comment on the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site.

Groundwater and surface water are potential targets at risk from effluent from potential wastewater treatment system, in particular the surface water management lagoon located down gradient of the proposed polishing filter location.

Site and surround appear to be free draining with no evidence of waterlogging or ponding.

Surface water pond and stream are far enough away, no other significant features identified (such as wells) - minimum site distances are satisfied.

Site potentially suitable for on site treatment system and discharge of effluent to ground

Site suitability will depend on nature and thickness of subsoil

*Note and record water level

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.1

Depth from ground surface to bedrock (m) if present:

Depth from ground surface to water table (m) if present: 2.1

Depth of water ingress: 2.1 Rock type if present: Not encountered

Date and time of excavation: 18-Jun-2021 09:00 Date and time of examination: 22-Jun-2021 09:15

Depth of Surface and Subsurface Percolation Tests	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m PT,2,3	0-2.1m Silty sandy GRAVEL with cobbles	Threads - 0.0.0 Ribbons - N/A Dilatant - YES	Structureless	Medium Dense Compact in places	Grey/Brown	None
0.2 m						
0.3 m						
0.4 m T1, 2, 3						
0.5 m						
0.6 m						
0.7 m						
0.8 m						
0.9 m						
1.0 m						
1.1 m						
1.2 m						
1.3 m						
1.4 m						
1.5 m						
1.6 m						
1.7 m						
1.8 m						
1.9 m						
2.0 m						
2.1 m	2.1m End of Trial Hole (Not excavated any deeper for safety reasons once water was encountered)					
2.2 m						
2.3 m						
2.4 m						
2.5 m						
2.6 m						
2.7 m						
2.8 m						
2.9 m						
3.0 m						
3.1 m						
3.2 m						
3.3 m						
3.4 m						
3.5 m						

Likely Subsurface Percolation Value: 10

Likely Surface Percolation Value: 10

Note: *Depth of percolation test holes should be indicated on log above (Enter Surface or Subsurface at depths as appropriate)

** See Appendix 6 for BS 5930 classification

*** Samples to be tested for each horizon and results should be entered above for each horizon

**** All signs of mottling should be recorded.

3.2 Trial Hole (contd.) Evaluation:

Silty sandy gravel subsoil is well draining, with no evidence of mottling.
Water seepage into trial hole from 2.1m. This is likely representative of the groundwater level locally.
Given the presence of groundwater in the trial hole, the site is unsuitable for a conventional septic tank; and the trial hole was not excavated below the water table for safety reasons.
Based on the trial hole assessment, the study area should be adequate for the installation of a wastewater treatment system provided the percolation rate is not too fast due to the presence of sands and gravels. However, the high silt content will likely reduce the percolation rate.
Site suitability to be confirmed by percolation testing.

3.3(a) Subsurface Percolation Test for Subsoil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm) (A)	400	400	400
Depth from ground surface to base of hole (mm) (B)	800	800	800
Depth of hole (mm) [B - A]	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date	10-Aug-2021	10-Aug-2021	10-Aug-2021
	Time	19:03	19:07	19:11
2nd pre-soak start	Date	11-Aug-2021	11-Aug-2021	11-Aug-2021
	Time	07:54	07:58	08:07

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test	11-08-2021	11-08-2021	11-08-2021
Time filled to 400 mm	12:21	12:25	12:32
Time water level at 300 mm	12:29	12:30	12:39
Time [illegible] to drop 100 mm (T_{100})	8.00	5.00	7.00
Average T_{100}			6.67

If T_{100} > 480 minutes then Subsurface Percolation value >120 – site unsuitable for discharge to ground
If T_{100} ≤ 210 minutes then go to Step 4;
If T_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $T_{value} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)
1	12:29	12:53	24.00	12:30	14:01	91.00	12:39	12:55	16.00
2	12:54	13:26	32.00	14:02	15:54	112.00	12:55	13:18	23.00
3	13:27	14:11	44.00	15:55	18:09	134.00	13:19	13:48	29.00
Average Δt Value			33.33			112.33			22.67
	Average Δt/4 = [Hole No.1]		8.33 (t_1)	Average Δt/4 = [Hole No.2]		28.08 (t_2)	Average Δt/4 = [Hole No.3]		5.67 (t_3)

Result of Test: Subsurface Percolation Value = 14.03 (min/25 mm)

Comments:

Subsurface percolation value within expect range for Silty subsoil and confirms the good hydraulic assimilative capacity of the subsoil.

Step 5: Modified Method (where $T_{test} > 210$ minutes)

Percolation Test Hole No. 1

Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_s = T_f / T_m$	$T = \text{Value} = 4.45 / K_s$
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T- Value		T- Value Hole 1 = (T_1)			0.00

Percolation Test Hole No. 2

Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_s = T_f / T_m$	$T = \text{Value} = 4.45 / K_s$
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T- Value		T- Value Hole 2 = (T_2)			0.00

Result of Test: Subsurface Percolation Value = 0.00 (min/25 mm)

Percolation Test Hole No. 3

Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_s = T_f / T_m$	$T = \text{Value} = 4.45 / K_s$
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T- Value		T- Value Hole 3 = (T_3)			0.00

Comments:

Modified method not used

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date	10-Aug-2021	10-Aug-2021	10-Aug-2021
	Time	19:05	19:09	19:13
2nd pre-soak start	Date	11-Aug-2021	11-Aug-2021	11-Aug-2021
	Time	07:55	08:02	08:11

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test	11-Aug-21	11-Aug-21	11-Aug-2021
Time filled to 400 mm	12:23	12:26	12:33
Time water level at 300 mm	12:35	12:31	13:00
Time to drop 100 mm (T_{100})	12.00	5.00	27.00
Average T_{100}			14.67

If T_{100} > 480 minutes then Surface Percolation value >90 ~ site unsuitable for discharge to ground
If T_{100} ≤ 210 minutes then go to Step 4;
If T_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $T_{300} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)
1	12:34	13:01	27.00	12:31	14:04	93.00	13:00	14:37	97.00
2	13:02	13:49	47.00	14:05	16:03	118.00	14:38	16:36	118.00
3	13:50	14:57	67.00	16:04	18:22	138.00	16:37	18:43	126.00
Average ΔT Value			47.00			116.33			113.67

Average ΔT/4 = [Hole No.1] 11.75 (T_1)

Average ΔT/4 = [Hole No.2] 29.08 (T_2)

Average ΔT/4 = [Hole No.3] 28.42 (T_3)

Result of Test: Surface Percolation Value = 23.08 (min/25 mm)

Comments:

Surface percolation value indicates good percolation characteristics of the upper overburden material.

Step 5: Modified Method (where $T_{300} > 210$ minutes)

Percolation Test Hole No. 1

Fall of water in hole (mm)	Time Factor = T_r	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	K_s = T / T_m	T – Value = 4.45 / K_s
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		

Average T- Value — T- Value Hole 1 = (T_1) 0.00

Percolation Test Hole No. 2

Fall of water in hole (mm)	Time Factor = T_r	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	K_s = T / T_m	T – Value = 4.45 / K_s
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		

Average T- Value — T- Value Hole 2 = (T_2) 0.00

Percolation Test Hole No. 3

Fall of water in hole (mm)	Time Factor = T_r	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	K_s = T / T_m	T – Value = 4.45 / K_s
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		

Average T- Value — T- Value Hole 3 = (T_3) 0.00

Result of Test: Surface Percolation Value = 0.00 (min/25 mm)

Comments:

Modified method not used

[illegible]

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Slope of proposed infiltration / treatment area: <1:20

Are all minimum separation distances met? ✓

Depth of unsaturated soil and/or subsoil beneath invert of gravel (or drip tubing in the case of drip dispersal system): 1.70

Percolation test result: Surface: 23.08 Sub-surface: 14.03

Not Suitable for Development ☐ **Suitable for Development** ✓

Identify all suitable options

1.	Septic tank system (septic tank and percolation area) **(Chapter 7)**	No
2.	Secondary Treatment System **(Chapters 8 and 9)** and soil polishing filter **(Section 10.1)**	Yes
3.	Tertiary Treatment System and Infiltration / treatment area **(Section 10.2)**	Yes

Discharge Route[1]

Groundwater

[illegible]

Propose to install: Tertiary Treatment System and Infiltration /treatment area

and discharge to: Ground Water

Invert level of the trench/bed gravel or drip tubing (m): 0.00

Site Specific Conditions (e.g. special works, site improvement works testing etc.

Installation as per EPA Code of Practice 2021 and attached drawings.
Wastewater effluent to flow by gravity secondary treatment system, with pumped discharge of effluent to intermittent filter for tertiary treatment. Final discharge by gravity to groundwater via 300mm deep gravel distribution bed, and subsequently groundwater. The area of the gravel distribution bed is 26.25m2 (as per Option 6, Table 10.1).
Existing gravel should be excavated and removed to a depth of 0.4m BGL, exposing the well drained virgin sand and gravel. This area should be covered with 300mm of 12-32mm washed sandstone gravel, and covered with a geotextile layer. The tertiary polishing filter will be constructed directly on top of the distribution gravel bed. Any exposed gravel and geotextile should be covered with 300mm of topsoil.
Please refer to the attached site layout map whereon is indicated an acceptable zone into which the percolation area may be located. This zone is determined by reference to the EPA CoP and the specified minimum separation distances in meters from the site boundary/road/dwelling/surface water.

[1] A discharge of sewage effluent to 'waters' (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.4

SYSTEM TYPE: Septic Tank Systems (Chapter 7)

Tank Capacity (m³)		Percolation Area		Mounded Percolation Area	
		No. of Trenches		No. of Trenches	
		Length of Trenches (m)		Length of Trenches (m)	
		Invert Level (m)		Invert Level (m)	

SYSTEM TYPE: Secondary Treatment System (Chapters 8 and 9) and polishing filter (Section 10.1)

Secondary Treatment Systems receiving septic tank effluent (Chapter 8)

Media Type	Area (m²)*	Depth of Filter	Invert Level
Sand/Soil			
Soil			
Constructed Wetland			
Other			

Packaged Secondary Treatment Systems receiving raw wastewater (Chapter 9)

Type: Submerged Aeration Plant

Capacity PE: 6

Sizing of Primary Compartment: 2.40 m³

Polishing Filter*: (Section 10.1)

Surface Area (m²)*

Option 1 - Direct Discharge
Surface area (m²)

Option 2 - Pumped Discharge
Surface area (m²)

Option 3 - Gravity Discharge
Trench length (m)

Option 4 - Low Pressure
Pipe Distribution
Trench length (m)

Option 5 - Drip Dispersal
Surface area (m²)

SYSTEM TYPE: Tertiary Treatment System and infiltration / treatment area (Section 10.2)

Identify purpose of tertiary treatment	Provide performance information demonstrating system will provide required treatment levels	Provide design information
To provide the best possible level of treatment of effluent in accordance with EPA CoP. 2021.	Secondary treatment to provide 20:30:20 effluent quality standards. Tertiary expected to provide at least 10:10:10 suspended solids: BOD: Ammonia	Gravity to secondary treatment system; Pumped to intermittent filter for Tertiary Treatment; with gravity discharge to ground.

DISCHARGE ROUTE:

Groundwater	✓	Hydraulic Loading Rate * (l/m².d)	19.80	Surface area (m²)	26.25
Surface Water **		Discharge Rate (m³/hr)			

* Hydraulic loading rate is determined by the percolation rate of subsoil

** Water Pollution Act discharge licence required

QUALITY ASSURANCE:

Installation & Commissioning

It is advisable that any pumping unit within the treatment system be alarmed.
It is not recommended that this area is trespassed.
Installation of treatment system & polishing filter to be supervised by a competent person.
Installation to be photographed and certified.

On-going Maintenance

Wastewater Treatment Plant to be de-sludged annually or as per manufacturer's specification (See section 12.2.2 EPA CoP 2021).
For sand filter systems, it is advisable that the manufacturer/appropriately trained and qualified person assesses the quality of the media at regular intervals. The surface of the media filter should be examined periodically for signs of ponding and, when it is evident, the manufacturer/installer should be contacted. The media should not be disturbed as this may lead to channelling of effluent or flooding, and should be replaced, if necessary. The sand or other media will require replacing in time and there will be associated costs. Insufficient desludging of the secondary treatment system will also shorten the useful life of the sand, or other media.
Tertiary Polishing filter to be inspected and maintained as per installers instructions.
Maintenance is the responsibility of the system owner (in this case M.F. Quirke and Sons).

Company: Parkmore Environmental Services Ltd

Prefix: Mr First Name: Richard Surname: Langford

Address: Kilcosgriff, Shanagolden, Co. Limerick

Qualifications/Experience: MSc (Hydrogeology) Fas/EPA Site Suitability Assessment for On-site WWT (FETAC)

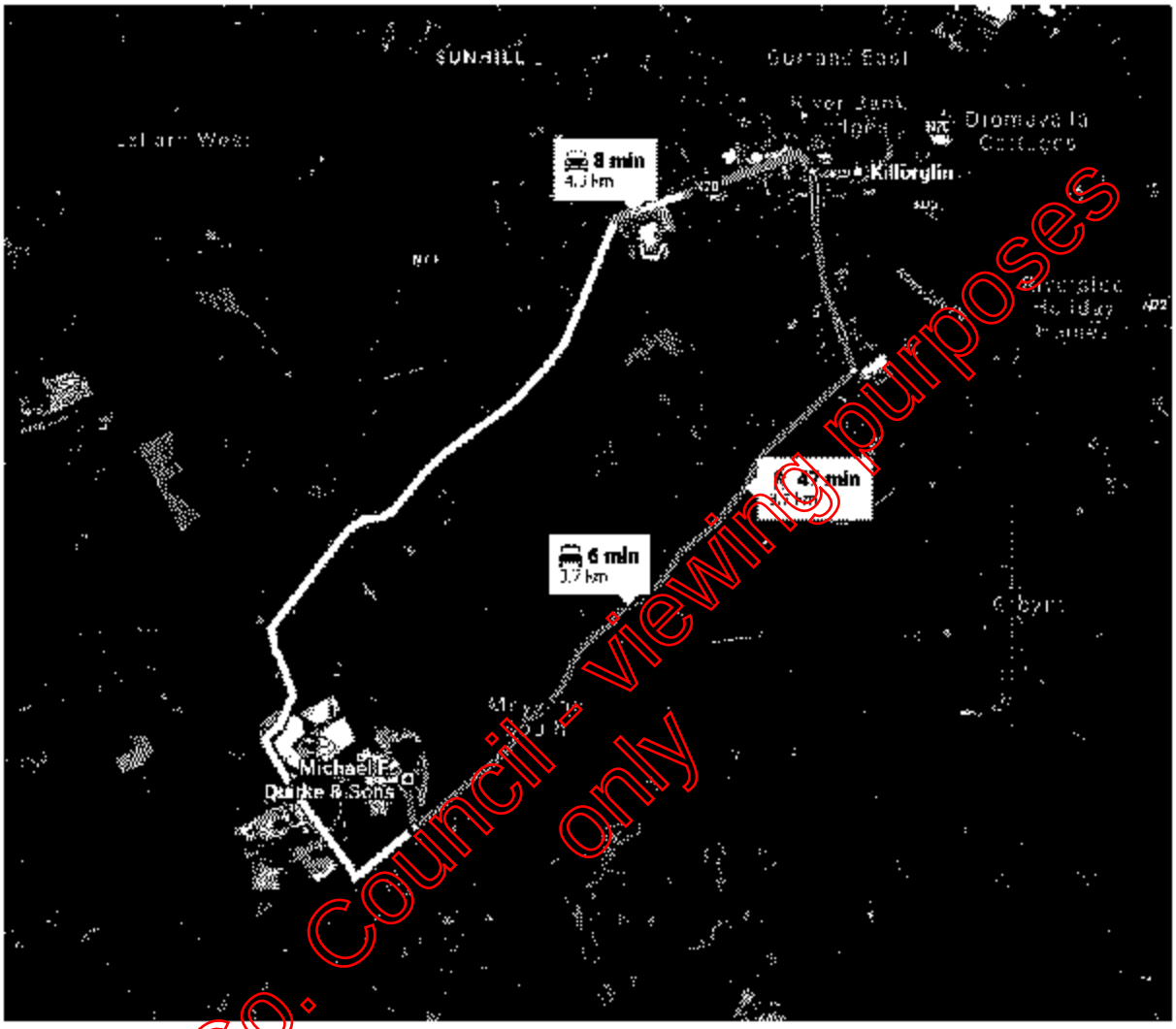
Date of Report: 11-Nov-2021

Phone: 0872823873 E-mail: info@parkmore.ie

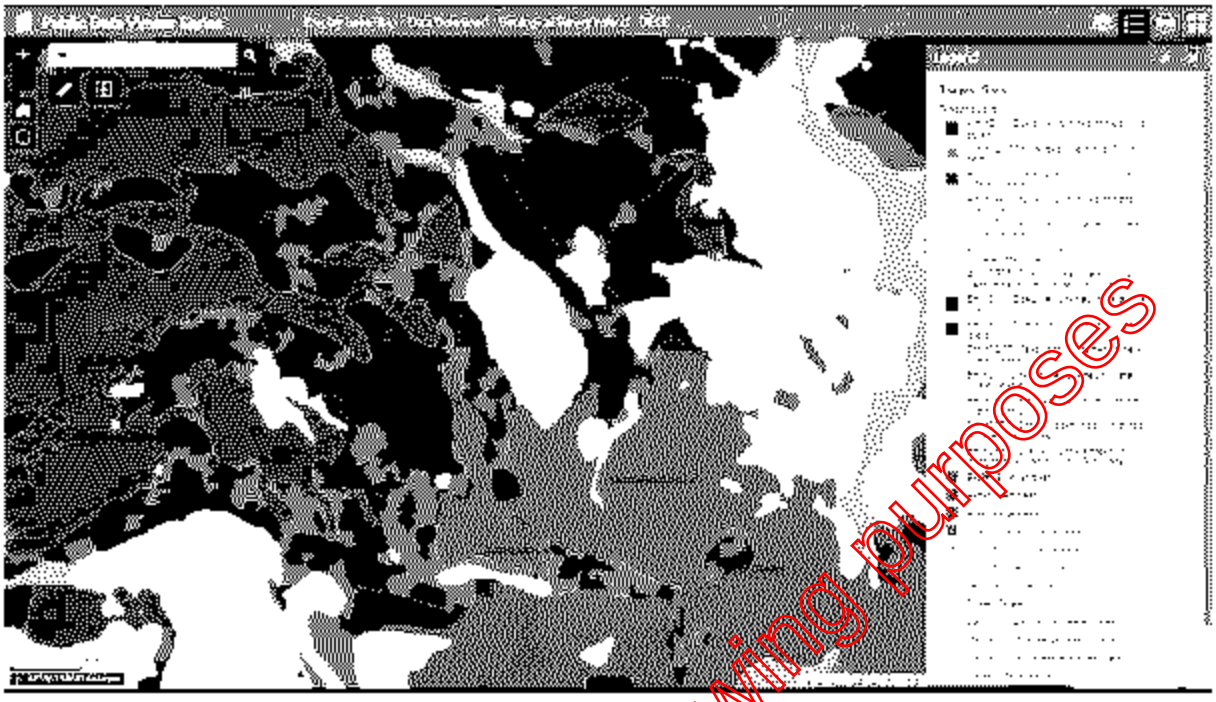
Indemnity Insurance Number: API0001469

Signature: Richard Langford

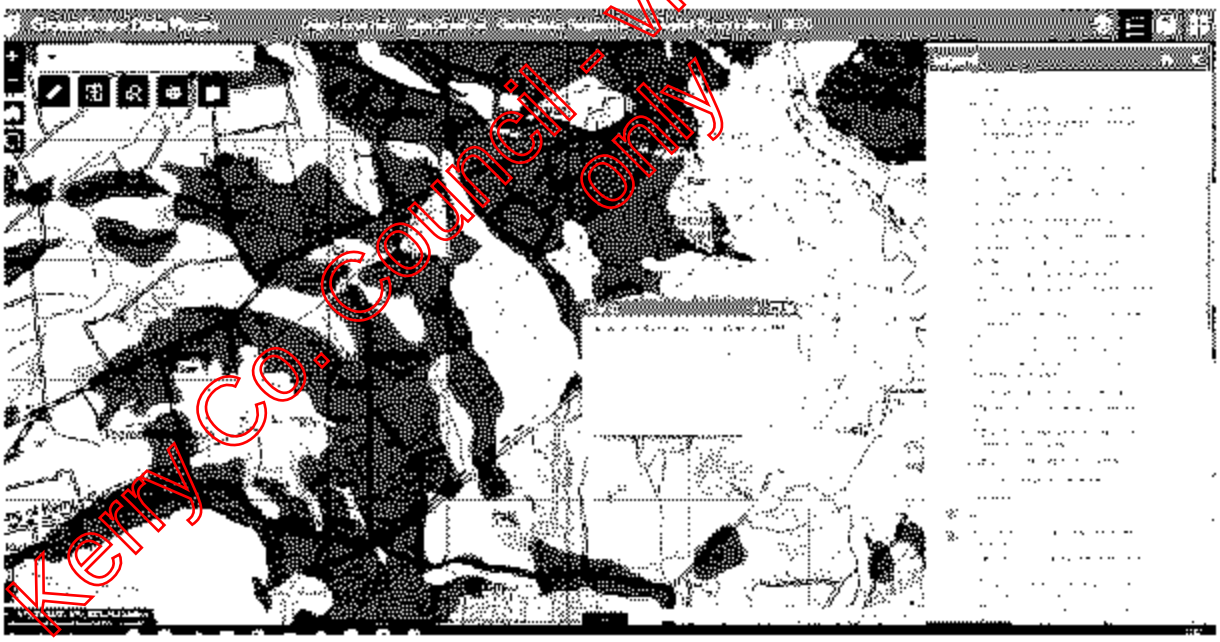
Appendix 2: Supporting Maps including Location, Soils, Vulnerability, Aquifer Classification and Bedrock Geology



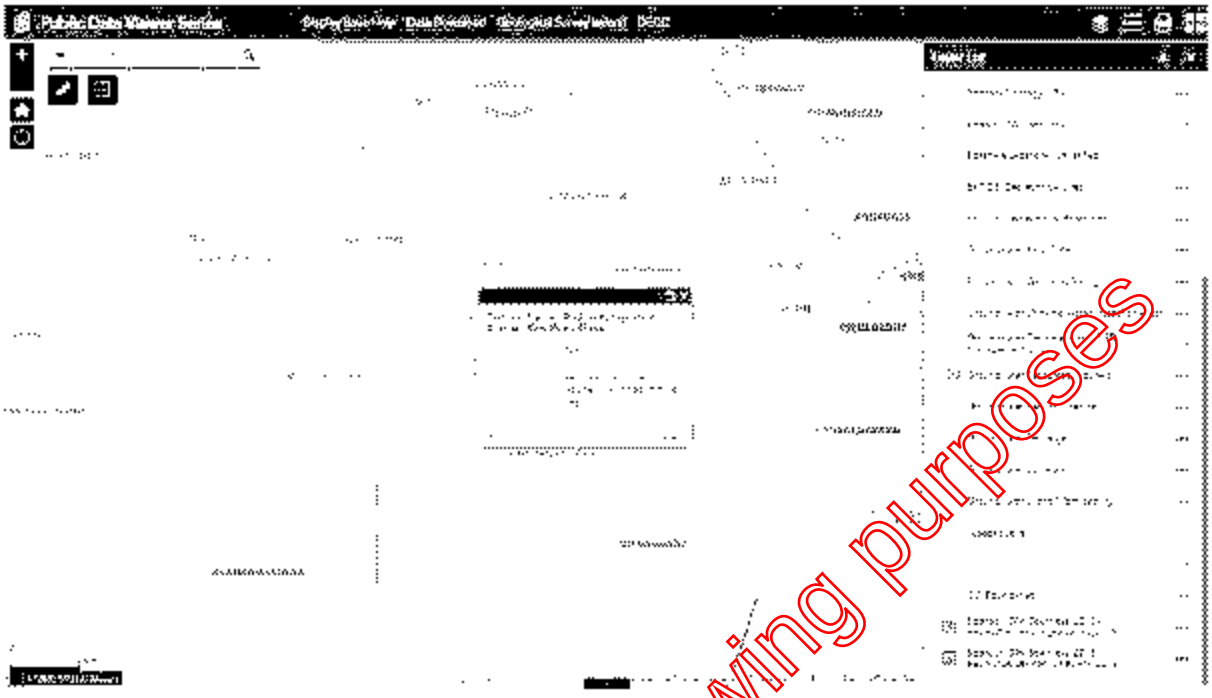
Location Map (Source, Google)



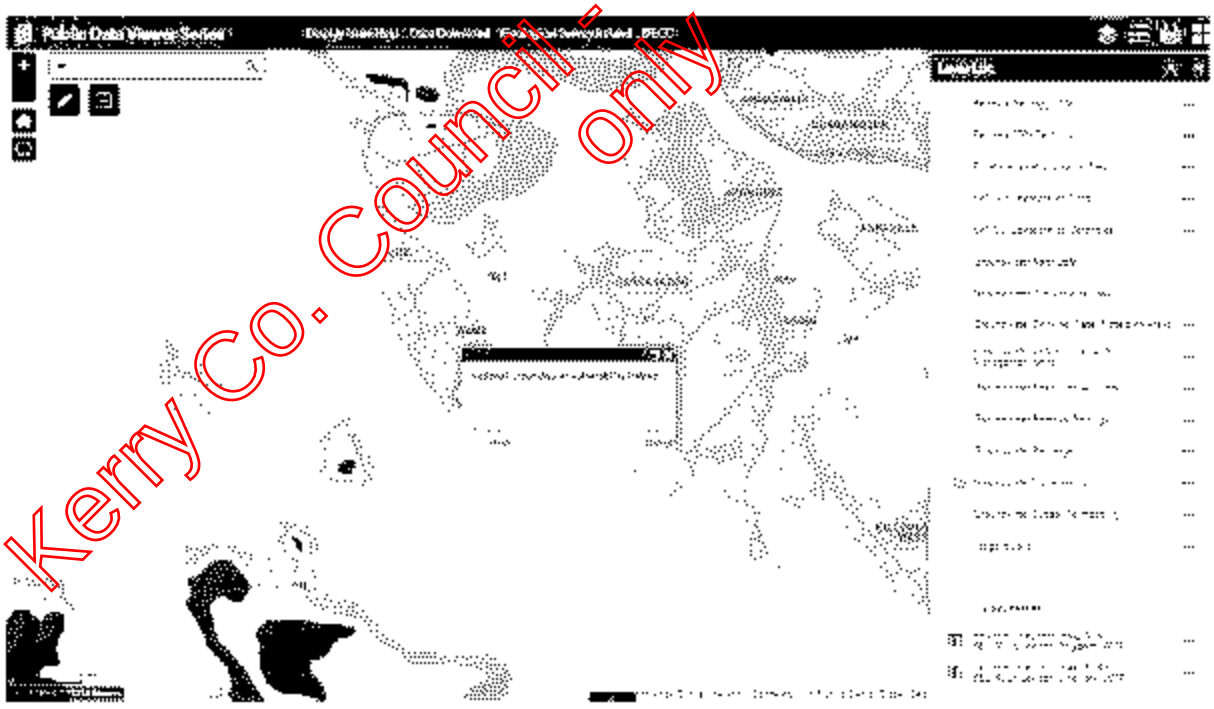
Soils Map (Source, GSI)



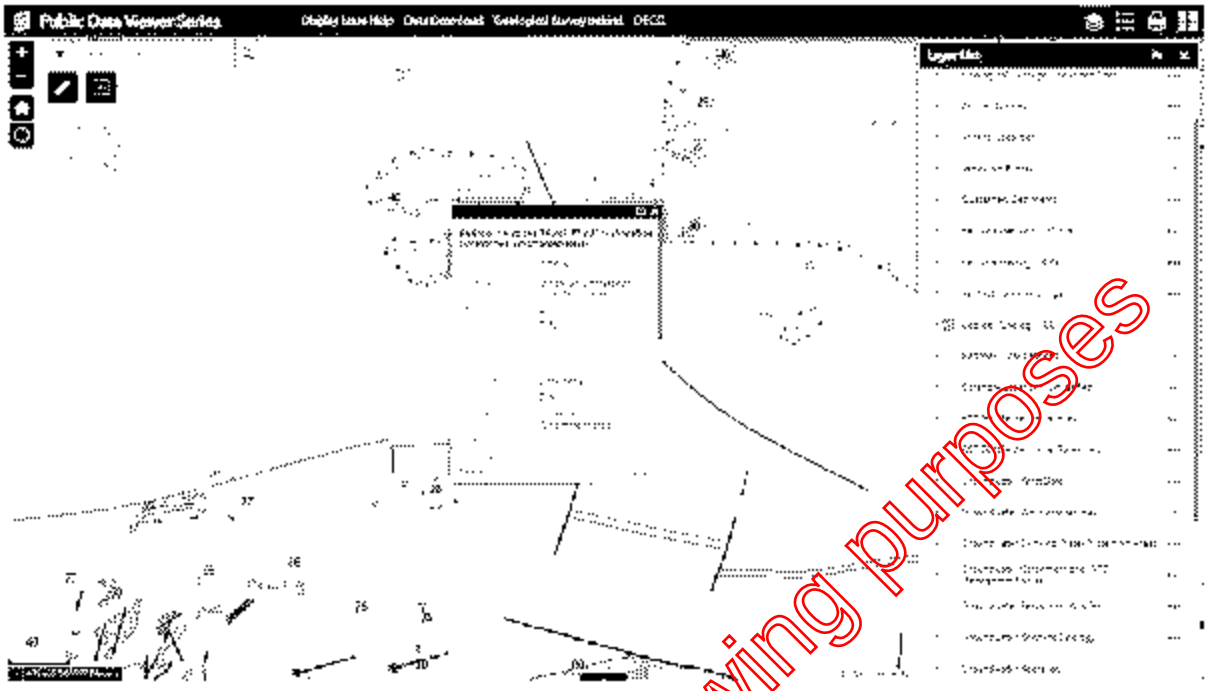
Subsoils Map (Source, GSI)



Aquifer Classification Map (Source, GSI)



Vulnerability Map (Source, GSI)



Bedrock Geology (Source: GSI)

Appendix 3 - Site Photographs

Plate 1. Spoil excavated from Trial Hole

Plate 3. View of Trial Hole with Offices in background

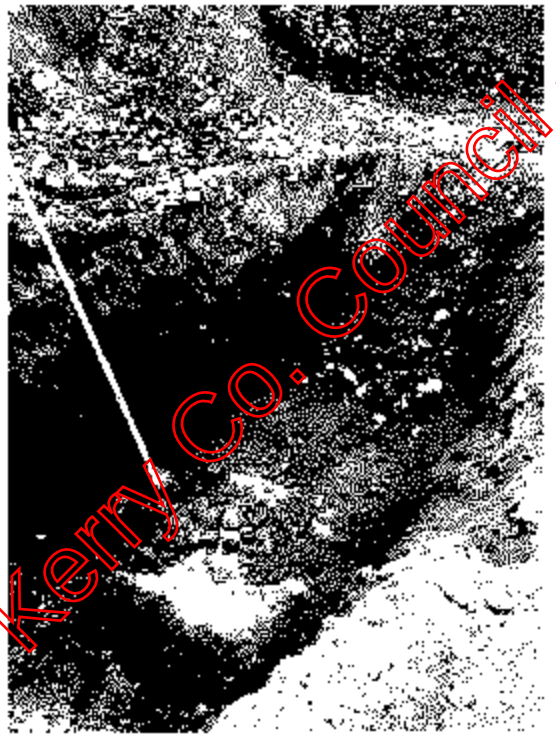


Plate 2. Trial Hole

Plate 4. Subsoil Profile

Plate 5. Silty sandy GRAVEL with cobbles

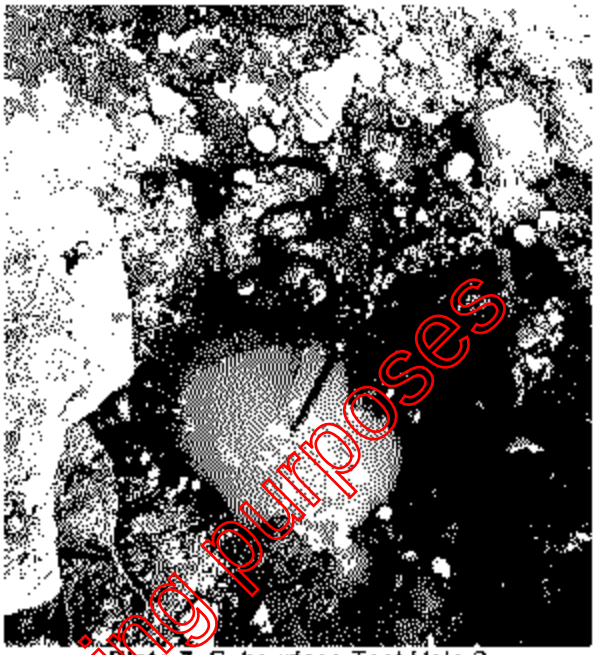


Plate 7. Subsurface Test Hole 2

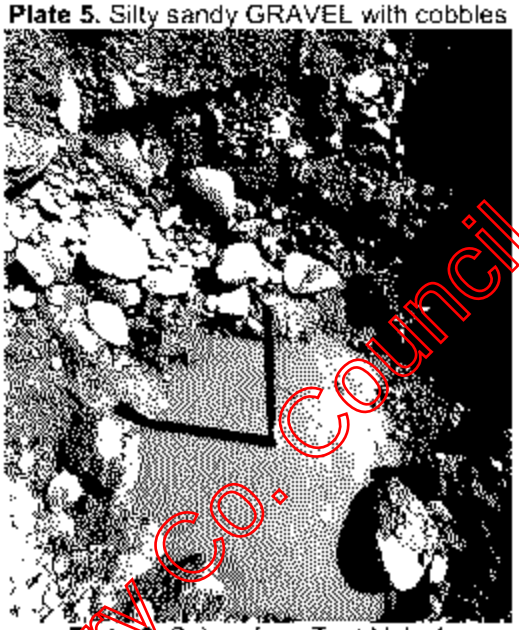


Plate 6. Subsurface Test Hole 1

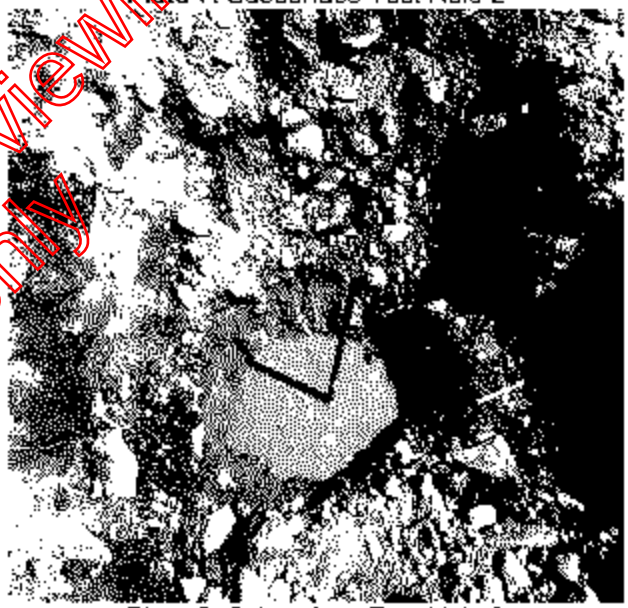


Plate 8. Subsurface Test Hole 3

Plate 9. Surface Test Hole 1

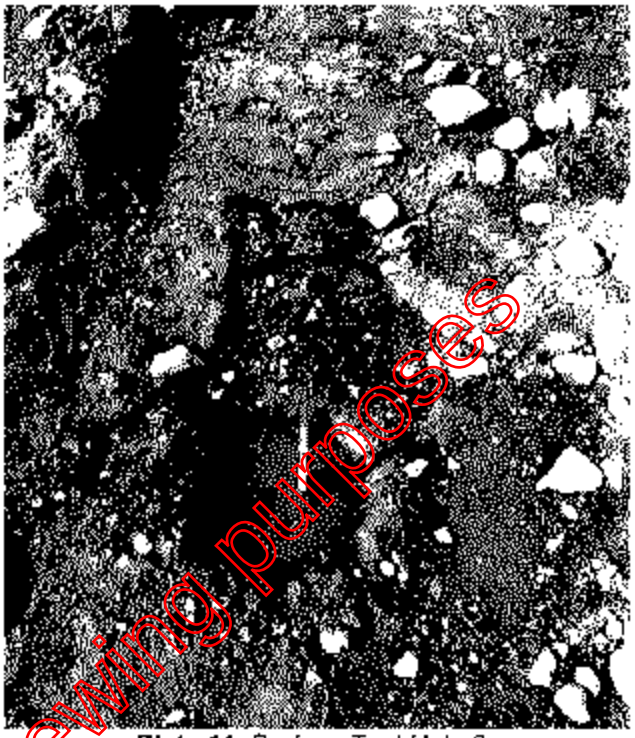


Plate 11. Surface Test Hole 3

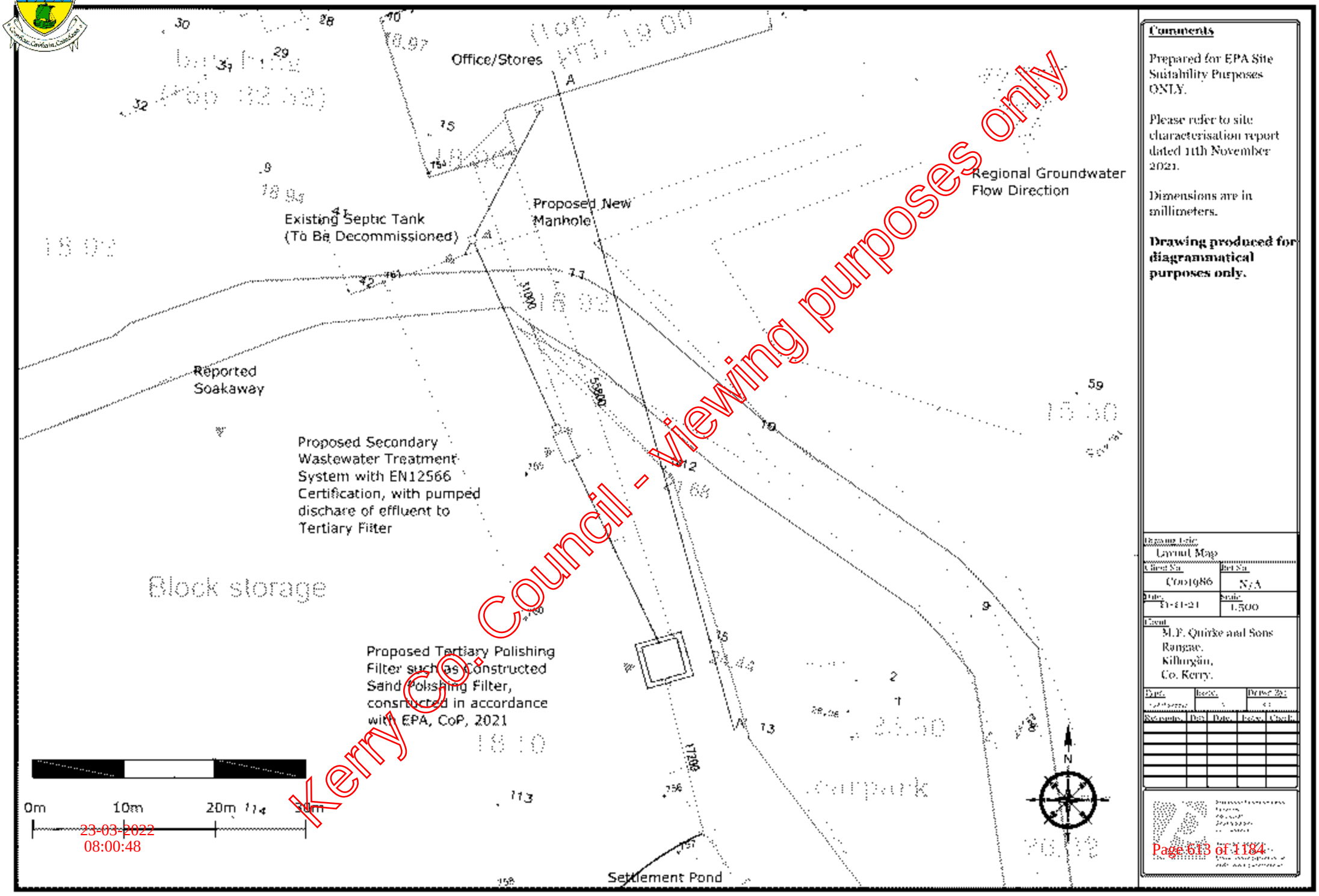
Plate 10. Surface Test Hole 23

Appendix 4

Layout Drawing

&

Polishing Filter Drawings



Comments

Prepared for EPA Site Suitability Purposes ONLY.

Please refer to site characterisation report dated 11th November 2021.

Dimensions are in millimeters.

Drawing produced for diagrammatical purposes only.

Drawing Title: Layout Map

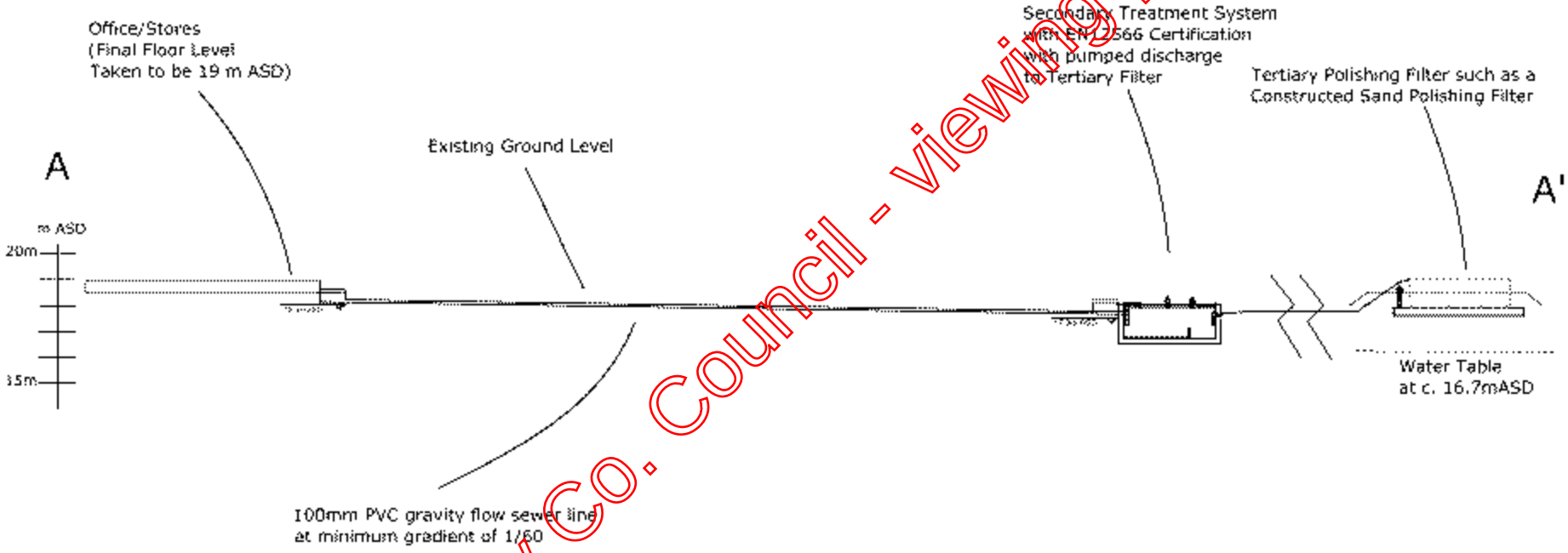
Project No.	Ref No.
C00/1986	N/A
Date: 01-11-21	Scale: 1:500

Client: M.F. Quirke and Sons Rangue, Kilmoyan, Co. Kerry.

Rev.	Issue	Drawn By:

Revisions	Det	Date	Issue	Check

Cross Section A - A'



Comments:

Prepared for EPA soil suitability purposes only

Please refer to Site Suitability Report and Layout Drawing

mASD = metres above sea datum

Drawing Title: Cross Section

Client No: Co03986 | Ref No: N/A

Date: 11-11-21 | Scale: 1:250

Client: M.F. Quirke and Son, Rasgue, Killorglin, Co. Kerry

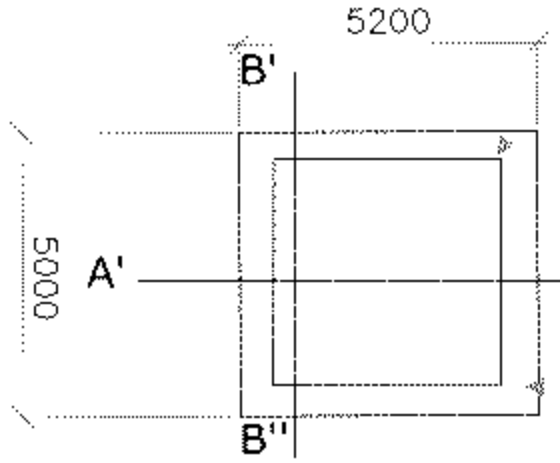
Drg.	Issue:	Drawn By:
	A	

Revisions	Drg	Date	Issue	Check

23-03-2022
08:00:48

Plan and Sections of Tertiary Treatment System and Distribution Gravel Layer

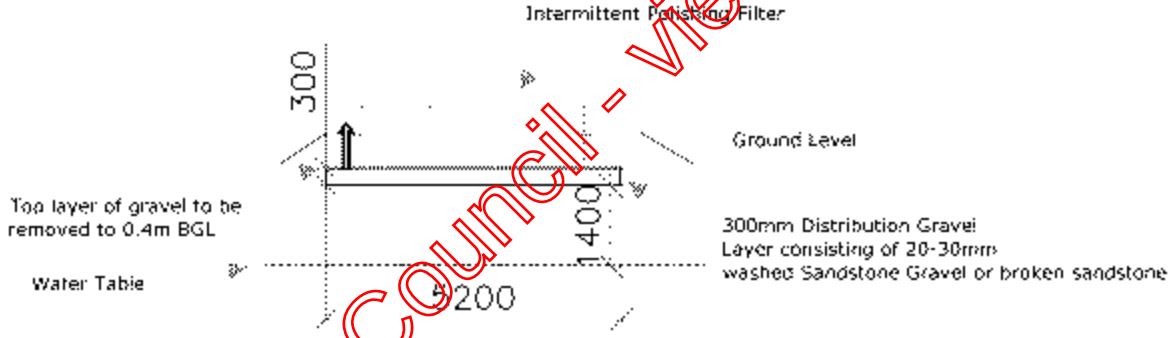
Plan



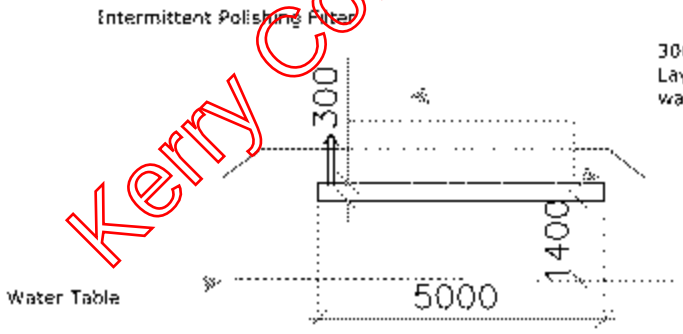
Intermittent Polishing Filter (such as sand/peat/coconut filter)

Distribution
Gravel Layers

Cross Section A' - A''



Cross Section B' - B''



Comments:

Prepared for EPA site suitability purposes only

Please refer to Site Suitability Report and Layout Drawing

Effluent to be pumped from advanced wastewater treatment system to intermittent polishing filter. Effluent to discharge via gravity main to intermittent polishing filter to gravel distribution area

Drawing Title:
Polishing Filter Drawings

Client No.: County86
Job No.: N/A

Date: 11-11-21
Scale: Not to scale

Client:
M. F. Quirke and Sons
Rangue,
Killorglin,
Co. Kerry.

Type:
Issue:
Drawn By:

Revisions	Des	Date	Issue	Check

Appendix 5

Site Specific Report

Tricel Site Recommendation Report
Tricel Novo Package Plant and Sandcel Sand Polishing Filter

TRICEL

Date	11/11/2021
Report No:	SA4_KY_10569
Client Name	M. F. Quirke & Sons
Site Location & Townland	Rangue, Killorglin, Kerry

Thank you for choosing Tricel for your wastewater treatment requirements. This report contains the following information for your site and is based on a population of 4 and a P/T value of between 21-40.

Please see outlined below the accompanying documents:

Section 1: Information on the Tricel Novo Package Plant

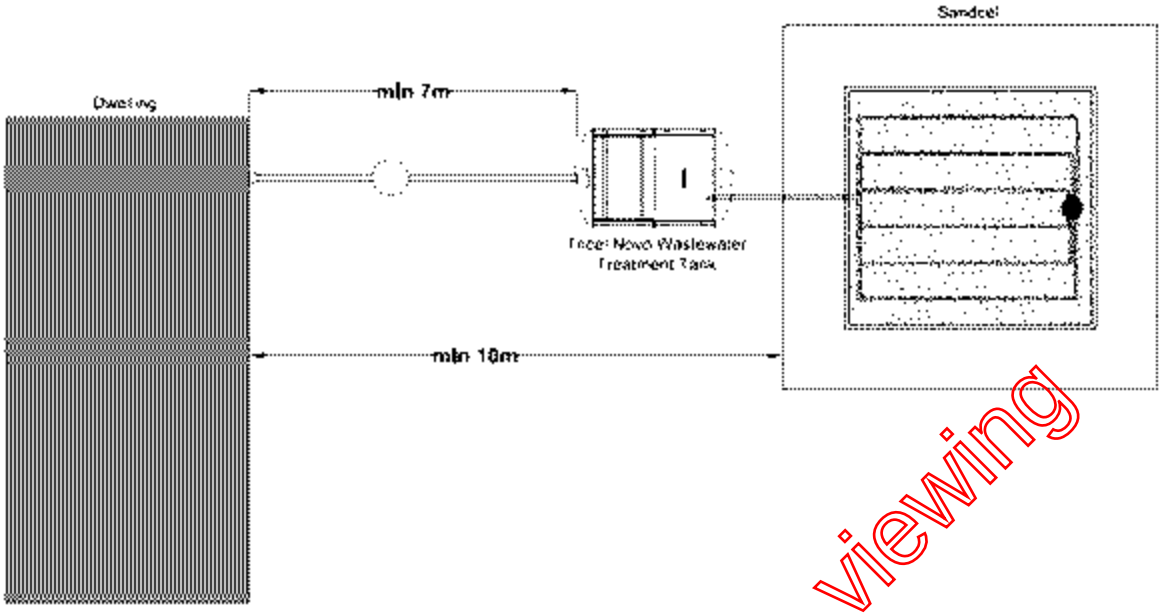
- Manufacturers report and sizing of the Tricel Novo Package Plant
- Drawing of the Tricel Novo Package Plant
- Certification of the selected Tricel Novo Package Plant

Section 2: Information on the percolation area

- Separation Distances
- Sandcel Sand Polishing Filter drawing
- Sandcel Technical Specification

Based on the information provided to us, using SR66 and the EPA Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤ 10), the appropriate solution for treating wastewater on your site is a Tricel Novo wastewater treatment plant followed by a Sandcel sand polishing filter. The Tricel Novo provides secondary treatment using submerged aeration filter technology. The Sandcel sand polishing filter, providing tertiary treatment, consists of a series of pipe work designed to distribute the effluent for treatment over stratified layers of certified sands according to the EPA Code of Practice. They are enclosed in GRP impermeable panels which will not rot or decay, ensuring the structure of the filter will hold for many years. These filters can be installed in above or below ground applications with all pipe work accessible from a service pod.

Typical layout of a Tricel Novo Package Plant and Sandcel Sand Polishing Filter:



For your site we recommend a Tricel Novo IRL6+ wastewater treatment plant which is designed to treat a maximum of 900 litres of wastewater per day. This recommendation is based on the EPA Code of Practice which states the plant selection should be based on a hydraulic loading of 150l/per person /per day. The Novo IRL6+ has a capacity of 4000 litres, of which 2400 are in the primary chamber, this ensures a long desludging interval. The Tricel Novo range of wastewater treatment plants is fully in conformance with EN12566-3 and complies with SR66.

The pump will need to be determined at the point of installation

The proposed solution for the tertiary treatment on the site is a Sandcel 900, a 15m^2 sand polishing filter. This is designed to treat the hydraulic load from a Tricel Novo IRL6+ plant. The size of the Sandcel is based on the EPA Code of practice which recommends a maximum hydraulic loading rate of 60l/m2/d.

Note:

In the above named site, a substitute wastewater treatment system may not be put in place of the Tricel wastewater treatment system.

This recommendation only applies to the above named site based on the information supplied to Tricel. A Site Characterisation Form should accompany this report. Tricel cannot be responsible for misinformation due to misleading information being received by us from clients.

Please see attached the accompanying documents in Section 1 for the Tricel Novo wastewater treatment plant and Section 2 for the percolation area.

Certificate in accordance with SR66 for EN12566-Part 3

PIA
Prüfinstitut für Abwassertechnik GmbH

TREATMENT PERFORMANCE RESULTS

Tricel (Killarney)
Ballyspillane Industrial Est., Killarney, Co. Kerry, Ireland

EN 12566-3
Results corresponding to EN 12566-3 and S.R. 66

PIA-SR66-1512-1062

Novo
Submerged fixed film

Nominal organic daily load	0.25 kg/d		
Nominal hydraulic daily load	0.90 m³/d		
Material	Glass reinforced plastic		
Watertightness	Pass		
Structural behaviour (Calculation)	Pass (also wet conditions)		
Durability	Pass		
Treatment efficiency (nominal sequences)		Efficiency	Effluent
	COD	91.6 %	52 mg/l
	BOD_5	95.9 %	11 mg/l
	NH_4-N	79.9 %	8 mg/l
	SS	95.3 %	10 mg/l
Number of desludging	Not more than once		
Electrical consumption	1.1 kWh/d		

Performance tested by

PIA – Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
52074 Aachen, Germany

This document replaces neither the declaration of performance nor the CE marking

Notified Body
No. 1739

Certified according to
ISO 9001:2008

DAkkS
Deutsche Akkreditierungsstelle
D-PL-11273-01-00

Prüfinstitut für Abwassertechnik GmbH
Elmar Lancé · Expert · Head

Elmar Lancé July 2015

Section 2

The location and construction of the sand polishing filter is the responsibility of the site engineer. A full site layout drawing should accompany this report.
The EPA CoP 2021 outlines the design, siting and construction requirements for sand polishing filters.
The tables below outline some of the key factors to take into consideration when designing and locating a sand polishing filter.

Table 6.2: Minimum separation distances from the entire DWWTS

Features	DWWTS – periphery of tank/plant and infiltration/ treatment area (m)
Karst feature	15
Lake or foreshore	50
Watercourse/stream	10
Open drain or drainage ditch	10
Adjacent tank/plant and percolation area, polishing filter or infiltration area	10
On-site dwelling house	7 (tank/plant) 10 (free water surface constructed wetland) 10 (infiltration/ treatment area)
Neighbouring dwelling house	7 (tank/plant) 25 (free water surface constructed wetland) 10 (infiltration/ treatment area)
Surface water soakaway*	5
Road	4
Slope break/cuts	4
Trees[b]	3
Site boundary	3
Heritage features, NHA/SAC/SPA[c]	See note

PV, percolation value.

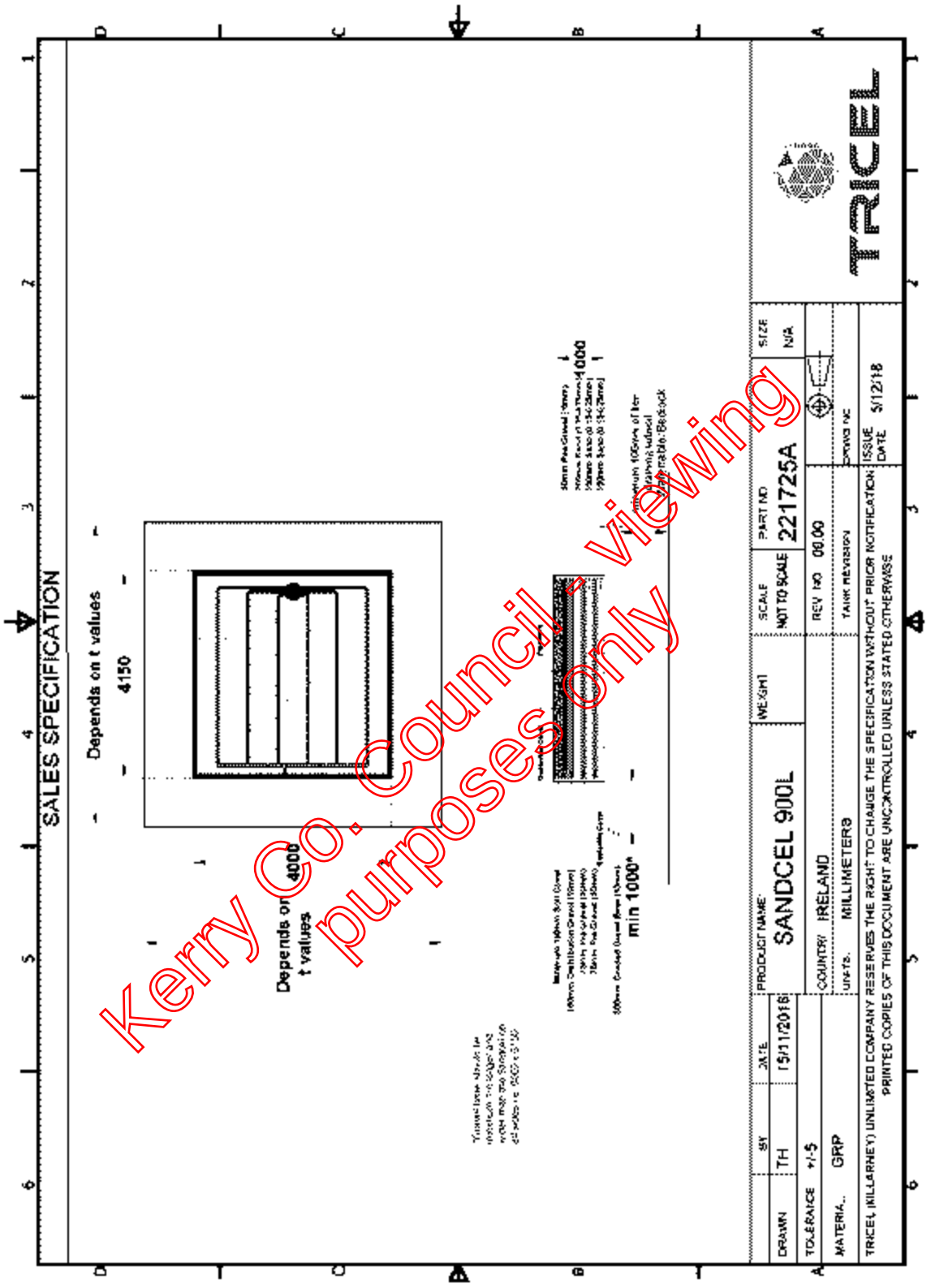
* The soakaway for surface water drainage should be located down-gradient of the infiltration/treatment area; it should also be ensured that this distance is maintained from neighbouring storm water disposal areas or soakaways.

[b] Tree roots may lead to PFPs developing. The canopy spread indicates potential root coverage.

[c] The distances required depend on the importance of the feature. Therefore, advice should be sought from the local authority and/or from the Department of Housing, Local Government and Heritage, specifically the National Monuments Service and the National Parks and Wildlife Service.

Table 6.2 EPA CoP 2021- Minimum seperation distances

The Sandcel sand polishing filter is a tertiary filter designed to the EPA CoP. It can be located above or below ground depending on the existing bedrock or subsoil. According to the EPA CoP the treated effluent which passes through a sand polishing filter is treated to a high enough standard to be allowed to discharge to groundwater through a distribution bed of gravel.



The Sandcel is available in 2 options:

- As a complete supply and fit product including a detailed report containing photographic evidence of works carried out, certification of sands used, testing of pipe network and sign off by a certified engineer.
- As a kit comprising of components and assembly instruction.

The Sandcel comprises of three layers, an upper layer of coarse sand and two lower layers of fine sand separated from each other by a thin layer of gravel as per **Fig. 1.0.**

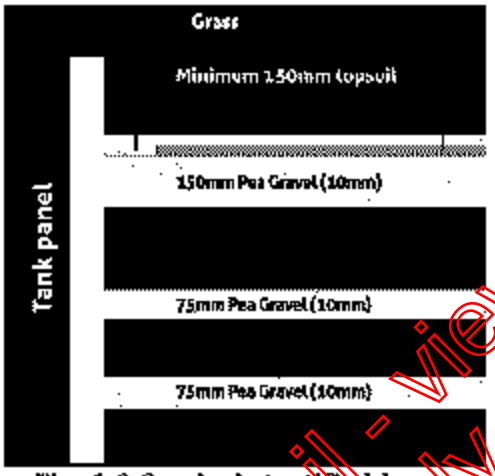


Fig. 1.0 Sandcel stratified layers

The sands used throughout are provided with certification to ensure compliance with the EPA Code of Practice. This washed and graded sands ensure little or no binding of sand particles during use. A sample copy of the certs are contained in Fig 2.0

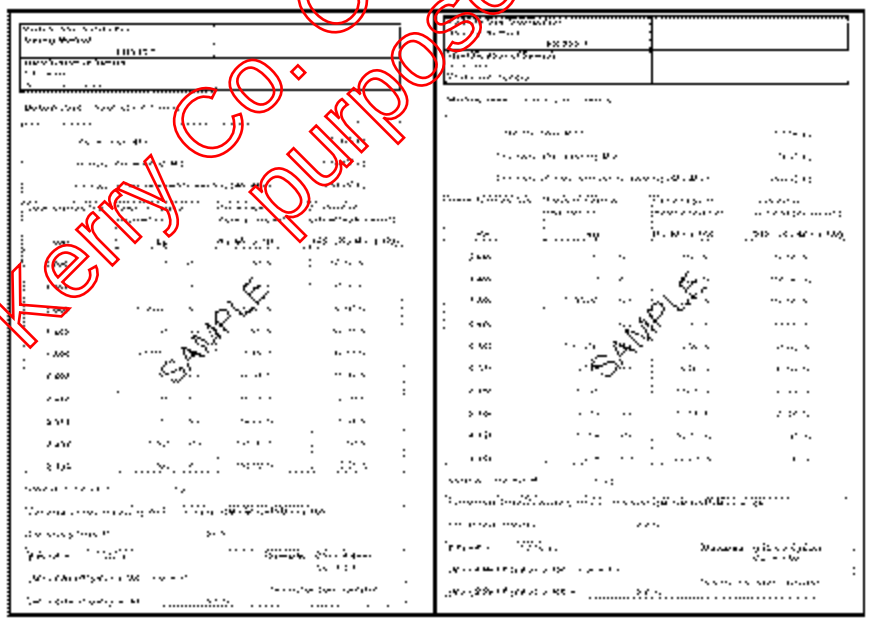


Fig 2.0 Examples of sand grading certificates supplied with Sandcel

The Sandcel must be placed on a gravel distribution bed to disperse the treated effluent. As outlined below in table 10.1 option 6 the area required per person of this distribution bed is dependent on the Subsurface value of the receiving subsoil. It is compulsory that the percolation test is carried out at the infiltration level which is located at the base of the proposed Sandcel. This distribution bed should comprise of a 300mm layer of 10mm pea gravel as in Fig 3.0.

Fig 3.0 Cross section through Sand filter

Critical to the life of the sand filter is the impermeable liner as dictated in the EPA CoP.
Tricel use a unique panel liner manufactured from a hybrid material known as Sheet Moulding Compound, SMC, which is a form of Glass Reinforced Plastic. These panels are used to form a durable, chemically and impact resistant, watertight, long lasting structure.

Table 10.1: Infiltration/treatment area and trench length design for tertiary treatment, per PE

	Area required per person (m²)	Trench length required per person (m)	Trench length required per person (m)	Area required per person (m²)	Area required per person (m²)
3 ≤ PV ≤ 20	≥7.5	≥6	≥6	≥5	≥3.75
21 < PV ≤ 40	≥15	≥12	≥12	≥14	≥7.5
41 < PV ≤ 50	≥30	≥17	≥17	≥16	≥15
51 < PV ≤ 75	≥30	≥19	≥19	≥22	≥25
76 < PV ≤ 90			≥28	≥34	
91 < PV ≤ 120	-	-	-	≥34	-

Table 10.1 from EPA CoP 2021 - Loading rates for gravity fed soil polishing filter

The distribution pipework in each zone, which is designed as a low pressure uPVC pipe network, is housed within the top pea-gravel layer. It comprises of 32mm dia. uPVC pipe, which disperses the effluent evenly of the entire surface area of the filter media. The pipework consists of a series of 3.4m laterals spaced at 0.6m centers. Each lateral contains 6 no orifices 4.8mm in diameter spaced at 0.6m along each length. The laterals are fed from a pump in the wastewater treatment unit through the main pipe manifold.

The network is designed with the following pipework dimensions:

Sandcel 900		
Description	**Unit**	**Qty**
No of Residents	Persons	6
Daily Flow rate	litres	900
Polishing filter Loading Rate	l/m2	60
Size of Polishing Filter	m2	15
Length of Polish Filter	m	4
Width of Polishing Filter	m	3.75
Orifice Diameter	mm	4.8
Orifice Spacing	m	0.6
Lateral Spacing	m	0.6
No. of laterals		6
Length of laterals	m	3.4
Lateral Diameter	mm	32
No of Orifices/lateral		6
Total No. of Orifices		36
Size of rising Main	mm	37.5
Min Dose Volume	litres	200
Discharge Rate	l/min	90
Total Head	m	0.750

A full set of Sandcel design calculations is available on request.

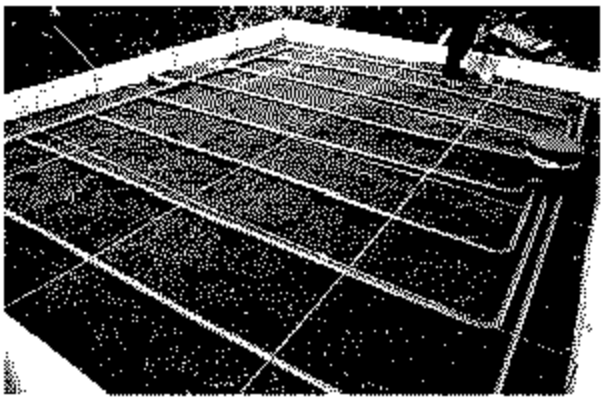


Fig 4.0 Completed pipe network on a Sandcel before placement of final gravel layer

All Sandcel filters have a service pod which is designed to provide access to the complete pipe network. All laterals terminate in the pod and are capped and sealed to maintain the pressure within the network. This ensures access to the pipe network for service and rodding if required.

Fig. 5.0 Servicing pod

A layer of geotextile is placed on top of the final layer of gravel to protect the filter from silt being washed down. On this geotextile a layer of topsoil can be placed to blend the entire unit in with its surroundings.

Terms and conditions:

Tricel cannot accept responsibility for incorrect site details or calculations as these are based on user inputs which are outside of Tricel control.
Full terms of website use are available at www.tricelsiteassessor.ie/TermsOfWebsiteUse

Appendix 7.6 Discharge Licence W61

Comhairle Chontae Chiarrai

KERRY COUNTY COUNCIL
ÁRAS CHONTAE
RATHASS, TRALEE, CO. KERRY
TEL 066-21111
ENVIRONMENTAL SERVICES
ROOM NO. 15

Our Ref: AL/MQ

25th May, 1989

Mr. Ml. F. Quirke & Sons Ltd.,
Rangue,
Killorglin,
Co. Kerry.

RE/ LOCAL GOVERNMENT (WATER POLLUTION) ACT 1977

Dear Sirs,

I enclose, herewith, Licence No. W61 to discharge trade effluent to waters in accordance with Section 4 of the Water Pollution Act 1977.

The Licence has been issued subject to the conditions scheduled. Failure to comply with these conditions renders you guilty of an offence under the terms of the Act, and on summary conviction a fine not exceeding £25 could be imposed.

An appeal may be lodged with An Bord Pleanála against the conditions of the Licence within one month from the date of grant of the Licence i.e. May 23rd, 1989. A fee of £36 should accompany such an appeal.

Condition No. (10) of the Licence provides for payment of a sum of £750 towards the Licensing Authority's annual monitoring costs. Please let me have payment of same forthwith.

Yours faithfully,

STAFF OFFICER
ENVIRONMENTAL SERVICES

.0. 1

ARTICLE 12

LOCAL GOVERNMENT (WATER POLLUTION) ACT, 1977

LICENCE TO DISCHARGE TRADE OR SEWAGE EFFLUENT TO WATERS

KERRY COUNTY COUNCIL

Reference No. in Register:-
W61

TO:

Ml. F. Quirke & Sons Ltd.,
Rangue,
Killorglin.

The Kerry County Council in exercise of the powers conferred on it by the Local Government (Water Pollution) Act, 1977, hereby grants a licence/~~an amended licence in substitution for licence dated~~ Reference NO. W61 to discharge trade and sewage effluent from Ml. F. Quirke & Sons Ltd., located at Rangue, Killorglin to watercourse at Rangue, Killorglin subject to the following conditions:-

SEE OVERLEAF FOR SCHEDULE OF CONDITIONS

Dated this 23rd day of May 1989

COUNTY MANAGER

Order No. ES/89/49

LICENCE CONDITIONS FOR

ML. F. QUIRKE & SONS LTD.

(1) The applicant shall construct three settling basins at the location shown on the plans submitted.
Settlement basins shall each be 30 meters in diameter, and have a minimum effective depth of 4.6 meters. All effluent generated in the area, coloured yellow and referred to as part 'A' on the lodged plans, shall be directed via cut-off drain surrounding the settling basins to settling basin No. 1. The overflow from settling basin No. 1 shall be directed to settling basin No. 2. The overflow from settling basin No. 2 shall be directed to settling basin No. 3.

(2) The settling basin shall be fitted with baffles at the entrance and exit points of the effluent.

(3) Settlement basin No. 3 shall be fitted with a floating take-off in order to enable the supernatant liquor to be pumped to the adjacent watercourse at the discharge point shown on the lodged plans. Floating take-off shall be located in the segment of the settlement basin which is contained between the outer face of the exit baffle and the basin wall.

(4) Baffle boards at the side of the ingress of the effluent to the settling basins should extend 0.5 meters below the inlet level of the inlet pipes.

(5) Baffle boards at the side of the egress of the effluent from the settlement basins should extend from the floor level of basins to within 0.2 meters of the maximum T.W.L. of the effluent contained within the basins.

(6) The Licensee shall, after consultation with the Licensing Authority, locate the mouth of the effluent outfall pipe at a location and position acceptable to the said Authority in order to facilitate sampling of effluent.

(7) The suspended solids concentration in the effluent shall not at any time exceed 30 mg/litre.

(8) Sediment contained in each settling basin shall not at any time occupy in excess of 20% of the effective depth of the said basins as outlined in condition (1) above.

.../...

(9) Sediment removed from the settling basins shall be disposed of in an environmentally safe and satisfactory manner.

(10) The Licensee shall contribute a sum of £750 per annum towards the Licensing Authority's monitoring costs which shall be payable on demand. The initial sum i.e. £750 shall be adjusted annually in accordance with the Consumer Price Index.

(11) The hydraulic loading should never exceed a rate of 135 cubic metres/hour or 3240 cubic metres per day.

Appendix 7.7 Laboratory Analytical Certificates

southern scientific services ltd.

Certificate of Analysis

Customer:	Parkmore Environmental Services	**Project:**	MF Quirke Quarries
Address:	Kilcosgriff Shanagolden Ireland	**Date Received:**	20/04/2021
		Condition of Sample:	Satisfactory
Report to:	Richard Langford	**Date Analysed:**	20/04/2021 - 27/04/2021
Customer PO		**Issue Date:**	30/04/2021
Quote No.		**BATCH NUMBER:**	**21-11331**

Ruth Murphy
Chemistry Laboratory Manager

Index to symbols used & Notes

*	Analysis is not INAB/UKAS accredited
**	Adapted from Standard Methods for the Examination of Water and Wastewater
***	Customer specific limits
(F)	Analysis carried out at our Farranfore Laboratory
(D)	Analysis carried out at our Dunrine Laboratory
LOD	Parameter Limit of Quantification
Note 6	Subcontracted Parameter

Notes

- **The results relate only to the items tested.**
- **Opinions and interpretations expressed herein are outside the scope of INAB accreditation.**
- **The analysis report shall not be reproduced except in full without written approval of the laboratory.**
- **Sampling is outside the scope of the laboratory activities.**

Notes for Drinking Water samples

Note A	The water should not be aggressive
Note B	Compliance must be ensured with the conditions that [NO3]/50 + [NO2]/3 =1
Note C	Acceptable to customers and no abnormal change
Note D	In the case of surface water treatment, a parametric value not exceeding 1 NTU in the water ex treatment works must be strived for
Note F	Fluoridated supplies 0.8 mg/L; Natural supplies 1.5 mg/L.

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4 park business centre | farranfore | county kerry | ireland | telephone +353 66 976 3588 | fax +353 66 976 3589
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web site www.southernscientificireland.com | e-mail info@southernscientificireland.com
directors: K. Murphy, M. Murphy & C. Murphy
registered in ireland no 323196 | vat reg no IE 6343196 M

southern scientific services ltd.

Customer Sample Ref:	SW1	**Customer Sample Code:**	
Project:	MF Quirke Quarries	**Sampled By:**	Customer
Our Reference:	34356 (21-11331)	**Sample Matrix:**	Surface Water
Date Sampled:	16/04/2021	**Time Sampled:**	:

Method:	Parameter:	Units	LOQ	Result
	Chemical Analysis: (F)			
SCP 052	Hydrogen Ion (pH)	pH units	4.0	6.4
SCP 052	Conductivity	µS/cm @ 20 °C	15	93
SCP 010	Suspended Solids	mg/L	4	< 4
SCP 027A	Total Ammonia	mg/L N	0.02	< 0.02
SCP 027G	Nitrate	mg/L N	0.25	< 0.25
SCP 027F	Nitrite	mg/L N	0.005	< 0.005
SCP 027C	Mol Reactive Phosphorus (MRP)	mg/L P	0.01	< 0.01
SCP 027B	Chloride	mg/L	0.5	27.7
SCP 044	Total Phosphorus	mg/L P	0.04	< 0.04
SCP 065A	Total Nitrogen	mg/L	0.5	0.5
SCP 065B	Total Organic Carbon (TOC)	mg/L	0.5	4.9
**2510 B	Total Dissolved Solids (TDS)	mg/L	5	52
SCP 115A	Total Petroleum Hydrocarbons (C10 - C40)	ug/L	10	< 16

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web site www.southernscientific.ireland.com | e-mail info@southernscientific.ireland.com
directors: K. Murphy, M. Murphy & C. Murphy
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southern scientific services ltd.

Customer Sample Ref:	SW2	**Customer Sample Code:**	
Project:	MF Quirke Quarries	**Sampled By:**	Customer
Our Reference:	34357 (21-11331)	**Sample Matrix:**	Surface Water
Date Sampled:	16/04/2021	**Time Sampled:**	:

Method:	Parameter:	Units	LOQ	Result
	Chemical Analysis: (F)			
SCP 052	Hydrogen Ion (pH)	pH units	*4.0*	6.1
SCP 052	Conductivity	µS/cm @ 20 °C	*15*	90
SCP 010	Suspended Solids	mg/L	*5*	6
SCP 027A	Total Ammonia	mg/L N	*0.03*	0.12
SCP 027G	Nitrate	mg/L N	*0.25*	< 0.25
SCP 027F	Nitrite	mg/L N	*0.005*	< 0.005
SCP 027C	Mol Reactive Phosphorus (MRP)	mg/L P	*0.01*	0.02
SCP 027B	Chloride	mg/L	*0.5*	26.8
SCP 044	Total Phosphorus	mg/L P	*0.04*	0.05
SCP 065A	Total Nitrogen	mg/L	*0.5*	0.7
SCP 065B	Total Organic Carbon (TOC)	mg/L	*0.5*	10.3
**2510 B	Total Dissolved Solids (TDS)	mg/L	*5*	41
SCP 115A	Total Petroleum Hydrocarbons (C10 - C40)	ug/L	*10*	< 17

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Certificate of Analysis

Customer:	Parkmore Environmental Services	**Project:**	
Address:	Kilcosgriff Shanagolden Ireland	**Date Received:**	14/05/2021
		Condition of Sample:	Satisfactory
Report to:	Richard Langford	**Date Analysed:**	14/05/2021 - 26/05/2021
Customer PO		**Issue Date:**	27/05/2021
Quote No.		**BATCH NUMBER:**	**21-11829**

Joanne O'Halloran
Deputy Laboratory Manager

Index to symbols used & Notes

*	Analysis is not INAB/UKAS accredited
**	Adapted from Standard Methods for the Examination of Water and Wastewater
***	Customer specific limits
(F)	Analysis carried out at our Farranfore Laboratory
(D)	Analysis carried out at our Dunrine Laboratory
LOD	Parameter Limit of Quantification
Note 6	Subcontracted Parameter

Notes

- **The results relate only to the items tested.**
- **Opinions and interpretations expressed herein are outside the scope of INAB accreditation.**
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- **Sampling is outside the scope of the laboratory activities.**

Notes for Drinking Water samples

Note A	The water should not be aggressive
Note B	Compliance must be ensured with the conditions that [NO3]/50 + [NO2]/3 =1
Note C	Acceptable to customers and no abnormal change
Note D	In the case of surface water treatment, a parametric value not exceeding 1 NTU in the water ex treatment works must be strived for
Note F	Fluoridated supplies 0.8 mg/L; Natural supplies 1.5 mg/L.

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Customer Sample Ref:	SW1	**Customer Sample Code:**	
Project:		**Sampled By:**	R Langford
Our Reference:	35911 (21-11829)	**Sample Matrix:**	Surface Water
Date Sampled:	14/05/2021	**Time Sampled:**	:

Method:		Parameter:	Units	LOQ	Result
		Chemical Analysis: (F)			
SCP 052		Hydrogen Ion (pH)	pH units	4.0	5.9
SCP 052		Conductivity	µS/cm @ 20 °C	15	82
SCP 015		Biological Oxygen Demand (BOD)	mg/L	1.0	1.3
SCP 015		Suspended Solids	mg/L	2	< 4
SCP 027A		Total Ammonia	mg/L N	0.02	< 0.02
SCP 027G		Nitrate	mg/L N	0.25	< 0.25
SCP 027F		Nitrite	mg/L N	0.005	< 0.005
SCP 027C		Mol Reactive Phosphorus (MRP)	mg/L P	0.01	< 0.01
SCP 027B		Chloride	mg/L	0.5	23.2
SCP 044		Total Phosphorus	mg/L P	0.04	< 0.04
SCP 065A		Total Nitrogen	mg/L	0.5	0.5
SCP 065B		Total Organic Carbon (TOC)	mg/L	0.5	7.4
**2510 B	*	Total Dissolved Solids (TDS)	mg/L	5	46
SCP 115A		Total Petroleum Hydrocarbons (C10 - C40)	µg/L	10	< 10

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web site www.southernscientific.ireland.com | e-mail info@southernscientific.ireland.com
directors: K. Murphy, M. Murphy & C. Murphy
registered in ireland no 323196 | vat reg no IE 6343196 M

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Customer Sample Ref:	SW2	**Customer Sample Code:**	
Project:		**Sampled By:**	R Langford
Our Reference:	35912 (21-11829)	**Sample Matrix:**	Surface Water
Date Sampled:	14/05/2021	**Time Sampled:**	:

Method:		Parameter:	Units	LOQ	Result
		Chemical Analysis: (F)			
SCP 052		Hydrogen Ion (pH)	pH units	4.0	7.2
SCP 052		Conductivity	µS/cm @ 20 °C	15	180
SCP 015		Biological Oxygen Demand (BOD)	mg/L	1.0	2.2
SCP 010		Suspended Solids	mg/L	4	< 4
SCP 027A		Total Ammonia	mg/L N	0.02	< 0.02
SCP 027G		Nitrate	mg/L N	0.25	< 0.25
SCP 027F		Nitrite	mg/L N	0.005	< 0.005
SCP 027C		Mol Reactive Phosphorus (MRP)	mg/L P	0.01	< 0.01
SCP 027B		Chloride	mg/L	0.5	28.8
SCP 044		Total Phosphorus	mg/L P	0.04	< 0.04
SCP 065A		Total Nitrogen	mg/L	0.5	< 0.5
SCP 065B		Total Organic Carbon (TOC)	mg/L	0.5	6.5
**2510 B	*	Total Dissolved Solids (TDS)	mg/L	5	102
SCP 115A		Total Petroleum Hydrocarbons (C10 - C40)	µg/L	10	< 10

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directors: K. Murphy, M. Murphy & C. Murphy
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Report No. 21-11829 Rev 0

Customer Sample Ref:	SW3	**Customer Sample Code:**	
Project:		**Sampled By:**	R Langford
Our Reference:	35913 (21-11829)	**Sample Matrix:**	Surface Water
Date Sampled:	14/05/2021	**Time Sampled:**	:

Method:		Parameter:	Units	LOQ	Result
		Chemical Analysis: (F)			
SCP 052		Hydrogen Ion (pH)	pH units	4.0	7.2
SCP 052		Conductivity	µS/cm @ 20 °C	15	219
SCP 015		Biological Oxygen Demand (BOD)	mg/L	1.0	1.9
SCP 010		Suspended Solids	mg/L	4	< 4
SCP 027A		Total Ammonia	mg/L N	0.02	< 0.02
SCP 027G		Nitrate	mg/L N	0.25	< 0.25
SCP 027F		Nitrite	mg/L N	0.005	< 0.005
SCP 027C		Mol Reactive Phosphorus (MRP)	mg/L P	0.01	< 0.01
SCP 027B		Chloride	mg/L	0.5	30.0
SCP 044		Total Phosphorus	mg/L P	0.04	< 0.04
SCP 065A		Total Nitrogen	mg/L	0.5	< 0.5
SCP 065B		Total Organic Carbon (TOC)	mg/L	0.5	3.8
**2510 B	*	Total Dissolved Solids (TDS)	mg/L	5	121
SCP 115A		Total Petroleum Hydrocarbons (C10 - C40)	µg/L	10	< 10

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web site www.southernscientific.ireland.com | e-mail info@southernscientific.ireland.com
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southern scientific services ltd.

Certificate of Analysis

Customer:	Parkmore Environmental Services	**Project:**	
Address:	Kilcosgriff Shanagolden Ireland	**Date Received:**	17/06/2021
		Condition of Sample:	Satisfactory
Report to:	Richard Langford	**Date Analysed:**	17/06/2021 - 28/06/2021
Customer PO		**Issue Date:**	29/06/2021
Quote No.		**BATCH NUMBER:**	**21-12505**

Joanne O'Halloran
Deputy Laboratory Manager

Index to symbols used & Notes

*	Analysis is not INAB/UKAS accredited
**	Adapted from Standard Methods for the Examination of Water and Wastewater
***	Customer specific limits
(F)	Analysis carried out at our Farranfore Laboratory
(D)	Analysis carried out at our Dunrine Laboratory
LOD	Parameter Limit of Quantification
Note 6	Subcontracted Parameter

Notes

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- **Sampling is outside the scope of the laboratory activities.**

Notes for Drinking Water samples

Note A	The water should not be aggressive
Note B	Compliance must be ensured with the conditions that [NO3]/50 + [NO2]/3 =1
Note C	Acceptable to customers and no abnormal change
Note D	In the case of surface water treatment, a parametric value not exceeding 1 NTU in the water ex treatment works must be strived for
Note F	Fluoridated supplies 0.8 mg/L; Natural supplies 1.5 mg/L.

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web site www.southernscientificireland.com | e-mail info@southernscientificireland.com
directors: K. Murphy, M. Murphy & C. Murphy
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Customer Sample Ref:	BH1	**Customer Sample Code:**	
Project:		**Sampled By:**	Customer
Our Reference:	38130 (21-12505)	**Sample Matrix:**	Ground Water
Date Sampled:	17/06/2021	**Time Sampled:**	:

Method:	Parameter:	Units	LOQ	Result
	Microbiological Analysis: (D)			
SMP 019	Coliforms	MPN/100mL	1	< 1
SMP 019	E. coli	MPN/100mL	1	< 1
	Chemical Analysis: (F)			
SCP 052	Hydrogen Ion (pH)	pH units	4.0	6.1
SCP 052	Conductivity	µS/cm @ 20 °C	15	166
SCP 015	Biological Oxygen Demand (BOD)	mg/L	1.0	< 1.0
SCP027H	Alkalinity	mg/L as CaCO3	5.0	40.5
SCP 027A	Total Ammonia	mg/L N	0.02	< 0.02
SCP 027G	Nitrate	mg/L N	0.25	1.46
SCP 027B	Chloride	mg/L	0.5	28.0
SCP 027D	Sulphate	mg/L	0.5	5.2
SCP 027I	Total Hardness	mg/L CaCO3	5	28
SCP 053A	Calcium (Ca)	mg/L	1.0	5.7
SCP 053A	Magnesium (Mg)	mg/L	0.2	3.3
SCP 053A	Potassium (K)	mg/L	1.0	< 1.0
SCP 053A	Sodium	mg/L	1.0	22.9
SCP 044	Total Phosphorus	mg/L P	0.04	0.04
SCP 018	True Colour	Pt-Co	5	< 5
SCP 065B	Total Organic Carbon (TOC)	mg/L	0.5	0.9
SCP 038/073	Aluminium	µg/L	10	28
SCP 038/073	Arsenic	µg/L	1	< 1
SCP 038/073 *	Barium (Ba)	µg/L	1	9
SCP 038/073	Cadmium	µg/L	0.45	< 0.45
SCP 038/073	Chromium	µg/L	1	< 1
SCP 038/073	Iron	µg/L	5	8
SCP 038/073	Lead	µg/L	1.00	< 1.00
SCP 038/073	Manganese	µg/L	1.00	3.15
SCP 038/073	Nickel	µg/L	1	< 1
SCP 038/073 *	Strontium (Sr)	µg/L	1	20
SCP 038/73	Zinc (Zn)	µg/L	8	< 8

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Customer Sample Ref:	BH3	**Customer Sample Code:**	
Project:		**Sampled By:**	Customer
Our Reference:	38131 (21-12505)	**Sample Matrix:**	Ground Water
Date Sampled:	17/06/2021	**Time Sampled:**	:

Method:	Parameter:	Units	LOQ	Result
	Microbiological Analysis: (D)			
SMP 019	Coliforms	MPN/100mL	<1	< 1
SMP 019	E. coli	MPN/100mL	<1	< 1
	Chemical Analysis: (F)			
SCP 052	Hydrogen Ion (pH)	pH units	1	6.6
SCP 052	Conductivity	µS/cm @ 20 °C	15	154
SCP 015	Biological Oxygen Demand (BOD)	mg/L	1.0	< 1.0
SCP027H	Alkalinity	mg/L as CaCO3	5.0	33.5
SCP 027A	Total Ammonia	mg/L N	0.02	< 0.02
SCP 027G	Nitrate	mg/L N	0.25	< 0.25
SCP 027B	Chloride	mg/L	0.5	27.3
SCP 027D	Sulphate	mg/L	0.5	8.6
SCP 027I	Total Hardness	mg/L CaCO3	5	34
SCP 053A	Calcium (Ca)	mg/L	1.0	8.0
SCP 053A	Magnesium (Mg)	mg/L	0.2	3.8
SCP 053A	Potassium (K)	mg/L	1.0	< 1.0
SCP 053A	Sodium	mg/L	1.0	15.5
SCP 044	Total Phosphorus	mg/L P	0.04	< 0.04
SCP 018	True Colour	Pt/Co	5	< 5
SCP 065B	Total Organic Carbon (TOC)	mg/L	0.5	1.3
SCP 038/073	Aluminium	µg/L	10	97
SCP 038/073	Arsenic	µg/L	1	< 1
SCP 038/073	Barium (Ba)	µg/L	1	5
SCP 038/073	Cadmium	µg/L	0.45	< 0.45
SCP 038/073	Chromium	µg/L	1	< 1
SCP 038/073	Iron	µg/L	5	27
SCP 038/073	Lead	µg/L	1.00	< 1.00
SCP 038/073	Manganese	µg/L	1.00	< 1.00
SCP 038/073	Nickel	µg/L	1	< 1
SCP 038/073	Strontium (Sr)	µg/L	1	17
SCP 038/73	Zinc (Zn)	µg/L	8	< 8

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web site www.southernscientific.ireland.com | e-mail info@southernscientific.ireland.com
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southern scientific services ltd.

Customer Sample Ref:	BH4	**Customer Sample Code:**	
Project:		**Sampled By:**	Customer
Our Reference:	38132 (21-12505)	**Sample Matrix:**	Ground Water
Date Sampled:	17/06/2021	**Time Sampled:**	:

Method:	Parameter:	Units	LOQ	Result
	Microbiological Analysis: (D)			
SMP 019	Coliforms	MPN/100mL	<1	< 1
SMP 019	E. coli	MPN/100mL	<1	< 1
	Chemical Analysis: (F)			
SCP 052	Hydrogen Ion (pH)	pH units	1	5.9
SCP 052	Conductivity	µS/cm @ 20 °C	15	126
SCP 015	Biological Oxygen Demand (BOD)	mg/L	1.0	1.3
SCP027H	Alkalinity	mg/L as CaCO3	5.0	34.0
SCP 027A	Total Ammonia	mg/L N	0.02	0.12
SCP 027G	Nitrate	mg/L N	0.25	< 0.25
SCP 027B	Chloride	mg/L	0.5	26.8
SCP 027D	Sulphate	mg/L	0.5	5.0
SCP 027I	Total Hardness	mg/L CaCO3	5	18
SCP 053A	Calcium (Ca)	mg/L	1.0	2.8
SCP 053A	Magnesium (Mg)	mg/L	0.2	1.2
SCP 053A	Potassium (K)	mg/L	1.0	< 1.0
SCP 053A	Sodium	mg/L	1.0	14.6
SCP 044	Total Phosphorus	mg/L P	0.04	0.11
SCP 018	True Colour	Pt/Co	5	< 5
SCP 065B	Total Organic Carbon (TOC)	mg/L	0.5	1.9
SCP 038/073	Aluminium	µg/L	10	700
SCP 038/073	Arsenic	µg/L	1	3
SCP 038/073	Barium (Ba)	µg/L	1	28
SCP 038/073	Cadmium	µg/L	0.45	< 0.45
SCP 038/073	Chromium	µg/L	1	2
SCP 038/073	Iron	µg/L	5	6849
SCP 038/073	Lead	µg/L	1.00	< 1.00
SCP 038/073	Manganese	µg/L	1.00	279.84
SCP 038/073	Nickel	µg/L	1	< 1
SCP 038/073	Strontium (Sr)	µg/L	1	14
SCP 038/73	Zinc (Zn)	µg/L	8	< 8

(registered office)
4 park business centre | farranfore | county kerry | ireland | telephone +353 66 976 3588 | fax +353 66 976 3589
dunnne | killarney | county kerry | ireland | telephone +353 64 66 33922 | fax +353 64 66 39022
web site www.southernscientific.ireland.com | e-mail info@southernscientific.ireland.com
directors: K. Murphy, M. Murphy & C. Murphy
registered in ireland no 323196 | vat reg no IE 6343196 M

City Analysts Limited
Environmental Laboratories

City Analysts Limited,
Pigeon House Road,
Ringsend,
Dublin 4.

Tel: (01) 613 6003
Fax: (01) 613 6008

Email:
reports@cityanalysts.ie

www.cityanalysts.ie

Customer

Richard Langford

Kilcosgriff
Shanagolden
Co. Limerick

Certificate Of Analysis

Job Number: 21-01176
Issue Number: 1
Report Date: 6 July 2021

Site: Not Applicable
PO Number: Not Supplied
Date Samples Received: 18/06/2021

Please find attached the results for the samples received at our laboratory on 18/06/2021.

Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our website at the above address.

Thank you for choosing City Analysts Limited. We look forward to assisting you again.

Authorised By: Louise Morrow **Authorised Date:** 6 July 2021

Louise Morrow

Notes are not INAB accredited

Results relate only to the items tested.
Information on methods of analysis and uncertainty of measurement is available on request.
Any opinions or interpretations indicated are outside the scope of our INAB accreditation.
This test report shall not be reproduced except in full or with written approval of City Analysts Limited.

City Analysts Limited
Environmental Laboratories

City Analysts Limited.
Pigeon House Road,
Ringsend.
Dublin 4.

Tel: (01) 613 6003
Fax: (01) 613 6009

Email:
reports@cityanalysts.ie

www.cityanalysts.ie

Certificate Of Analysis

Customer

Richard Langford

Kilcosgriff
Shanagolden
Co. Limerick

Report Reference: 21-01176

Report Version: 1

Site: Not Applicable

Sample Description: BH2

Sample Type: Ground

Lab Reference Number: 585468

Date of Sampling 17/06/2021

Date Sample Received: 18/06/2021

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/DS000#	25/06/2021	Alkalinity CaCO3	57.8	mg/l	-
D/DS000#	25/06/2021	Ammonia as N	0.127	mg/l	-
S/S1003#	17/06/2021	CBOD5	11	mg/l O2	-
D/DS000#	30/06/2021	Calcium	19.4	mg/l	-
D/DS000#	25/06/2021	Chloride	30.4	mg/l	-
S/S3010#	19/06/2021	Colour True	8.00	Hazen	-
S/S3011#	18/06/2021	Conductivity @ 20°C	194	uS/cm @20°C	-
D/DS001#	30/06/2021	Hardness as CaCO3	60.0	mg/l	-
D/DS001#	30/06/2021	Magnesium	2.83	mg/l	-
D/DS001#	30/06/2021	Iron	1320	ug/l	-
D/DS001#	30/06/2021	Manganese	76.8	ug/l	-
D/DS000#	25/06/2021	Nitrate as N	< 2.00	mg/l	-
S/S1041#	18/06/2021	PH	9.82	pH Unit	-
D/DS001#	30/06/2021	Potassium	3.41	mg/l	-
D/DS001#	30/06/2021	Sodium	17.4	mg/l	-
D/DS000#	25/06/2021	Sulphate	< 20.0	mg/l	-
S/S3224#	25/06/2021	Total Organic Carbon	4.58	mg/l	-
EPH Chem 6-10-21-40 (Q20-20480)					

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note.
PV Value is the parametric value, taken from European Communities. (Drinking Water) Regulations. 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
NAC & ATC - No abnormal change and acceptable to customers.
TVC - Total viable count
Site D = Analysed at City Analysts Dublin, Site S = Analysed at City Analysts Shannon

City Analysts Limited
Environmental Laboratories

City Analysts Limited,
Pigeon House Road,
Ringsend,
Dublin 4.

Tel: (01) 613 6003
Fax: (01) 613 6008

Email:
reports@cityanalysts.ie

www.cityanalysts.ie

Certificate Of Analysis

Customer

Richard Langford

Kilcosgriff
Shanagolden
Co. Limerick

Report Reference: 21-01176

Report Version: 1

Site: Not Applicable

Sample Description: BH1

Sample Type: Ground

Lab Reference Number: 585468

Date of Sampling 17/06/2021

Date Sample Received: 18/06/2021

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
1670*U	-	TPH >C6 - C10	< 0.10	µg/l	-
1670*U	-	TPH >C10 - C21	< 0.10	µg/l	-
1670*U	-	TPH >C21 - C40	< 0.10	µg/l	-
1670*U	-	TPH >C6 - C40	< 10	µg/l	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities (Drinking Water) Regulations, 2014, S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
NAC & AFC - No abnormal change and acceptable to customers.
TVC - Total viable count
Site D = Analysed at City Analysts Dublin, Site S = Analysed at City Analysts Shannon

Appendix 7.3 Groundwater Sampling Logs

Monitoring Well Sampling Log

Well No.:BH1 Knocknaboola

Project Details

Project No.:	C001966	***Location:***	Quirkes. Knocknaboola
Date:	17/06/2021	***Sampler:***	Richard Langford

Well Details

Well No.:	BH1	***Measurement Point:***	Top of Steel Casing
Stick up:	0.74	***TOC Elevation (mAOD):***	35.715
Water Level (mBTOC):	21.056	***Well Depth:***	17
Purged:	Sample Pump	***Well Diameter:***	0.05
Containers Used:	1l plastic, 1l Glass		

Field Parameters

Observed Colour:	Clear	***Odour:***	No Odour
Temperature (° C):	11.5	***Conductivity (µS):***	187
pH:	5.44	***DO (%):***	N/A

Analysis Required

Physico-Chemical Parameters, Main Ions, Phosphorus, Total Organic Carbon

Comments

Well purged using 2" sampling pump. Sample was initially cloudy but ran clear after two minutes. Sampled after 40 minutes when approximately 240 litres had been purged from the well.

Monitoring Well Sampling Log

Well No.:BH1 Knocknaboola

Project Details

Project No.:	C001986	***Location:***	Quirkes, Knocknaboola
Date:	17/06/2021	***Sampler:***	Richard Langford

Well Details

Well No.:	BH1	***Measurement Point:***	Top of Steel Casing
Stick up:	0.74	***TOC Elevation (mAOD):***	35.715
Water Level (mBTOC):	21.055	***Well Depth:***	17
Purged:	Sample Pump	***Well Diameter:***	0.05
Containers Used:	1l plastic, 1l Glass		

Field Parameters

Observed Colour:	Clear	***Odour:***	No Odour
Temperature (° C):	11.5	***Conductivity (µS):***	187
pH:	5.44	***DO (%):***	N/A

Analysis Required

Physico-Chemical Parameters, Main Ions, Phosphorus, Total Organic Carbon

Comments

Well purged using 2" sampling pump. Sample was initially cloudy but ran clear after two minutes. Sampled after 40 minutes when approximately 240 litres had been purged from the well.

Monitoring Well Sampling Log

Well No.:BH3 Riordan's

Project Details

Project No.:	C001986	***Location:***	Quirkes. Riordans
Date:	17/06/2021	***Sampler:***	Richard Langford

Well Details

Well No.:	BH3	***Measurement Point:***	Top of Plastic Casing
Stick up:	1.23	***TOC Elevation (mAOD):***	28.95
Water Level (mBTOC):	7.4	***Well Depth:***	9.01
Purged:	Sample Pump	***Well Diameter:***	0.05
Containers Used:	1l plastic. II Glass		

Field Parameters

Observed Colour:	Clear	***Odour:***	No Odour
Temperature (° C):	11.4	***Conductivity (µS):***	172
pH:	8.32	***DO (%):***	N/A

Analysis Required

Physico-Chemical Parameters, Main Ions, Phosphorus, Total Organic Carbon

Comments

Well purged using 2" sampling pump. Sample was initially cloudy but ran clear after three minutes. Sampled after 24 minutes when approximately 144 litres had been purged from the well.

Monitoring Well Sampling Log

Well No.:BH4 Knocknaboola

Project Details

Project No.:	C0019B6	***Location:***	Quirkes Knocknaboola
Date:	17/06/2021	***Sampler:***	Richard Langford

Well Details

Well No.:	BH4	***Measurement Point:***	Top of Steel Casing
Stick up:	0.6	***TOC Elevation (mAOD):***	28.98
Water Level (mBTOC):	11.37	***Well Depth:***	16.8
Purged:	Sample Pump	***Well Diameter:***	0.05
Containers Used:	1l plastic, 1l Glass		

Field Parameters

Observed Colour:	Slightly cloudy	***Odour:***	No Odour
Temperature (° C):	11.2	***Conductivity (µS):***	142
pH:	5.5	***DO (%):***	N/A

Analysis Required

Physico-Chemical Parameters, Main Ions, Phosphorus, Total Organic Carbon

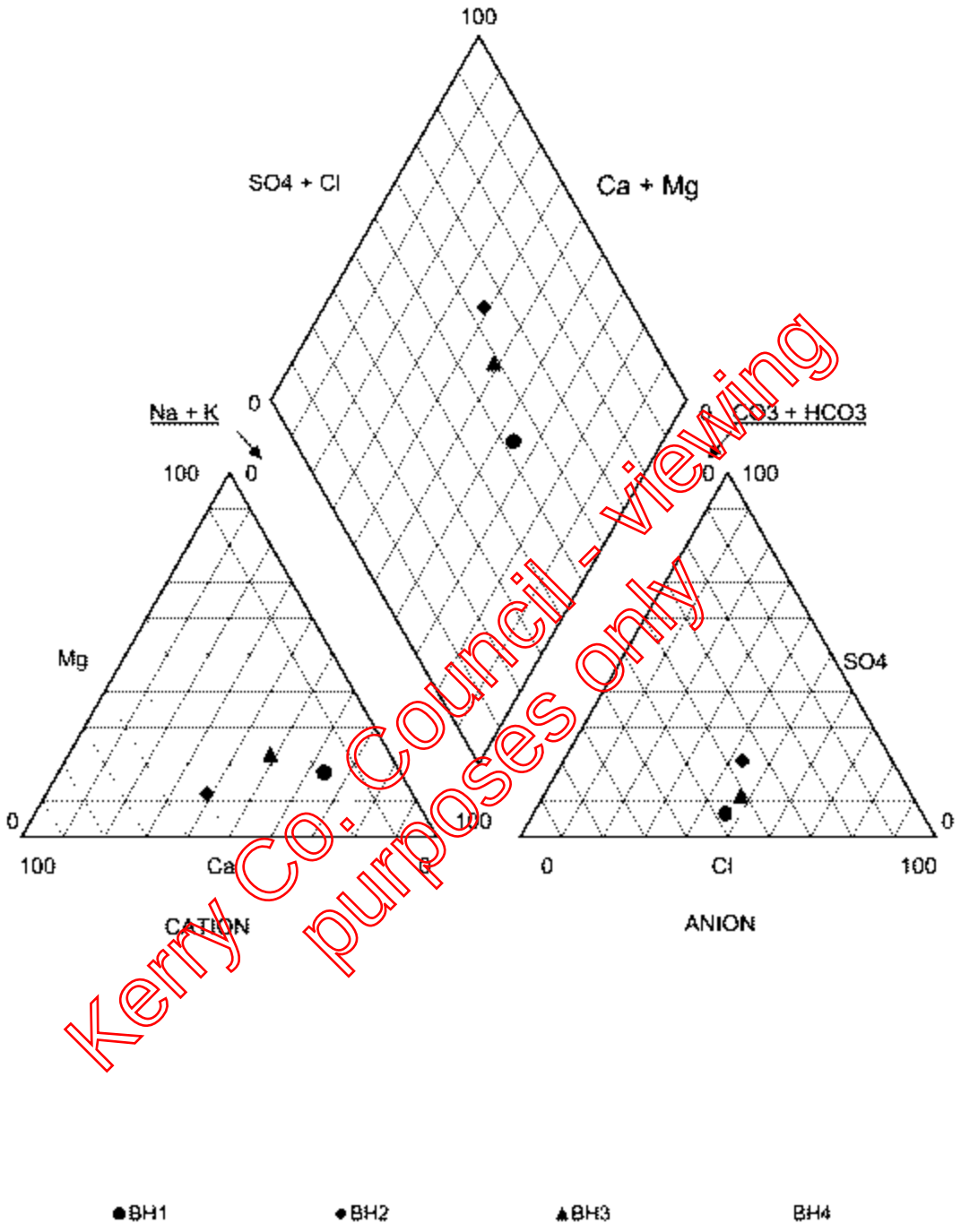
Comments

Well purged using 2" sampling pump. Sample was initially cloudy but cleared up slightly with time. Sampled after 36 minutes when approximately 234 litres had been purged from the well.

Appendix 7.0 Groundwater Piper Plot

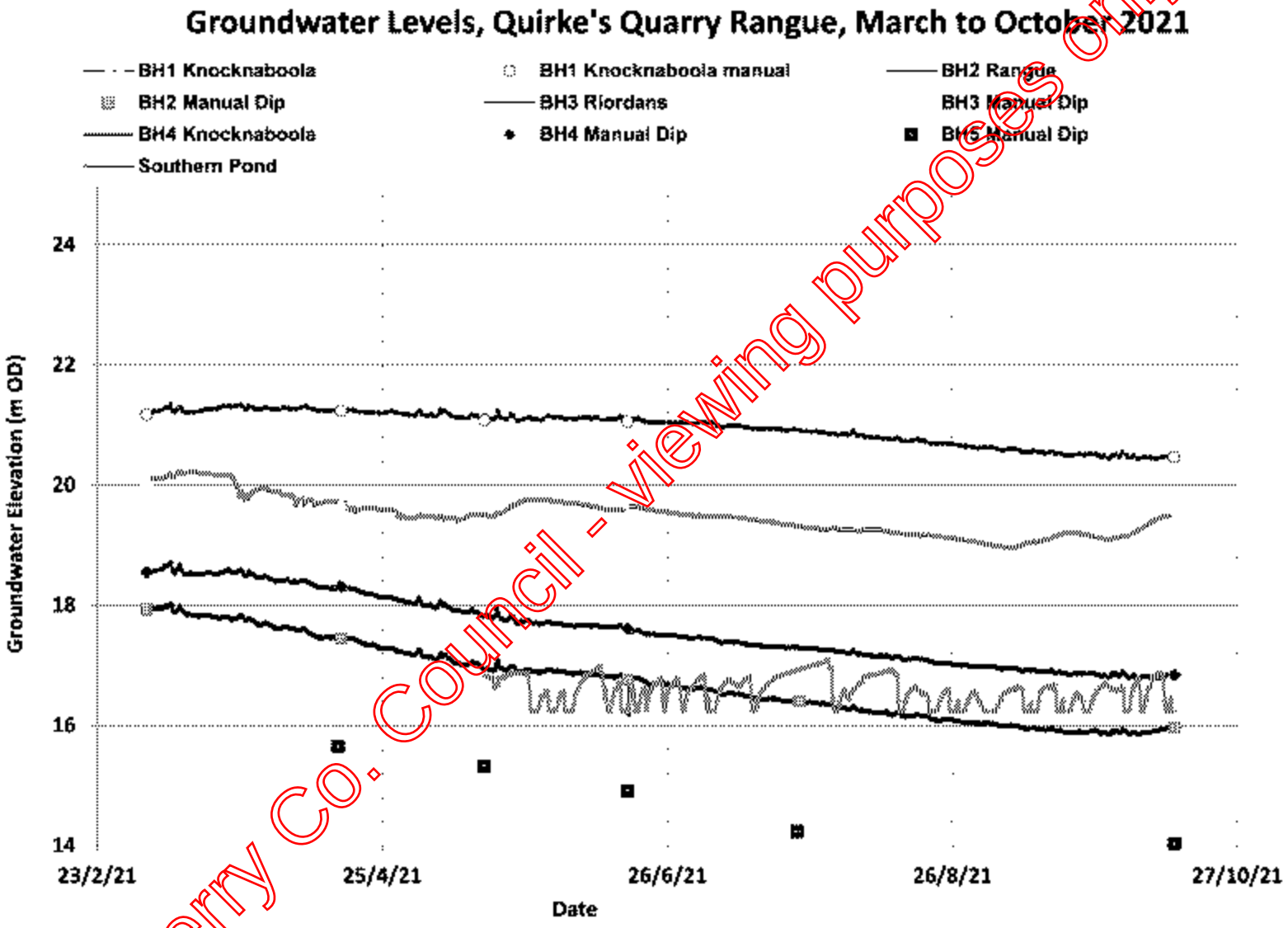
Rangue (June 2021)

PIPER DIAGRAM



●BH1 ●BH2 ▲BH3 BH4

Appendix 7.10 Groundwater Level Plots



Appendix 7.1 Stream Flow Gauging

SW1 Upstream

Section Number	Tape Reading (m)	Section Width (m)	Depth Reading (m)	Mean Depth of Section (m)	Area Section (m2)	Current-meter reading at 0.6 depth (m/s)	Mean vertical current meter reading (m/s)	Mean Velocity of Section (m/s)	Flow for section (m3/s)	Comments
Edge	0		0			0	0			
		0.1		0.085	0.0085			0.0065	5.53E-05	Not enough flow to force impellor
1	0.1		0.17			0.013	0.013			
		0.2		0.185	0.037			0.0275	0.001038	
2	0.3		0.2			0.042	0.042			
		0.2		0.195	0.039			0.0435	0.001697	
3	0.5		0.19			0.045	0.045			
		0.1		0.185	0.0185			0.0225	0.000416	
4	0.6		0.18			0	0			
		0.1		0.175	0.0175			0	0	
5	0.7		0.17			0	0			
		0.2		0.15	0.03			0	0	
6	0.9		0.13			0	0			
		0.2		0.105	0.021			0.003	0.000063	
7	1.1		0.08			0.006	0.006			
		0.16		0.04	0.0064			0.031	1.98E-05	
8	1.26		0			0.016	0.016			
							Total Flow = Q =		0.003	m3/second

SW2 Downstream of Quarry

Section Number	Tape Reading (m)	Section Width (m)	Depth Reading (m)	Mean Depth of Section (m)	Area Section (m2)	Current-meter reading at 0.6 depth (m/s)	Mean vertical current meter reading (m/s)	Mean Velocity of Section (m/s)	Flow for section (m3/s)	Comments
Edge	2.2		0			0	0			
		0.1		0.025	0.0025			0.0125	3.13E-05	Stone from 2.05 to 1.9 blocking flow
1	2.3		0.05			0.025	0.025			
		0.3		0.085	0.0255			0.0255	0.00065	Gravelly river bed with large cobbles
2	1.8		0.12			0.026	0.026			
		0.25		0.11	0.0275			0.0375	0.001031	Good flow across all channel
3	1.55		0.1			0.049	0.049			
		0.25		0.105	0.02625			0.0445	0.001168	
4	1.3		0.16			0.04	0.04			
		0.2		0.13	0.0325			0.034	0.001105	
5	1.05		0.15			0.028	0.028			
		0.25		0.125	0.03125			0.0325	0.001016	
6	0.8		0.1			0.037	0.037			
		0.25		0.1025	0.025625			0.055	0.002409	
7	0.55		0.105			0.073	0.073			
		0.25		0.1175	0.029375			0.044	0.001238	
8	0.3		0.12			0.015	0.015			
		0.1		0.105	0.0105			0.032	0.000336	
9	0.2		0.09			0.049	0.049			
		0.1		0.055	0.0055			0.0245	0.000135	
Edge	0.1		0.02			0	0			
							Total Flow = Q =		0.006	m3/second

SW1 Upstream

Section Number	Tape Reading (m)	Section Width (m)	Depth Reading (m)	Mean Depth of Section (m)	Area Section (m2)	Current-meter reading at 0.6 depth (m/s)	Mean vertical current meter reading (m/s)	Mean Velocity of Section (m/s)	Flow for section (m3/s)	Comments
Edge	0		0			0	0			
		0.1		0.02	0.002			0.0375	0.000075	
1	0.1		0.04			0.075	0.075			
		0.1		0.045	0.0045			0.075	0.000338	
2	0.2		0.05			0.075	0.075			
		0.1		0.0525	0.00525			0.084	0.000441	
3	0.3		0.055			0.093	0.093			
		0.1		0.0475	0.00475			0.093	0.000442	
4	0.4		0.04			0.093	0.093			
		0.1		0.0375	0.00375			0.0905	0.000339	
5	0.5		0.035			0.088	0.088			
		0.1		0.0325	0.00325			0.088	0.000286	
6	0.6		0.03			0.088	0.088			
		0.02		0.015	0.0003			0.044	1.32E-05	
7	0.62		0			0	0			
							Total Flow = Q =		0.002	m3/second

SW2 Downstream

Section Number	Tape Reading (m)	Section Width (m)	Depth Reading (m)	Mean Depth of Section (m)	Area Section (m2)	Current-meter reading at 0.6 depth (m/s)	Mean vertical current meter reading (m/s)	Mean Velocity of Section (m/s)	Flow for section (m3/s)	Comments
Edge	0		0			0	0			
		0.1		0.01	0.001			0	0	
1	0.1		0.02			0	0			
		0.1		0.035	0.0035			0.11	0.000385	
2	0.2		0.05			0.22	0.22			
		0.1		0.055	0.0055			0.135	0.000743	
3	0.3		0.06			0.05	0.05			
		0.1		0.065	0.0065			0.0425	0.000276	
4	0.4		0.07			0.035	0.035			
		0.1		0.06	0.006			0.0175	0.000105	
5	0.5		0.05			0	0			
		0.1		0.025	0.0025			0	0	
6	0.6		0			0	0			
							Total Flow = Q =		0.002	m3/second

SW1 Upstream

Section Number	Tape Reading (m)	Section Width (m)	Depth Reading (m)	Mean Depth of Section (m)	Area Section (m2)	Current meter reading at 0.6 depth (m/s)	Mean vertical current meter reading (m/s)	Mean Velocity of Section (m/s)	Flow for section (m3/s)	Comments
Edge	0.2		0.1			0	0			
		0.3		0.1	0.01			0	0	
1	0.3		0.1			0	0			
		0.2		0.14	0.028			0.012	0.000336	
2	0.5		0.18			0.024	0.024			
		0.2		0.19	0.038			0.033	0.001254	
3	0.7		0.2			0.042	0.042			
		0.2		0.21	0.042			0.041	0.001721	
4	0.9		0.22			0.04	0.04			
		0.2		0.225	0.045			0.0415	0.001868	
5	1.1		0.23			0.043	0.043			
		0.2		0.215	0.043			0.0405	0.002086	
6	1.3		0.2			0.054	0.054			
		0.2		0.175	0.035			0.0405	0.001418	
7	1.5		0.15			0.027	0.027			
		0.2		0.075	0.015			0.0135	0.000203	
Edge	1.7		0			0	0			
							Total Flow = Q =		0.009	

SW2 Downstream

Section Number	Tape Reading (m)	Section Width (m)	Depth Reading (m)	Mean Depth of Section (m)	Area Section (m2)	Current meter reading at 0.6 depth (m/s)	Mean vertical current meter reading (m/s)	Mean Velocity of Section (m/s)	Flow for section (m3/s)	Comments
Edge	0.2		0			0	0			Discharge taking place from quarry
		0.3		0.04	0.012			0.07	0.00084	
1	0.5		0.08			0.14	0.14			
		0.3		0.115	0.0345			0.1965	0.006779	
2	0.8		0.15			0.253	0.253			
		0.25		0.1675	0.042875			0.2265	0.009485	
3	1.05		0.185			0.2	0.2			
		0.15		0.1925	0.028875			0.215	0.006208	
4	1.2		0.2			0.23	0.23			
		0.2		0.195	0.039			0.245	0.009555	
5	1.4		0.19			0.26	0.26			
		0.2		0.195	0.039			0.227	0.008853	
6	1.6		0.2			0.194	0.194			
		0.2		0.2025	0.0405			0.14	0.00567	
7	1.8		0.205			0.086	0.086			
		0.2		0.1975	0.0395			0.1015	0.004009	
8	2		0.19			0.117	0.117			
		0.3		0.19	0.057			0.077	0.004389	
9	2.3		0.19			0.037	0.037			
		0.3		0.165	0.0495			0.057	0.002822	
10	2.6		0.14			0.077	0.077			
		0.2		0.07	0.014			0.0385	0.000539	
Edge	2.8		0			0	0			
							Total Flow = Q =		0.059	

SW1 Upstream of Quarry

Section Number	Tape Reading (m)	Section Width (m)	Depth Reading (m)	Mean Depth of Section (m)	Area Section (m2)	Current-meter reading at 0.6 depth (m/s)	Mean vertical current meter reading (m/s)	Mean Velocity of Section (m/s)	Flow for section (m3/s)	Comments
Edge	0.45		0.04			0	0			
		0.25		0.055	0.01375			0.0115	0.000158	
1	0.7		0.07			0.023	0.023			
		0.3		0.04	0.012			0.023	0.000276	
2	1		0.01			0.023	0.023			
		0.3		0.01	0.003			0.018	0.000054	
3	1.3		0.01			0.013	0.013			
		0.3		0.065	0.0195			0.011	0.000215	
4	1.6		0.12			0.009	0.009			
		0.3		0.07	0.021			0.0045	9.45E-05	
5	1.9		0.02			0	0			
		0.3		0.01	0.003			0	0	
Edge	2		0			0	0			
							Total Flow = Q =		0.001 m3/s	

SW2 Downstream of Quarry

Section Number	Tape Reading (m)	Section Width (m)	Depth Reading (m)	Mean Depth of Section (m)	Area Section (m2)	Current-meter reading at 0.6 depth (m/s)	Mean vertical current meter reading (m/s)	Mean Velocity of Section (m/s)	Flow for section (m3/s)	Comments
Edge	0		0			0	0			
		0.2		0	0			0	0	
1	0.2		0			0	0			
		0.3	0.05		0.015			0.001	0.000015	
2	0.5		0.1			0.002	0.002			
		0.3		0.08	0.024			0.015	0.00036	
3	0.8		0.06			0.028	0.028			
		0.3		0.08	0.024			0.0275	0.00066	
4	1.1		0.1			0.027	0.027			
		0.3		0.1	0.03			0.04	0.0012	
5	1.4		0.1			0.053	0.053			
		0.3		0.1	0.03			0.0615	0.001845	
6	1.7		0.1			0.07	0.07			
		0.3		0.095	0.0285			0.0345	0.0009833	
7	2		0.09			-0.001	-0.001			
		0.3		0.065	0.0195			-0.0005	-9.75E-06	
Edge	2.3		0.04			0	0			
							Total Flow = Q =		0.0051	

17th May 2021

Discharge through corripipe to Discharge point when small pump working

Diameter of pipe	=	0.444 m
Radius of pipe	=	0.222 m
Flow at 0.2 D	=	0.172 m/s
Flow at 0.6D	=	0.144 m/s
Flow at 0.8D	=	0.145 m/s
Average Flow	=	0.154 m/s
Depth of water	=	0.18 m
Wetted area	=	0.0589 m2
Discharge	=	0.0091 m3/second

Discharge through corripipe to Discharge point when 6" pump working

Diameter of pipe	=	0.444 m
Radius of pipe	=	0.222 m
Flow at 0.2 D	=	0.411 m/s
Flow at 0.6D	=	0.338 m/s
Flow at 0.8D	=	0.325 m/s
Average Flow	=	0.358 m/s
Depth of water	=	0.275 m
Wetted area	=	0.1 m2
Discharge	=	0.036 m3/second

Appendix 7.12 Surface Water Sampling Logs

Surface Water Sampling Log

Sampling Point.:SW1

Project Details

Project No.:	C001986	***Location:***	Knocknaboola, Upstream of Quarry
Date:	16/04/2021	***Sampler:***	Richard Langford

Field Parameters

Observed Colour:	Red tinge from water	***Odour:***	None
Temperature (°C):	11	***Conductivity (µS):***	112
pH:	7.37		

Analysis Required

Physicio-chemical Parametres, Ammonia, Nitrate, Nitrite, Ortho-P, Total P, Total Suspended Solids, Chloride, Total Nitrogen, Total Organic Carbon, Hydrocarbons.

Comments

Low flow sampling conditions

Surface Water Sampling Log

Sampling Point:SW2

Project Details

Project No.:	C001986	***Location:***	Rangue,Downstream of Quarry
Date:	16/04/2021	***Sampler:***	Richard Langford

Field Parameters

Observed Colour:	Red Tinge	***Odour:***	None
Temperature (°C):	9.7	***Conductivity (µS):***	125
pH:	6.59		

Analysis Required

Physicio-chemical Parametres, Ammonia, Nitrate, Nitrite, Ortho-P, Total P, Total Suspended Solids, Chloride, Total Nitrogen, Total Organic Carbon, Hydrocarbons

Comments

Low flow sampling conditions

Surface Water Sampling Log

Sampling Point.:SW1

Project Details

Project No.:	C001986	***Location:***	Knocknaboola, Upstream of Quarry
Date:	14/05/2021	***Sampler:***	Richard Langford

Field Parameters

Observed Colour:	Red Tinge from water	***Odour:***	None
Temperature (°C):	12.7	***Conductivity (µS):***	114
pH:	6.78		

Analysis Required

Physicio-chemical Parametres, Ammonia, Nitrate, Nitrite, Ortho-P, Total P, Total Suspended Solids, Chloride, Total Nitrogen, BOD, Total Organic Carbon, Hydrocarbons.

Comments

Moderate flow sampling conditions

Surface Water Sampling Log

Sampling Point:SW02

Project Details

Project No.:	C001986	***Location:***	Rangue,Downstream of Quarry
Date:	14/05/2021	***Sampler:***	Richard Langford

Field Parameters

Observed Colour:	Red Tinge	***Odour:***	None
Temperature (°C):	12.8	***Conductivity (µS):***	202
pH:	6.87		

Analysis Required

Physicio-chemical Parametres, Ammonia, Nitrate, Nitrite, Ortho-P, Total P, Total Suspended Solids, Chloride, Total Nitrogen, BOD, Total Organic Carbon, Hydrocarbons.

Comments

Moderate flow sampling conditions

Surface Water Sampling Log

Sampling Point:SW05

Project Details

Project No.:	C001986	***Location:***	Discharge Point
Date:	14/05/2021	***Sampler:***	Richard Langford

Field Parameters

Observed Colour:	Clear	***Odour:***	None
Temperature (°C):	13.1	***Conductivity (µS):***	246
pH:	6.9		

Analysis Required

Physicio-chemical Parametres, Ammonia, Nitrate, Nitrite, Ortho-P, Total P, Total Suspended Solids, Chloride, Total Nitrogen, BOD, Total Organic Carbon, Hydrocarbons.

Comments

Appendix 7.13 NPWS Site Synopsis

Site Name: Castlemaine Harbour SAC

Site Code: 000343

This is a large site located on the south-east corner of the Dingle Peninsula, Co. Kerry. It consists of the whole inner section of Dingle Bay, i.e. Castlemaine Harbour, the spits of Inch and White Strand/Rosbehy and a little of the coastline to the west. The River Maine, almost to Castlemaine, and much of the River Laune catchment, including the Gaddagh, Gweestion, Glanooragh, Cottoner's River and the River Loe, are also included within the site.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1130] Estuaries
[1140] Tidal Mudflats and Sandflats
[1210] Annual Vegetation of Drift Lines
[1220] Perennial Vegetation of Stony Banks
[1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
[1310] *Salicornia* Mud
[1330] Atlantic Salt Meadows
[1410] Mediterranean Salt Meadows
[2110] Embryonic Shifting Dunes
[2120] Marram Dunes (White Dunes)
[2130] Fixed Dunes (Grey Dunes)*
[2170] Dunes with Creeping Willow
[2190] Humid Dune Slacks
[91E0] Alluvial Forests*

[1095] Sea Lamprey (*Petromyzon marinus*)
[1099] River Lamprey (*Lampetra fluviatilis*)
[1106] Atlantic Salmon (*Salmo salar*)
[1355] Otter (*Lutra lutra*)
[1395] Petalwort (*Petalophyllum ralfsii*)

Inch Spit holds a fine sand dune system. It is one of the largest and best remaining dune systems in the country. Fore dunes are found on the western side of Rosbehy and Inch. In these younger, mobile dunes, Marram (*Ammophila arenaria*) is common, with Groundsel (*Senecio vulgaris*), Sea Rocket (*Cakile maritima*) and Dandelion

(*Taraxacum* agg.) also present. Other characteristic species include Sand Couch (*Elymus farctus*), Lyme-grass (*Leymus arenarius*) and Sea Spurge (*Euphorbia paralias*). Fixed dune, a priority habitat under the E.U. Habitats Directive, is well-represented at the site, and in particular towards the tip of Inch Spit. Such areas support species such as Lady's Bedstraw (*Galium verum*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Wild Thyme (*Thymus praecox*), Kidney Vetch (*Anthyllis vulneraria*), Wild Pansy (*Viola tricolor*), Biting Stonecrop (*Sedum acre*), Common Centuary (*Centaurium erythraea*), Thyme-leaved Sandwort (*Arenaria serpyllifolia*) and Common Whitlowgrass (*Erophila verna*), among others. There is also a rich lichen and bryophyte flora. The slightly damper conditions which prevail in dune slacks support Creeping Bent (*Agrostis stolonifera*), Crested Dog's-tail (*Cynosurus cristatus*), Glaucous Sedge (*Carex flacca*), Creeping Willow (*Salix repens*) and Jointed Rush (*Juncus articulatus*). The rare bryophyte Petalwort (*Petalophyllum ralfsii*), which is listed on Annex II of the E.U. Habitats Directive, has been recorded on this system. A smaller spit, with a similar diversity of dune types, occurs at Rossbehy on the southern shore, from where Yellow Centaury (*Cicendia filiformis*) and Knotted Pearlwort (*Sagina nodosa*) have been recorded from a dune slack along with other, more common, species.

The sand spits, and also the Coomore peninsula, are underlain by shingle and in places the shingle is exposed and supports a characteristic flora. Species present include Lyme-grass and Sea Sandwort (*Honckenya peploides*). Strandline communities are well-developed along Inch spit, with the exception of the north-western end where recreational pressure is high. Typical species of the strandline include Prickly Saltwort (*Salsola kali*), Sea Rocket, oraches (*Atriplex* spp.) and Sea Sandwort. Two Red Data Book plants, Sea Pea (*Lathyrus japonicus* subsp. *maritimus*) and Sea-kale (*Crambe maritima*), are found associated with the shingle and strandline communities.

The coastline is fringed in many places by saltmarsh. The vegetation here includes Thrift (*Armeria maritima*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Sea Rush (*Juncus maritimus*) and Sea Plantain (*Plantago maritima*). Upper saltmarsh communities extend inland, along estuarine channels, where they are mixed with freshwater communities. Sea Club-rush (*Scirpus maritimus*) and Common Reed (*Phragmites australis*) occur at these locations. Common Cord-grass (*Spartina anglica*) has colonised the lower part of the saltmarsh at Inch and extends out onto the open mudflat. Glassworts (*Salicornia* spp.) occur in association with saltmarsh.

West of Inch, cliffs of glacial drift occur, which support such plants as Ivy (*Hedera helix*), Red Fescue (*Festuca rubra*), Heather (*Calluna vulgaris*), Thrift, Sea Plantain, Sea Mayweed (*Matricaria maritima*), Kidney Vetch and Honeysuckle (*Lonicera periclymenum*). Along the cliff-tops there is coastal grassland with species such as Sweet Vernal-grass (*Anthoxanthum odoratum*), Cock's-foot (*Dactylis glomerata*) and Wood Sage (*Teucrium scorodonia*).

Much of the site consists of intertidal sand and mudflats, supporting a number of soft sediment communities, including beds of eelgrass (mostly *Zostera noltii*) in some

places. A subtidal mixed sediment community complex is also present in the channel between Rossbehy Point and Inch Point.

The rivers and their associated habitats also make up a considerable portion of the site. These associated habitats include wet grassland, woodland, scrub and bog/heath. In the valley up-river of Killorglin, is an interesting area of alluvial wet woodland, dominated by Alder (*Alnus glutinosa*) and willows (*Salix* spp.). The vegetation is quite diverse, and there are spectacular tussocks of Greater Tussock-sedge (*Carex paniculata*). Other species which occur include Ash (*Fraxinus excelsior*), Wild Angelica (*Angelica sylvestris*), Cuckooflower (*Cardamine pratensis*), Meadowsweet (*Filipendula ulmaria*), Common Nettle (*Urtica dioica*), Remote Sedge (*Carex remota*) and a range of bryophytes. While small in area, this is one of the few examples in Ireland of woodland on riverine alluvium dominated by native tree species.

Five plants listed in the Irish Red Data Book have been recorded at this site: Sea-kale, Corn Cockle (*Agrostemma githago*), Sea Pea, Pennyroyal (*Mentha pulegium*) and Irish Lady's-tresses (*Spiranthes romanzoffiana*). The three last-named are legally protected under the Flora (Protection) Order, 1999, as is the rare bryophyte, Petalwort. Other scarce species which occur here are Yellow Bartsia (*Parentucellia viscosa*), Lax-flowered Sea-lavender (*Limonium humile*) and Blue-eyed-grass (*Sisyrinchium bermudiana*).

The vicinity of Castlemaine Harbour is also important as one of few areas in Ireland (all of which are in Co. Kerry) where the Natterjack Toad naturally occurs. This amphibian is listed in the Irish Red Data Book and on Annex IV of the E.U. Habitats Directive.

The site also supports a small colony of Common Seal, while two Lamprey species have been recorded in the Laune river catchment. The Laune catchment is used by Otter and is also an important Salmon system with nurseries, riffles pools and glides.

Castlemaine Harbour is a very important site for passage and wintering waterfowl. The following figures are derived from counts between 1994/5 and 1996/7. One species occurs here in internationally important numbers - Brent Goose (734) - with 16 species having populations of national importance: Cormorant (215), Shelduck (129), Pintail (167), Scaup (138), Wigeon (3,513), Red-breasted Merganser (51), Oystercatcher (1,539), Ringed Plover (330), Golden Plover (1,940), Grey Plover (122), Knot (347), Sanderling (207), Dunlin (1,360), Redshank (299), Greenshank (26) and Turnstone (296).

Castlemaine Harbour is of major ecological importance. It contains a range of coastal habitats of excellent quality, including many that are listed on Annex I of the E.U. Habitats Directive, and two which are listed with priority status (fixed dunes and alluvial forests). It also includes long stretches of river and stream which are excellent habitats for Salmon, Lamprey and Otter. Inch dunes are recognised as among the finest in the country, with particularly well-developed dune slacks. The

site supports internationally important waterfowl populations, rare plant species, the rare Natterjack Toad, as well as populations of several animal species that are listed on Annex II of the E.U. Habitats Directive. Part of the site is designated a Special Protection Area (SPA) and is listed as a site under the Ramsar Convention. Part of Castlemaine Harbour is a Statutory Nature Reserve, while Inch and Rosbehy are Wildfowl Sanctuaries.

Attachment 4

Cultural Heritage Appendix

Tobar Report

An Roinn Cultúir,
Oidhreachta agus Gaeltachta
Department of Culture,
Heritage and the Gaeltacht

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Site Owner: M.F. Quirke & Sons

Address: Rangue,

Killorglin, Co. Kerry

Planning Authority: Kerry County Council

Planning Reg. No.: Pre-planning

Excavation Type: Testing

[as per licence application]

Contractor/Developer: As Above

Address: As Above

Background to excavation:

Pre-development archaeological testing

Signed:		Date:	04/06/2021

Proposed Quarry Extension at Rangue and Knocknaboola Tds., Killorglin, Co. Kerry

Archaeological Testing Report (Final) – Part 2

Author: Miriam Carroll, BA, MA, MIAI

Excavation Licence No. 20E0517(EXT) X (Miriam Carroll)

Planning Ref: Pre-Planning

Client: M.F. Quirke & Sons

C/O Irish Concrete Federation

Date: 04/06/2021

Contents

1. REPORT DETAILS

Excavation report	Final Report
Excavation Licence No.	**20E0517 X**
Licensee:	Miriam Carroll
Planning Ref:	Pre-planning
Townland:	Rangue and Knocknaboola
County:	Kerry
ITM Coordinates (Centre point)	ITM E475848 N593387
Planning Status:	Pre-planning

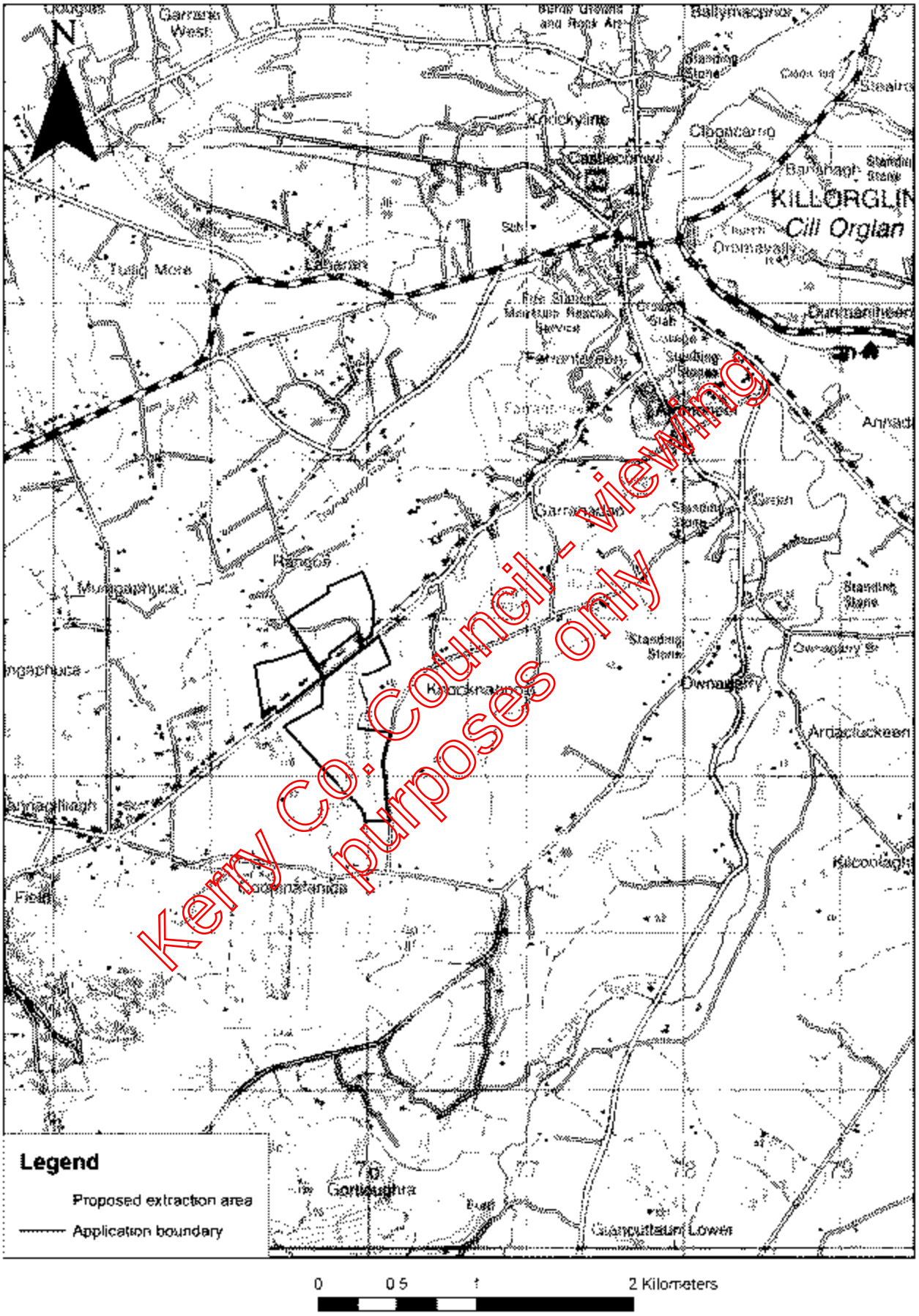
2. INTRODUCTION

2.1 Scope of Work

Tobar Archaeological Services were engaged by M.F. Quirke and Sons Ltd. to carry out pre-development archaeological testing of a proposed quarry extension at Rangue and Knocknaboola townlands, Killorglin, Co. Kerry. The testing was carried out by Miriam Carroll in May 2021 under excavation licence 20E0517 and involved the excavation of 50 test trenches within the proposed extraction area. No recorded monuments are located on or close to the proposed extraction area and no archaeological finds, features or deposits were identified during the testing.

2.2 Development Description and Site Location

The proposed development comprises an extension to an existing quarry at Rangue and Knocknaboola townlands, Killorglin, Co. Kerry. The proposed extraction area is located to the south of an existing quarry and south-east of a local road which extends between Killorglin c. 2.3km to the north-east and Carragh village c. 1km to the south-west. The proposed development site is located in grass-covered blanket peat and is bound to the east by the Glashacoamnafanida Stream. Some drainage features with flowing water are also present within the proposed development site. Peat harvesting has taken place in at least some portions of the proposed extraction area. In general peat depths were shallow typically measuring between 0.2m-0.6m but up to 1m in places. Deeper peat was encountered at the north-west side of the proposed extraction area. This coupled with peat stability limited the excavation of trenches in this area.



2.3 Methodology

The testing methodology was agreed with the National Monuments Service (NMS) through the licensing system. Blanket testing of the proposed extraction area was undertaken as per the method statement agreed through the licensing system. It was intended to excavate 56 trenches to provide an overview of the archaeological potential of the proposed extraction area. It was outlined in the agreed method statement, however, that ground conditions such as peat depth or stability may limit or restrict the excavation of trenches in certain areas. As stated above, deep peat was encountered at the north-west side of the proposed extraction area. The stability of the peat combined with its depth did not allow for the safe excavation of five trenches. Further to the north-east an additional trench was not excavated due to the presence of a drainage feature with flowing water.

Consequently, a total of 50 trenches were excavated across the site. They measured between 30m and 100m in length and were excavated using a tracked excavator equipped with a 1.8-2m wide grading (toothless) bucket. The trenches were set out using a a mm accurate GNSS Leica GPS and were excavated to the top of the underlying subsoil. A photographic and descriptive record was made of each trench. No archaeological finds, features or deposits were uncovered within the limits of any of the excavated trenches.

3. STATUTORY CONTEXT

3.1 Current Legislation

Archaeological monuments are safeguarded through national and international policy, which is designed to secure the protection of the cultural heritage resource. This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention). This was ratified by Ireland in 1997.

Both the National Monuments Acts 1930 to 2004 and relevant provisions of the Cultural Institutions Act 1997 are the primary means of ensuring protection of archaeological monuments, the latter of which includes all man-made structures of whatever form or date. There are a number of provisions under the National Monuments Acts which ensure protection of the archaeological resource. These include the Register of Historic Monuments (1997 Act) which means that any interference to a monument is illegal under that Act. All registered monuments are included on the Record of Monuments and Places (RMP).

The Record of Monuments and Places (RMP) was established under section 12 (1) of the National Monuments (Amendment) Act 1994 and consists of a list of known archaeological monuments and accompanying maps. The Record of Monuments and Places affords some protection to the monuments entered therein. Section 12 (3) of the 1994 Amendment Act states that any person proposing to carry out work at or in relation to a recorded monument must give notice in writing to the Minister (Environment, Heritage and Local Government) and shall not commence the work for a period of two months after having given the notice. All proposed works, therefore, within or around any archaeological monument are subject to statutory protection and legislation (National Monuments Acts 1930-2004).

Under the Heritage Act (1995) **architectural heritage** is defined to include *'all structures, buildings, traditional and designed, and groups of buildings including street-scapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents...'*. A heritage building is also defined to include *'any building, or part thereof, which is of significance because of its intrinsic architectural or artistic quality or its setting or because of its association with the commercial, cultural, economic, industrial, military, political, social or religious history of the place where it is situated or of the country or generally'*.

The Planning and Development Act 2000 (as amended), sets out the legal framework for the protection of buildings/structures which are of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest. Such protection is afforded through the mechanism of the Record of Protected Structures (RPS). In relation to a protected structure or proposed protected structure, the term 'structure' includes the interior of the structure, the land lying within the curtilage of the structure, any other structures lying within that curtilage and their interior, and all fixtures and features which form part of the interior or exterior of that structure. The protection also extends to any features specified as being in the attendant grounds.

4. ARCHAEOLOGICAL PLANNING REQUIREMENTS

The archaeological testing at Rangue and Knocknaboola, Killorglin, Co. Kerry was carried out at the pre-planning stage of the proposed development. This report will be submitted with the planning application for the proposed extraction area.

TOBAR ARCHAEOLOGICAL SERVICES

Proposed Quarry Extension at Rangue and Knocknaboola Tds., Killorglin, Co. Kerry

Archaeology Testing Report Part 1 - Final

Author: Miriam Carroll, BA, MA, MIAI

Excavation Licence No. 20E0517 (EXT)

Date: 04/06/2021

5. ARCHAEOLOGICAL BACKGROUND

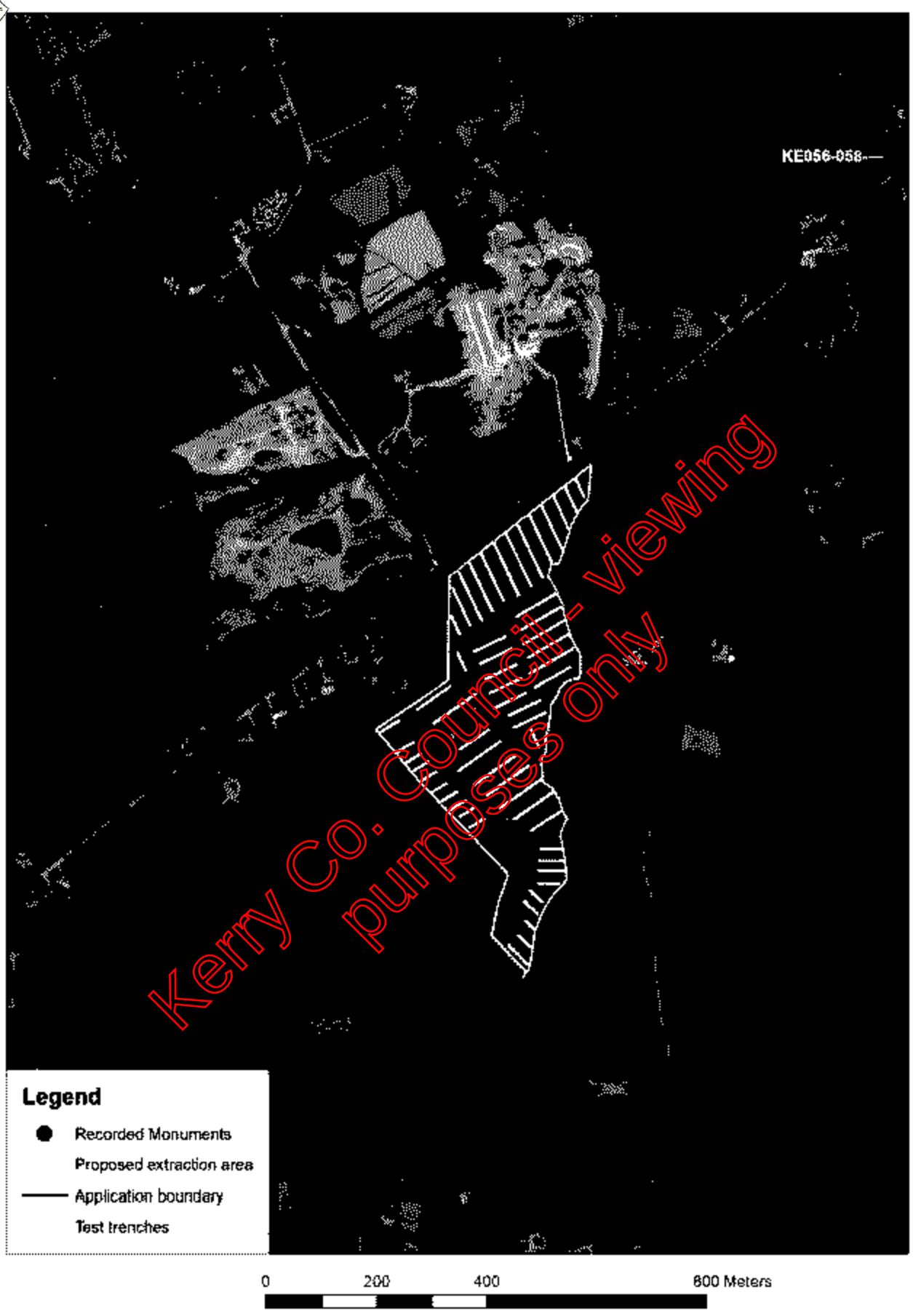
5.1 Recorded Monuments

No recorded monuments are situated in the area which is now proposed for development and within which the proposed test trenches were excavated. The nearest recorded monument is situated over 500m to the north-east in the townland of Rangue and comprises a burnt spread KE056-058. It is described in the Historic Environment Viewer (www.webgis.archaeology.ie/historicenvironment) as follows:

KE056-058----
Class: Burnt spread
Townland: RANGUE
Scheduled for inclusion in the next revision of the RMP: Yes
Description: A probable burnt spread or fulacht fiadh, found 0.6m below current ground level. The test trench was extended to the north and south and the site appears to have been situated along the edge of a body of water to the west. The deposit of heat shattered stone and charcoal-rich soil is at least 0.75m in thickness and its extent can be measured as 14m north/south by 8.5m east/west. This has been preserved in situ but there is no surface trace.

Compiled by: Aidan Harte

Date of upload: 7 July 2016



6. RESULTS OF ARCHAEOLOGICAL TESTING

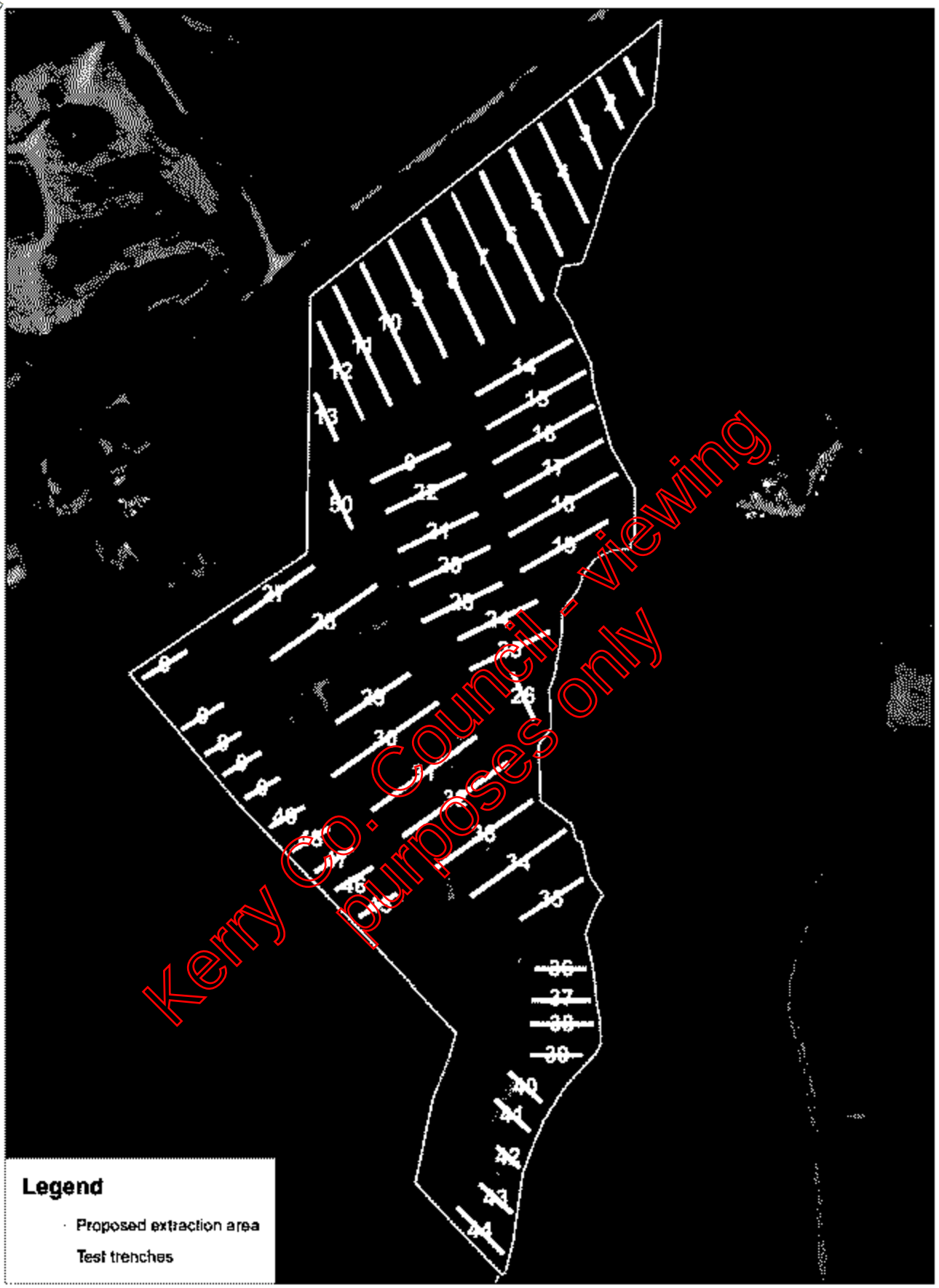
A total of 50 trenches were excavated across the proposed extraction area at Rangue and Knocknaboola in varying weather conditions. All trenches were set out using a mm accurate Leica GPS CS20 Field Controller and GS16 antenna. As outlined above, peat depths varied across the site but generally were relatively shallow and overlay a beige-grey stoney subsoil. Deep peat measuring in excess of 2m in depth was encountered at the west side of the proposed extraction area and was also waterlogged and unstable. Trenching was therefore limited in this area of the site. Water ingress occurred in several trenches, however, the subsoil was exposed at the base of each trench and was relatively consistent throughout. No archaeological finds, features or deposits were uncovered within the limits of any of the excavated trenches. The test trenches are described below and listed in Table 1.

Table 1 Test trench details

Test trench No.	Length	Width	Archaeology Present
1	31m NW/SE	2m	No
2	41m NW/SE	2m	No
3	55m NW/SE	2m	No
4	81m NW/SE	2m	No
5	85m NW/SE	2m	No
6	107m NW/SE	2m	No
7	104m NW/SE	2m	No
8	100m NW/SE	2m	No
9	95m NW/SE	2m	No
10	97m NW/SE	2m	No
11	94m NW/SE	2m	No
12	79m NW/SE	2m	No
13	38m NW/SE	2m	No
14	82m NE/SW	2m	No
15	83m NE/SW	2m	No
16	87m NE/SW	2m	No
17	83m NE/SW	2m	No

18	90m NE/SW	2m	No
19	73m NE/SW	2m	No
20	60m NE/SW	2m	No
21	64m NE/SW	2m	No
22	63m NE/SW	2m	No
23	64m NE/SW	2m	No
24	65m NE/SW	2m	No
25	65m NE/SW	2m	No
26	38m NW/SE	2m	No
27	71m NE/SW	2m	No
28	96m NE/SW	2m	No
29	64m NE/SW	2m	No
30	76m NE/SW	2m	No
31	92m NE/SW	2m	No
32	94m NE/SW	2m	No
33	89m NE/SW	2m	No
34	85m NE/SW	2m	No
35	57m NE/SW	2m	No
36	38m E/W	2m	No
37	42m E/W	2m	No
38	46m E/W	2m	No
39	40m E/W	2m	No
40	30m NW/SE	2m	No
41	30m NW/SE	2m	No
42	26m NW/SE	2m	No
43	32m NW/SE	2m	No

44	49m NW/SE	2m	No
45	29m NE/SW	2m	No
46	33m NE/SW	2m	No
47	32m NE/SW	2m	No
48	32m NE/SW	2m	No
49	29m NE/SW	2m	No
50	38m NW/SE	2m	No



6.1 Trench 1

Trench 1 was located at the north-east side of the site in shallow grass and heather-covered peat. It measured c. 31m in length and was orientated NW/SE. Peat cover here measured c.0.15m and overlay a grey stoney subsoil. No archaeological finds, features or deposits were uncovered.

Photo 1. Trench 1 looking SE

6.2 Trench 2

Trench 2 was located to the south-west of Trench 1 and measured c. 41m in length. Peat cover here measured c. 0.15m and overlay a grey stoney subsoil. No archaeological finds, features or deposits were uncovered.

Photo 2. Trench 2 looking SE

6.3 Trench 3

Trench 3 was excavated to the south-west of Trench 2. It measured c. 55m in length and was orientated NW/SE. Peat cover here measured c.0.15m and overlay a grey stoney subsoil. No archaeological finds, features or deposits were uncovered.

6.4 Trench 4

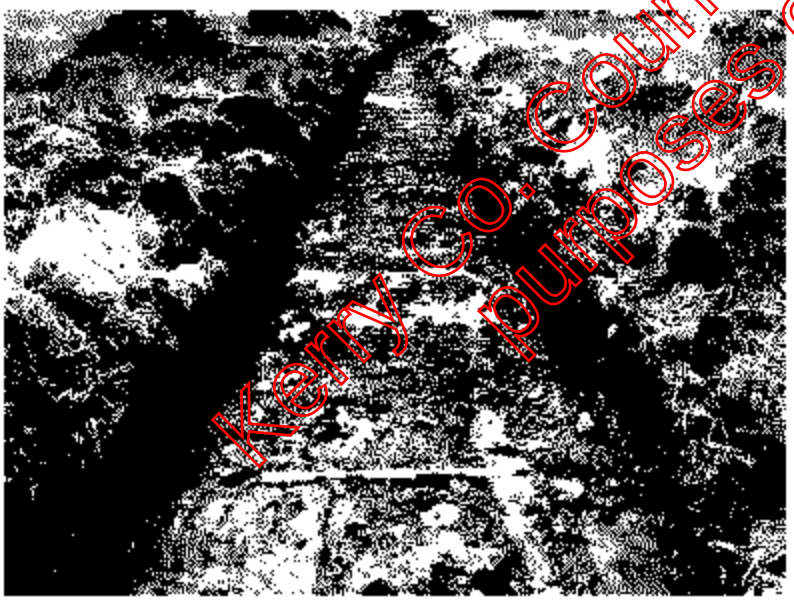
Trench 4 was located to the south-west of trench 3. It measured ca. 81m in length and was orientated NW/SE. The stratigraphy in this trench consisted of shallow peat 0.2m-0.25m in thickness which overlay a beige grey stoney subsoil. No archaeological finds, features or deposits were uncovered.

6.5 Trench 5

Trench 5 was situated to the south-west of Trench 4. It measured c. 85m in length and was orientated NW/SE. Peat here was c. 0.3m thick at the south end of trench becoming slightly thicker to the north where it measured c. 0.4m. It overlay a beige grey stoney subsoil and no archaeological finds, features or deposits were uncovered.

6.6 Trench 6

Trench 6 was excavated to the south-west of Trench 5. It measured c. 107m in length and was orientated NW/SE. Peat depth within this trench varied from 0.3m at the south-east end to 0.3m further north, getting slightly deeper again at the north end before again rising up. It overlay a beige grey stoney subsoil and no archaeological finds, features or deposits were uncovered.

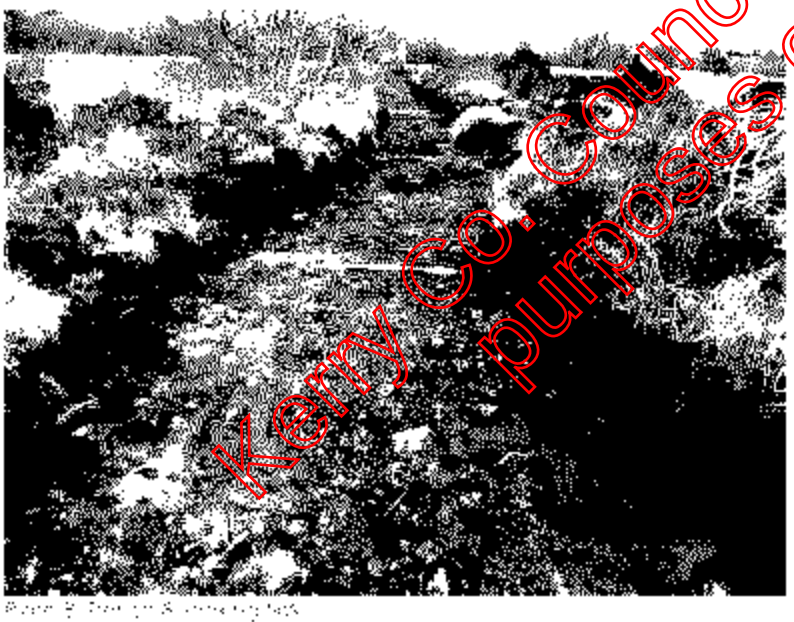


6.7 Trench 7

Trench 7 was located to the south-west of Trench 6. It measured c. 104m in length and was orientated NW/SE. Over much of the trench length the peat varied between 0.4m-0.5m in thickness and overlay a beige grey stoney subsoil. The peat depth became shallower towards the north-west where it measured c.0.2min thickness. No archaeological finds, features or deposits were uncovered.

6.8 Trench 8

Trench 8 was excavated to the south-west of Trench 7. It was orientated NW/SE and measured c. 100m in length. The peat depth varied throughout the length of the trench but on average ranged from 0.3m-0.6m. At the north-west end of the trench the peat measured only 0.1-0.2m in thickness and overlay the same stoney beige-grey subsoil exposed in the previous trenches. No archaeological finds, features or deposits were uncovered.



6.9 Trench 9

Trench 9 measured c. 95m in length and was excavated to the south-west of Trench 8. The stratigraphy in this trench consisted of 0.3-0.4m of peat over the same stoney beige grey subsoil. No archaeology was uncovered.

6.10 Trench 10

Trench 10 was located south-west of Trench 9. It measured c. 97m in length and was orientated NW/SE. The stratigraphy in this trench was shallow and comprised c.0.2-0.3m of peat over a beige grey stoney subsoil. No archaeological find, features or deposits were uncovered.

6.11 Trench 11

Trench 11 was excavated to the south-west of Trench 10. It measured c. 94m in length and was orientated NW/SE. The stratigraphy in this trench consisted of c. 0.3m of peat over a stoney beige grey subsoil. No archaeological finds, features or deposits were uncovered.

6.12 Trench 12

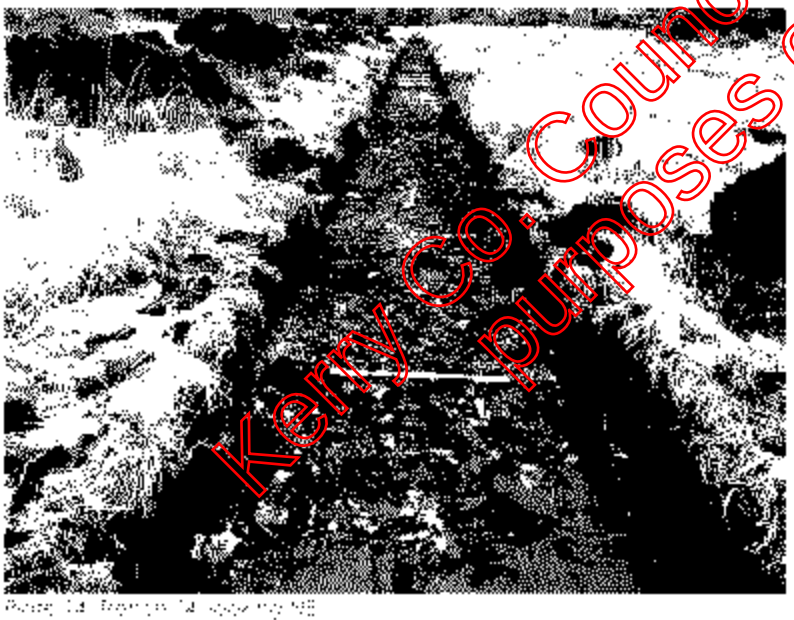
Trench 12 was located to the south-west of Trench 11. It was orientated NW/SE and measured c. 79m in length. The stratigraphy in this trench consisted of c. 0.3m of peat over a stoney beige grey subsoil. No archaeological finds, features or deposits were uncovered.

6.13 Trench 13

Trench 13 was excavated to the south-west of Trench 12. It measured c. 38m in length and was orientated NW/SE. Peat in this trench was c 0.3-0.4m in thickness and overlay a beige grey stoney subsoil. No archaeological finds, features or deposits were uncovered.

6.14 Trench 14

Trench 14 was situated in a parcel of the proposed extraction area which is separated from the area in which trenches 1-13 were excavated by a drain. Trench 14 was excavated at the east side of the site and was orientated NE/SW. It measured c. 82m in length and 0.5m-0.6m in depth. After the removal of peat and occasional tree roots the same beige-grey stoney subsoil was exposed along the length of the trench. No archaeological finds, features or deposits were uncovered.



6.15 Trench 15

Trench 15 was located at the east side of the site, south of Trench 14. It measured c. 83m in length and was orientated NE/SW. The stratigraphy here was similar to that in trench 14 and consisted of 0.5m-0.6m of peat which overlay a beige-grey stoney subsoil. No archaeological finds or features were uncovered.

6.16 Trench 16

Trench 16 was situated at the east side of the proposed extraction area, south of Trench 15. It measured c. 87m in length and was orientated NE/SW. The peat in this trench measured only 0.4-0.5m in thickness and overlay a beige grey stoney natural. No finds or features were uncovered.

6.17 Trench 17

Trench 17 was excavated to the south of Trench 16 at the east side of the proposed development site. It measured c. 83m in length and was orientated NE/SW. The stratigraphy generally comprised 0.4m of peat overlying the grey-beige stoney subsoil, although the ground undulated slightly over the length of the trench. No archaeological finds or features were uncovered.

6.18 Trench 18

Trench 18 was located at the east side of the site, south of Trench 17. It measured c. 90m in length and was orientated NE/SW. The stratigraphy in this trench consisted of 0.4m-0.6m of peat over the grey beige stoney subsoil. Water ingress occurred at the north-east end of trench where peat was deepest. No archaeological finds or features were uncovered.

6.19 Trench 19

This trench was excavated at the east side of the site, south of Trench 18. It measured c. 73m in length and was orientated NE/SW. The peat cover in Trench 19 was relatively shallow at the north-east becoming gradually thicker towards the south-west where it measured up to 1m and overlay the grey-beige stoney subsoil noted elsewhere on the site. No archaeological finds or features were uncovered.

6.20 Trench 20

Trench 20 was excavated south-west of Trench 18 towards the central portion of the proposed development site. It measured c. 60m in length and was orientated NE/SW. Peat measuring c. 0.4m in thickness overlay the same grey beige stoney subsoil. No finds or features were uncovered.

6.21 Trench 21

Trench 21 was excavated to the north of Trench 20. It measured c. 64m in length and was orientated NE/SW. The stratigraphy in this trench was shallow comprising 0.3m-0.45m of peat over the same stoney subsoil. No archaeological finds or features were uncovered.

6.22 Trench 22

Trench 22 was located to the north of Trench 21. It was orientated NE/SW and measured c. 63m in length. Peat varied in thickness from 0.5m-0.6m at the south-west end to 0.45m at the north-east. No archaeological finds or features were uncovered and a grey-beige stoney subsoil was exposed throughout the length of the trench.

6.23 Trench 23

Trench 23 was excavated to the south of Trench 20. It measured c. 64m in length and was orientated NE/SW. Very shallow peat cover was apparent in this trench with only 0.1m of peat remaining along much of the trench length. The peat became very gradually thicker towards the north-east where it measured 0.3m. No archaeological finds or features were uncovered and the beige-grey stoney subsoil was exposed throughout.

6.24 Trench 24

Trench 24 was located to the south-east of Trench 23 towards the east side of the proposed extraction area. It measured c. 65m in length and was orientated NE/SW. Peat cover in this trench was shallow measuring only 0.15m-0.2m in thickness and overlay a beige-grey stoney subsoil. No archaeological find or features were uncovered.

6.25 Trench 25

Trench 25 was excavated south-east of Trench 24 at the east side of the proposed extraction area. It measured c. 65m in length and was orientated NE/SW. The peat measured c 0.35m-0.4m throughout the length of the trench and overlay the stoney subsoil. No archaeological finds or features were uncovered.

6.26 Trench 26

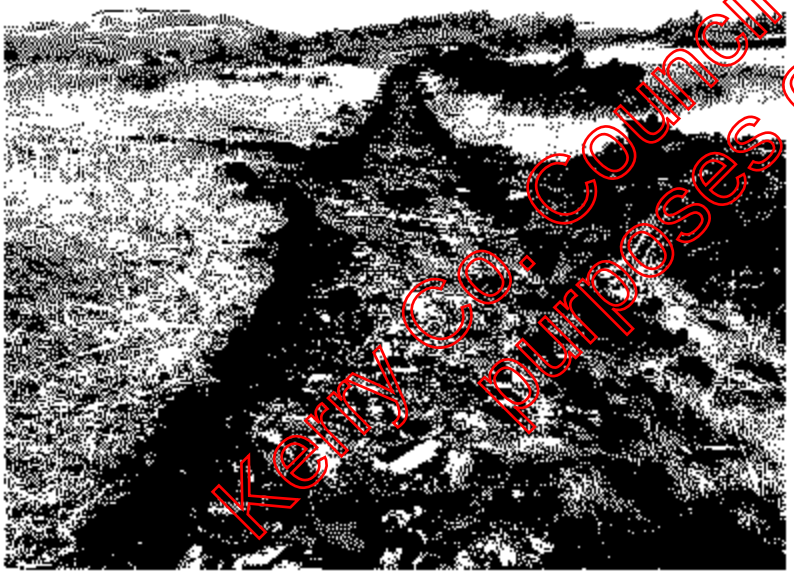
Trench 26 was located at the east side of the proposed extraction area, south-east of Trench 25. It measured c. 38m in length and was orientated NW/SE. Peat measuring 0.3m-0.4m in thickness overlay a very stoney subsoil No archaeological finds, features or deposits were uncovered.

6.27 Trench 27

Trench 27 was excavated towards the north-west side of the proposed extraction area, west of an existing track. It measured c. 71m in length and was orientated NE/SW. The peat in this trench was generally 0.4m in thickness but up to 0.7m in thickness where the ground undulates. It overlay a stoney subsoil and no archaeological finds or features were uncovered.

6.28 Trench 28

Trench 28 was located to the south-east of Trench 27. It measured c. 46m in length and was orientated NE/SW. The peat varied in thickness from c 0.1m at north-east end to 0.8m towards the south-west and overlay the stoney subsoil noted elsewhere on the site. No finds or features were uncovered.



6.29 Trench 29

Trench 29 was excavated to the south-east of Trench 28. It measured c. 64m in length and was orientated NE/SW. In this trench 0.3m-0.4m of peat overlay a beige grey slightly stoney subsoil. No finds or features were uncovered.

6.30 Trench 30

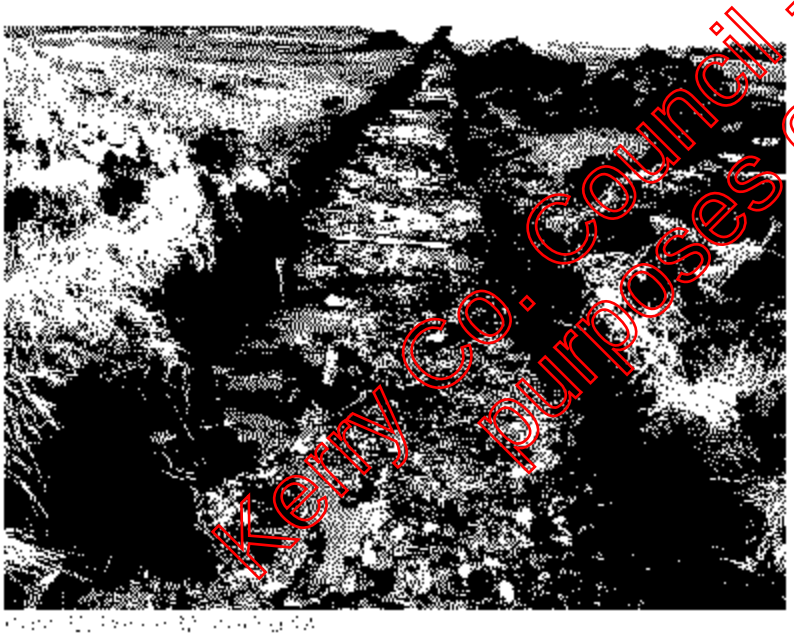
Trench 30 was situated to the south-east of Trench 29. It measured c. 76m in length and was orientated NE/SW. Here the peat was 0.3m-0.45m in thickness and overlay a beige stoney subsoil. No finds or features were uncovered.

6.31 Trench 31

Trench 31 was excavated to the south-east of Trench 30. It measured c. 92m in length and was orientated NE/SW. The stratigraphy in this trench varied somewhat with very shallow peat cover towards the north-east end where almost all of the peat has been removed. Elsewhere the peat was generally 0.4m in thickness and overlay a beige stoney subsoil. No finds or features were uncovered.

6.32 Trench 32

Trench 32 was located to the south-east of Trench 31. It measured c. 84m in length and was orientated NE/SW. The ground undulated in this area resulting in deeper pockets of peat (up to 0.7m deep), however, peat cover was generally c. 0.4m in thickness and overlay a beige slightly stoney subsoil.



6.33 Trench 33

Trench 33 was situated south-east of Trench 32. It measured c. 89m in length and was orientated NE/SW. At the north-east end of the trench the peat measured 0.8m in thickness but became gradually shallower towards the south-west where it measured 0.3m-0.5m and overlay subsoil. No archaeological finds or features were uncovered.

Plate 33 Trench 33 looking NE

6.34 Trench 34

Trench 34 was located to the south-east of Trench 33 towards the east side of the proposed extraction area. It measured c. 85m in length and was orientated NE/SW. The peat in this area was deeper than encountered elsewhere and was quite waterlogged which made excavation difficult. Peat measured c. 0.8m-1.2m and overlay a beige stoney subsoil. Tree roots were present within the peat, however, no archaeological find or features were uncovered.

Plate 34 Trench 34 looking south-west looking SW

6.35 Trench 35

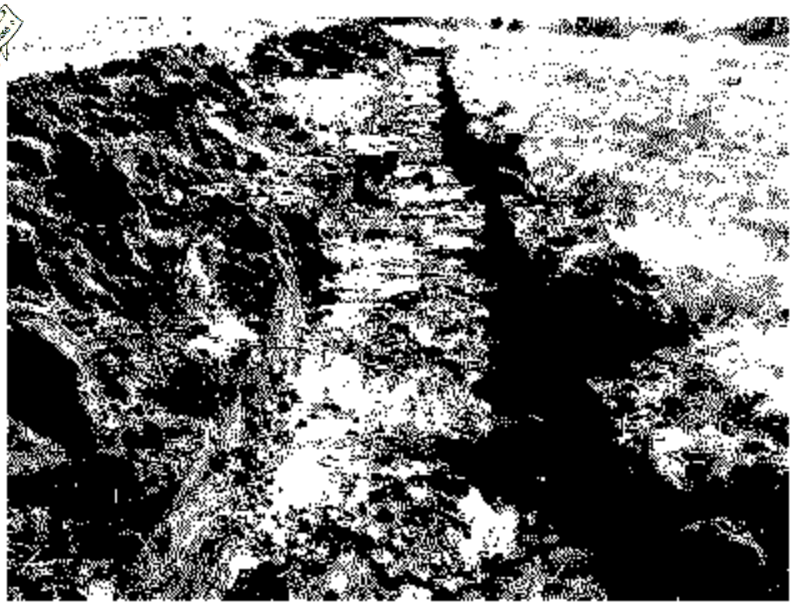
Trench 35 was located to the south-east of Trench 34 at the east side of the proposed extraction area. It measured c. 57m in length and was orientated NE/SW. At the south-west end of the trench the peat measured c 1.4m in thickness, becoming gradually shallower towards the NE where it measured c. 0.8m in thickness. It also contained some tree roots and trunks and overlay a beige grey stoney subsoil. No finds or features were uncovered.

6.36 Trench 36

Trench 36 was located at the east side of the proposed extraction area, south of Trench 35 and towards the southern end of the site. It measured c. 38m in length and was orientated E/W. Here peat measured 0.6m-0.7m in thickness and overlay a beige grey stoney subsoil with boulders and occasional tree roots. No finds or features were uncovered.

6.37 Trench 37

This trench was excavated to the south of Trench 36 at the south-east side of the proposed extraction area. It measured c. 42m in length and was orientated E/W. Peat here was 0.5m-0.7m in thickness and overlay a beige grey stoney subsoil with boulders rising up to the surface in places. No finds or features were uncovered.



6.38 Trench 38

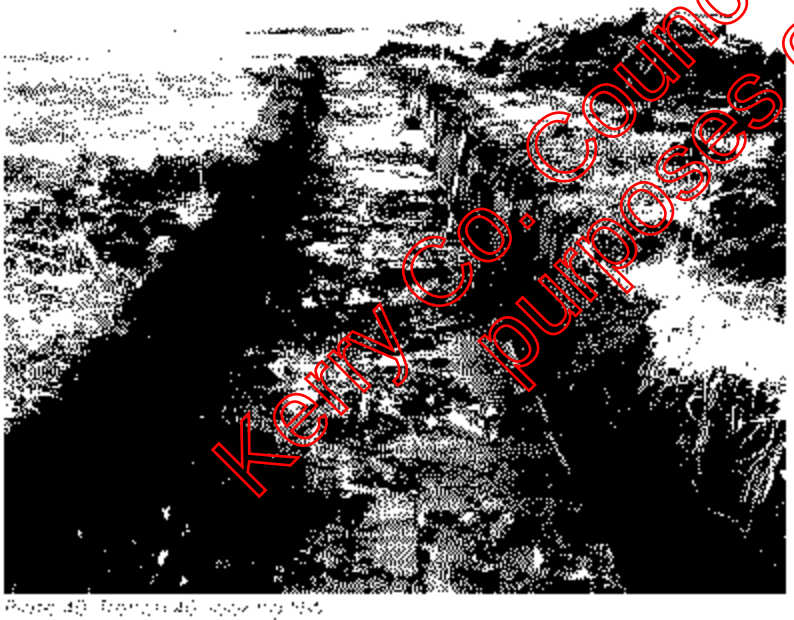
Trench 38 was excavated to the south of Trench 37. It was orientated E/W and measured c. 46m in length. The stratigraphy consisted of of 0.4m-0.7m of wet peat overlying a grey beige stoney subsoil with large boulders rising up in places. No finds or features were uncovered.

6.39 Trench 39

This trench was situated to the south of Trench 38 at the south-east side of the proposed extraction area. It measured c. 40m in length and was orientated E/W. The peat here was shallow peat measuring c 0.3m-0.4m over a grey beige stoney subsoil with occasional boulders.

6.40 Trench 40

Trench 40 was excavated to the south-west of Trench 39 at the south end of the proposed extraction area. It was orientated NW/SE and measured c. 30m in length. Peat depths in the trench varied considerably from c 1m at south-east end, then rising up to virtually no peat cover north-west of centre and then increasing to 0.3m in thickness. A beige slightly stoney subsoil was exposed throughout the length of the trench and no archaeological finds or features were uncovered.



6.41 Trench 41

Trench 41 was located to the south-west of Trench 40 at the south end of the proposed extraction area. It measured c. 30m in length and was orientated NW/SE. The peat measured c. 0.7m in thickness at the south-east end, however, the ground rose up towards the north-west where the peat measured only 0.1m-0.2m and overlay a beige grey stoney subsoil. No finds or features were uncovered.

6.42 Trench 42

Trench 42 was located to the south-west of Trench 41 at the south end of the proposed extraction area. The trench measured c. 26m in length and was orientated NW/SE. The peat cover here was generally shallow measuring c. 0.3m-0.4m in thickness and overlying a beige grey stoney subsoil.

6.43 Trench 43

Trench 43 was excavated to the south-west of Trench 42 at the south end of the proposed extraction area. It measured c. 32m in length and was orientated NW/SE. The ground here slopes down here from the north-west to the south-east. Water ingress occurred at the south-east end where peat was deepest and measured c 0.65m in thickness. It became gradually thinner towards the north-west where it measured c. 0.3m-0.4m and overlay a very stoney subsoil.

6.44 Trench 44

Trench 44 was located at the southernmost end of the proposed extraction area, south-west of Trench 43. It measured c. 49m in length and was orientated NW/SE. Peat measuring c. 1m-1.2m was encountered along much of the length of this trench, rising up somewhat at the NW end where it measured c. 0.7m in thickness and overlay a stoney subsoil. No finds or features were encountered.

6.45 Trench 45

Trench 45 was located at the west side of the proposed extraction area, south-west of Trench 33 and adjacent to area previously disturbed and unsuitable for testing. It measured c. 29m in length and was orientated NE/SW. Peat measured up to 1m in thickness at south-west end of trench rising up gradually to the east where it measured only c 0.2m thick and overlay a beige stoney subsoil. No finds or features were uncovered.

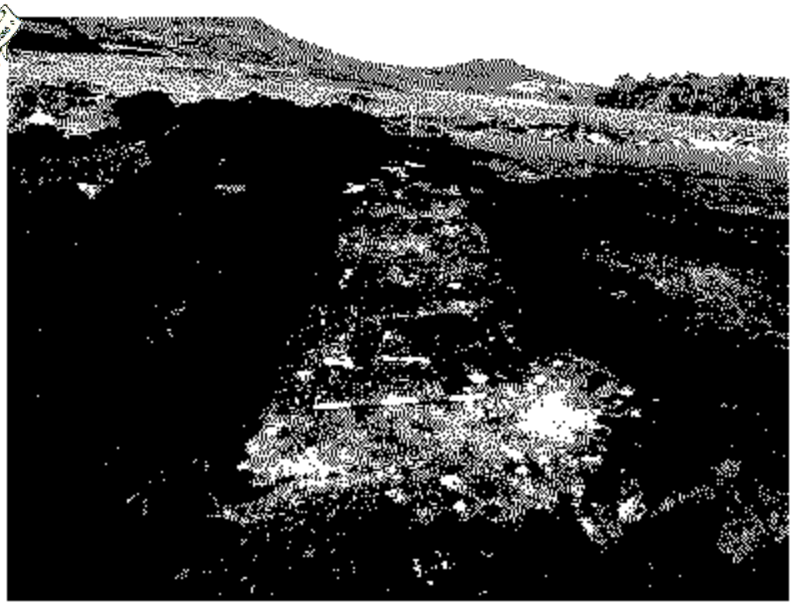


Plate 45 Trench 45 looking SW

6.46 Trench 46

Trench 46 was located north-west of Trench 45 at the west side of the proposed extraction area on a south-west-facing slope. The trench measured c. 33m in length and was orientated NE-SW. At the south-west end of the trench the peat was deepest measuring c. 0.6m in thickness but generally measured 0.4m throughout much of the length of the trench. It overlay a stoney beige grey subsoil and no archaeological finds or features were uncovered.

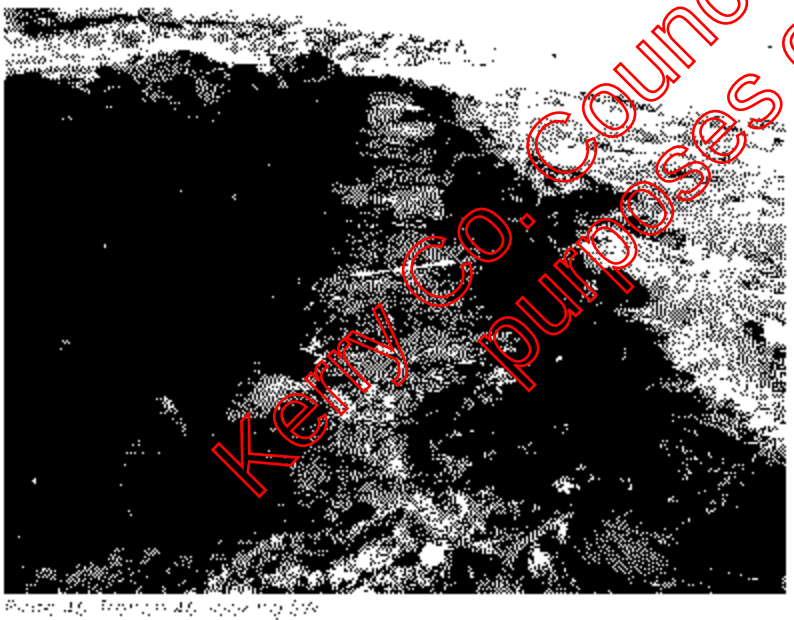


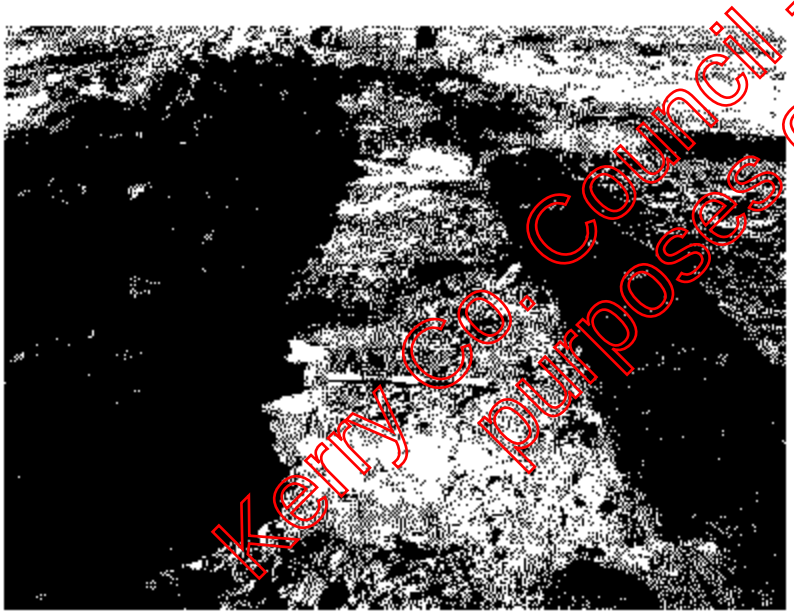
Plate 46 Trench 46 looking SW

6.47 Trench 47

This trench was located to the north-west of Trench 46 at the west side of the proposed extraction area. It measured c. 32m in length and was orientated NE/SW. The stratigraphy consisted of c. 0.6m of peat at the south-west end of the trench, becoming slightly shallower towards the north-east. The middle portion of the trench was waterlogged, however, elsewhere a beige slightly stoney subsoil was exposed.

6.48 Trench 48

Trench 48 was located to the north-west of Trench 47 at the west side of the proposed extraction area. It measured c. 32m in length and was orientated NE/SW. The stratigraphy generally comprised 0.4m-0.5m of peat overlying a beige stoney subsoil. No archaeological finds or features were uncovered.



6.49 Trench 49

Trench 49 was excavated to the north-west of Trench 48 at the west side of the proposed extraction area. The south-west end of this trench was situated in a portion of high bog which continues further to the north along the west side of the proposed extraction area. The peat in this area proved to be both deep and unstable limiting the excavation of trenches due to health and safety considerations. Deep unstable peat was encountered at the south-west end of trench 49 where the peat was deepest and the excavator became stuck. Further to the north-east the peat became shallower where it measured c. 0.4-0.5m and overlay a beige stoney subsoil.

6.50 Trench 50

Trench 50 was located towards the north-west side of the proposed extraction area, west of Trench 22 and east of an existing track. It measured c. 38m in length and was orientated NW/SE. The stratigraphy here was very shallow comprising 0.1m-0.3m of peat over a stoney beige grey subsoil. No archaeological find or features were uncovered.

7. POTENTIAL IMPACTS

7.1 Potential sub-surface archaeology

A total of 50 test trenches were excavated across the proposed extraction area at Rangue and Knocknaboola, Killorglin in order to ascertain the overall archaeological potential of the proposed development site and to establish if sub-surface archaeological features or deposits existed therein. No archaeological finds, features or deposits were uncovered within the confines of the excavated trenches which were located across the entire extraction area, with the exception of the north-west corner where deep peat prevented the safe excavation of test trenches. Subsoil was exposed in all trenches. As no potential sub-surface archaeological features or deposits were encountered no direct impacts to such features are identified. Furthermore, the lack of any features or finds within the

excavated trenches would suggest that the overall archaeological potential of the proposed extraction area is low.

7.2 Recorded monuments

No recorded monuments are located on or within close proximity to the proposed extraction area therefore no direct impacts to this resource are identified.

8. MITIGATION MEASURES

Fifty archaeological test trenches were excavated throughout the proposed extraction area. The trenching has provided an overview of the archaeological potential of the site and the presence of sub-surface archaeological features within the proposed development area. No archaeological finds, features or deposits were encountered within any of the trenches excavated within the proposed extraction area, and no direct impacts on such features have been identified. In this regard the overall archaeological potential of the proposed development site is regarded as low and no mitigation measures are therefore recommended[1].

9. CONCLUSION

Pre-development archaeological testing of a proposed quarry extension at Rangue and Knocknaboola townlands, Killorglin, Co. Kerry was carried out by Tobar Archaeological Services on behalf of M.F. Quirke & Sons. The testing was carried out at the pre-planning stage of the proposed development and this report will be submitted with the planning application for the site. A total of 50 trenches were excavated throughout the proposed extraction area. No archaeological finds, features or deposits were identified within any of the excavated trenches and the overall archaeological potential of the site is regarded as low. No further archaeological input in the proposed development is therefore recommended.

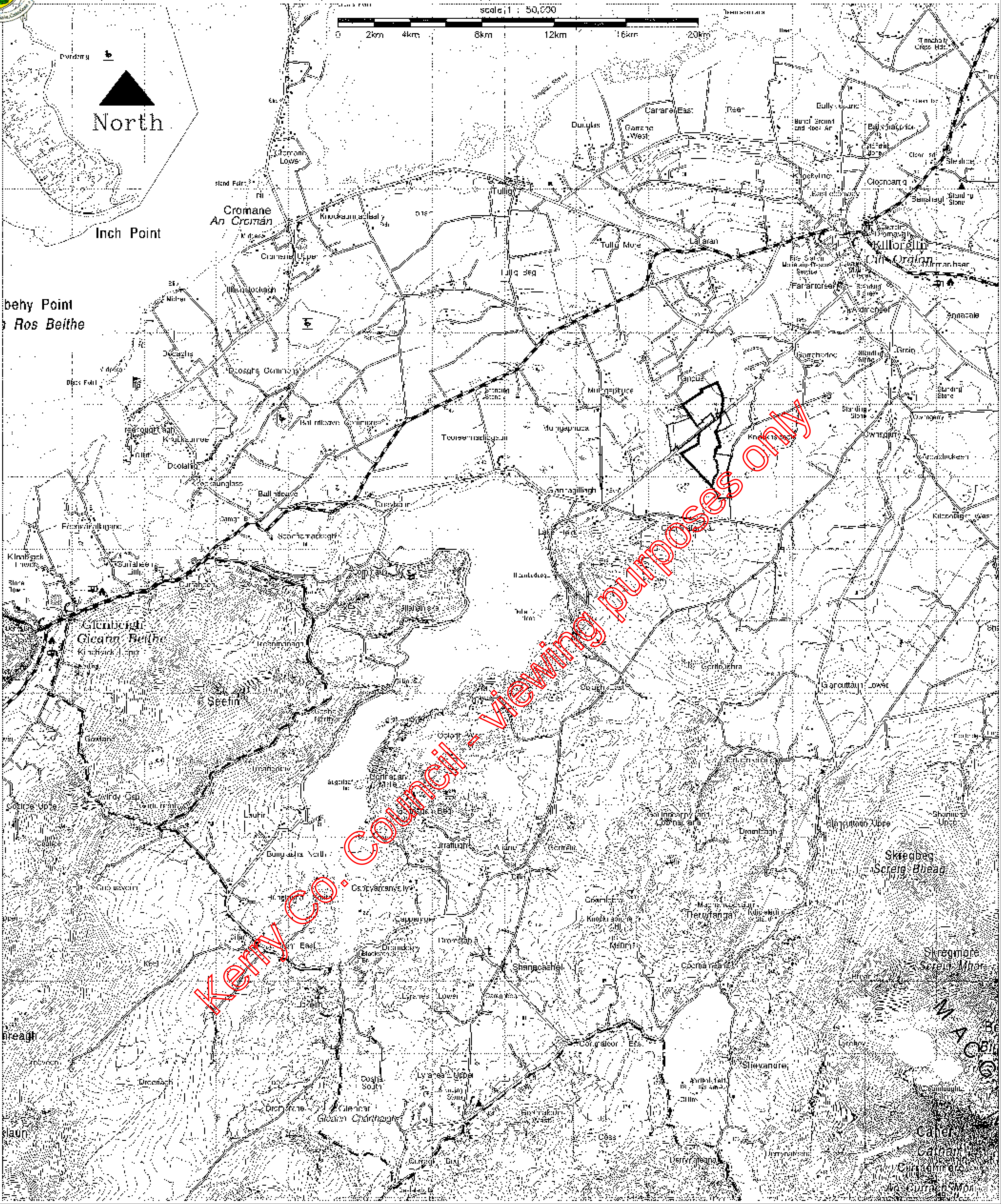
10. BIBLIOGRAPHY

- Record of Monuments and Places (RMP) for County Kerry.
- Department of Arts, Heritage, Gaeltacht and the Islands, 1999, Framework and Principles for the Protection of the Archaeological Heritage, 1999.

[1] *Mitigation/recommendations are subject to the approval of the National Monuments Service and the Planning Authority.*

Attachment 5

Drawings



Legend

Applicant's Landholding 70.00 Ha

Planning application boundary
18.5 Ha + 24.5 Ha extension = 43.00 Ha

Rev Date Comment

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax 06697 64910
Mobile: 086 8377804
email:

Notes:
1. Based on Ordnance Survey 1:50000 series Sheets 6030 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 (C) Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475808 590841
4. Levels in metres above OS Datum Malin Head

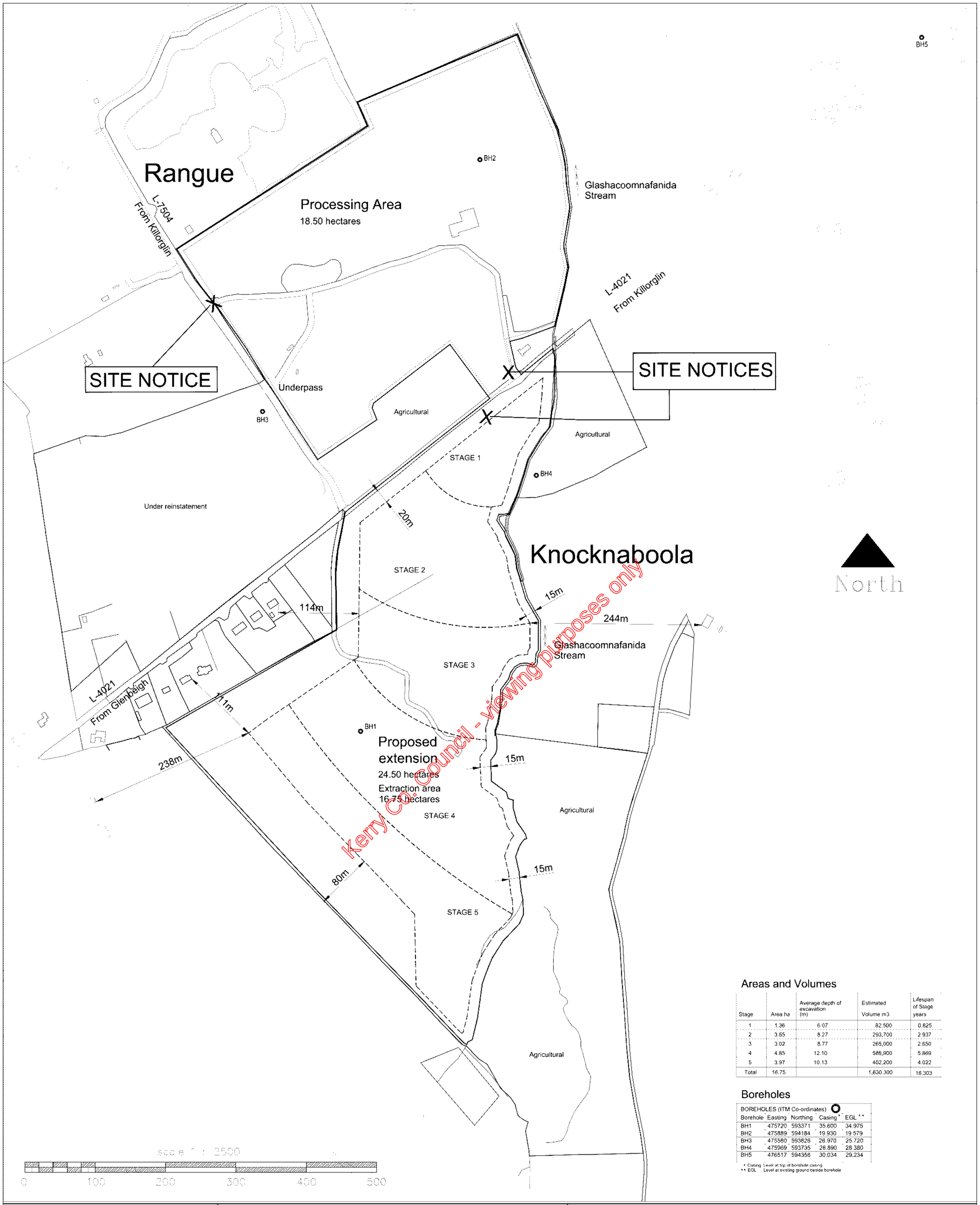
Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Location Map
(Print A3_scale 1:50,000)

Scale 1 : 50,000 | Date 13/05/2021 | Drawn By moc

Drawing Nr PL_01 | Rev. No



Areas and Volumes

Stage	Area ha	Average depth of excavation (m)	Estimated Volume m3	Lifespan of Stage years
1	1.36	6.07	82,500	0.825
2	3.55	8.27	293,700	2.937
3	3.02	8.77	265,000	2.650
4	4.85	12.10	586,900	5.869
5	3.97	10.13	402,200	4.022
Total	16.75		1,630,300	16.303

Boreholes

BOREHOLES (ITM Co-ordinates)				
Borehole	Easting	Northing	Casing *	EGL **
BH1	475720	593371	35.600	34.975
BH2	475889	594184	19.930	19.579
BH3	475580	593826	26.970	25.720
BH4	475969	593735	28.890	28.380
BH5	476517	594358	30.034	29.234

* Casing Level at top of borehole casing
** EGL Level at existing ground beside borehole

Notes:

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3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary 18.5 Ha + 24.5 Ha extension = 43.00 Ha
- Existing processing 18.50 Ha
- Proposed extraction 16.75 Ha
- BH2 Existing Boreholes Refer to the EIAR for detailed description and analysis of surface and ground water features

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Rev	Date	Comment

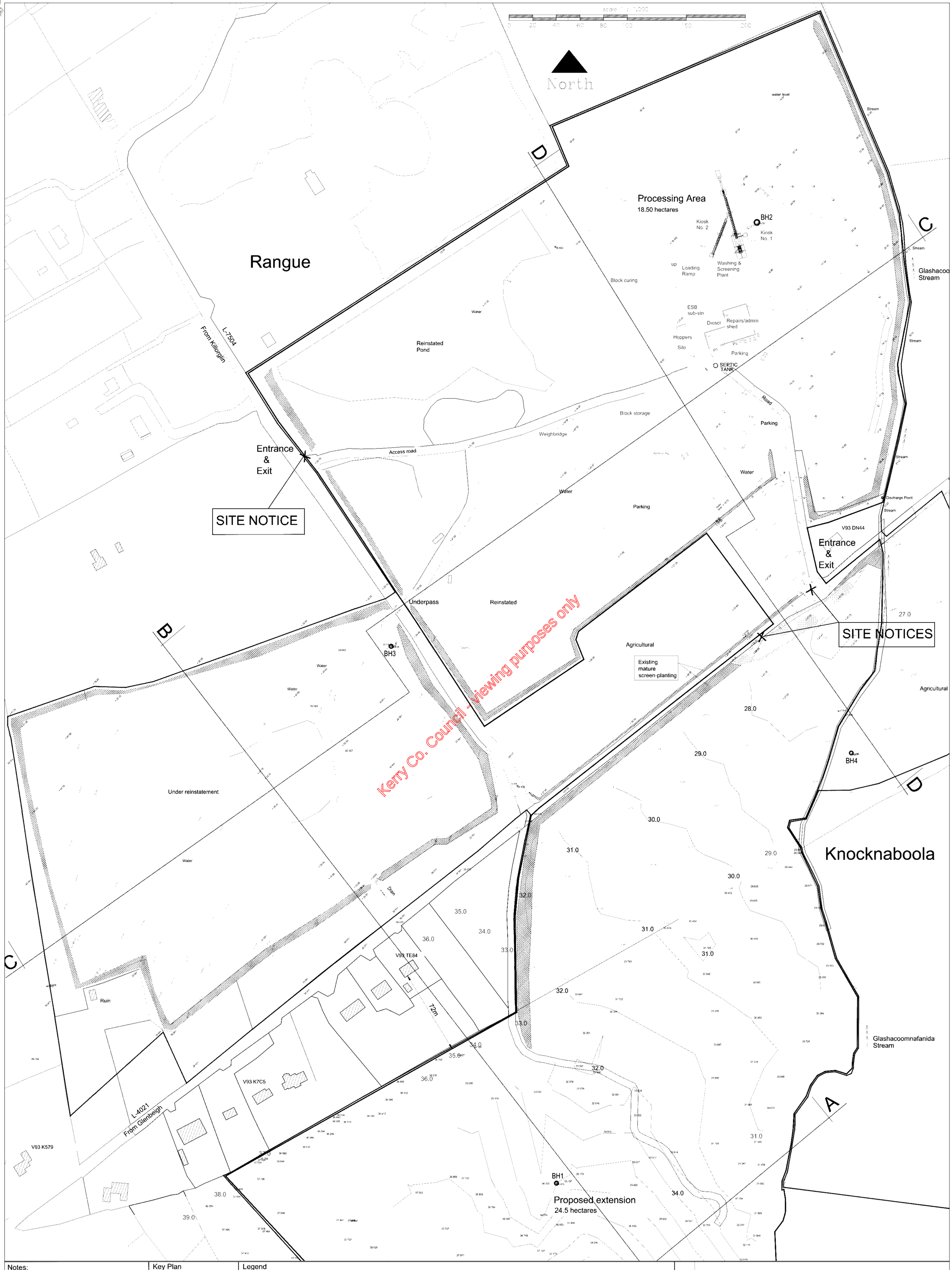
Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Location Map
(Print A1_scale 1:2,500)

Scale: 1 : 2,500 | Date: 13/05/2021 | Drawn By: moc

Drawing Nr. PL_02 | Rev. No.



Notes:

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3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Key Plan

PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary 18.5 Ha + 24.5 Ha extension = 43.00 Ha
- Existing processing 18.50 Ha
- Proposed extraction 16.75 Ha
- 33.10 — Existing spot level in metres AOD
- 33.10 — Proposed spot level in metres AOD
- 33.0 — Existing contours at 1 metre intervals
- 33.0 — Proposed contours at 2 metre intervals
- Excavated materials and areas under reinstatement
- Existing berm/screen-planting
- Proposed berm 3 metres high, 13 metres wide along western, northern and eastern perimeters of proposed quarry extension
- Proposed silt fence
- BH2 — Existing Boreholes Refer to the Environmental Impact Assessment Report (EIAR) for detailed description and analysis of surface and ground water features
- Surface water
- P1 - P2 / C1 - C13 — SITE STRUCTURES P1 - P2 Portacabins C1 - C13 Steel containers

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Rev	Date	Comment

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - EXISTING
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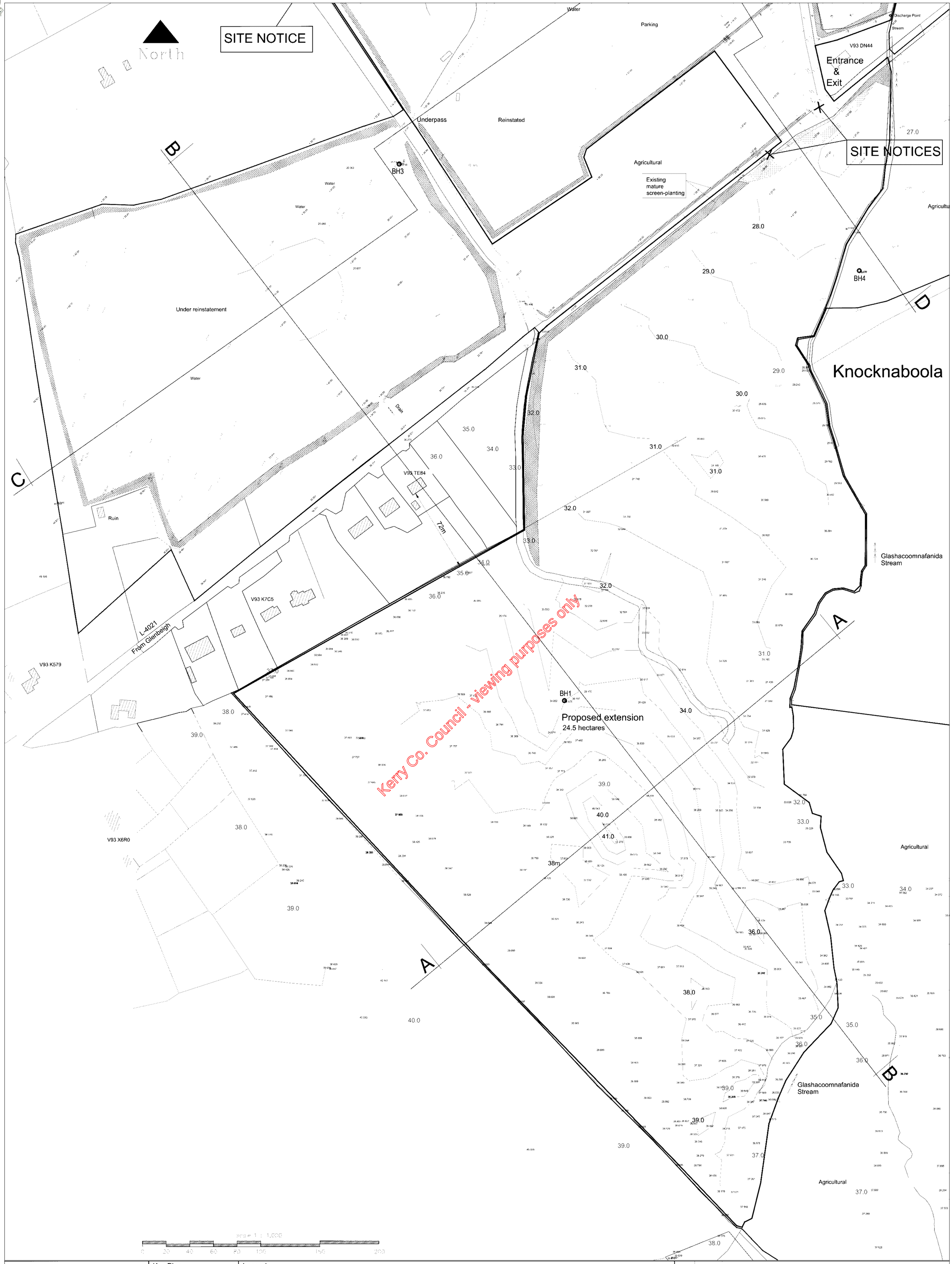
Scale: 1 : 1,000 | Date: 13/05/2021 | Drawn By: moc

Drawing Nr. PL_03a | Rev. No.

23-03-2022 08:00:48



Notes:

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2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Key Plan

PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
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- Surface water
- P1 - P2 / C1 - C13 SITE STRUCTURES P1 - P2 Portacabins C1 - C13 Steel containers

Rev	Date	Comment

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - EXISTING
(Print A0_scale 1:1,000)

Scale: 1 : 1,000 Date: 13/05/2021 Drawn By: moc

Drawing Nr. PL_03b Rev. No.

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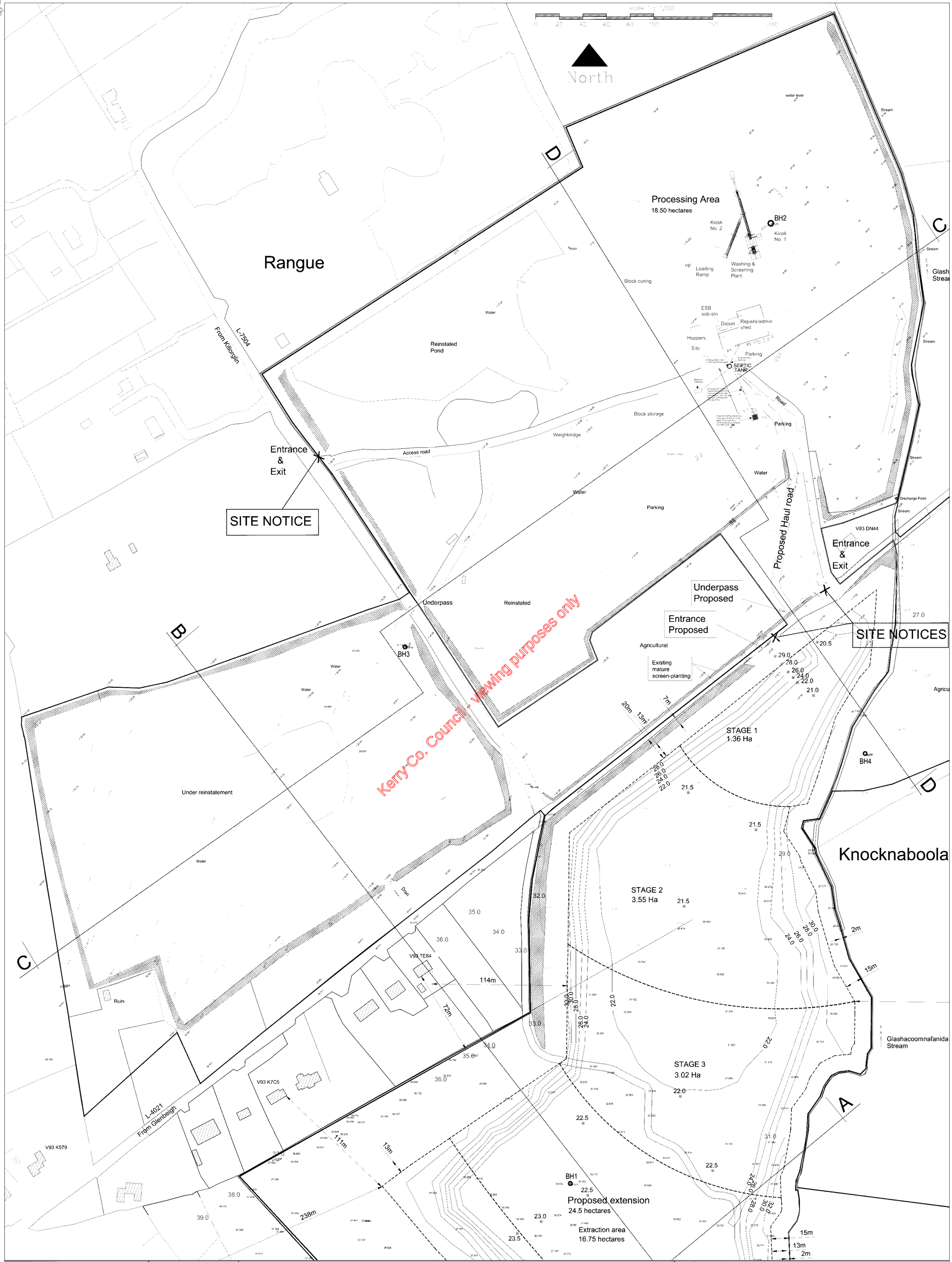

Notes:

1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

22-03-2022 08:00:48

Key Plan

PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary 18.5 Ha + 24.5 Ha extension = 43.00 Ha
- Existing processing 18.50 Ha
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- 33.10 Existing spot level in metres AOD
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- 33.0 Proposed contours at 2 metre intervals
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- Proposed silt fence
- BH2 Existing Boreholes Refer to the Environmental Impact Assessment Report (EIAR) for detailed description and analysis of surface and ground water features
- Surface water
- P1 - P2 SITE STRUCTURES P1 - P2 Portacabins
- C1 - C13 C1 - C13 Steel containers

Rev	Date	Comment

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - PROPOSED
(Print A0_scale 1:1,000)

Scale: 1 : 1,000 Date: 13/05/2021 Drawn By: moc

Drawing Nr. PL_04a Rev. No.

SITE NOTICE

North

SITE NOTICES

Water

Parking

Discharge Point

Stream

V93 DN44

Entrance & Exit

Proposed Haul road

Underpass

Reinstated

Underpass Proposed

Entrance Proposed

Agricultural

Existing mature screen-planting

BH3

BH4

BH1

Water

Under reinstatement

Drain

Ruin

V93 TE84

V93 K7C5

V93 K579

V93 X6R0

L-4021 From Glenbeigh

Knocknaboola

Glashacoomnafanida Stream

Agricultu

STAGE 1
1.36 Ha

STAGE 2
3.55 Ha

STAGE 3
3.02 Ha

STAGE 4
4.85 Ha

STAGE 5
3.97 Ha

Proposed extension
24.5 hectares

Extraction area
16.75 hectares

20m
13m
7m
2m
15m
72m
114m
111m
238m
80m

A
B
C
D
X
Y

scale # 1 : 1,000

0 20 40 60 80 100 150 200

Notes:

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2. Ordnance Survey Ireland Licence no. 50092262_1 & 2
   © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

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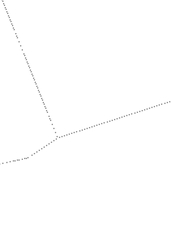
Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

22-03-2022 08:00:48

Key Plan



PL03a and PL03b EXISTING Site Layout
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- Surface water
- P1 - P2 / C1 - C13 SITE STRUCTURES P1 - P2 Portacabins C1 - C13 Steel containers

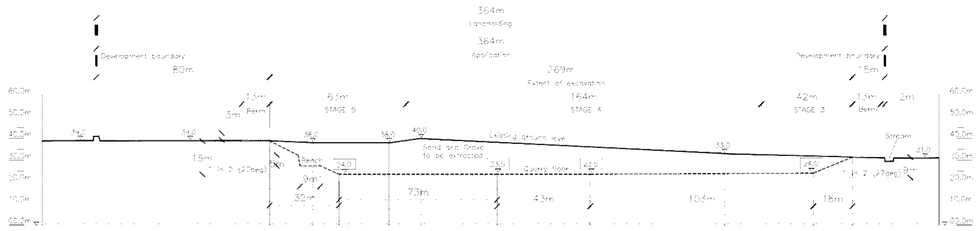
Rev	Date	Comment

Client: Michael F. Quirke & Sons

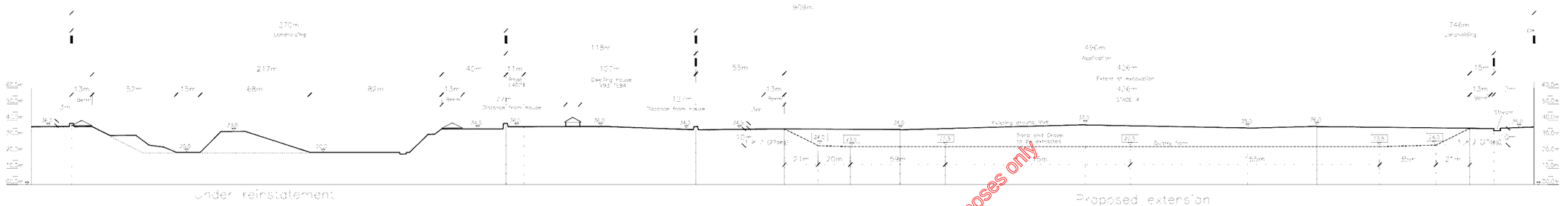
Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - PROPOSED
(Print A0_scale 1:1,000)

Scale: 1 : 1,000
Date: 13/05/2021
Drawn By: moc
Drawing Nr. PL_04b
Rev. No.

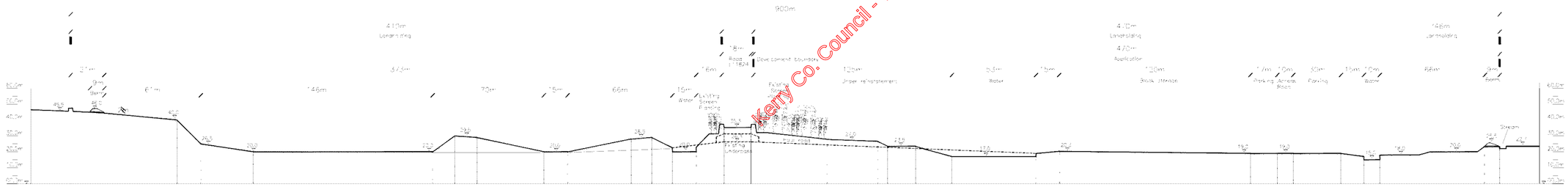


Section A–A Proposed extension S/W to N/E
scale 1:1000 on A0



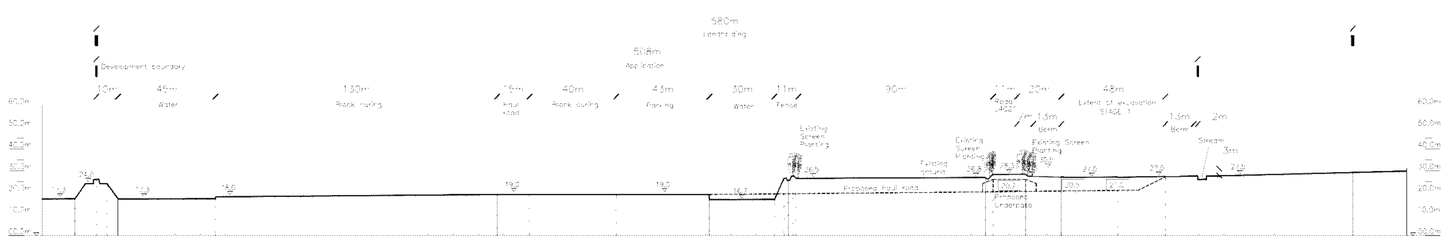
Under reinstatement
Proposed extension

Section B–B Under reinstatement and Proposed extension N/W to S/E
scale 1:1000 on A0



Under reinstatement
Existing processing

Section C–C Under reinstatement and Existing processing S/W to N/E
scale 1:1000 on A0



Existing processing
Proposed extension

Section D–D Existing processing and Proposed extension N/W to S/E
scale 1:1000 on A0

Notes:

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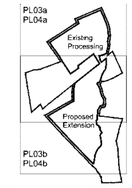
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Key Plan



PL03a and PL03b EXISTING Site Layout
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Rev.	Date	Comment

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Sections
(Print A0_scale 1:1,000)

Scale: 1 : 1,000
Date: 13/05/2021
Drawn By: moc

Drawing Nr. PL_05
Rev. No.

North

water level 19.97

Stream

Glashacoomnafanida Stream

Kiosk No. 2

Kiosk No. 1

BH2

Kiosk

Loading Ramp

Washing & Screening Plant

Processing Area
18.50 hectares

34m

Block curing
3,434 sq.m

101m

ESB sub-stn

Re-fueling

Diesel

Repairs/Admin shed

Hoppers

Silo

Parking

Admin

Proposed New Manhole

Existing Septic Tank (To Be Decommissioned)

Septic Tank

Reported Soakaway

Proposed Secondary Wastewater Treatment System with EN12566 Certification, with pumped discharge of effluent to Tertiary Filter

Proposed Tertiary Polishing Filter such as Constructed Sand Polishing Filter, consrtucted in accordance with EPA, CoP, 2021

Block storage
5,040 sq.m

126m

40m

Weighbridge

Water pump

Water

Parking

Drain

Trees

Proposed Haul road

Access road

Discharge Point

L-4021 From Killorglin

V93 DN44

Entrance & Exit

Underpass proposed

Entrance Proposed

Excluded

Existing mature screen-planting

27.0

SITE NOTICES

29.0

20.5

21.0

7m

scale 1 : 500

0 20 40 80 120 160 200

Notes:

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Key Plan

PL03a PL04a

Existing Processing

Proposed Extension

PL03b PL04b

PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

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- P1 - P2 SITE STRUCTURES P1 - P2 Portacabins
- C1 - C13 C1 - C13 Steel containers

Rev	Date	Comment

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - PROCESSING
(Print A0_scale 1:500)

Scale: 1 : 500
Date: 13/05/2021
Drawn By: moc

Drawing Nr. PL_06
Rev. No.

North

water level 19.97

Stream

Glashacoomnafanida Stream

BH2 579

Kiosk No. 2

Kiosk No. 1

Kiosk

Loading Ramp

up

Loading Ramp

Washing & Screening Plant

Processing Area
18.50 hectares

34m

Block curing
3,434 sq.m

101m

ESB sub-stn

Re-fueling

Diesel

Repairs/Admin shed

Hoppers

Silo

Silo

Admin

P1

P2

Parking

Proposed New Manhole

Existing Septic Tank (To Be Decommissioned)

Septic Tank

Reported Soakaway

Proposed Secondary Wastewater Treatment System with EN12566 Certification, with pumped discharge of effluent to Tertiary Filter

Proposed Tertiary Polishing Filter such as Constructed Sand Polishing Filter, consrtucted in accordance with EPA, CoP, 2021

Access road

Parking

Weighbridge

Weighbridge

Block storage
5,040 sq.m

126m

40m

Water pump

Parking

Water

Water

Parking

Drain

Trees

Proposed Haul road

Access road

Drain

V93 DN44

Entrance & Exit

Discharge Point

L-4021 From Killorglin

Underpass proposed

Entrance Proposed

Excluded

Existing mature screen-planting

Drain

Trees

Drain

Trees

7m

27.0

SITE NOTICES

29.0

20.5

27.0

21.0

+27.50

+27.50

Kerry Co. Council - viewing purposes only

Notes:
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3. ITM Centrepoint co-ordinates 475608, 593641
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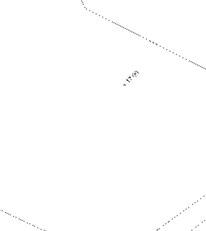
Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

22-03-2022 08:00:48

Key Plan



PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

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- C1 - C13 C1 - C13 Steel containers

Rev	Date	Comment

Client: Michael F. Quirke & Sons

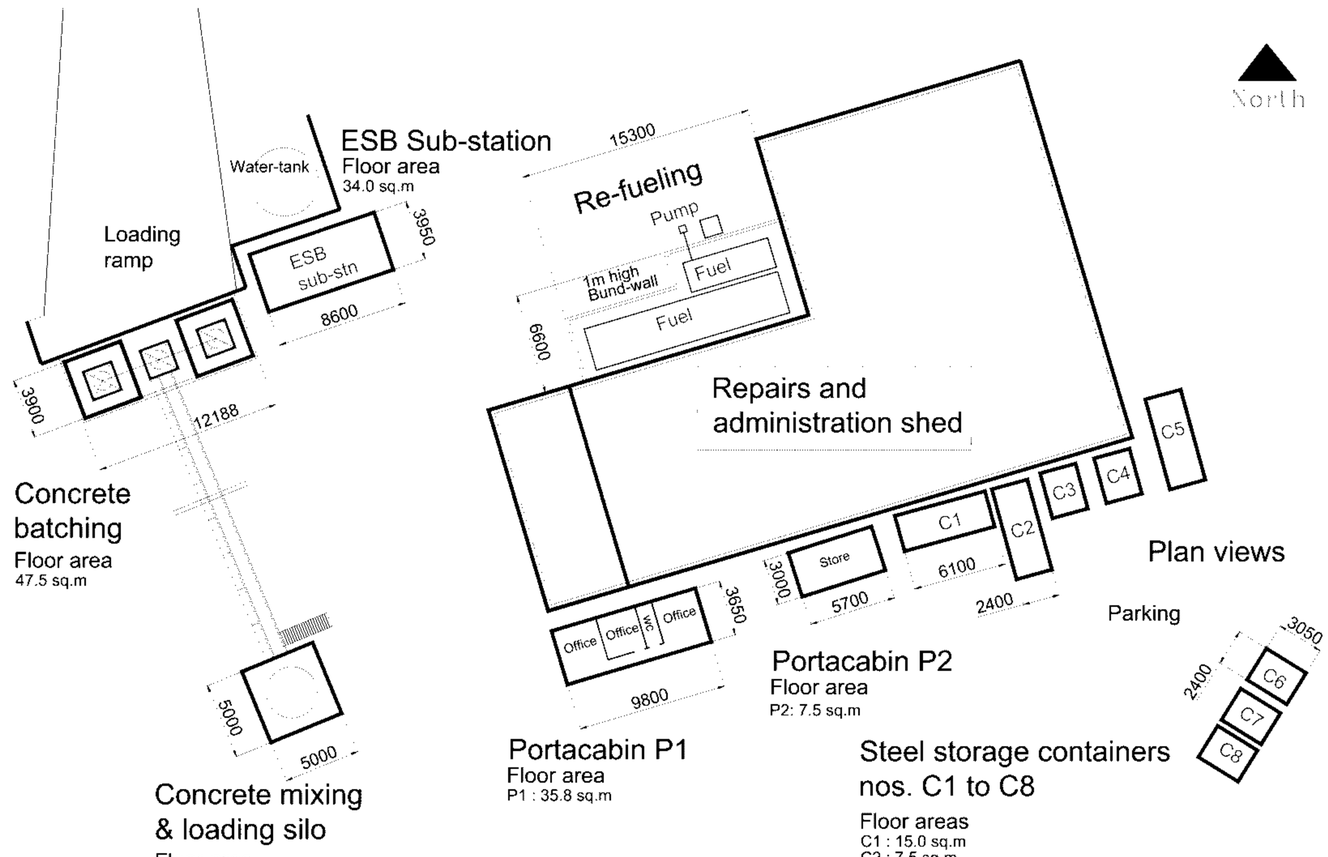
Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Layout Plan - PROCESSING
(Print A0_scale 1:500)

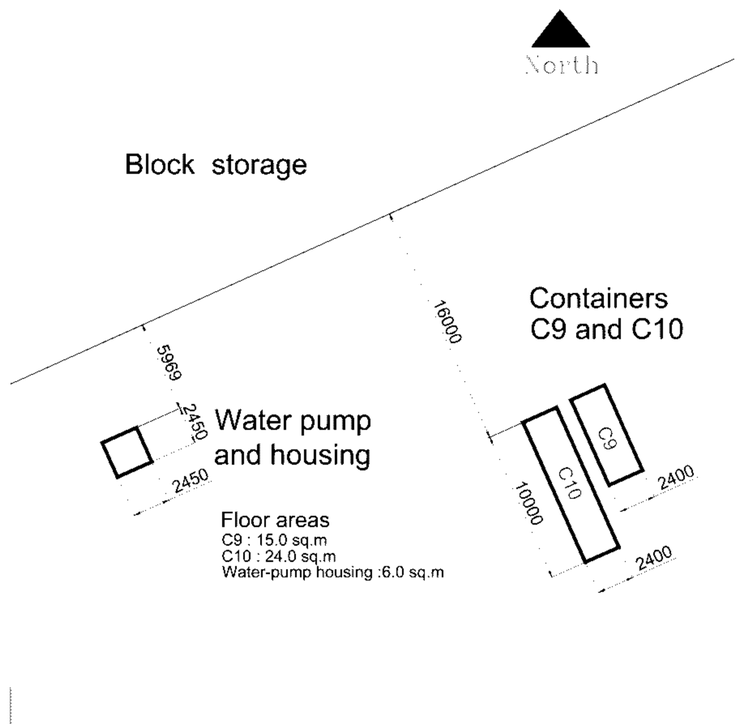
Scale: 1 : 1,000
Date: 13/05/2021
Drawn By: moc

Drawing Nr. PL_06
Rev. No.

Reception, Admin, Repairs shed, Portacabins, Containers, ESB sub-stn, Mixing hoppers, Concrete silo/loading

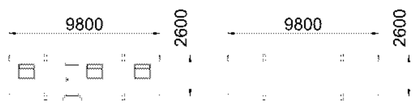


Steel storage containers Nos. C9 and C10 and Water pump/housing located adjacent to the Block-curing slab



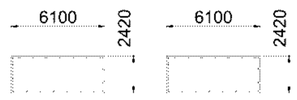
Plan views

Portacabin P1 adjacent to the reception

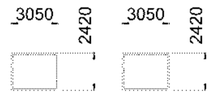


Portacabin P2 adjacent to the repairs shed

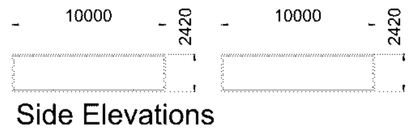
Containers C1, C2, C5, C8, C9, and C13



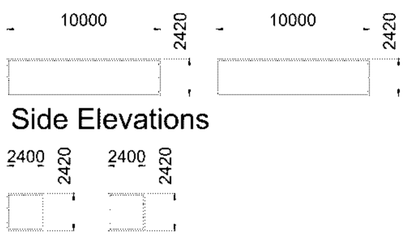
Containers C3, C4, C6, C7 and C8



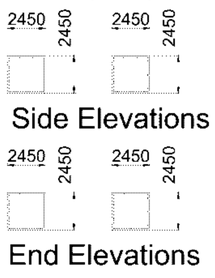
Container C10



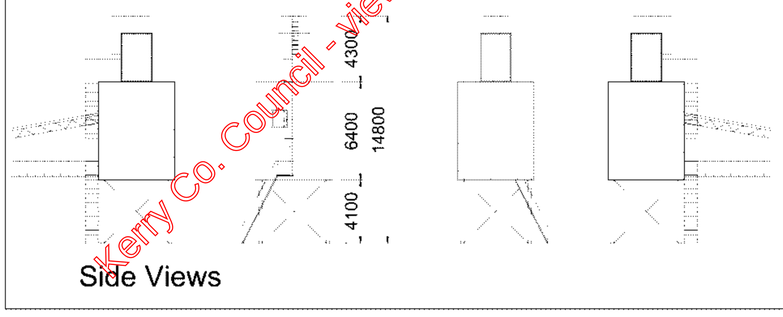
Containers C12 and C13



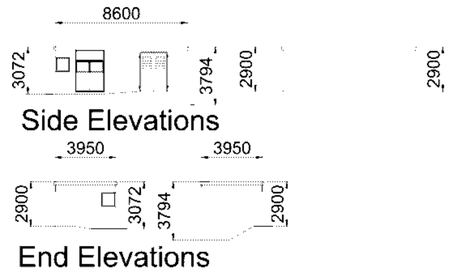
Water pump housing



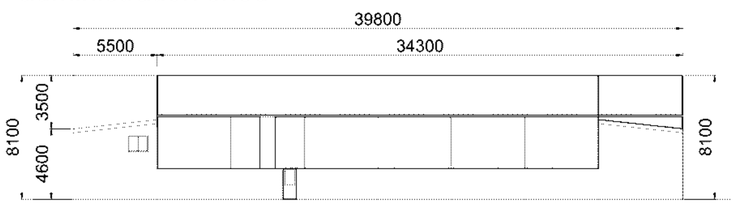
Concrete mixing & loading silo

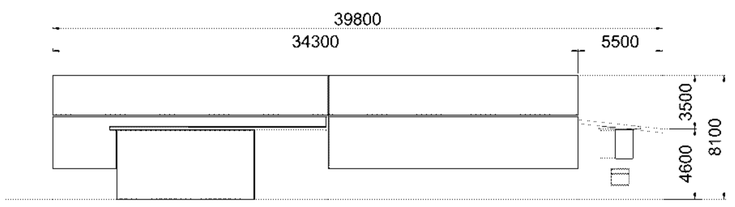


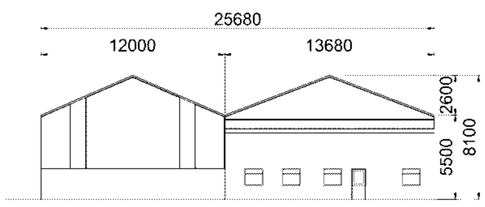
ESB Sub-station

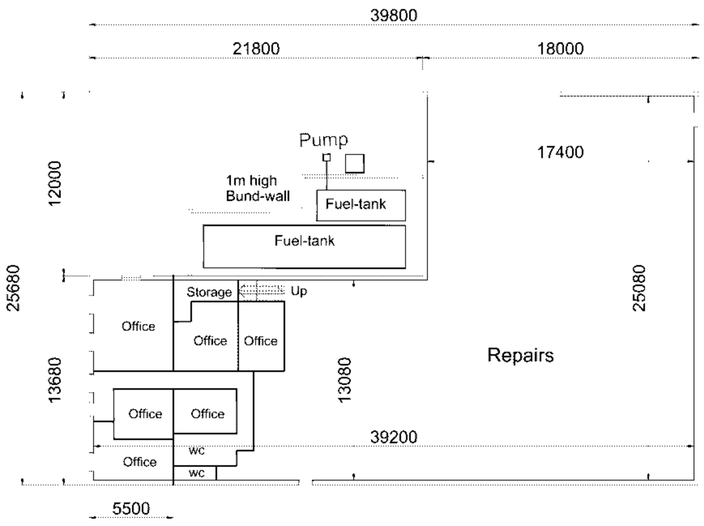


Repairs and administration shed



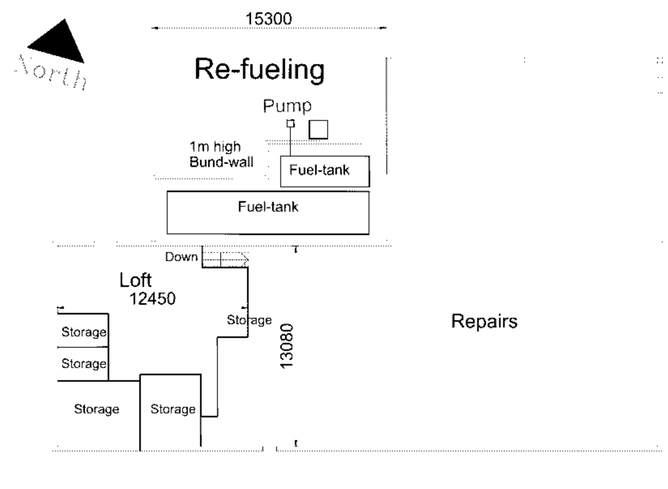






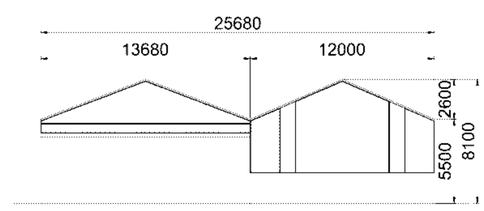
Ground floor plan

Floor area
Admin/welfare : 141.0 sq.m
Repairs : 580.5 sq.m
Overall ground floor : 721.5 sq.m



Loft floor plan

Floor area
Loft storage : 141.2 sq.m



Overall Floor area: 862.7 sq.m

Notes:
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4. Levels in metres above OSI Datum Malin Head

Michael O'Connor Tech. Dip. Eng. M.I.E.I.
Longfield
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Mobile: 086 8377804
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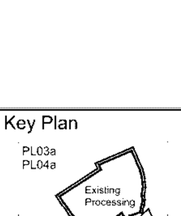
Key Plan



PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

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- Surface water
- P1 - P2 SITE STRUCTURES P1 - P2 Portacabins C1 - C13 C1 - C13 Steel containers

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

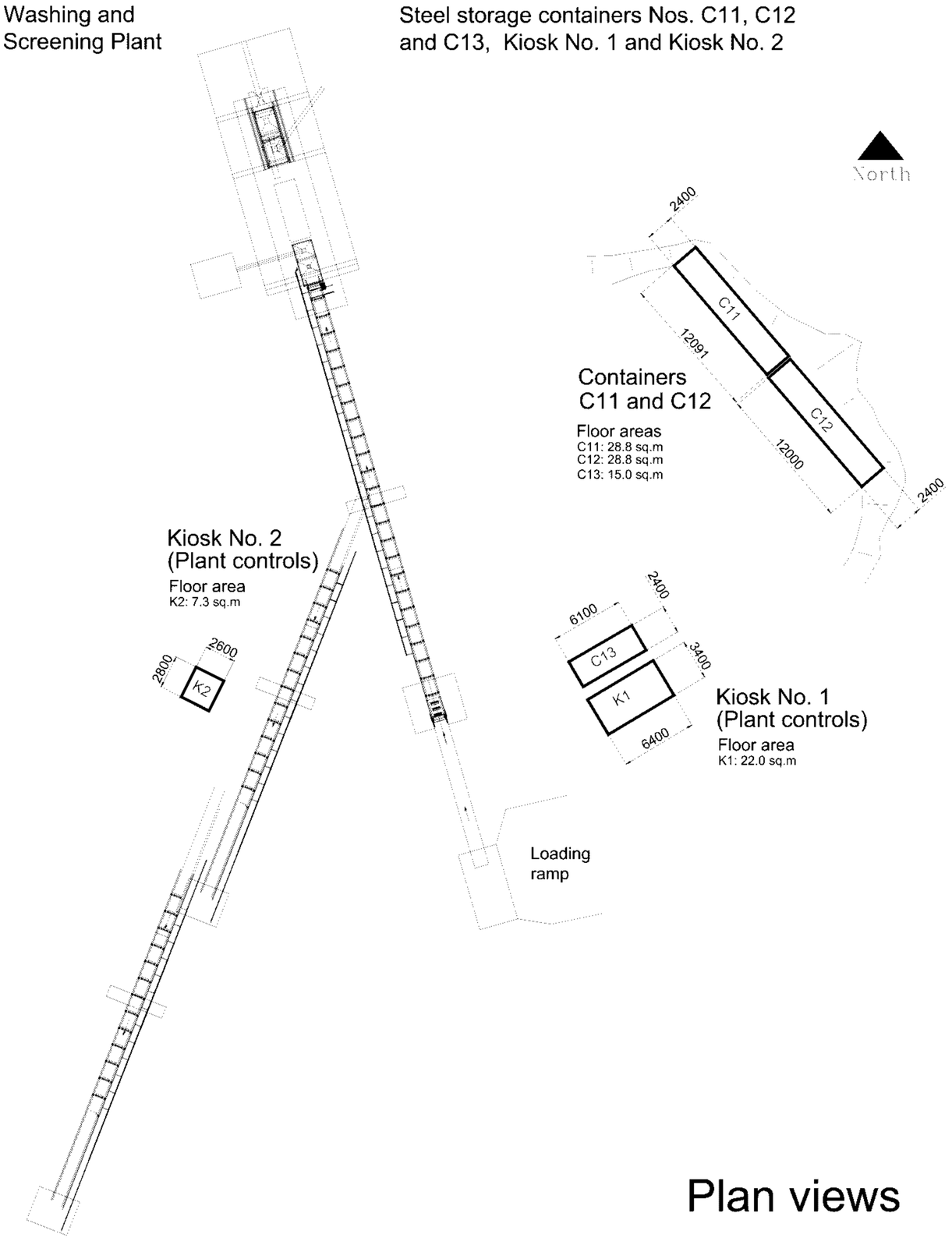
Drawing: Site Structures
(Print A0_scale 1:200)

Scale: 1 : 200
Date: 12/11/2021
Drawn By: moc

Drawing Nr: PL_07a
Rev. No.

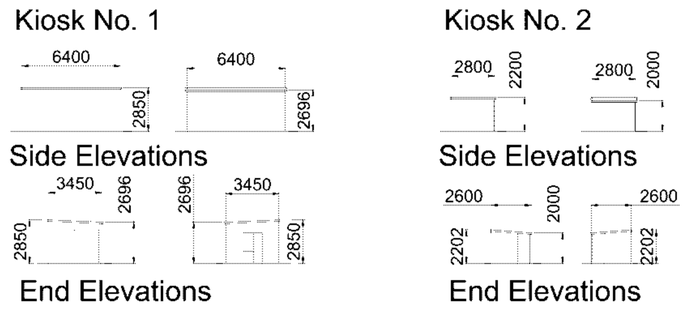
Washing and Screening Plant

Steel storage containers Nos. C11, C12 and C13, Kiosk No. 1 and Kiosk No. 2

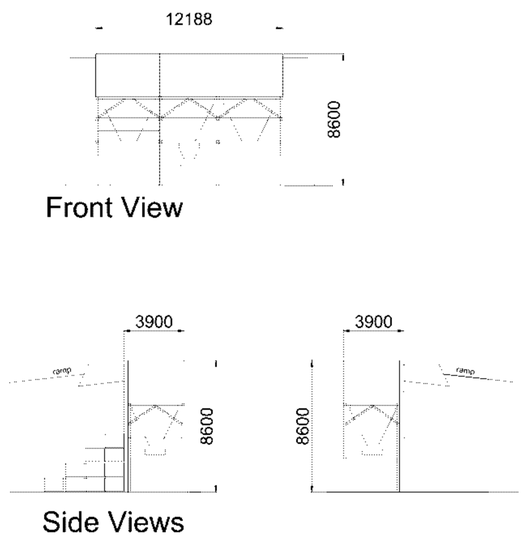


Plan views

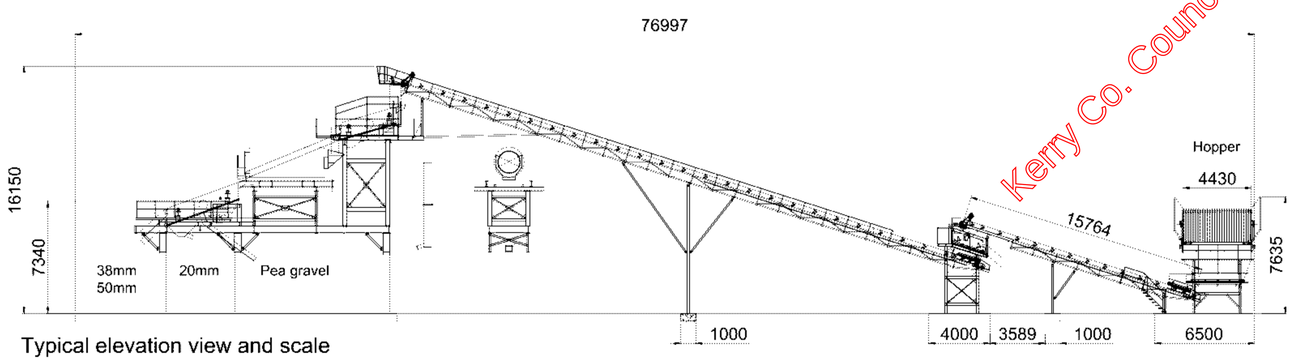
Kiosk No. 1 and Kiosk No. 2



Concrete batching

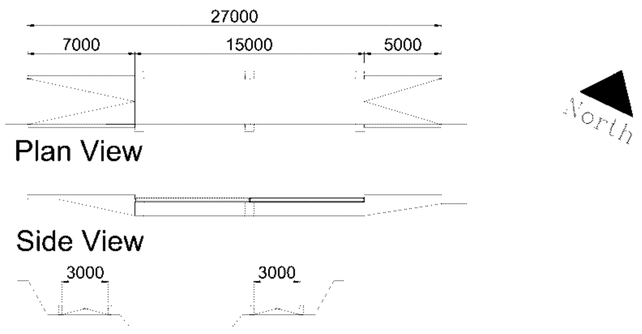


Washing and Screening Plant



Typical elevation view and scale

Weighbridge



Notes:

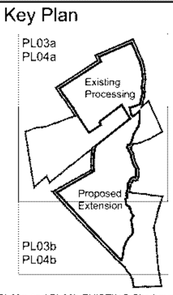
1. Based on Ordnance Survey 1:5000 series Sheets 6033 and 6044
2. Ordnance Survey Ireland Licence no. 50092262_1 & 2 © Ordnance Survey & Government of Ireland
3. ITM Centrepoint co-ordinates 475608, 593641
4. Levels in metres above OSi Datum Malin Head

Michael O'Connor Tech. Dip. Eng. M.I.E.I.

Longfield
Firies
Killarney

Tel/Fax: 06697 64910
Mobile: 086 8377804
email:

Key Plan



PL03a and PL03b EXISTING Site Layout
PL04a and PL04b PROPOSED Site Layout

Legend

- Applicant's Landholding 70.00 Ha
- Planning application boundary 18.5 Ha + 24.5 Ha extension = 43.00 Ha
- Existing processing 18.50 Ha
- Proposed extraction 16.75 Ha
- 33.10 — Existing spot level in metres AOD
- 33.10 — Proposed spot level in metres AOD
- 130 — Existing contours at 1 metre intervals
- 33.0 — Proposed contours at 2 metre intervals
- Excavated materials and areas under reinstatement
- Existing berm/screen-planting
- Proposed berm 3 metres high, 13 metres wide along western, northern and eastern perimeters of proposed quarry extension
- Proposed silt fence
- BH2 — Existing Boreholes Refer to the Environmental Impact Assessment Report (EIAR) for detailed description and analysis of surface and ground water features
- Surface water
- P1 - P2 — SITE STRUCTURES P1 - P2 Portacabins
- C1 - C13 — C1 - C13 Steel containers

Rev.	Date	Comment

Client: Michael F. Quirke & Sons

Job Title: Rangue & Knocknaboola Quarry
Killorglin, Co. Kerry
Planning Application

Drawing: Site Structures
(Print A0_scale 1:200)

Scale: 1 : 200
Date: 12/11/2021
Drawn By: moc
Drawing Nr. PL_07b
Rev. No.