Planning and Environmental Consultants

Appropriate Assessment Screening Report and Natura Impact Statement

Proposed Quarry Extraction and Restoration at Roadstone Ballyquin, Co. Clare

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Planning and Environmental Consultants

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1. INTRODUCTION

1.1 Background

MKO has been appointed to provide the information necessary to allow the competent authority to conduct an Article 6(3) Appropriate Assessment (AA) of the Proposed Development at Ballyquin, Co. Clare. The Proposed Development site is located approximately 8 kilometres southwest of the town of Killaloe and 1.5 kilometres to the northwest of the village of Bridgetown, Co. Clare. The site comprises a quarry void area which has been used for sand and gravel extraction since c. 1954. The Grid Reference co-ordinates for the approximate centre of the site are X 562651, Y 669425 in Irish Transverse Mercator (ITM).

Screening for AA is required under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). Where it cannot be excluded that a project or plan, either alone or in combination with other projects or plans, would have a significant effect on a European Site then same shall be subject to an AA of its implications for the site in view of the site's conservation objectives. The current project is not directly connected with, or necessary for, the management of any European Site. Consequently, the project has been subject to the Appropriate Assessment Screening process.

This Natura Impact Statement (NIS) has been prepared in accordance with the European Commission's Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2021) and Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2018) as well as the Department of the Environment's Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DoEHLG, 2010) and the Appropriate Assessment Screening for Development Management. Office of the Planning Regulator, Dublin 7, Ireland OPR (2021).

1.2 Statement of Authority

Multidisciplinary walkover surveys were undertaken on the 20th of March 2023, 25th of April 2023, 18th of May 2023, 17th of July 2023, 28th of August 2023, and 16th of April 2024 by Brónagh Boylan (BSc. Env), Rachel Minogue (BSc. Env), Aran von der Geest Moroney (BSc. Eco) and David Culleton (BSc. Zoo, M.Sc. Conservation Behaviour) of MKO. This report has been prepared by Brónagh Boylan (BSc.) and Cora Twomey (B.Sc. Eco) and has been reviewed by Rachel Walsh (BSc. Env) who has extensive experience in ecological consulting and management.

1.3 Methodology

1.3.1 Appropriate Assessment Process

Screening - The purpose of the screening stage is to determine, on the basis of a preliminary assessment and objective criteria, whether a plan or project, either alone or in combination with other plans or projects, is likely to have significant effects on a European site in view of the site's conservation objectives.

There is no necessity to establish such an effect; it is merely necessary for the Competent Authority to determine that there may be such an effect. The need to apply the precautionary principle in making any key decisions in relation to the tests of AA has been confirmed by the case law of the Court of Justice of the European Union (CJEU). Plans or projects that have no appreciable effect on a European site may be excluded. The threshold at this first stage is a very low one and operates as a trigger in order to determine whether AA of a project is required. Therefore, where significant effects are likely, uncertain or unknown at screening stage, an AA of the project will be required.

Appropriate Assessment - This stage of the process is a focused and detailed examination, analysis and evaluation by the Competent Authority of the implications of the plan or project, either alone or in

combination with other plans and projects, on the integrity of a European site in view of that site's conservation objectives. Case law has established that such an AA, to be lawfully conducted must:

> *(i) identify, in the light of the best scientific knowledge in the field, all aspects of the proposed project which may, by itself or in-combination with other plans or projects, affect the conservation objectives of the European site;*
>
> *(ii) contain complete, precise and definitive findings and conclusions and may not have lacunae or gaps; and*
>
> *(iii) may only include a determination that the proposed project will not adversely affect the integrity of any relevant European site where the competent authority decides (on the basis of complete, precise and definitive findings and conclusions) that no reasonable scientific doubt remains as to the absence of potential adverse effects. If adverse impacts can be satisfactorily avoided or successfully mitigated at this stage, so that no reasonable doubt remains as to the absence of the identified potential effects, then the process is complete. If the assessment is negative, i.e. adverse effects on the integrity of a site cannot be excluded, then the process must proceed to stage three (assessment of alternative) and, if necessary, stage four (IROPI[1]).*

1.3.2 Ecological Survey Methodologies

The following sections describe the methodologies followed to establish the baseline ecological condition of the site and surrounding area.

1.3.2.1 Ecological Multidisciplinary Walkover Surveys

Multidisciplinary walkover surveys were undertaken on the 20th of March 2023, 25th of April 2023, 18th of May 2023, 17th of July 2023, 28th of August 2023, and 16th of April 2024 by Brónagh Boylan (BSc. Env), Rachel Minogue (BSc. Env), Aran von der Geest Moroney (BSc. Eco) and David Culleton (BSc. Zoo, M.Sc. Conservation Behaviour) of MKO.

Survey timings fall within the recognised optimum period for vegetation surveys/habitat mapping, i.e. April to September. A comprehensive walkover of the entire Proposed Development site was completed. The walkover surveys were also designed to detect the presence, or likely presence, of a range of protected species and habitats. The multi-disciplinary walkover surveys comprehensively covered the entire study area and based on the survey findings, further detailed targeted surveys were carried out for features and locations of ecological significance.

Other targeted survey methodologies undertaken at the Site are described in the following subsections.

1.3.2.2 Invasive species survey

During the multi-disciplinary walkover surveys, a search for non-native invasive species was undertaken within the Site. The survey focused on the identification of invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (As Amended) (S.I. 477 of 2015).

1.3.2.3 Otter Surveys

The Bridgetown River Waterbody flows along the southeast boundary of the Proposed Development site is heavily encroached by vegetation with no flowing water present, however it does offer connectivity to the Lower River Shannon Special Area of Conservation (SAC) and as a result was surveyed for the present of Otter. This habitat was suboptimal; however, a search of the area surrounding this feature for evidence of otter activity was conducted as per the guidelines *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes* (NRA, 2009). This involved a

[1] *IROPI - 'imperative reasons of overriding public interest', the test found in Article 6(4) of the Habitats Directive.*

search for all otter signs e.g. spraints, scat, prints, slides, trails, couches and holts. There was no suitable riparian habitat within 10m of the watercourse, which is generally considered to comprise part of the otter habitat when surveying watercourses (NPWS 2009). The otter survey also followed the guidance as set out *Guidelines for the Treatment of Otters Prior to the Construction of National Roads Schemes* (NRA, 2008) and following Chartered Institute of Ecology and Environmental Management (CIEEM) best practice competencies for species surveys (CIEEM, 2013[2]).

1.3.3 Desk Study

The desk study undertaken for this assessment included a thorough review of the available ecological data associated with the screened-in European Sites within the likely zone of impact of the Proposed Development. Sources of data included the following:

- Review of NPWS Conservation Objectives supporting documents, site synopsis, standard data forms and supporting documents for European Designated Sites,
- Review of online web-mappers: National Parks and Wildlife Service (NPWS), Environmental Protection Agency (EPA),
- Review of the publicly available National Biodiversity Data Centre (NBDC) web-mapper,
- Review of NPWS Article 17 metadata and GIS database.

[2] *CIEEM, 2013, Technical Guidance Series – Competencies for Species Survey, Online, Available at: https://cieem.net/resource/competencies-for-species-survey-css/ Accessed: 11.11.2019*

2. DESCRIPTION OF PROPOSED DEVELOPMENT

2.1 Proposed Development

2.1.1 Site Location

The Proposed Development site comprises land in the townlands of Ballyquin More, Leitrim, Woodpark and Fahy More North, Co. Clare. The site is located approximately 8 kilometres southwest of the town of Killaloe and 1.5 kilometres to the northwest of the village of Bridgetown, Co. Clare. The site comprises a quarry void area which has been used for sand and gravel extraction since c. 1954. The Grid Reference co-ordinates for the approximate centre of the site are X 562651, Y 669425 in Irish Transverse Mercator (ITM).

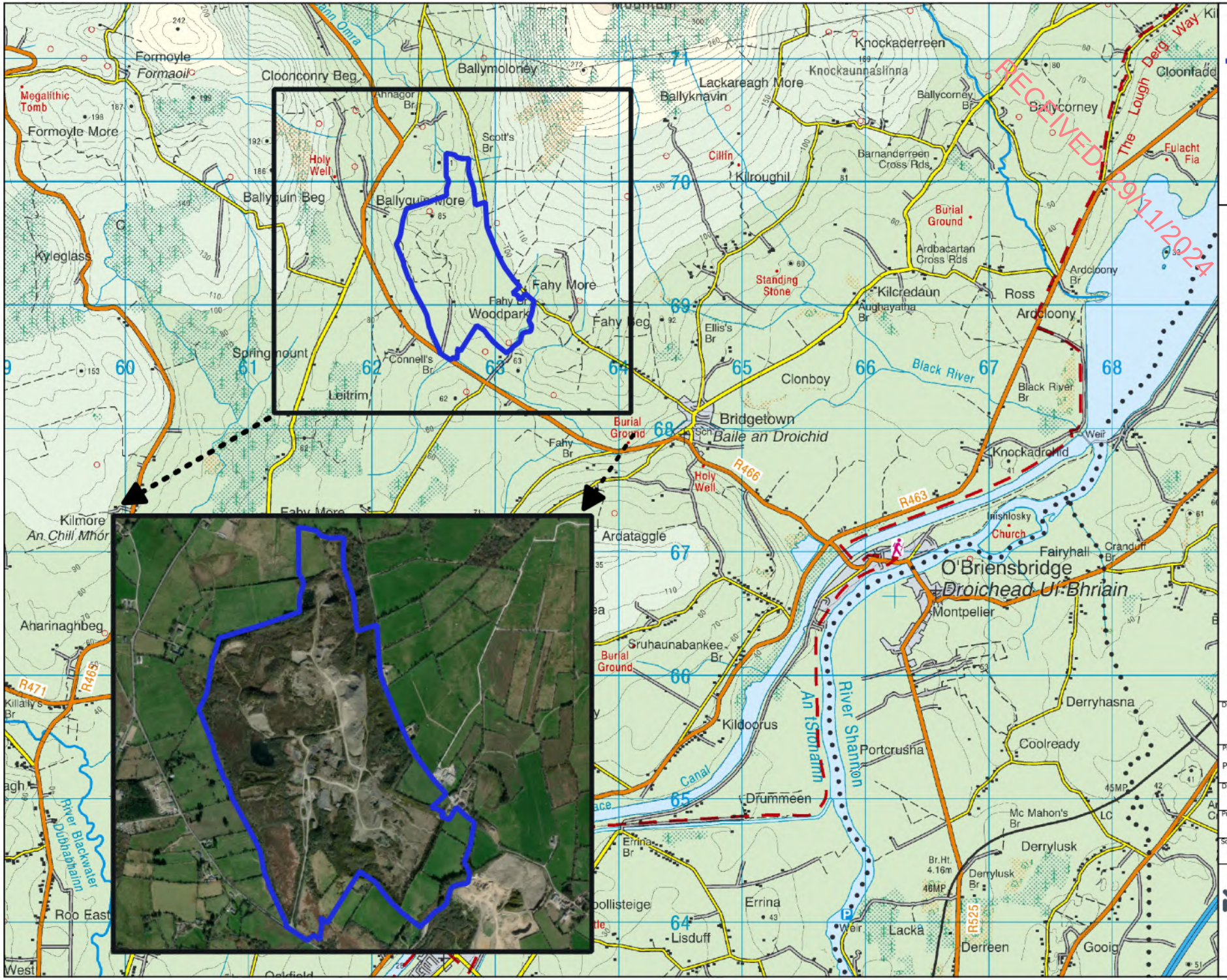
The site location is shown in Figure 2-1 Site Location Map.

2.1.2 Brief Summary of the Proposed Development

The Proposed Development being applied for under this planning application includes for the construction of a soil inspection shed, refuelling area, settlement ponds, road improvements, drainage network and environmental berms. The Proposed Development also includes for the extraction, processing and washing of sand and gravel from an area measuring approximately 16.3 hectares (ha) which will allow for the extraction of approximately 1,428,571 tonnes of material.

The development proposals also include for the infilling and restoration of an existing and future quarry void back to original land contour levels. It is proposed to fill the void with either inert soil and stone waste (imported inert greenfield and non-greenfield soils and stone, and river dredge spoil) which will be a soil recovery facility and require a waste management licence or soil and stone by-product (i.e., essentially virgin soil or equivalent to virgin soil and stone, and river dredge spoil) which will be notified to the Environmental Protection Agency (EPA) as an Article 27 by-product. The quantity of soil and stone material required for restoration has been estimated to be approximately 4,471,200 tonnes.
A layout of the Proposed Development is provided in Figure 2-2.

A detailed description of the Proposed Development is provided in Chapter 3 of the EIAR that this report accompanies.


Map Legend
Proposed Development boundary
RECEIVED: 29/11/2024
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Drawing Title
Site Location Map
Project Title
Proposed Quarry Extraction and Restoration at Roadstone Ballyquin, Co. Clare
Drawn By
CT
Checked By
RW
Project No.
211137
Drawing No.
Figure 2-1
Scale
1:40,000
Date
15.10.24
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Formoyle
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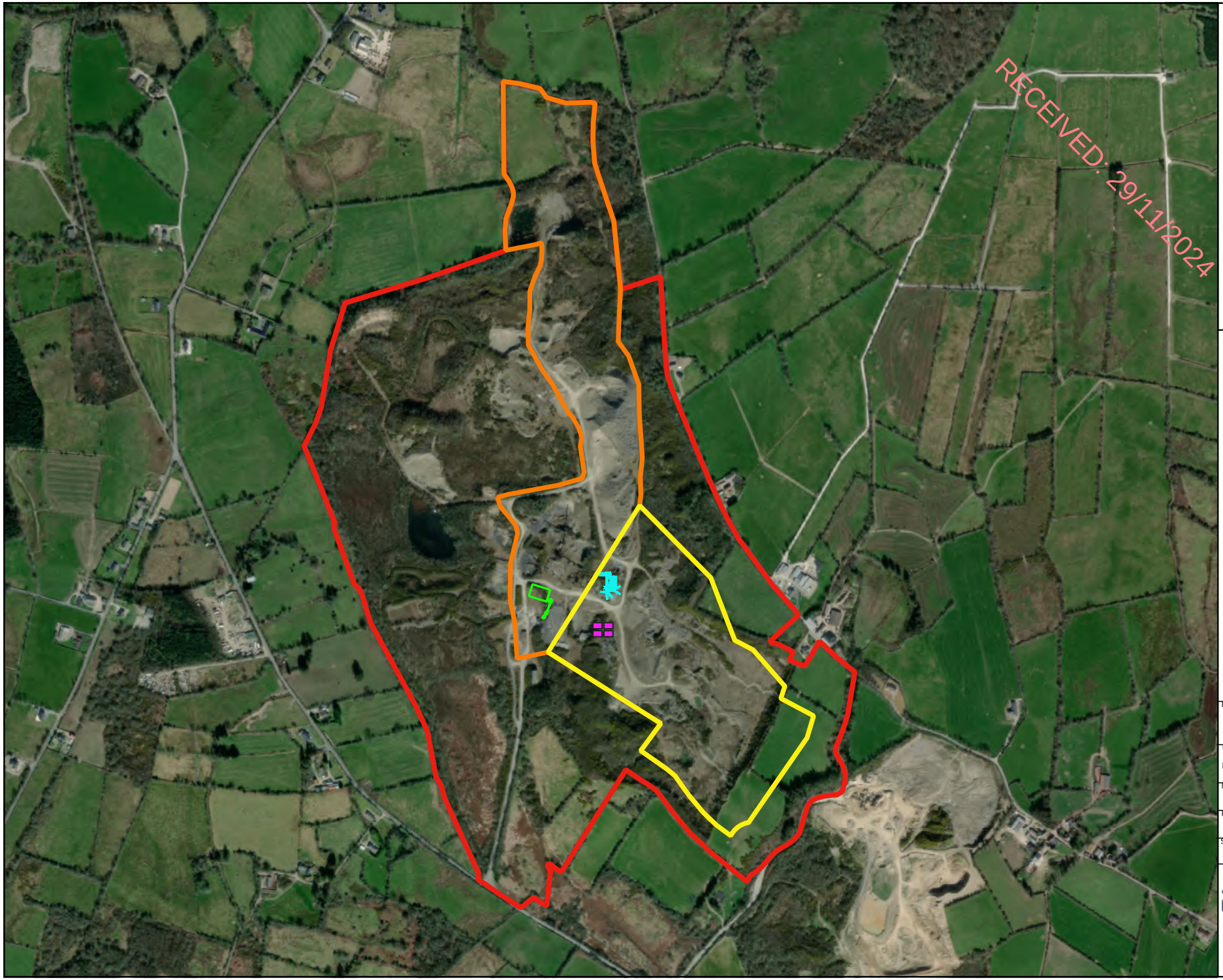
Cloonconry Beg
Ballymoloney
Knockaderreen
Knockaunnaslinna
Lackareagh More
Ballyknavin
Ballycorney
Cloonfadd
Fulacht Fia
Barnanderreen Cross Rds.
Cillín
Kilroughil
Ballyquin Beg
Ballyquin More
Holy Well
Scott's Br
Fahy More
Fahy Br
Woodpark
Fahy Beg
Kyleglass
Springmount
Connell's Br
Leitrim
Ellis's Br
Standing Stone
Burial Ground
Ardbacartan Cross Rds
Kilcredaun
Ross
Ardcloony
Ardcloony Br
Aughayatha Br
Clonboy
Black River
Black River Br
Bridgetown
Baile an Droichid
Knockadroid
Weir
R466
R463
Kilmore
An Chill Mhór
Ardataggle
Nishlosky Church
Fairyhall
Cranduff Br
O'Briensbridge
Droichead Uí Bhriain
Montpelier
Aharinaghbeg
R471
R463
Killaly's Br
Sruhaunabankee Br
Kildoorus
An tSionainn
River Shannon
Portcrusha
Derryhasna
Coolready
Canal
Drummeen
Mc Mahon's Br
Derrylusk
Br.Ht. 4.16m
Derrylusk Br
Errina Br
Errina
Lacka
Derreen
Gooig
Lisduff
R525
River Blackwater
Dubhabhainn
Roo East
West
Oakfield



Map Legend

- Proposed Development boundary
- Proposed Extraction boundary
- Proposed Restoration boundary
- Proposed New Inspection Shed & Soakway
- Proposed Settlement Pond Area
- Proposed Washplant Location

N

Drawing Title

Proposed Site Layout

Project Title: Proposed Quarry Extraction and Restoration at Roadstone Ballyquin, Co. Clare	
Drawn By: CT	Checked By: RW
Project No.: 211137	Drawing No.: Figure 2-2
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2.1.3 Biodiversity Enhancement and Management Plan

The restoration phase of the Proposed Development will result in the replanting of 2,756 linear metres of hedgerows and 160 linear metres of treeline habitat within the Proposed development site. The restoration proposal measures will see the site returning to agricultural use similar to the land use prior to quarrying, with agricultural grasslands bordered by hedgerows. Whips/bare root stock are recommended for the restoration phase planting due to the establishment success rates[3]. As linear connectivity within the Proposed Development site is not common, the restoration replanting once matured will significantly improve the connectivity onsite and will provide connecting corridors between the immature woodlands (which will have matured over the 22 years during the operational phase). This gain of linear habitat onsite will open up new shelter, refuges and nesting areas for fauna that utilise the site. All plant species proposed for replanting will be indigenous to the local area and recommended under the All-Ireland Pollinator Plan[4].

The proposed creation of 15.8 ha of grasslands within the Proposed Development site will be a mosaic of dry calcareous and neutral grasslands (GS1) and dry meadows and grassy verges (GS2), with the establishment of species with a diversity of grass species. Such grasslands are not currently observed within the Proposed Development boundary and will increase the heterogeneity of habitats within the site boundary and will increase the diversity of species found therein. Once established, the nature of the species comprising the swards will allow for tussocky grass species to form and create refuges and foraging areas for species that currently breed onsite or forage within the site boundary.

Further details with regard to the planting and seeding proposals are contained within the Biodiversity Enhancement and Management Plan (BEMP).

[3] *Hedging plating: answers to 18 common questions. Natural England 2008.*
[4] *All-Ireland Pollinator Plan 2021-2025. National Biodiversity Data Centre Series No. 25, Waterford. March 2021.*

3. CHARACTERISTICS OF THE RECEIVING ENVIRONMENT

3.1 Results of Baseline Ecological Surveys

3.1.1 Habitats

The site entrance, weighbridge within the site boundary, existing buildings and old quarrying equipment, and hardstand areas are classified under **Buildings and artificial surfaces (BL3)**.

*Plate 3-1 Shed found on site classified under **Buildings and artificial surfaces (BL3).***

The Proposed Development site is an existing quarry. As a result of previous extraction procedures, there are stockpiles of sand and gravel on site classified under **Active quarries/mines (ED4)**. Areas of the site have been classified as active quarries, despite inactivity within the quarry, as areas of the site have remained uncolonized during the inactive years, and due to the high levels of unconsolidated stockpiles within the quarry. There are multiple unconsolidated roads running through the site classified as **Spoil and bare ground (ED2).**

*Plate 3-2- Piles of sand and gravel on site were classified under **Active quarries/mines (ED4)** as the stockpiles as the stockpiles have not been recolonised by vegetation or fauna.*

*Plate 3-3 Typical section of unconsolidated access track within the EIAR Study Boundary that has been classified as **Spoil and bare ground (ED2).***

A **Depositing/lowland river (FW2)** borders the southeast of the Proposed Development site. The Bridgetown watercourse and is heavily encroached by vegetation, primarily bramble (*Rubus fruticosus agg.*) with little standing water and no flow present in the section of the watercourse bordering the grasslands to the southeast of the site.. The watercourse was bordered by **Scrub (WS1)** habitat. The water was turbid and moderate flowing at the time of the survey with a watercourse width of 1-2m (Plate 3-4).

*Plate 3-4- **Depositing/lowland river (FW2)** present across the southeast of the EIAR Site Boundary, and **Scrub (WS1)** comprising the riverbank and riparian vegetation.*

To the west of the entrance to the Proposed Development site, is an area of **Reed and Large swamps (FS1)**. The habitat is dominated by common reed (*Phragmites australis*) and bulrush (*Typha latifolia*) in an area of standing water.

*Plate 3-5- **Reed and Large Sedge Swamp (FS1)** present to the west of the entrance road within the Proposed Development site.*

In areas of the north-west, southeast and centre of the site, areas of **Recolonising bare ground (ED3)** were documented. Species within these areas included colt's foot (*Tussilago farfara*), nettle (*Urtica dioica*),

willow herb (*Epilobium* spp.), shepherd's purse (*Capsella bursa-pastoris*), dandelion (*Taraxacum* spp.), common gorse (*Ulex europaeus*), scatterings of conifer & willow saplings (*Sitka* spp.) *Salix* spp.), hawksbeard (*Crepis capillaris*), daisy (*Bellis perennis*) and ragwort (*Jacobaea vulgaris*).

*Plate 3-6- Area of **Recolonising bare ground (ED3)** present within the Proposed Extraction area.*

The majority of the northwest and easternmost extent of the site contained **Immature Woodland (WS2)**, particularly along the west and eastern boundaries of the site. Species of this habitat found on site included Birch (*Betula* spp.), Willow (*Salix* spp.), with some common gorse (*Ulex europaeus*). Ground flora included: nettle (*Urtica dioica*), foxglove (*Digitalis purpurea*), herb Robert (*Geranium robertianum*), hard shield fern (*Polystichum aculeatum*), ivy (*Hedera hibernica*), bramble (*Rubus fruticosus agg.*).

*Plate 3-7- **Immature woodland (WS2)** present along the western boundary of the Proposed Development.*

At times across the site, **Immature Woodland (WS2)** was bordered by **Scrub (WS1)** vegetation, with Scrub (WS1) vegetation dominating the south-western corner of the site. Additionally, **Scrub (WS1)** vegetation had recolonised areas between existing sand and gravel piles with common gorse (*Ulex europaeus*) heavily present on site. **Scrub (WS1)** species found within the Proposed Development site included willow (*Salix* spp.), Birch (*Betula* spp.), gorse (*Ulex* spp.), Blackthorn (*Prunus spinosa*), bracken fern (*Pteridium aquilinum*), bramble (*Rubus fruticosus agg.*), nettle (*Urtica dioica*), thistle (*Cirsium vulgare*) and Himalayan Knotweed (*Persicaria wallichii*).

*Plate 3-8- Gorse **Scrub (WS1)** present in the south-east of the site.*

Across the site, there are multiple areas of **Exposed sand, gravel or till (ED1)** in the form of exposed sand cliff faces and gravel stockpiles. The exposed sand cliff faces were often colonised by gorse and offer suitable nesting habitat to Sand Martin (*Riparia riparia*).

Plate 3-9 Exposed sand, gravel or till (ED1) cliff face in the northwest of the Proposed Development site.

Other artificial lakes and ponds (FL8) are present in the west and north of the Proposed Development with two small ponds found in the south-east of the Proposed Development within the proposed extraction area. Vegetation documented surrounding these ponds included soft rush (*Juncus effusus*), hard rush (*Juncus inflexus*), bulrush (*Typha latifolia),* marsh thistle (*Cirsium palustre*), fire weed (*Chamaenerion angustifolium*), and marsh horsetail (*Equisetum palustre*). The pond present in the northwest of site was heavily encroached by the stockpiles of sand and gravel located to the east of the pond as there is no barrier present between the pond and stockpiles. Additionally, the pond had a muddy substrate with a low number of small rocks/cobbles present and was 0.5 m in depth.

Plate 3-10- Pond present in the north-west of the site heavily encroached by willow (Salix spp.) classified under ***Other artificial lakes and ponds (FL8).***

The pond in the far north of site within an associated area of **Marsh (GM1)** was approximatley 1m in depth with large boulders present in the water. Surrounding the pond was a high number of both soft rush (*Juncus effusus*) and hard rush (*Juncus inflexus*) with approximately 30% coverage of algae at the surface of the pond. The large pond present to the east of the site was surrounded by bull rush (*Typha latifolia)* and previously listed **Scrub (WS1)** vegetation.

Plate 3-11- Pond found in the most northern section of the site, with a boulder substrate classified under ***Artificial lakes and ponds (FL8).***

As previously stated, the area to the far north of the site is dominated by **Marsh (GM1).** Vegetation recorded in this habitat included watercress (*Nasturtium officinale*), hairy bittercress (*Cardamine hirsute*), soft rush (*Juncus effusus*), marsh horsetail (*Equisetum palustre*), common water-starwort (*Callitriche stagnalis*), yarrow (*Achillea millefolium*), marsh pennywort (*Hydrocotyle vulgaris*), marsh cinquefoil (*Potentilla palustris*), *Calliergon* moss, horsetails (*Equisetum* spp.) bog chickweed (*Stellaria alsine*), and water figwort (*Scrophularia auriculata*).

Plate 3-12- Marsh (GM1) area located adjacent to Artificial lakes and ponds (FL8) present in the north of the site.

A **Drainage Ditch (FW4)** is present in the north-west of the Proposed Development site, bordered on both sides by immature woodland (WS2). The **Drainage Ditch (FW4)** had no flow and was heavily encroached by vegetation. The **Drainage Ditch (FW4)** had stagnant water in which pondweed (*Potamogeton natans*), marsh horsetail (*Equisetum palustre*), marsh woundwort (*Stachys palustris*), bull rush (*Typha latifolia*), willow (*Salix* spp.) and beech (*Fagus sylvatica*) were present.

*Plate 3-13- **Drainage ditch (FW4)** present in the northwest of the Proposed Development site.*

Grasslands recorded as **Dry meadows and grassy verges (GS2)** were present in the south-west of the Proposed Development site separated from one another and the wider site by **Hedgerows (WL1).** Species found in these grasslands were meadow foxtail (*Alopecurus pratensis*), cock's foot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), germain speedwell (*Veronica chamaedrys*), nettle (*Urtica dioica*), pignut (*Conopodium majus*), clovers (*Trifolium* spp.), lesser stitchwort (*Stellaria graminea*), red fescue *(Festuca rubra*), soft rush (*Juncus effusus*), yarrow (*Achillea millefolium*), and creeping buttercup (*Ranunculus repens*). **Hedgerow (WL1)** lines were made up of Blackthorn (*Prunus spinosa*), hawthorn (*Crataegus monogyna*), Holly (*Ilex aquifolium*), bramble (*Rubus fruticosus agg.*), elder (*Sambucus nigra*), oak saplings (*Quercus* spp.), willow (*Salix* spp.), birch (*Betula* spp.), common gorse (*Ulex europaeus*), nettles (*Urtica dioica*) and bracken (*Pteridium aquilinum*.).

*Plate 3-14- Grassland designated under **Dry meadows and grassy verges (GS2)** separated from adjacent fields by **Hedgerows (WL1).***

Grasslands present to the far south-east of the site and northwest of the Proposed Development boundary were classified as **Improved agricultural grassland (GA1)** due to the species composition present and the presence of livestock grazing within them. Species recorded within these fields included yorkshire fog (*Holcus lanatus)*, ribwort plantain (*Plantago lanceolata)*, white clover (*Trifolium repens)*, red clover (*Trifolium pratense)*, soft rush (*Juncus effusus*), perennial rye grass *(Lolium perenne)*, creeping buttercup (*Ranunculus repens*), meadow buttercup (*Ranunculus acris*), smooth hawk's-beard (*Crepis vesicaria*), ragwort (*Jacobaea vulgaris)*, yarrow (*Achillea millefolium),* sheep's sorrel (*Rumex acetosella*), fescue (*Festuca* spp.), *vulgare*), broadleaved dock (*Rumex obtusifolius),* sweet vernal grass (*Anthoxanthum odoratum*), knapweed (*Centaurea nigra*), common vetch (*Vicia sativa),* and bracken (*Pteridium aquilinum*.).

Within the field in the northwest, the **Treeline (WL2**) habitat surrounding the grassland was bordered by Hawthorn (*Crataegus monogyna*) with ground flora within the treeline consisting of native bluebell (*Hyacinthoides non-scripta)*, lesser celandine (*Ficaria verna*), and wood anemone (*Anemone nemorosa*).

*Plate 3-15- **Improved agricultural grassland (GA1)** present in the southeast of the Site.*

Surrounding the boundary of the Proposed Development site in the northeast of the site and the northern agricultural grassland, **Treelines (WL2)** are present. **Treelines (WL2)** identified bordering the boundary of the Proposed Development site consist primarily of ash (*Fraxinus excelsior*) trees, with the agricultural grassland to the north of the site surrounded by ash (*Fraxinus excelsior*), hazel (*Corylus avellana*) and oak (*Quercus petraea*).

*Plate 3-16- **Treeline (WL2)** present at the north of the site.*

None of the habitats within the Proposed Development site proposed for extraction and restoration boundaries conform to habitats listed under Annex I of the EU Habitats Directive.

Himalayan Knotweed (*Persicaria wallichii)*, listed on the Third Schedule of the S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011, was recorded within the EIAR

Study Area. An Invasive Species Management Plan for this species has been prepared and is included in Appendix 5-3 of the EIAR.

No botanical species protected under the Flora (Protection) Order (2022) were recorded during the survey.

3.1.2 Otter Survey Results

The Bridgetown River Waterbody present at the southeast boundary of the Proposed Development site offers surface water connectivity to the Lower River Shannon SAC, in which otter is a Qualifying Interest. As such, the watercourse was assessed and surveyed for potential foraging and commuting habitat to otter.

No sign of otter was observed. No sign of otter spraints, scat, prints, slides, trails, couches and holts was observed. The watercourse to the southeast was heavily encroached with vegetation primarily bramble, containing a low level of standing water with no flow at the time of survey (Plate 3-17). To the southwest of the EIAR Study Area boundary, the no flow contained turbid water, and no signs of otter observed.

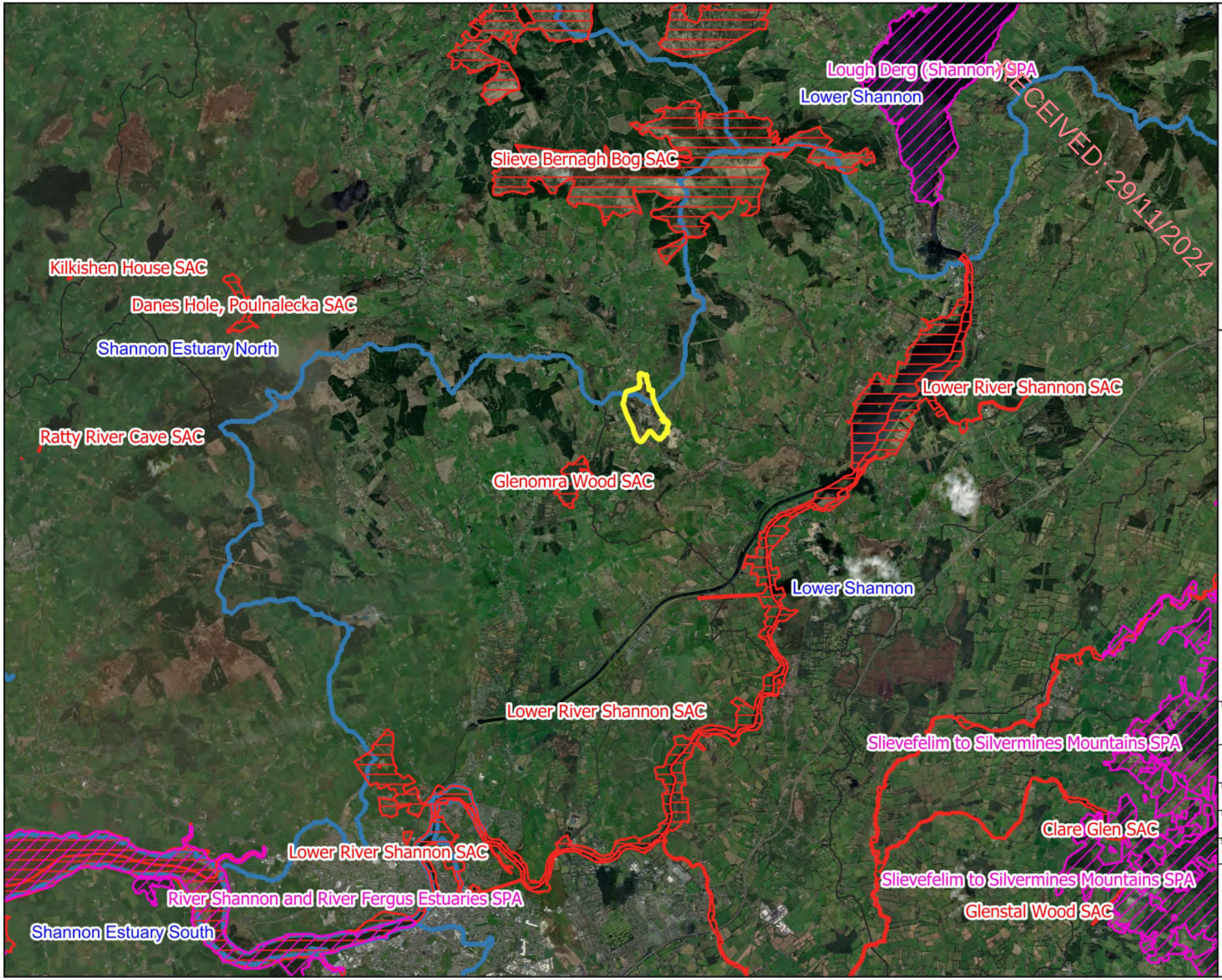
Plate 3-17 Depositing/lowland river (FW1) assessed for signs of otter.

4. STAGE 1 – APPROPRIATE ASSESSMENT SCREENING

4.1 Identification of Relevant European Sites

The following methodology was used to establish any European Sites upon which there is a potential for a likely significant effect to occur either individually or in combination with other plans and projects as a result of the Proposed Development:

- Initially the most up to date GIS spatial datasets for European designated sites and water catchments were downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie).
- All European Sites that could potentially be affected were identified using a source-pathway - receptor model. To provide context for the assessment, European Sites surrounding the development site are shown on Figure 4-1. Information on these sites according to the site-specific conservation objectives is provided in Table 4-1.
- The catchment mapping was used to establish or discount potential hydrological connectivity between the site of the Proposed Development and any European Sites. The hydrological catchments are also shown in Figure 4-1.
- In relation to Special Protection Areas, in the absence of any specific European or Irish guidance in relation to such sites, the Scottish Natural Heritage (SNH) Guidance, '*Assessing Connectivity with Special Protection Areas* (SPA)' (2016) was consulted. This document provides guidance in relation to the identification of connectivity between the Proposed Development and Special Protection Areas. The guidance takes into consideration the distances species may travel beyond the boundary of their SPAs and provides information on dispersal and foraging ranges of bird species which are frequently encountered when considering plans and projects.
- Table 4-1, provides details of all relevant European Sites as identified in the preceding steps and assesses the potential for likely significant effects on each.
- The assessment considers any likely direct or indirect impacts of the Proposed Development, both alone and in combination with other plans and projects, on European Sites by virtue of criteria including the following: size and scale, land-take, distance from the European Site or key features of the site, resource requirements, emissions, excavation requirements, transportation requirements and duration of construction, operation and decommissioning were considered in this assessment.
- The site synopses and conservation objectives of these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report.
- Where potential pathways for Likely Significant Effect are identified, the site is included within the Likely Zone of Impact and further assessment is required within the NIS.
- The potential for the Proposed Development to result in cumulative impacts on any European Sites in combination with other plans and projects was considered in the assessment that is presented in Table 4-1. Plans and projects considered include those that are listed in Section 8.



Map Legend

- Proposed Development boundary
- Special Area of Conservation (SAC)
- Speacial Protection Area (SPA)
- Hydrological Catchments (WFD)
- Hydrological Subcatchments (WFD)

Drawing Title
EU Sites Within the Likely Zone of Influence

Project Title
Proposed Quarry Extraction and Restoration at Roadstone Ballyquin, Co. Clare

Drawn By	Checked By
CT	RW
Project No.	Drawing No.
211137	Figure 4-1
Scale	Date
1:120,000	15.10.24

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Table 4-1 Identification of European Sites within the Likely Zone of Impact

European Sites and distance from Proposed Development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie)	Conservation Objectives	Identification of Source-Pathway-Receptor chain
Special Areas of Conservation (SAC)			
Glenomra Wood SAC [001013] **Distance:** 1.3km	› [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Detailed conservation objectives for this site, (Version 1, June 2018[5]), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct impact on this SAC as it is located entirely outside of the Proposed Development site boundary. There is no hydrological connectivity between the proposed site and this SAC. Due to the terrestrial nature of this SAC, there is no potential source-pathway-receptor chain identified for effect on the terrestrial Qualifying Interests (QIs) for which this SAC is designated exists. **No pathway for likely significant effect on this European Site was identified, when considered in the absence of any mitigation, individually or cumulatively with other plans or projects and the site is not within the Likely Zone of Influence of the Proposed Development and is not considered further in this assessment.**
Slieve Bernagh Bog SAC [002312] **Distance:** 2.7km	› [4010] European Atlantic wet heaths with *Erica tetralix* › [4030] European dry heaths › [7130] Blanket bogs (* if active bog)	Detailed conservation objectives for this site, (Version 1, August 2016[6]), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct impact on this SAC as it is located entirely outside of the Proposed Development site boundary. The SAC and the Proposed Development site are located within separate groundwater bodies. There is no surface water connectivity between the SAC and the Proposed Development site. Although the SAC and Proposed Development site are located within the same Sub-catchment (Owenogarney_SC_010), the SAC is located hydrologically upstream of the Proposed Development site. Therefore there is no

[5] *NPWS (2018) Conservation Objectives: Glenomra Wood SAC 001013. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.*
[6] *NPWS (2016) Conservation Objectives: Slieve Bernagh Bog SAC 002312. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.*

European Sites and distance from Proposed Development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie)	Conservation Objectives	Identification of Source-Pathway-Receptor chain
			possibility for indirect effects on the QIs of the SAC in the absence of a complete source-pathway-receptor chain for effect. **No pathway for likely significant effect on this European Site was identified, when considered in the absence of any mitigation, individually or cumulatively with other plans or projects and the site is not within the Likely Zone of Influence of the Proposed Development and is not considered further in this assessment.**
Lower River Shannon SAC [002165] **Distance**: 3.3km **Hydrological Distance:** • 5.8km approximately downstream via the Bridgetown River • 27.5km approximately downstream via the Broadford River	› [1029] Freshwater Pearl Mussel *Margaritifera margaritifera* › [1095] Sea Lamprey *Petromyzon marinus* › [1096] Brook Lamprey *Lampetra planeri* › [1099] River Lamprey *Lampetra fluviatilis* › [1106] Atlantic Salmon *Salmo salar* (only in fresh water) › [1110] Sandbanks which are slightly covered by sea water all the time › [1130] Estuaries › [1140] Mudflats and sandflats not covered by seawater at low tide › [1150] *Coastal lagoons › [1160] Large shallow inlets and bays › [1170] Reefs	Detailed conservation objectives for this site, (Version 1, August 2012[7]), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects on this SAC as it is located entirely outside of the Proposed Development site boundary. Hydrological connectivity between the Proposed Development site and the SAC exists, as the SAC is located within the same subcatchment and is hydrologically connected via two watercourses which border the Proposed Development site. The SAC is hydrologically 5.8km downstream via the Bridgetown River Waterbody (ID: IE_SH_25B230100), and 27.5km downstream via the Broadford River Waterbody (IE_SH_27b020300). The Proposed Development and the SAC are in separate groundwater bodies. The Proposed Development utilises a closed system of settlement ponds, a man-made pond that is groundwater fed, and a wetland lagoons system. There will be no overflow to watercourses as a result of the closed system. However, taking a precautionary approach there is potential for deterioration of water quality during the construction and operational phases of the Proposed Development. Potential pathways for indirect effects on the aquatic dependent QI's of the SAC exist, in the form of water quality deterioration.

[7] *NPWS (2012) Conservation Objectives: Lower River Shannon SAC 002165. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.*

European Sites and distance from Proposed Development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie)	Conservation Objectives	Identification of Source-Pathway-Receptor chain
	› [1220] Perennial vegetation of stony banks › [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts › [1310] *Salicornia* and other annuals colonizing mud and sand › [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) › [1349] Bottlenose Dolphin *Tursiops truncatus* › [1355] Otter *Lutra lutra* › [1410] Mediterranean salt meadows (*Juncetalia maritimi*) › [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* Vegetation › [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) › [91E0] *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)		**A complete source-pathway-receptor chain was identified and in the absence of mitigation, there is potential for the Proposed Development to result in likely significant effects on this European Site. The Designated Site is considered to be within the Likely Zone of Influence of the Proposed Development and further assessment is required.**
Danes Hole, Poulnalecka SAC [000030]	› [1303] Lesser Horseshoe Bat *Rhinolophus hipposideros*	Detailed conservation objectives for this site, (Version 1, July 2018[8]), were	There will be no direct effect on this SAC as it is located entirely outside of the Proposed Development site boundary.

[8] *NPWS (2018) Conservation Objectives: Danes Hole, Poulnalecka SAC 000030. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.*

European Sites and distance from Proposed Development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie)	Conservation Objectives	Identification of Source-Pathway-Receptor chain
Distance: 8.5km	› [8310] Caves not open to the public › [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	reviewed as part of the assessment and are available at www.npws.ie	The proposed site is located 8.5km southeast of the SAC. Therefore, the site is located outside the 2.5km core forging range for the lesser horseshoe bat roosts (NPWS, 2018). No potential pathway for indirect impact on this species exists. Indirect effects on the terrestrial QIs of the SAC can be ruled out due to the terrestrial nature of the habitats/species, the distance from the Proposed Development site and the absence of a complete source-pathway-receptor chain for effect. **No pathway for likely significant effect on this European Site was identified, when considered in the absence of any mitigation, individually or cumulatively with other plans or projects and the site is not within the Likely Zone of Influence of the Proposed Development and is not considered further in this assessment.**
Clare Glen SAC [000930] **Distance**: 13.1km	› [1421] Killarney Fern *Trichomanes speciosum* › [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Detailed conservation objectives for this site, (Version 1, May 2018[9]), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct impact on this SAC as it is located entirely outside of the Proposed Development site boundary. There is no hydrological connectivity between the Proposed Development site and this SAC. The Site is located in a separate subcatchment and is located hydrologically upstream of the Proposed Development site. The Site and the Proposed Development are located within separate groundwater bodies. Therefore, there are no potential pathways for indirect effects on the terrestrial and aquatic QIs for which this SAC is designated exists, due to the absence of a complete source-pathway-receptor chain for effect.

[9] *NPWS (2018) Conservation Objectives: Clare Glen SAC 000930. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.*

European Sites and distance from Proposed Development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie)	Conservation Objectives	Identification of Source-Pathway-Receptor chain
			No pathway for likely significant effect on this European Site was identified, when considered in the absence of any mitigation, individually or cumulatively with other plans or projects and the site is not within the Likely Zone of Influence of the Proposed Development and is not considered further in this assessment.
Kilkishen House SAC [002319] **Distance**: 13.7km	› [1303] Lesser Horseshoe Bat *Rhinolophus hipposideros*	Detailed conservation objectives for this site, (Version 1, July 2018[10]), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct impact on this SAC as it is located entirely outside of the Proposed Development site boundary. The proposed site is located 13.7km southeast of the SAC. Therefore, the site is located outside the 2.5km core forging range for Lesser Horseshoe Bat roosts (NPWS, 2018). Therefore, no potential pathway for indirect impact on this QI species that this SAC is designated for. **No pathway for likely significant effect on this European Site was identified, when considered in the absence of any mitigation, individually or cumulatively with other plans or projects and the site is not within the Likely Zone of Influence of the Proposed Development and is not considered further in this assessment.**
Ratty River Cave SAC [002316] **Distance**: 14.1km	› [1303] Lesser Horseshoe Bat *Rhinolophus hipposideros* › [8310] Caves not open to the public	Detailed conservation objectives for this site, (Version 1, July 2018[11]), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct impact on this SAC as it is located entirely outside of the Proposed Development site boundary. Indirect effects on the terrestrial QIs of the SAC can be ruled out due to the terrestrial nature of the habitats and the distance from the Proposed Development site. The Proposed Development site is located 14.1km southeast of the SAC. Therefore, the site is located outside the 2.5km core forging

[10] *NPWS (2018) Conservation Objectives: Kilkishen House SAC 002319. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.*
[11] *NPWS (2018) Conservation Objectives: Ratty River Cave SAC 002316. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht*

European Sites and distance from Proposed Development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie)	Conservation Objectives	Identification of Source-Pathway-Receptor chain
			range for Lesser Horseshoe Bat roosts (NPWS, 2018). No potential pathway for indirect impact on this species exists. **No pathway for likely significant effect on this European Site was identified, when considered in the absence of any mitigation, individually or cumulatively with other plans or projects and the site is not within the Likely Zone of Influence of the Proposed Development and is not considered further in this assessment.**
Special Protection Area (SPA)			
Lough Derg (Shannon) SPA [004058] **Distance:** 7.8km	› [A017] Cormorant *Phalacrocorax carbo* › [A061] Tufted Duck *Aythya fuligula* › [A067] Goldeneye *Bucephala clangula* › [A193] Common Tern *Sterna hirundo*	First Order Site-specific conservation objectives for this site, (November 2022[12]), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct impact on this SPA as it is located entirely outside of the Proposed Development site boundary. There will be no indirect effects on this Site as the Proposed Development is located hydrologically downstream of the SPA, within a separate subcatchment. The SPA and Proposed Development site overlap in the same groundwater body, however only one field within the Proposed Development site overlaps into the Lough Graney groundwater body. There are no proposed works with the areas that overlap with this groundwater body. The habitats present within the Proposed Development site offer some suitable foraging habitat to the wading SCI species of this SPA; however, the Site is vastly outside all known core foraging ranges for the SCI species. The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site, and more suitable areas for foraging are present within the wider landscape. Therefore, there is no loss of potential significant suitable nesting and foraging habitat for the species, and no

[12] *NPWS (2022) Conservation objectives for Lough Derg (Shannon) SPA [004058]. First Order Site-specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage.*

European Sites and distance from Proposed Development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie)	Conservation Objectives	Identification of Source-Pathway-Receptor chain
			potential disturbance to the SCI species is predicted due to the nature and distance of the Proposed Development to the SPA. **No pathway for likely significant effect on this European Site was identified, when considered in the absence of any mitigation, individually or cumulatively with other plans or projects and the site is not within the Likely Zone of Influence of the Proposed Development and is not considered further in this assessment.**
River Shannon and River Fergus Estuaries SPA [004077] **Distance:** 12.8km **Hydrological Distance via Bridgetown Watercourse:** 29.4km **Hydrological Distance via the Broadford Watercourse:** 30km	› [A017] Cormorant *Phalacrocorax carbo* › [A038] Whooper Swan *Cygnus cygnus* › [A046] Light-bellied Brent Goose *Branta bernicla hrota* › [A048] Shelduck *Tadorna tadorna* › [A050] Wigeon *Anas penelope* › [A052] Teal *Anas crecca* › [A054] Pintail *Anas acuta* › [A056] Shoveler *Anas clypeata* › [A062] Scaup *Aythya marila* › [A137] Ringed Plover *Charadrius hiaticula* › [A140] Golden Plover *Pluvialis apricaria* › [A141] Grey Plover *Pluvialis squatarola* › [A142] Lapwing *Vanellus vanellus* › [A143] Knot *Calidris canutus* › [A149] Dunlin *Calidris alpina*	Detailed conservation objectives for this site, (Version 1, September 2012[13]), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct impact on this SPA as it is located entirely outside of the Proposed Development site boundary. Hydrological connectivity to the SPA exists, as the Proposed Development site is located downstream via the Broadford River Waterbody along the northern site boundary, and via the Bridgetown River Waterbody at the southern boundary. The SPA is located approximately 29.4km downstream via the Bridgetown River and 30km downstream via the Broadford River. The Proposed Development site and the SPA are located within separate subcatchments. However, the SPA and Proposed Development site are located within the same groundwater body (Tulla-Newmarket on Fergus). The habitats present within the Proposed Development site offer some suitable foraging and nesting habitat to the SCI species of this SPA; however, the site is outside of all known core foraging ranges for the SCI species. The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site, and more suitable areas for foraging are present within the wider landscape. Therefore, there will be no loss of potential significant suitable nesting and foraging habitat for the species, and no

[13] *NPWS (2012) Conservation Objectives: River Shannon and River Fergus Estuaries SPA 004077. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht*

European Sites and distance from Proposed Development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie)	Conservation Objectives	Identification of Source-Pathway-Receptor chain
	› [A156] Black-tailed Godwit *Limosa limosa* › [A157] Bar-tailed Godwit *Limosa lapponica* › [A160] Curlew *Numenius arquata* › [A162] Redshank *Tringa totanus* › [A164] Greenshank *Tringa nebularia* › [A179] Black-headed Gull *Chroicocephalus ridibundus* › [A999] Wetlands		potential disturbance to the SCI species is predicted due to the distance of the Proposed Development to the SPA. **Taking a precautionary approach, a complete source-pathway-receptor chain was identified and in the absence of mitigation, there is potential for the Proposed Development to result in likely significant effects on this European Site. The Designated Site is considered to be within the Likely Zone of Influence of the Proposed Development and further assessment is required.**
Slievefelim and Silvermines Mountains SPA [004165] **Distance:** 13.7km	› [A082] Hen Harrier *Circus cyaneus*	Detailed conservation objectives for this site, (Version 1, September 2022[11]), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effect on this SPA as it is located entirely outside of the Proposed Development site boundary. The Proposed Development site is outside the core foraging range of 2km for this SCI species, and is also outside the maximum foraging range of 10km, as the SPA occurs over 13km from the Proposed Development site. The site of the Proposed Development does not provide suitable habitat for Hen Harrier, the SCI species of the SPA. **No pathway for likely significant effect on this European Site was identified, when considered in the absence of any mitigation, individually or cumulatively with other plans or projects and the site is not within the Likely Zone of Influence of the Proposed Development and is not considered further in this assessment.**

[11] *NPWS (2022) Conservation Objectives: Slievefelim to Silvermines Mountains SPA 004165. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.*

4.2 Stage 1 Appropriate Assessment Screening Conclusion

It cannot be excluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the Proposed Development, individually or in combination with other plans and projects, would be likely to have a significant effect on:

- Lower River Shannon SAC [002165]
- River Shannon and River Fergus Estuaries SPA [004077]

As a potential pathway for likely significant effect on the above listed European Site was identified via deterioration in water quality during construction of the Proposed Development, an Appropriate Assessment is required, and a Natura Impact Statement has been provided in Section 5 below.

5. STAGE 2- NATURA IMPACT STATEMENT (NIS)

The potential for likely significant effects on the following European Sites in the absence of any mitigation, individually or cumulatively with other plans or projects, was identified in the preceding section:

- Lower River Shannon SAC [002165]
- River Shannon and River Fergus Estuaries SPA [004077]

The following sections consider each European Site individually to:

1. Determine which individual qualifying features have the potential to be adversely affected by the Proposed Development.
2. Provide information with regard to the Conservation Objectives and site-specific pressures and threats for those qualifying features that have the potential to be adversely effected.

5.1 Identification of relevant Qualifying Features and Desk Study

5.1.1 Lower River Shannon SAC (002165)

The potential for impacts on this SAC were identified in Section 4.1 above. Due to the distance between the Proposed Development and this SAC, the identified pathways for effect include the following:

This European Site is located approximately 6km hydrological distance from the Proposed Development via the Bridgetown River Waterbody. There is potential for adverse effects in terms of the deterioration of water quality due to the construction and operational phase of the Proposed Development on the aquatic designated QI habitats and species.

Table 5-1 below lists the qualifying features of this European Site and determines, in the light of their Conservation Objectives, whether there is any complete source-pathway-receptor chain, by which adverse effects may occur.

5.1.1.1 Identification of Individual Qualifying Features with the Potential to be Affected

Table 5-1 Assessment of Qualifying features potentially affected for the Lower River Shannon SAC (002165)

Qualifying feature	Conservation Objective (NPWS, Version 1, August 2012[15]),	Rationale	Potential for Adverse Effects Y/N
[1029] Freshwater Pearl Mussel *(Margaritifera margaritifera)*	To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC.	According to the maps provided within the SSCO document for this SAC, this species has not been recorded downstream of the Proposed Development site. Additionally, there are no known NPWS records of this species downstream of the Proposed Development. There is no identifiable surface water connectivity with the identified location of this species within the SAC, according to the SSCO document, the location of this species within the SAC is situated upstream of the Proposed Development. Therefore, there are no predicted adverse effects on this species and no further assessment is required.	No

[15] *NPWS (2012) Conservation Objectives: Lower River Shannon SAC 002165. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.*

Qualifying feature	Conservation Objective (NPWS, Version 1, August 2012[15]),	Rationale	Potential for Adverse Effects Y/N
[1095] Sea Lamprey *(Petromyzon marinus)*	To restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC.	Although the distribution of lamprey species within this SAC is currently unknown, there is potential for the construction and operational phase of the Proposed Development to adversely affect the supporting habitat for Lamprey species via deterioration in water quality of the downstream Lower River Shannon SAC as a result of the construction and operational phase of the Proposed Development.Therefore, further assessment is required.	Yes
[1096] Brook Lamprey *(Lampetra planeri)*	To maintain the favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC.		
[1099] River Lamprey *(Lampetra fluviatilis)*	To maintain the favourable conservation condition of River Lamprey in the Lower River Shannon SAC.		
[1106] Atlantic Salmon *(Salmo salar)* (only in fresh water)	To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC.	This SAC is located approximately 6km downstream of the Proposed Development site. Although the distribution of this species is not mapped within the SAC, there is potential for the Proposed Development to adversely affect the supporting habitat for this species via deterioration of water quality within the downstream Lower River Shannon SAC as a result of the construction and operational phase. Therefore, further assessment is required.	Yes
[1110] Sandbanks which are slightly covered by sea water all the time	To maintain the favourable conservation condition of Sandbanks which are slightly covered by sea water all the time in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. Due to the nature of the proposed construction works and operational phase of the Proposed Development and the significant intervening distance (>100km hydrological distance) between the Proposed Development and the mapped habitat of this QI, no identifiable source-pathway-receptor chain for adverse effects have been identified. No further assessment is required.	No
[1130] Estuaries	To maintain the favourable conservation condition of Estuaries in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat 6km downstream of the Proposed Development. Due to the nature of the proposed	Yes

Qualifying feature	Conservation Objective (NPWS, Version 1, August 2012[15]),	Rationale	Potential for Adverse Effects Y/N
		construction and operational phase of the Development and the hydrological distance downstream between the Proposed Development and this SAC, an identifiable source-pathway-receptor chain for adverse effects have been identified, further assessment is required.	
[1140] Mudflats and sandflats not covered by seawater at low tide	To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat 6km downstream of the Proposed Development. Due to the nature of the proposed construction and operational phase of the Development and the hydrological distance downstream between the Proposed Development and this SAC, an identifiable source-pathway-receptor chain for adverse effects have been identified, further assessment is required.	Yes
[1150] *Coastal lagoons	To restore the favourable conservation condition of Coastal lagoons in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat 50km downstream of the Proposed Development Due to the nature of the proposed construction and operational phase of the Proposed Development and the hydrological distance downstream between the Proposed Development and this SAC, an identifiable source-pathway-receptor chain for adverse effects have been identified, further assessment is required.	Yes
[1160] Large shallow inlets and bays	To maintain the favourable conservation condition of Large shallow inlets and bays in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat 80km downstream of the Proposed Development. Due to the nature of the proposed construction works and operational phase of the Proposed Development and the significant intervening distance (approximately 92km downstream) between the Proposed Development and the mapped habitat of this QI, no identifiable source-pathway-receptor chain for adverse effects have been identified. No further assessment is required.	No
[1170] Reefs	To maintain the favourable conservation condition of Reefs in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat over 40km downstream of the Proposed Development. Due to the nature of the proposed construction and operational phase of the Development and the hydrological distance	Yes

Qualifying feature	Conservation Objective (NPWS, Version 1, August 2012[15]),	Rationale	Potential for Adverse Effects Y/N
		downstream between the Proposed Development and this SAC, an identifiable source-pathway-receptor chain for adverse effects have been identified, further assessment is required.	
› [1220] Perennial vegetation of stony banks	To maintain the favourable conservation condition of Perennial vegetation of stony banks in the Lower River Shannon SAC.	This QI habitat is entirely terrestrial in nature. This SAC is located over 3.3km overland distance from the Proposed Development. Due to the terrestrial nature of this QI, no identifiable source-pathway-receptor chain for adverse effects have been identified. No further assessment is required.	No
› [1230] Vegetated Sea cliffs of the Atlantic and Baltic coasts	To maintain the favourable conservation condition of Vegetated sea cliffs in the Lower River Shannon SAC.	This QI habitat is entirely terrestrial in nature. This SAC is located over 3.3km overland distance from the Proposed Development. Given the significant spatial separation between the Proposed Development Site and this SAC with no identifiable source-pathway-receptor chain, there are no predicted adverse effects based on the proposed construction and operational phases. No further assessment is required.	No
› [1310] *Salicornia* and other annuals colonizing mud and sand	To maintain the favourable conservation condition of Salicornia and other annuals colonizing mud and sand in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat over 100km downstream of the Proposed Development. Due to the nature of the proposed construction and operational phase of the Development and the significant intervening distance (100km hydrological distance) between the Proposed Development and the mapped habitat of this QI, no identifiable source-pathway-receptor chain for adverse effects have been identified. No further assessment is required.	No
› [1330] Atlantic salt meadows *(Glauco-Puccinellietalia maritimae)*	To restore the favourable conservation condition of Atlantic salt meadows (Glauco-Puccinellietalia maritimae) in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat over 40km downstream of the Proposed Development. Due to the nature of the proposed construction and operational phase of the Proposed Development and the hydrological distance downstream between the Proposed Development and this SAC, an identifiable source-pathway-receptor chain for adverse effects have been identified, further assessment is required.	Yes

Qualifying feature	Conservation Objective (NPWS, Version 1, August 2012[15]),	Rationale	Potential for Adverse Effects Y/N
[1349] Bottlenose Dolphin *(Tursiops truncates)*	To maintain the favourable conservation condition of Bottlenose Dolphin in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat 32km downstream of the Proposed Development, with critical habitat 76km downstream of the Proposed Development site. Due to the nature of the proposed construction and operational phase of the Proposed Development and the hydrological distance downstream between the Proposed Development and this SAC, an identifiable source-pathway-receptor chain for adverse effects have been identified, further assessment is required.	Yes
[1355] Otter (*Lutra lutra)*	To restore the favourable conservation condition of Otter in the Lower River Shannon SAC.	According to the SSCO document for this SAC, the distribution of this species within the SAC is not mapped. The area mapped within this SAC is based on evidence that otters tend to forage within 80m of the shoreline and that the otter is assumed to be distributed throughout this SAC; given that the Otter *(Lutra lutra)* is known to occur within most waterways in Ireland. Dedicated otter surveys were undertaken within the Bridgetown River Waterbody. No otter evidence was recorded, however the Broadford River Waterbody provide suitable habitat for the species and may occur in the area on occasion. Therefore, potential adverse effects exist via deterioration in water quality of the downstream Lower River Shannon SAC as a result of the construction and operational phases of the Proposed Development. Therefore, further assessment is required.	Yes
[1410] Mediterranean salt meadows *(Juncetalia maritimi)*	To restore the favourable conservation condition of Mediterranean salt meadows (Juncetalia maritimi) in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat over 63km downstream of the Proposed Development Due to the nature of the proposed construction and operational phase of the Development and the hydrological distance downstream between the Proposed Development and this SAC, an identifiable source-pathway-receptor chain for adverse effects have been identified, further assessment is required.	Yes
[3260] Water courses of plain to montane levels with the *Ranunculion*	To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat 6km downstream of the Proposed Development. Due to the nature of the proposed construction and operational phases of the Development and the hydrological distance	Yes

Qualifying feature	Conservation Objective (NPWS, Version 1, August 2012[15]),	Rationale	Potential for Adverse Effects Y/N
fluitantis and *Callitricho-Batrachion* vegetation	Callitricho-Batrachion vegetation in the Lower River Shannon SAC.	downstream between the Proposed Development and this SAC, an identifiable source-pathway-receptor chain for adverse effects have been identified, further assessment is required.	
[6410] *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils *(Molinion caeruleae)*	To maintain the favourable conservation condition of Molinia meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae)* in the Lower River Shannon SAC.	This QI habitat is entirely terrestrial in nature. This SAC is located over 3.3km overland distance from the Proposed Development. Given the significant spatial separation between the Proposed Development site and this SAC with no identifiable source-pathway-receptor chain, there are no predicted adverse effects based on the proposed construction and operational phases. No further assessment is required.	No
[91E0] *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*	To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* in the Lower River Shannon SAC.	According to the SSCO document for this SAC, there are records of this habitat located downstream of the Proposed Development. There are mapped distributions of this habitat approximately 8km downstream of the Proposed Development. Due to the nature of the proposed construction and operational phases of the Proposed Development and the hydrological distance downstream between the Proposed Development and this SAC, an identifiable source-pathway-receptor chain for adverse effects have been identified, further assessment is required.	Yes

5.1.1.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to impact on the European Site were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-2 below.

Table 5-2 Site-specific threats, pressures and activities

Rank	Code	Threats and pressures	Inside/outside/ both
L	C01.01.02	Removal of beach materials	I
L	F01	Marine and freshwater aquaculture	I
M	E03	Discharges	B
M	J02.01.01	Polderisation	I
L	J02.12.01	Sea defence or coast protection works, tidal barrages	I
L	G01.01	Nautical sports	I
L	J02.10	Management of aquatic and bank vegetation for drainage purposes	I
L	F03.01	Hunting	I
M	A04	Grazing	I
L	B	Sylviculture, forestry	I
M	H04	Air pollution, air-borne pollutants	O
L	D01.01	Paths, tracks, cycling tracks	I
M	J02.01.02	Reclamation of land from sea, estuary or marsh	O
L	I01	Invasive non-native species	I
M	E01	Urbanised areas, human habitation	O
M	A08	Fertilisation	B
M	K02.03	Eutrophication (natural)	O
L	C01.03.01	Hand cutting of peat	I

With regard to the Proposed Development, a pressure/threat to the SAC exists in the form of E03 'Discharges' both inside and outside of the SAC, I01 'Invasive non-native species' inside the SAC, and H04 'Air pollution, air-borne pollutants' outside of the SAC.

5.1.1.3 Species Specific Information

5.1.1.3.1 *[1095] Sea Lamprey (Petromyzon marinus)*

Description from SSCO document and Article 17 Report

According to the SSCO document for this species, juveniles burrow in areas of fine sediment in still water. Lampreys spawn in clean gravels. Surveys by Inland Fisheries Ireland (IFI) commonly indicated accumulations of redds downstream of major weirs. According to the site synopsis for this SAC, the three lampreys and Salmon have all been observed spawning in the Lower Shannon or its tributaries. There are few other river systems which contain all three of the lamprey species.

According to the Article 17 Report (NPWS, 2019), The sea lamprey is listed in the most recent Irish Red Data Book as Near Threatened. This assessment was primarily based on (a) the limited access to freshwater due to impassable anthropogenic barriers in the lower reaches of numerous large rivers and (b) the very limited degree to which juvenile sea lamprey were occurring in catchment-wide surveys in systems where spawning was known to occur. The low level of occurrence may be due to profligacy in spawning, with reports indicating up to 75% of gametes lost or washed out of the spawning nest, or due to competition for occupancy of sedimented areas by already-resident brook and/or river lamprey.

The sea lamprey life cycle contains both a marine and a freshwater phase. Sea lamprey spawning has been recorded within Hectad R66 according to the NBDC map distribution for this species.

According to the Article 17 Report, this species has been assessed as having a 'Bad' overall assessment of conservation trend and a 'Bad' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this species is to restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC.

Table 5-3 Targets and Attributes for [1095] Sea Lamprey (Petromyzon marinus)

Attribute	Target
Distribution: extent of anadromy	Greater than 75% of main stem length of rivers accessible from estuary.
Population structure of juveniles	At least three age/size groups present
Juvenile density in fine sediment	Juvenile density at least 1/m²
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
Availability of juvenile habitat	More than 50% of sample sites positive

5.1.1.3.2 *[1096] Brook Lamprey (Lampetra planeri)*

Description from SSCO document and Article 17 Report

According to the SSCO document for this species, it is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target. Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date.

According to the Article 17 Report (NPWS, 2019), unlike the sea lamprey (Petromyzon marinus) and the river lamprey (*Lampetra fluviatilis*), the brook lamprey is non-parasitic and non-migratory as an adult,

living its entire life in freshwater. Adults spawn in spring, excavating shallow nests in relatively small-sized gravels in areas of reduced flow. After hatching, the larvae ('ammocoetes') drift or swim downstream to areas of riverbed or margins with fine silt deposits. They burrow into this substrate and live as filter feeders over a period of years before transforming into young adult fish. The young adults overwinter before migrating short distances upstream to gravelled areas where they spawn. The adult fish die after spawning. Adult brook lamprey require well-oxygenated gravelled areas for spawning in the main channels and tributaries of rivers. Nursery habitat in the form of fine sands/silts in depositional areas is required for the larval life stage.

According to the Article 17 Report, this species has been assessed as having a 'stable' overall assessment of conservation trend and a 'Favourable' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this species is to maintain favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC.

Table 5-4 Targets and Attributes for [1096] Brook Lamprey (Lampetra planeri)

Attribute	Target
Distribution	Access to all water courses down to first order streams
Population structure of juveniles	At least three age/size groups of brook/river lamprey present
Juvenile density in fine sediment	Mean catchment juvenile density of brook/river lamprey at least 2/m²
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
Availability of juvenile habitat	More than 50% of sample sites positive

5.1.1.3.3 *[1099] River Lamprey (Lampetra fluviatilis)*

Description from SSCO document and Article 17 Report

According to the SSCO document for this species, it is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target. Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date. Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date.

According to the Article 17 Report (NPWS, 2019, the river lamprey (*Lampetra fluviatilis*) breeds in freshwater rivers and streams. Adults spawn in spring, excavating shallow nests in riverine sections comprising fine gravels and small stones. After hatching, the larvae or 'ammocoetes' drift or swim downstream to areas of river bed or margins with fine silt deposits. They burrow into this bed material where they live as filter feeders over a period of years before transforming into young adult fish and migrating downriver to estuarine and marine habitats. As adults they are parasitic, attaching to and feeding on larger fish in coastal waters. They can grow up to 25- 30cm at maturity at which stage they return to freshwater habitats to spawn, attracted by pheromones exuded by their larvae within the system. The adult fish die after spawning. River and brook lamprey are indistinguishable as larvae. The mature adult

forms are, however, clearly distinguishable based on body size. The two types of lamprey are considered by many in the same context as the brown trout / sea trout pairing, with a similar absence of genetic discriminators.

According to the Article 17 Report, this species has been assessed as having a 'unknown' overall assessment of conservation trend and a 'Unknown' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this species is to maintain favourable conservation condition of River Lamprey in the Lower River Shannon SAC.

Table 5-5 Targets and Attributes for [1099] River Lamprey (Lampetra fluviatilis)

Attribute	Target
Distribution	Access to all water courses down to first order streams
Population structure of juveniles	At least three age/size groups of brook/river lamprey present
Juvenile density in fine sediment	Mean catchment juvenile density of brook/river lamprey at least 2/m²
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
Availability of juvenile habitat	More than 50% of sample sites positive

5.1.1.3.4 *[1106] Atlantic Salmon (Salmo salar)*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*). On the Shannon main channel, salmon smolt abundance may be significantly affected by mortality passing through hydro- electric turbines.

According to the Article 17 Report (NPWS, 2019), the Atlantic salmon is an anadromous species indigenous to the North Atlantic. In freshwater it is found in an arc from Northern Portugal in the east, to Connecticut River, New England, United States in the west. The Irish population generally comprises fish that spend two years (small numbers spend one or three years) as sub-adults in freshwater before going to sea as smolts. The majority of fish spend one winter at sea before returning to their natal rivers, mainly during the summer, as grilse. Smaller numbers spend two winters at sea, returning mainly in spring, hence "spring" salmon. A small proportion of the adult population returns to the sea post-spawning (known at this spent stage as a kelt) and can return to spawn again.

The influence of climate change and concomitant negative effects on food prey structure and abundance have increasingly been attributed to the declines observed in stocks at sea (Friedland et al. 2014; ICES 2017). Within river systems, variation in individual stock abundance can be influenced by a variety of factors, notably, alterations in physical habitat, water quality, environmental factors, predation, and angling and commercial fisheries exploitation pressure.

According to the Article 17 Report, this species has been assessed as having a 'inadequate' overall assessment of conservation trend and a 'stable' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this species is to restore the favourable conservation condition of Salmon in the Lower River Shannon SAC.

Table 5-6 Targets and Attributes for [1106] Atlantic Salmon (Salmo salar)

Attribute	Target
Distribution: extent of anadromy	100% of river channels down to second order accessible from estuary
Adult spawning fish	Conservation Limit (CL) for each system consistently exceeded
Salmon fry abundance	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling
Out-migrating smolt abundance	No significant decline
Number and distribution of redds	No decline in number and distribution of spawning redds due to anthropogenic causes
Water quality	At least Q4 at all sites sampled by EPA

5.1.1.3.5 *[1130] Estuaries*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, habitat area was estimated as 24,273 ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive. The likely area of these communities was derived from intertidal and subtidal surveys undertaken in 2010 (Aquafact, 2011a and c).

According to the Article 17 Report (NPWS, 2019), the EU interpretation manual describes the habitat Estuaries as the 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 significant freshwater influence. Estuaries are an extremely diverse and dynamic habitat and play a major role in maintaining the health of coastal ecosystems. They support a mosaic of other habitats depending on their geomorphology and hydrology. Boulder and cobble beds frequently fringe the margins of estuaries, especially further upstream, and intertidal mudflats are often associated with the margins of estuaries where the tidal influence is stronger.

According to the Article 17 Report, this habitat has been assessed as having a 'inadequate' overall assessment of conservation trend and a 'deteriorating' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to maintain the favourable conservation condition of Estuaries in the Lower River Shannon SAC.

Table 5-7 Targets and Attributes for [1130] Estuaries

Attribute	Target
Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes

Community Distribution	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with Nucula nucleus community complex; Subtidal sand to mixed sediment with Nephtys spp. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community.

5.1.1.3.6 *[1140] Mudflats and sandflats not covered by seawater at low tide*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, the habitat area was estimated using OSi data as 8,808ha, with the likely area of these communities was derived from an intertidal survey in 2010 (Aquafact, 2011c).

According to the Article 17 Report (NPWS, 2019), mudflats and sandflats not covered by seawater at low tide are comprised of the intertidal section of the coastline where sands and muds dominate. They are dynamic ecosystems, dependent on the balance of natural accretion and erosion. The fundamental building block of this habitat is sediment ranging from around 1 micron to 2 millimetres. The finer silt and clay sediments are dominant in mudflats and the larger sand fractions are associated with areas exposed to significant wave energy. The fine sediment of intertidal mudflats is most often associated with rivers. The limit of tidal ingress often coincides with the beginning of flanking mudflat habitats. The competing forces of seaward-flowing freshwater meeting the flooding tide reduces net flow velocity and consequently the carrying capacity for sediment, leading to deposition.

According to the Article 17 Report, this habitat has been assessed as having a 'inadequate' overall assessment of conservation trend and a 'deteriorating' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Lower River Shannon SAC.

Table 5-8 Targets and Attributes for [1140] Mudflats and sandflats not covered by seawater at low tide

Attribute	Target
Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes
Community Distribution	Conserve the following community types in a natural condition: Intertidal sand with Scolelepis squamata and Pontocrates spp. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex

5.1.1.3.7 *[1150] Coastal Lagoons*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, the areas calculated from spatial data derived from Oliver, 2007. Site codes IL031- IL034.

According to the Article 17 Report (NPWS, 2019), Lagoons are expanses of coastal salt water, of varying salinity, which are wholly or partially separated from the sea. There are five morphological lagoon types in Ireland and, with the exception of karst lagoons which are confined to mid-west and rock/peat lagoons to the west and northwest, they occur all around the coast. The type of lagoon may determine to a certain extent the typical species found within it. Numerically, artificial lagoon is the most common type and

represents 33.3% of the habitat area. The classic "sedimentary" lagoons with a sedimentary barrier represent the highest proportion of the habitat area (43.8%). These may or may not have a permanent tidal inlet but more than half of these have a barrier of cobbles rather than sand or shingle; this is considered unusual in Europe.

According to the Article 17 Report, this habitat has been assessed as having a 'bad' overall assessment of conservation trend and a 'deteriorating' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to restore the favourable conservation condition of Coastal Lagoons in the Lower River Shannon SAC.

Table 5-9 Targets and Attributes for [1150] Coastal Lagoons

Attribute	Target
Habitat Area	Area stable or increasing, subject to natural processes. Favourable reference area 33.4ha- Shannon Airport Lagoon 24.2ha; Cloonconeen Pool 3.9ha; Scattery Lagoon 2.8ha; Quayfield and Poulaweala Loughs 2.5ha.
Habitat Distribution	No decline, subject to natural processes
Salinity Regime	Median annual salinity and temporal variation within natural ranges
Hydrological Regime	Annual water level fluctuations and minima within natural ranges
Barrier: Connectivity between lagoon and sea	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management
Water Quality:Chlorophyll a	Annual median chlorophyll a within natural ranges and less than 5µg/L
Water quality: Molybdate Reactive Phosphorus (MRP)	Annual median MRP within natural ranges and less than 0.1mg/L
Water Quality: Dissolved Inorganic Nitrogen (DIN)	Annual median DIN within natural ranges and less than 0.15mg/L
Depth of macrophyte colonisation	Macrophyte colonisation to maximum depth of lagoons
Typical Plant Species	Maintain number and extent of listed lagoonal specialists, subject to natural variation
Typical Animal Species	Maintain listed lagoon specialists, subject to natural variation
Negative Indicator Species	Negative indicator species absent or under control

5.1.1.3.8 *[1170] Reefs*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, the habitat area was estimated as 21,421 ha from the 2010 intertidal and subtidal reef survey (Aquafact 2011b and c).

According to the Article 17 Report (NPWS, 2019), reef habitats are widespread marine features with immobile hard substrate available for colonisation by epifauna. Reef habitat in Irish waters ranges from the intertidal to 4500m below the sea surface and more than 400km from the coast. Intertidal Reefs are familiar and widespread habitats characterised by hard rock washed by the tide. There are a number of factors that influence this habitat type including tidal immersion, influence of freshwater (riverine and rainwater), variation in temperature, desiccation, exposure to waves, stability of substrate, and weathering of substrate. With distance from the intertidal these parameters become less active in influencing the habitat. Subtidal Reefs are most often found in exposed areas with little influence of freshwater. In depths down to 30m along the Atlantic margin there is still a significant penetration of light and swell waves reach the reef. In depths below 30m (or shallower in some coastal areas) insufficient light penetrates to hard rock structures to allow photosynthesis of algae and the habitat usually becomes dominated by fauna.

According to the Article 17 Report, this habitat has been assessed as having an 'inadequate' overall assessment of conservation trend and a 'stable' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to maintain the favourable conservation condition of Reefs in the Lower River Shannon SAC.

Table 5-10 Targets and Attributes for [1170] Reefs

Attribute	Target
Habitat distribution	The distribution of Reefs is stable, subject to natural processes
Habitat area	The permanent habitat area is stable, subject to natural processes
Community distribution	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone- dominated subtidal reef community; and Laminaria- dominated community complex

5.1.1.3.9 *[1310] Salicornia and other annuals colonising mud and sand*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, the areas calculated are based from Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009).

According to the Article 17 Report (NPWS, 2019), *Salicornia* and other annuals colonising mud and sand (1310) is a pioneer saltmarsh community that may occur on muddy sediment seaward of established saltmarsh, or form patches within other saltmarsh communities where the elevation is suitable and there is regular tidal inundation. The Interpretation Manual of EU Habitats (European Commission, 2013[16]) defines habitat 1310 as annuals belonging mainly to the genus Salicornia that colonise periodically inundated muds and sands of marine or interior salt marshes and belong to the phytosociological classes *Thero-Salicornietea, Frankenietea pulverulentae* and *Saginetea maritimae*. Only vegetation from the first and third class is known in Ireland. As this habitat is dominated by annuals it can be ephemeral or transient in nature and is highly susceptible to erosion. Its distribution can vary considerably from year to year and it can move in response to changing conditions, e.g. in estuaries with shifting river channels.

According to the Article 17 Report, this habitat has been assessed as having a 'stable' overall assessment of conservation trend and a 'favourable' overall assessment of conservation status.

[16] *European Commission, DG-ENV (2013). Interpretation Manual of European Union Habitats, Version EUR 28.*

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Lower River Shannon SAC.

Table 5-11 Targets and Attributes for [1310] Salicornia and other annuals colonizing mud and sand

Attribute	Target
Habitat Area	Area stable or increasing, subject to natural processes, including erosion and successi on. For sub-sites mapped: Carrigafoyle 0.005ha; Inishdea, Owenshere - 0.003ha; Knock 0.029ha; Querin - 0.185ha; Rinevilla Bay - 0.001ha. Total estimated area of 0.223ha.
Habitat Distribution	No decline, or change in habitat distribution, subject to natural processes.
Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical ob structions.
Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including eros ion and succession.
Physical structure flooding regime	Maintain natural tidal regime.
Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural p rocesses including erosion and succession.
Vegetation structure: vegetation height	Maintain structural variation within sward.
Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated.
Vegetation composition: typical species and sub-communities	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCo rry and Ryle, 2009[17]).
Vegetation structure: negative indicator species- *Spartina anglica*	No significant expansion of common cordgrass (Spartina anglica), with an annual spr ead of less than 1%.

5.1.1.3.10 *[1330] Atlantic salt meadows (Glauco-Puccinellietalia maritimae)*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle 2009). Ten sub-sites that supported Atlantic salt meadow were mapped (119.36ha) and additional areas of potential saltmarsh (376.07ha) were identified from an examination of aerial photographs, giving a total estimated area of 495.43ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site.

According to the Article 17 Report (NPWS, 2019), Atlantic salt meadows generally occupy the widest part of the saltmarsh gradient. They also contain a distinctive topography with an intricate network of creeks and salt pans occurring on the medium to large-sized saltmarshes. Atlantic salt meadows contain

[17] *McCorry, M; Ryle, T. (2009) Unpublished Report to NPWS, Saltmarsh Monitoring Programme 2007-2008.*

several distinctive zones that are related to elevation and submergence frequency. The lowest part along the tidal zone is generally dominated by common saltmarsh-grass (Puccinellia maritima) with species like glassworts (Salicornia spp.), annual seablite (Suaeda maritima) and lax-flowered sea-lavender (Limonium humile) also important. The invasive common cordgrass (Spartina anglica) can be locally abundant in this habitat. The mid-marsh zones are generally characterised by thrift (Armeria maritima) and/or sea plantain (Plantago maritima). This zone is generally transitional to an upper marsh herbaceous community with red fescue (Festuca rubra), saltmarsh rush (Juncus gerardii) and creeping bent (Agrostis stolonifera). This habitat is also important for other wildlife including wintering waders and wildfowl. Atlantic salt meadows are distributed around most of the coastline of Ireland. The intricate topography of the Irish coastline with many inlets has created an abundance of sites that are sheltered and allow muddy sediments to accumulate, leading to the development of saltmarsh

According to the Article 17 Report, this habitat has been assessed as having an 'inadequate' overall assessment of conservation trend and a 'deteriorating' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae)* in the Lower River Shannon SAC.

Table 5-12 Targets and Attributes for [1330] Atlantic salt meadows (Glauco-Puccineillietalia maritmae)

Attribute	Target
Habitat Area	Area stable or increasing, subject to natural processes, including erosion and succession.
Habitat Distribution	No decline or change in habitat distribution, subject to natural processes. S
Physical Structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions
Physical Structure: creeks and pans	Maintain creek and pan structure, subject to natural processes, including erosion and succession
Physical Structure: Flooding regime	Maintain natural tidal regime
Vegetation Structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation Structure: vegetation height	Maintain structural variation within sward
Vegetation Structure: vegetation cover	Maintain more than 90% of the saltmarsh area vegetated
Vegetation Composition: typical species and sub-communities	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)
Vegegtation Structure: negative indicator species-*Spartina anglica*	No significant expansion of common cordgrass (Spartina anglica), with an annual spread of less than 1%

5.1.1.3.11 *[1410] Mediterranean salt meadows (Juncetalia maritime)*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Eight sub-sites that support Mediterranean salt meadows were mapped (22.379ha) and additional areas of potential saltmarsh (25.646ha) were identified from an examination of aerial photographs, giving a total estimated area of 48.025ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998).

According to the Article 17 Report (NPWS, 2019), Mediterranean salt meadows occupy the upper zone of saltmarshes and usually occur adjacent to the boundary with terrestrial habitats. They are widespread on the Irish coastline; however, they are not as extensive as Atlantic salt meadows (1330). The habitat is distinguished from Atlantic salt meadows by the presence of rushes such as sea rush (Juncus maritimus) and/or sharp rush (Juncus acutus), along with a range of species typically found in Atlantic salt meadows, including sea aster (Aster tripolium), sea purslane (Atriplex portulacoides), sea-milkwort (Glaux maritima), saltmarsh rush (Juncus gerardii), parsley water-dropwort (Oenanthe lachenalii), sea plantain (Plantago maritima) and common saltmarsh grass (Puccinellia maritima).

According to the Article 17 Report, this habitat has been assessed as having an 'inadequate' overall assessment of conservation trend and a 'deteriorating' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi)* in the Lower River Shannon SAC.

Table 5-13 Targets and Attributes for [1410] Mediterranean salt meadows (Juncetalia maritime)

Attribute	Target
Habitat Area	Area stable or increasing, subject to natural processes, including erosion and succession.
Habitat Distribution	No decline or change in habitat distribution, subject to natural processes.
Physical Structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions
Physical Structure: creeks and pans	Maintain creek and pan structure, subject to natural processes, including erosion and succession
Physical Structure: Flooding regime	Maintain natural tidal regime
Vegetation Structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation Structure: vegetation height	Maintain structural variation within sward
Vegetation Structure: vegetation cover	Maintain more than 90% of the outside creeks vegetated
Vegetation Composition: typical species	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)
Vegegtation Structure: negative indicator species-*Spartina anglica*	No significant expansion of common cordgrass (Spartina anglica), with an annual spread of less than 1%

5.1.1.3.12 *[1349] Bottlenose Dolphin (Tursiops truncatus)*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, the attribute and targets are based on Ingram and Rogan (2002), Englund et al. (2007), Englund et al. (2008), Berrow (2009), Berrow et al. (2010) and review of data from other studies.

According to the Article 17 Report (NPWS, 2019), Bottlenose Dolphin is found throughout the world's tropical and temperate marine waters, though in the North-East Atlantic it is rarely recorded in the Baltic Sea or north of the Faroe Islands (Hammond et al., 2012). Classified by the IUCN as a species of Least Concern, partly due to its global distribution and abundance, the Bottlenose dolphin is regularly recorded in Irish coastal and offshore waters (Ó Cadhla et al., 2004; Berrow et al., 2010a; Wall et al., 2013) while some communities show a level of residency in quite discrete coastal areas (DEHLG, 2009). Bottlenose dolphins are one of the most frequently recorded and familiar cetaceans occurring in Ireland. With adults averaging up to 3.0-3.8m in length, they are quite readily identifiable, bearing a substantial curved grey dorsal fin, a short but pronounced rounded beak, and lacking an obvious pattern in their grey body colouration except for a paler ventral surface.

According to the Article 17 Report, this habitat has been assessed as having a 'favourable' overall assessment of conservation trend and a 'stable' overall assessment of conservation status.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to maintain the favourable conservation condition of Bottlenose Dolphin in the Lower River Shannon SAC.

Table 5-14 Targets and Attributes for [1349] Bottlenose Dolphin (Tursiops truncates)

Attribute	Target
Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use
Habitat use: critical areas	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition.
Disturbance	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site

5.1.1.3.13 *[1335] Otter (Lutra lutra)*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed.

According to the Article 17 Report (NPWS, 2019), Otters have two basic requirements: aquatic prey and safe refuges where they can rest. In Ireland, otter populations are found along rivers, lakes and coasts, where fish and other prey are abundant, and where the bank-side habitat offers plenty of cover. The otter is an opportunistic predator with a broad and varied diet. In coastal areas fish, crabs and molluscs are known to be eaten. In freshwater areas a variety of fish from sticklebacks to salmon and eels will be taken, while crayfish and frogs can be important locally or seasonally.

This species has been given an overall 'favourable' conservation status and the overall trend in the conservation status of this species is 'improving'. The population of this species is recorded as 'favourable'.

Targets and Attributes

According to the SSCO document for this SAC, the overall conservation objectives for this species is to restore the favourable conservation condition of Salmon in the Lower River Shannon SAC.

Table 5-15 Targets and Attributes for [1355] Otter (Lutra lutra)

Attribute	Target
Distribution	No significant decline.
Extent of terrestrial habitat	No significant decline. Area mapped and calculated as 596.8ha above high-water mark (HWM); 958.9ha along river banks/ around ponds
Extent of marine habitat	No significant decline. Area mapped and calculated as 4,461.6ha.
Extent of freshwater (river) habitat	No significant decline. Length mapped and calculated as 500.1km.
Extent of freshwater (lake/lagoon) habitat	No significant decline. Area mapped and calculated as 125.6ha.
Couching sites and holts	No significant decline.
Fish biomass available	No significant decline.
Barriers to connectivity	No significant increase.

5.1.1.3.14 *[3260] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion Vegetation*

Description from SSCO document and Article 17 Report

According to the SSCO supporting document for this QI within this SAC, while the known extent of the three sub-types has been broadly mapped within the SAC, the exact area of each has not been quantified. The area of the *Schoeoplectus triqueter* sub-type is likely to be smaller than the mapped range, however, as both the *Groenlandia densa* and the bryophyte-rich sub-types are presumed to be more widespread than mapped, it is not possible to comment on their areas at this time.

According to the Article 17 Report (NPWS, 2019), this annexed habitat has a broad definition, covering from upland, flashy, oligotrophic, bryophyte- and algal-dominated rivers, to tidal reaches dominated by higher plants. In Ireland, the highest riverine conservation interest is associated with lowland depositing and tidal rivers and unmodified, fast-flowing, low-nutrient rivers. A number of rare submerged and marginal species are found in the former including opposite-leaved pondweed (Groenlandia densa), starworts (e.g. Callitriche truncata), triangular club-rush (Schoenoplectus triqueter), needle spike rush (Eleocharis acicularis) and mud-dwelling mosses (e.g. Ephemerum spp.). The low-nutrient, high-velocity river types are associated with high bryophyte diversity, cascades, riffles and riparian woodland. Important communities also occur in groundwater-fed, base-rich oligotrophic rivers.

This habitat has been given an overall 'Inadequate' conservation status and the overall trend in the conservation status of this species is 'deteriorating'.

Targets and Attributes

5.1.1.3.1 According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Lower River Shannon SAC.

Table 5-16 Targets and Attributes for [[3260] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion Vegetation

Attribute	Target
Habitat area	Area stable or increasing, subject to natural processes
Habitat distribution	No decline, subject to natural processes
Hydrological regime: river flow	Maintain appropriate hydrological regimes
Hydrological regime: tidal influence	Maintain natural tidal regime
Hydrological regime: freshwater	Maintain appropriate freshwater seepage regimes
Substratum composition: particle size range	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)
Water quality: nutrients	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition
Vegetation composition: typical species	Typical species of the relevant habitat sub-type should be present and in good condition
Floodplain connectivity	The area of active floodplain at and upstream of the habitat should be maintained
Riparian habitat	The area of riparian woodland at and upstream of the bryophyte-rich sub-type should be maintained

5.1.1.3.2 *[91E0] Alluvial Forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*

Description from SSCO document and Article 17 Report

According to the SSCO document for this SAC, Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick. There is no mapped area available in the SSCO for this Qualifying Interest.

According to the Article 17 Report (NPWS, 2019), riparian forests of ash (*Fraxinus excelsior*) and alder (*Alnus glutinosa*) occurs on heavy soils which are periodically inundated by the annual rise of river levels, but which are otherwise well drained and aerated during low water. This habitat has suffered considerable historic losses and is highly fragmented, with non-native and invasive species being the primary pressure on this habitat.

This habitat has been given an overall 'bad conservation status and the overall trend in the conservation status of this species is 'improving'.

Targets and Attributes

5.1.1.3.3 According to the SSCO document for this SAC, the overall conservation objectives for this habitat is to restore the favourable conservation condition of Alluvial Forests with *Alnus glutinoosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) in the Lower River Shannon SAC.

Table 5-17 Targets and Attributes for [91E0] Alluvial Forests with Alnus glutinoosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

Attribute	Target
Habitat area	Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed
Habitat distribution	No decline
Woodland size	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size
Woodland structure: cover and height	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi- mature trees and shrubs; and well-developed herb layer
Woodland structure: community diversity and extent	Maintain diversity and extent of community types
Woodland structure: natural regeneration	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy
Hydrological regime: flooding depth/height of water table	Appropriate hydrological regime necessary for maintenance of alluvial vegetation
Woodland structure: dead wood	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)
Woodland structure: veteran trees	No decline
Woodland structure: indicators of local distinctiveness	No decline
Vegetation composition: native tree cover	No decline. Native tree cover not less than 95%
Vegetation composition: typical species	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*)
Vegetation composition: negative indicator species	Negative indicator species, particularly non-native invasive species, absent or under control

5.1.2 River Shannon and River Fergus Estuaries SPA [004077]

The potential for impacts on this SPA were identified in Section 4.1 above. The Proposed Development is located 29.4km upstream of the SPA via the Bridgetown River Waterbody, and 30km upstream via the Broadford River Waterbody.

There is potential for adverse effects in terms of the deterioration of water quality due to the construction and operational phase of the Proposed Development on the SCI supporting habitat of the SPA.

The table below lists the qualifying features of this European Site and determines, in the light of their Conservation Objectives, whether there is any complete source-pathway-receptor chain, by which adverse effects may occur.

5.1.2.1 Identification of Individual Qualifying Features with the Potential to be Affected

Table 5-18 Assessment of Qualifying features potentially affected

Qualifying feature	Conservation Objective (NPWS, Version 1, September 2012[18]),	Rationale	Potential for Adverse Effects Y/N
[A017] Cormorant (*Phalacrocorax carbo*)	To maintain the favourable conservation condition of Cormorant in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable nesting and foraging habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A038] Whooper Swan (*Cygnus cygnus*)	To maintain the favourable conservation condition of Whooper	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable	Yes

[18] *NPWS (2012) Conservation Objectives: River Shannon and River Fergus Estuaries SPA 004077. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.*

Qualifying feature	Conservation Objective (NPWS, Version 1, September 2012[18]),	Rationale	Potential for Adverse Effects Y/N
	Swan in the River Shannon and River Fergus Estuaries SPA	wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	
[A046] Light-bellied Brent Goose (*Branta bernicla hrota*)	To maintain the favourable conservation condition of Light-bellied Brent Goose in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A048] Shelduck (*Tadorna tadorna*)	To maintain the favourable conservation condition of Shelduck in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A050] Wigeon (*Anas penelope*)	To maintain the favourable conservation condition of Wigeon in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes

Qualifying feature	Conservation Objective (NPWS, Version 1, September 2012[18]),	Rationale	Potential for Adverse Effects Y/N
[A052] Teal (*Anas crecca*)	To maintain the favourable conservation condition of Teal in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A054] Pintail (*Anas acuta*)	To maintain the favourable conservation condition of Pintail in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A056] Shoveler (*Anas clypeata*)	To maintain the favourable conservation condition of Shoveler in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A062] Scaup (*Aythya marila*)	To maintain the favourable conservation condition of Scaup in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss.	Yes

Qualifying feature	Conservation Objective (NPWS, Version 1, September 2012[18]),	Rationale	Potential for Adverse Effects Y/N
		However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	
[A137] Ringed Plover (*Charadrius hiaticula*)	To maintain the favourable conservation condition of Ringed Plover in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A140] Golden Plover (*Pluvialis apricaria*)	To maintain the favourable conservation condition of Golden Plover in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	No
[A141] Grey Plover (*Pluvialis squatarola*)	To maintain the favourable conservation condition of Grey Plover in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes

Qualifying feature	Conservation Objective (NPWS, Version 1, September 2012[18]),	Rationale	Potential for Adverse Effects Y/N
[A142] Lapwing (*Vanellus vanellus*)	To maintain the favourable conservation condition of Lapwing in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A143] Knot (*Calidris canutus*)	To maintain the favourable conservation condition of Knot in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A149] Dunlin (*Calidris alpina*)	To maintain the favourable conservation condition of Dunlin in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A156] Black-tailed Godwit (*Limosa limosa*)	To maintain the favourable conservation condition of Black-tailed Godwit in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss.	Yes

Qualifying feature	Conservation Objective (NPWS, Version 1, September 2012[18]),	Rationale	Potential for Adverse Effects Y/N
		However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	
[A157] Bar-tailed Godwit (*Limosa lapponica*)	To maintain the favourable conservation condition of Bar-tailed Godwit in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A160] Curlew (*Numenius arquata*)	To maintain the favourable conservation condition of Curlew in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A162] Redshank (*Tringa totanus*)	To maintain the favourable conservation condition of Redshank in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes

Qualifying feature	Conservation Objective (NPWS, Version 1, September 2012[18]),	Rationale	Potential for Adverse Effects Y/N
[A164] Greenshank (*Tringa nebularia*)	To maintain the favourable conservation condition of Greenshank it in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A179] Black-headed Gull (*Chroicocephalus ridibundus*)	To maintain the favourable conservation condition of Black-headed Gull it in the River Shannon and River Fergus Estuaries SPA	The habitats onsite are not deemed as significant suitable habitat due to the presence of a main road and active quarry located adjacent to the site. There will be no loss of potential suitable wintering habitat for the species, therefore there is no potential for adverse effect via ex-situ habitat loss. However, a potential for adverse effect to the species was identified as a result of deterioration in water quality during construction, and operation of the Proposed Development, thus affecting the supporting wetland habitat of the species. Therefore, further assessment is required.	Yes
[A999] Wetland and Waterbirds	To maintain the favourable conservation condition of the wetland habitat in the River Shannon and River Fergus Estuaries SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.	A potential for adverse effect to the SCI supporting wetland habitats of the SPA was identified as a result of deterioration in water quality during construction and operation of the Proposed Development. Therefore, further assessment is required.	Yes

5.1.2.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to impact on the European Site were reviewed and considered in relation to the Proposed Development. These are provided in the table below.

Table 5-19 Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Medium	G01.01	Nautical sports	Inside
Medium	D03.02	Shipping lanes	Inside
High	E03	Discharges	Inside
High	E01	Urbanised areas, human habitation	Outside
High	A08	Fertilisation	Outside
High	E02	Industrial or commercial areas	Outside
Medium	F01	Marine and freshwater aquaculture	Inside

Potential pathways for effect with regard to site-specific threats, pressures and activities have been identified in relation to 'Discharges' and 'Industrial or commercial areas'.

5.1.2.3 Special Conservation Interest (SCI) Specific Information

5.1.2.3.1 *Wetland and Waterbirds*

The wetland habitats contained within the River Shannon and River Fergus Estuaries SPA are identified to be of conservation importance for non-breeding (wintering) migratory waterbirds. According to the site-specific conservation objectives, the wetland habitat area was estimated as 32,261 ha.

Targets and Attributes

Table 5-20 Targets and attributes associated with the conservation objective for [A999] Wetlands and waterbirds

Attribute	Target
Wetland habitat area	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261ha, other than that occurring from natural patterns of variation

5.1.2.3.2 *Cormorant (Phalacrocorax carbo)*

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of Cormorant (*Phalacrocorax carbo*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 245 individuals. Recent data indicates that numbers have decreased within the SPA to 237 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-21 Targets and attributes associated with the conservation objective for Cormorant

Attribute	Target
Breeding population abundance: apparently occupied nests (AONs)	No significant decline
Productivity rate	No significant decline
Distribution: breeding colonies	No significant decline
Prey biomass available	No significant decline
Barriers to connectivity	No significant increase
Disturbance at the breeding site	Human activities should occur at levels that do not adversely affect the breeding cormorant population
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by cormorant other than that occurring from natural patterns of variation

5.1.2.3.3 *Whooper Swan (Cygnus cygnus)*

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of the Annex I species Whooper Swan (Cygnus cygnus). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 118 individuals. Recent data indicates that numbers have increased within the SPA to 269 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-22 Targets and attributes associated with the conservation objectives for Whooper Swan

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by whooper swan other than that occurring from natural patterns of variation

5.1.2.3.4 *Light-bellied Brent Goose (Branta bernicla hrota)*

As per the conservation objectives supporting document for the SPA, during winter 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 494 individuals. Recent data indicates that numbers have decreased within the SPA to 176 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-23 Targets and attributes associated with the conservation objective for Light-bellied Brent Goose

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by light-bellied brent goose other than that occurring from natural patterns of variation

5.1.2.3.5 *Shelduck (Tadorna tadorna)*

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of Shelduck (*Tadorna tadorna*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,025 individuals. Recent data indicates that numbers have decreased within the SPA to 291 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-24 Targets and attributes associated with the conservation objective for Shelduck

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by shelduck other than that occurring from natural patterns of variation

5.1.2.3.6 *Wigeon (Anas Penelope)*

As per the conservation objectives supporting document for the SPA, during winter 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 3,761 individuals. Recent data indicates that numbers have decreased within the SPA to 1,821 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-25 Targets and attributes associated with the conservation objective for Wigeon

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by wigeon other than that occurring from natural patterns of variation

5.1.2.3.7 *Teal (Anas crecca)*

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of Teal (*Anas crecca*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 2,260 individuals. Recent data indicates that numbers have decreased within the SPA to 812 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-26 Targets and attributes associated with the conservation objective for Teal

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by teal other than that occurring from natural patterns of variation

5.1.2.3.8 *Pintail (Anas acuta)*

As per the conservation objectives supporting document for the SPA, Pintail (*Anas acuta*) was recorded in numbers of all-Ireland importance during the baseline period (1995/96 – 1999/00), at 62 individuals. Recent data indicates that numbers have decreased within the SPA to 30 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-27 Targets and attributes associated with the conservation objective for Pintail

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by pintail other than that occurring from natural patterns of variation

5.1.2.3.9 *Shoveler (Anas clypeata)*

As per the conservation objectives supporting document for the SPA, Shoveler (*Anas clypeata*) was recorded in numbers of all-Ireland importance during the baseline period (1995/96 – 1999/00), at 107 individuals. Recent data indicates that numbers have decreased within the SPA to 45 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-28 Targets and attributes associated with the conservation objective for Shoveler

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by shoveler other than that occurring from natural patterns of variation

5.1.2.3.10 *Scaup (Aythya marila)*

As per the conservation objectives supporting document for the SPA, Scaup (*Aythya marila*) was recorded in numbers of all-Ireland importance during the baseline period (1995/96 – 1999/00), at 102 individuals. Recent data indicates that numbers have decreased within the SPA to 24 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-29 Targets and attributes associated with the conservation objective for Scaup

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by scaup other than that occurring from natural patterns of variation

5.1.2.3.11 Ringed Plover (*Charadrius hiaticula*)

As per the conservation objectives supporting document for the SPA, during winter 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 223 individuals. Recent data indicates that numbers have decreased within the SPA to 92 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-30 Targets and attributes associated with the conservation objective for Ringed Plover

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by ringed plover other than that occurring from natural patterns of variation

5.1.2.3.12 Golden Plover (*Pluvialis apricaria*)

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of the Annex I species Golden Plover (*Pluvialis apricaria*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 5,664 individuals. Recent data indicates that numbers have decreased within the SPA to 1,929 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-31 Targets and attributes associated with the conservation objective for Golden Plover

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by golden plover other than that occurring from natural patterns of variation

5.1.2.3.13 Grey Plover (*Pluvialis squatarola*)

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of Grey Plover (*Pluvialis squatarola*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 558 individuals. Recent data indicates that numbers have decreased within the SPA to 69 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-32 Targets and attributes associated with the conservation objective for Grey Plover

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by grey plover other than that occurring from natural patterns of variation

5.1.2.3.14 *Lapwing (Vanellus vanellus)*

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of Lapwing (*Vanellus vanellus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 15,126 individuals. Recent data indicates that numbers have decreased within the SPA to 2,012 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-33 Targets and attributes associated with the conservation objective for Lapwing

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by lapwing other than that occurring from natural patterns of variation

5.1.2.3.15 *Knot (Calidris canutus)*

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of Knot (*Calidris canutus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 2,015individuals. Recent data indicates that numbers have decreased within the SPA to 2,012 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-34 Targets and attributes associated with the conservation objective for Knot

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by knot other than that occurring from natural patterns of variation

5.1.2.3.16 *Dunlin (Calidris alpina)*

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the biogeographic population of Dunlin (*Calidris alpina*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 15,131 individuals. Recent data indicates that numbers have decreased within the SPA to 2,012 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-35 Targets and attributes associated with the conservation objective for Dunlin

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by dunlin other than that occurring from natural patterns of variation

5.1.2.3.17 Black-tailed Godwit (*Limosa limosa*)

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the biogeographical population of Black-tailed Godwit (*Limosa limosa*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 2,035 individuals. Recent data indicates that numbers have decreased within the SPA to 2,012 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-36 Targets and attributes associated with the conservation objective for Black-tailed Godwit

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by black-tailed godwit other than that occurring from natural patterns of variation

5.1.2.3.18 Bar-tailed Godwit (*Limosa lapponica*)

As per the conservation objectives supporting document for the SPA, during winter 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 within the SPA during the baseline period (1995/96 – 1999/00) was 460 individuals. Recent data indicates that numbers have decreased within the SPA to 2,012 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-37 Targets and attributes associated with the conservation objective for Bar-tailed Godwit

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by bar-tailed godwit other than that occurring from natural patterns of variation

5.1.2.3.19 Curlew (*Numenius arquata*)

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of Curlew (*Numenius arquata*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 2,396 individuals. Recent data indicates that numbers have decreased within the SPA to 2,012 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-38 Targets and attributes associated with the conservation objective for Curlew

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by curlew other than that occurring from natural patterns of variation

5.1.2.3.20 *Redshank (Tringa totanus)*

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of Redshank (*Tringa totanus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 2,645 individuals. Recent data indicates that numbers have decreased within the SPA to 2,012 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-39 Targets and attributes associated with the conservation objective for Redshank

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by redshank other than that occurring from natural patterns of variation

5.1.2.3.21 *Greenshank (Tringa nebularia)*

As per the conservation objectives supporting document for the SPA, during winter the site regularly supports 1% or more of the all-Ireland population of Greenshank (*Tringa nebularia*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 61 individuals. Recent data indicates that numbers have decreased within the SPA to 2,012 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-40 Targets and attributes associated with the conservation objective for Greenshank

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by greenshank other than that occurring from natural patterns of variation

5.1.2.3.22 *Black-headed Gull (Chroicocephalus ridibundus)*

As per the conservation objectives supporting document for the SPA, Black-headed Gull (*Chroicocephalus ridibundus*) was recorded in numbers of all-Ireland importance during the baseline period (1995/96 – 1999/00), at 2,681 individuals. Recent data indicates that numbers have decreased within the SPA to 1,303 individuals (2006/07 – 2010/11).

Targets and Attributes

Table 5-41 Targets and attributes associated with the conservation objective for Black-headed Gull

Attribute	Target
Population trend	Long term population trend stable or increasing
Distribution	There should be no significant decrease in the range, timing or intensity of use of areas by black-headed gull other than that occurring from natural patterns of variation

5.2 Hydrological Desk Study

The Broadford River Waterbody (ID: IE_SH_27B020300) flows in a western direction along the northeastern boundary of the site, while the Bridgetown River Waterbody (ID: IE_SH_25B230100) is located to the south-east of the site flowing in a southwest direction. A search of the Inland Fisheries Ireland (IFI) online database was carried out to determine the species richness of the watercourses surrounding the proposed site. The closest waterbody with IFI data is the Broadford River.

The only WFD Fish Ecological Status 2008-2021 data available in the vicinity of the proposed site was from the Broadford River Waterbody to the north of the site.

The results from the identified IFI study sites are presented in Table 5-42.

Table 5-42 IFI data and associated Q values

Station Name (Site Code)	Species	Draft Fish Ecological Status	Assessment Year
Just u/s South Branch confl_B	Brown trout (*Salmo trutta*), Salmon (*Salmo salar*) Three-spined stickleback (*Gasterosteus aculeatus*)	Good	2008
Just u/s South Branch confl_B	Brown trout (*Salmo trutta*), European eel (*Anguilla anguilla*), Salmon (*Salmo salar*), Three-spined stickleback (*Gasterosteus aculeatus*)	Good	2008

The closest watercourses to the Proposed Development site are the Broadford River Waterbody (ID: IE_SH_27B020300), which flows across the northern boundary of the site in a north-western direction ultimately flowing into Doon Lough west of the town of Broadford. To the south-east of the site is the Bridgetown River Waterbody (ID: IE_SH_25B230100), which flows through Bridgetown village and ultimately flows into the River Shannon.

The Biotic Index of Water Quality (BIWQ) was developed in Ireland by the EPA. Q-values are assigned using a combination of habitat characteristics and structure of the macro-invertebrate community within the waterbody. Individual macro-invertebrate families are classified according to their sensitivity to organic pollution and the Q-value is assessed based primarily on their relative abundance within a sample.

The EPA Envision map viewer was consulted on 27th June 2024 regarding the water quality status of the watercourses which run adjacent to the Study Area. The Broadford watercourse has been assigned a 3-4 ''Moderate' Q-Value when measured at the Scott's Bridge (RS27B020500) monitoring station in 2022. Q-rating data is also available for the Bridgetown watercourse (Station RS25B230100). Most recent data (2021) have assigned a Q rating of 4 (Good) to the watercourse at this point.

Further details on the hydrology of the site can be found in Chapter 7 Water of the EIAR included as Appendix 2 of this NIS.

6. ASSESSMENT OF POTENTIAL EFFECTS & ASSOCIATED MITIGATION

This section of the NIS assesses the potential effects of the Proposed Development on the identified relevant Qualifying Interests. This assessment is undertaken in the absence of any mitigation and in respect of the conservation objectives of the European Site. The Conservation Objectives each of the European Sites assessed were reviewed on the 27th May 2024. The Conservation Objectives for these sites are available at the following locations:

- Lower River Shannon SAC [002165]: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002165.pdf
- River Shannon and River Fergus Estuaries SPA [004077] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004077.pdf

Following the initial impact assessment, mitigation is prescribed where necessary to avoid adverse effects on the Conservation Objectives of the relevant QIs/SCIs. This is presented in a schedule of mitigation that is provided below.

6.1 Potential for Indirect Effects on the European Sites

6.1.1 Deterioration in Water and Air Quality

Following a precautionary approach, a potential pathway for indirect effects on the Qualifying Interests of the Lower River Shannon SAC and Special Conservation Interests of the River Shannon and River Fergus Estuaries SPA was identified as a result of surface water deterioration during construction and operation of the Proposed Development.

Specific measures will be implemented on site to avoid potential for surface water pollution. The implementation of these measures on site will avoid potential for significant impacts on downstream European Sites and sensitive ecological receptors.

Best practice environmental control measures have been incorporated in the design of the development and are described in the following subsections.

6.1.1.1 Construction Phase

Measures to avoid the release of suspended solids from excavation activities during construction

The following mitigation measures will be implemented to eliminate the risk of negative effects on the lowland depositing river habitat and aquatic ecology from the proposed excavation works of topsoil, the removal of vegetation, and the creation of suspended solids during the construction phase of the development:

- Drainage from the development reception area will be directed towards the existing lagoons on the west of the Proposed Development site.
- Prior to the commencement of earthworks, silt fencing will be placed down-gradient of the proposed extraction boundary and the Bridgetown watercourse at the south of the Proposed Development site. These will be embedded into the local soils to ensure all site water is captured and filtered;
- Daily monitoring and inspections of any constructed site drainage channels during the construction phase will be completed; and
- Earthworks will take place during periods of low rainfall to reduce run-off and potential siltation of watercourses.

Measures to avoid the release of hydrocarbons during construction

The following mitigation measures will be implemented to eliminate the risk of negative effects on lowland depositing river habitat and aquatic ecology from hydrocarbons, fuels, oils, and other compounds used during the construction phase of the development:

- No plant maintenance will be completed on site. Any broken-down plant will be removed from the site to be fixed;
- Refuelling will be completed in a controlled manner within the proposed refuelling area which will be served by an oil interceptor;
- Mobile double skinned bowser will used outside the refuelling area;
- A spill kit with absorbent material and pads in the event of any accidental spillages will be kept in the bowser. Drip trays and fuel absorbent mats will be used during all refuelling operations;
- Refuelling will be carried out by trained personnel only;
- Fuels stored on site during construction will be minimised. Fuel storage areas will be served by an oil interceptor; and,
- The plant used during construction will be regularly inspected for leaks and fitness for purpose.

Measures to avoid the release of cement-based material during construction

The following mitigation measures will be implemented to eliminate the risk of negative effects on lowland depositing river habitat and aquatic ecology from concrete and cement based products and other compounds used during the construction phase of the development:

- Where concrete is used on site, only the chute will be cleaned, using the smallest volume of water practicable. Washout will be into a skip or dedicated concrete washout area.
- No discharge of cement contaminated waters to the site phase drainage system or directly onto bare ground; and,
- The pour site (i.e. soil inspection shed floor slab) will be kept free of standing water and plastic covers will be ready in case of a sudden rainfall event.

Dust Control

- The hardstanding/roads adjacent the site will continue to be regularly inspected by the Facility Manager for cleanliness and cleaned as necessary.
- Any hardstanding areas/site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential). Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.
- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by Site Management for cleanliness and cleaned as necessary.
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind.
- Water misting or bowsers will operate on-site to mitigate dust in dry weather conditions.
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary.
- All vehicles required to pass through the wheel-wash on exiting the site.
- All construction related traffic will have speed restrictions on un-surfaced roads to 15 km/h.
- Daily inspection of construction sites to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper.
- All plant and machinery will be maintained in good operational order while onsite.

- All plant and materials vehicles shall be stored in the dedicated area.
- Monitoring of dust will continue as per the existing and proposed locations (Chapter 8).

Environmental Monitoring

- The contractor will assign a member of the site staff as the environmental officer with the responsibility for ensuring the environmental measures prescribed in this document are adhered to. Any environmental incidents or non-compliance issues will immediately be reported to the project team.

6.1.1.2 Operational Phase

Measures to avoid the release of hydrocarbons during operation and infilling phases:

- On site re-fuelling of machinery will be carried out in a dedicated refuelling area, or using a mobile double skinned fuel bowser outside the refuelling area. A dedicated refuelling area will be constructed as part of the Proposed Development.
- No plant maintenance will be completed on site. Any broken-down plant will be removed from the site to be fixed;
- Mobile double skinned bowser will be stored in the refuelling area
- Drainage from the refuelling areas will be routed through a full hydrocarbon interceptor, prior to the final discharge to the swamp wetland within on the southwest of the site. There will be an inspection chamber between the wetland and the lagoon for inspection/sampling.
- Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations;
- Onsite refuelling will be carried out by trained personnel only;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose;
- An emergency plan for the operational phase to deal with accidental spillages will be implemented as follows:
    - Procedures and contingency plans will be set up to deal with emergency accidents or spills. The following steps provide the procedure to be followed in the event of oil/fuel spill or leak:
    - Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers;
    - If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;
    - Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill;
    - If possible, clean up as much as possible using the spill control materials;
    - Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited;
    - Notify the Site Manager immediately giving information on the location, type and extent of the spill so that they can take appropriate action; and,
    - The Site Manager will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.

Dust Control

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by Site Management for cleanliness and cleaned as necessary.

- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind.
- Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions.
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary.
- All construction related traffic will have speed restrictions on un-surfaced roads of 15 km/h.
- Daily inspection of construction sites to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper.

Environmental Monitoring

- The contractor will assign a member of the site staff as the environmental officer with the responsibility for ensuring the environmental measures prescribed in this document are adhered to. Any environmental incidents or non-compliance issues will immediately be reported to the project team.

6.1.2 Disturbance to Otter

Following a precautionary approach, a potential pathway for indirect effects on the Qualifying Interests of the Lower River Shannon SAC was identified as a result of disturbance to Otter during the construction phase of the Proposed Development.

No otter signs were recorded during dedicated otter surveys; however, the Proposed Development site has suitable otter habitat present and is located 3.3km from the Lower River Shannon SAC. Therefore, taking a precautionary approach holts may be establish during the intervening period before construction works commence. Specific measures will be implemented on site to avoid potential disturbance to this species. The implementation of these measures on site will avoid potential for significant impacts on this QI species and the Lower River Shannon SAC.

6.1.2.1 Construction Phase

Prior to the commencement of construction works associated with the proposed extraction and infill and restoration area, the following measures will be undertaken for the avoidance of disturbance to otter and to ensure no holts have been established since the original surveys undertaken. The following measures are in line with '*Guidelines For The Treatment Of Otter Prior To The Construction Of National Road Schemes* (TII 2008[19]).

- No signs of otter were found during the dedicated otter surveys. However, from a precautionary basis, pre-commencement survey for otter will be carried out prior to any works commencing. Should otter holts be recorded within 150m of the proposed works, a derogation license will be obtained from NPWS and works carried out in accordance with NRA (2006) *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes*. The otter survey will be carried out no more than 10 months in advance of commencement.
- All plant and equipment for use will comply with Statutory Instrument No 359 of 1996 "European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1996".
- Operating machinery will be restricted to the Proposed Development site boundary.
- Work will be completed during daylight hours. However, if lighting is needed for construction during certain periods over winter months, this lighting will be limited and

[19] *National Roads Authority (2008) Guidelines for the treatment of otters prior to the construction of National Road Schemes.*

will face downwards, with no lighting focussed onto surrounding habitats or watercourses.
- Regular maintenance of plant will be carried out in order to minimise noise emissions. Particular attention will be paid to the lubrication of bearings and the integrity of silencers.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works.
- Compressors will be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machines, which are used intermittently, will be shut down during those periods when they are not in use.

6.1.3 Invasive Species

Following a precautionary approach, a potential pathway for indirect effects on the Qualifying Interests of the Lower River Shannon SAC and Special Conservation Interests of the River Shannon and River Fergus Estuaries SPA was identified as a result of the potential spread of Third Schedule invasive species during the operational phase of the Proposed Development.

Himalayan Knotweed (*Koenigia polystachya)* was recorded within the Proposed Development Site. Specific measures will be implemented on site to avoid potential spread of the invasive species. The implementation of these measures on site will avoid potential for significant impacts on European Sites and sensitive ecological receptors.

6.1.3.1 Operational Phase

A pre-construction survey will be carried out by a suitably experienced ecologist to ascertain the potential further spread of Himalayan Knotweed during the intermittent period within the Proposed Development site boundary. The survey will also assess the need for any specific additional mitigation required in order to ensure that there would be no significant residual impacts on ecological receptors. Removal of Himalayan Knotweed within the Proposed Development site boundary will be carried out using the most appropriate measures according to the species' current extent at the time of the preconstruction survey.

The following management is proposed in relation to Himalayan Knotweed:

Spraying Schedule (Chemical Control)

- Prior to the outset of works, the plant will be sprayed with herbicide that is suitable for use in or near water such as Glyphosate or 2,4-D Amine. This will be undertaken to reduce above ground biomass. This will be undertaken between May - September or before leaves discolour and fall. Spring treatment is also an option but less effective. The majority of herbicides require living foliage to take up the active ingredient, therefore the more foliage the greater the uptake. Spraying will be undertaken twice, once in early summer (May) and again in autumn (September) to achieve maximum results. Spraying will be carried out by a competent person adhering to the specific label instructions.
- Note: After the above spraying schedule it is still possible for regrowth to occur. Additionally, root materials may still be viable within the soil (can remain viable up to 20 years) and any disturbance to the soil is likely to stimulate more growth. For this reason, it is necessary to carry out both chemical and physical treatment in order to obtain full eradication of the plant. Physical removal of the plant is described in detail below and within the Invasive Species Management Plan accompanying this planning application.

Site set-up and associated measures

- Prior to the commencement of any works, a pre-commencement survey for Himalayan Knotweed will be undertaken by a fully qualified ecologist to determine the locations

and extent of the species within the development site and to determine whether there have been any changes in the extent of the infestation since the undertaking of surveys in 2023 & 2024.

- The locations and extent of Himalayan Knotweed within Proposed Infill Boundary and north of the man-made pond will be clearly marked out using temporary fencing to ensure they are not disturbed. An exclusion zone surrounding each stand will also be identified and the will inform the extent of the area to be treated as potentially contaminated. The exclusion zone will be 7m.
- Tool box talks will be held with all members of the contractors team responsible for carrying out measures detailed in this mangement plan. This will detail locations of infested material and how to carry out work on site in a biosecure way.
- Areas infested with Invasive Alien Plant Species (IAPS) will be clearly identified and the specific sites of infestation isolated with fencing or warning tape.
- 'Biosecure zone' signs will be erected at each contaminated site to alert workers that IAPS are present and to avoid entering or interfering with these sites. Likewise, any stockpiles of soil that are or could be contaminated with IAPS must be clearly marked.
- Designated and clearly marked cleaning and/or disinfection stations will be strategically placed within the work site for use by staff, vehicles and machinery.
- Where it is necessary to work in contaminated areas, vehicles with caterpillar tracks will be avoided.
- As a precautionary measure, machinery will be thoroughly cleaned down before entering the site to prevent potential spread of invasive species from elsewhere.
- All vehicles and equipment that have been used in IAPS control operations will be thoroughly pressure-washed in a designated wash-down area each time they leave the works site and once work in that area has been completed. This also includes footwear, personal protective equipment (PPE), tools, and other light equipment. It is important to remove soil that may contain seeds or plant fragments, which otherwise could be transported along the road corridor as works are being undertaken.
- Vehicles leaving contaminated area(s) will either be confined to marked haulage routes protected by root barrier membranes, or be pressure-washed before leaving the area. Only vehicles that are deemed to be biosecure (i.e. sealed so that no soil can escape) shall be used to transport contaminated soil and all will be thoroughly pressure-washed in the designated washdown area before exiting the infested area.
- The clean-down area will be underlain with an impermeable membrane such as a radon barrier to prevent contamination resulting from this operation. In addition, a boot wash with a stiff brush will be installed at the edge of the exclusion zone for pedestrian use.

Excavation and Burial

- Particular care is required in relation to the disposal of Japanese and other knotweed species. Where burial is being used to dispose of these species, a non-persistent herbicide shall be applied to the infestation prior to excavation. The material shall then be excavated and subsequently buried to a minimum depth of 5m. The waste shall be covered with a proprietary root barrier membrane layer and infilled with a minimum 5m depth of uncontaminated soil20.
- Any geotextile membranes used for burial must be undamaged, sealed securely, have a manufacturer's guarantee that it will remain intact for at least 50 years, and be UV resistant. Where burial to a depth of 5m is not possible, the infestation shall be treated with a non-persistent herbicide prior to excavation, excavated and then completely encapsulated in a proprietary root barrier membrane cell. The upper surface of the cell shall be buried to a depth of at least 2m with uncontaminated soil.
- Clean down will be carried out using brushes and shovels and power washing will be avoided. This is to prevent potentially contaminated run-off spreading outside the Proposed Development site.
- Once the machinery has been cleaned down as much as possible in the dry, the machines will be power-washed, or air blasted to remove any remaining material. The machine will track out of the cell over plywood or other suitable material in order to

[20] *'The Management of Invasive Alien Plant Species on National Roads', TII (2020)*

protect the machine from potential contamination while exiting the contaminated cell area.
- Material used for tracking machinery out of the cell will be thoroughly cleaned down under supervision of the invasive species specialist prior to removal off site.

Laying of the Root Barrier Membrane

- Once burial is complete, in order to prevent potential re-growth of rhizomes, infested areas will be overlain with a solid root barrier membrane. The root barrier membrane must stay intact for at least 50 years. A manufacturers' guarantee is required. This will be sized and installed under the supervision of a suitably qualified ecologist and in accordance with the relevant guidelines.
- A layer of no sharps sand or equivalent will be placed on the ground beneath the membrane to ensure that there are no opportunities for it to become ripped. The membrane will be inspected for damage prior to it being laid.
- Ideally, the membranes would consist of a single sheet with no joints. However, if joints are necessary, they will be sufficiently overlapped and sealed with a solid seam (either glue, heat or tape as per manufacturer's recommendations).
- The supervising ecologist will oversee the installation of the membrane and determine whether further measures are required to prevent lateral spread of the plant outward from under the excavated area.
- Following satisfactory laying of the membrane, it will be covered with a 50mm sand layer and then a solid concrete cap for extra protection.
- Once the soil has been removed, the membrane placed and the slab poured, the site will be considered uncontaminated for the purposes of continued works.
- A record will be kept of the affected areas and no further excavations or below ground works will be permitted in these areas.

General Biosecurity Measures

The following best practice measures should be adhered to during the treatment and management of the Himalayan Knotweed within the Proposed Development Site.

- No ground works should take place on site prior to the application of the site- specific Invasive Species Management Plan (ISMP). The ISMP will ensure all measures are taken to avoid the spread of species listed on the Third Schedule.
- Ensure all visitors to the site are made aware of the location of the Himalayan Knotweed recorded and are familiar with its characteristics and method of reproduction.
- Machinery operatives and all staff will be given a Toolbox Talk on Himalayan Knotweed and the risks associated with the Third Schedule invasive species prior to any works commencing in either of the Knotweed exclusion zones.
- Only people familiar with identifying Himalayan Knotweed will be allowed to work in close proximity to the plant species.
- A clearly defined bio-secure clean-down area will be established. Additionally, all bio-secure clean-down area associated measures will be carried out.
- No works will take place within the Himalayan Knotweed exclusion zone other than those prescribed in the Invasive Species Management Plan.
- All excavation works within the exclusion zone will be supervised by the contractor's ecologist.
- All measures prescribed in the Himalayan Knotweed management plan will be incorporated into the contractor's respective method statements for works where Third Schedule invasive species occur.
- All soil, river dredge and inert materials imported to infill and regrade the Proposed Infill Boundary will be screened for invasive species by a suitably qualified ecologist before transportation to the site.
- All machinery should be thoroughly cleaned down prior to arriving on the site to avoid the potential spread of invasive species from elsewhere.

- Good construction site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (e.g., Himalayan Balsam, Japanese Knotweed etc.) by thoroughly washing vehicles prior to leaving any site.
- All plant and equipment employed on the construction site (e.g., excavator, footwear, etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species. Wheel washing facilities will be provided at the site entrance. All washing must be undertaken in areas with no potential to result in the spread of invasive species.
- All infill material required at the site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present.
- Despite these measures, should any invasive alien species be introduced to site, these shall be dealt with in accordance with guidelines issued by the National Roads Authority - The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads (NRA, 2010).
- Should despite these measures any invasive alien species be introduced to site, these shall be dealt with in accordance with guidelines issued by the National Roads Authority - The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads (NRA, 2010).

The following management is to be employed when dealing with the medium impact invasive species Buddleia:

- As per TII guidelines Buddleia is to be physically removed prior to commencement of construction by excavating all instances of Buddleia from within the site boundary. Care is to be taken to remove all traces of Buddleia from the site as broken branches can root and form new plants.

Further details on the removal and management of Himalayan Knotweed can be found in the ISMP (Appendix 5-3 of the EIAR).

7. ASSESSMENT OF RESIDUAL ADVERSE EFFECTS

The potential for residual adverse effects on each of the individual relevant Qualifying Features of the Screened In European Sites following the implementation of mitigation, is assessed in this section of the report.

Based on the above, in view of best scientific knowledge, on the basis of objective information, there is no potential for adverse effect on the identified QIs/SCIs and their associated targets and attributes, or on any European Site Potential pathways for effect have been robustly blocked through measures to avoid impacts and the incorporation of best practice/mitigation measures into the project design.

Taking cognisance of measures to avoid impacts and best practice/mitigation measures incorporated into the project design which are considered in the preceding section, the Proposed Development will not have an adverse effect on the integrity of any European Site.

The Proposed Development will not prevent the QIs/SCIs of European Sites from achieving/maintaining favourable conservation status in the future as defined in Article 1 of the EU Habitats Directive. A definition of Favourable Conservation Status is provided below:

> *'Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2; The conservation status will be taken as 'favourable' when:*
>
> - *Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
> - *The natural range of the species is neither being reduced nor is 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.'*

Based on the above, it can be concluded in view of best scientific knowledge, on the basis of objective information that the Proposed Development will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any European Site.

8. ASSESSMENT OF CUMULATIVE EFFECTS

A search and review in relation to plans and projects that may have the potential to result in cumulative and/or in-combination impacts on European Sites was conducted. This assessment focuses on the potential for cumulative in-combination effects on the European Sites where potential for adverse effects was identified in Section 4 of this report. This included a review of online Planning Registers, development plans and other available information and served to identify past and future plans and projects, their activities and their predicted environmental effects.

8.1.1 Plans

The following development plans been reviewed and taken into consideration as part of this assessment:

- Clare County Development Plan 2023-2029
- 4th National Biodiversity Action Plan 2023-2030
- Regional Spatial and Economic Strategy (RSES) for the Southern Region

The review focused on policies and objectives that relate to European Sites.

Table 8-1 Assessment of Plans

Plans	Key Policies/Issues/Objectives Directly Related To European Sites In The Zone of Influence	Assessment of Potential Impact on European Sites
Clare County Development Plan 2023-2029	**CDP3.3** It is an objective of the Clare County Council: a) To require compliance with the objectives and requirements of the Habitats Directive, specifically Article 6(3) and where necessary 6(4), Birds, Water Framework, and all other relevant EU Directives and all relevant transposing national legislation; b) To require project planning to be fully informed by ecological and environmental constraints at the earliest stage of project development and any necessary assessment to be undertaken, including assessments of disturbance to species, where required together with the preparation of both statutory and non-Statutory Ecological Impact Assessments (EcIA); c) To protect, manage and enhance ecological connectivity and improve the coherence of the Natura 2000 Network; d) To require all proposals to ensure there is 'no net loss' of biodiversity within developments **CDP8.14** - It is an objective of Clare County Council: To promote the extraction of minerals and aggregates and their associated processes where such activities do not have a significant negative impact on the environment, landscape, public health, archaeology or residential amenities of the receiving environment and where such operations are in compliance with all national regulations and guidelines applicable to quarrying and mining activities **CDP15.3** - It is an objective of Clare County Council: a) To afford the highest level of protection to all designated European sites in accordance with the relevant Directives and legislation on such matters; b) To require all planning applications for development that may have (or cannot rule out) likely significant effects on European Sites in view of the site's Conservation Objectives, either in isolation or in combination with other plans or projects, to submit a Natura Impact Statement in accordance with the requirements of the EU Habitats Directive and the Planning and Development Act, 2000 (as amended); and	The Development plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the Natura 2000 network and other natural heritage interests. There is no potential for cumulative impacts when considered in conjunction with the current proposal were identified. The footprint of the proposed works is located outside of any EU and Nationally designated sites. No potential for negative cumulative impacts when considered in conjunction with the current proposal were identified. No developments or projects identified within the draft plan were found to occur in the wider area surrounding the Proposed Development.

Plans	Key Policies/Issues/Objectives Directly Related To European Sites In The Zone of Influence	Assessment of Potential Impact on European Sites
	c) To recognise and afford appropriate protection to any new or modified SPAs or SACs that are identified during the lifetime of this Development Plan through the planning application process bearing in mind proposals for development outside of a European site may also have an indirect effect. **CDP15.4** - It is an objective of Clare County Council: a) To implement Article 6(3) and where necessary 6(4) of the Habitats Directive and to ensure that Appropriate Assessment is carried out in relation to works, plans and projects likely to impact on European sites (SACs and SPAs), whether directly or indirectly or in combination with any other plan(s) or project(s); and b) To have regard to Appropriate Assessment of Plans and Projects in Ireland – Guidelines for Planning Authorities 2009 or any updated version.	
4th National Biodiversity Action Plan 2023-2030	Irelands 4th National Biodiversity Action Plan 2023-2030 (Department of Housing, Local Government and Heritage, 2024) (the "NBAP"). The NBAP strives for a "whole of government, whole of society" approach to the governance and conservation of biodiversity. It demonstrates Ireland's continuing commitment to meeting and acting on its obligations to protect Ireland's biodiversity for the benefit of future generations and will implement this through a number of key targets, actions and objectives. The Wildlife (Amendment) Act 2023 introduced a new public sector duty on biodiversity. The legislation provides that every public body, as listed in the Act, is obliged to have regard to the objectives and targets in the NBAP. The NBAP sets out five key objectives as follows: › **Objective 1:** Adopt a Whole-of Government, Whole of-Society Approach to Biodiversity. Proposed actions include capacity and resource reviews across Government; determining responsibilities for the expanding biodiversity agenda providing support for communities, citizen scientists and business; and mechanisms for the governance and review of this National Biodiversity Action Plan. › **Objective 2:** Meet Urgent Conservation and Restoration Needs. Supporting actions will build on existing conservation measures. Efforts to tackle Invasive Alien Species will be elevated. The protected area network will be expanded to include the Marine Protected Areas. The	The design and mitigations included as part of the Proposed Development are such that there will be no adverse effect on any European Site and the Protected Areas Network. The Proposed Development will not impact on connectivity within the wider area and will maintain watercourses within and adjacent to the development site in good condition.

Plans	Key Policies/Issues/Objectives Directly Related To European Sites In The Zone of Influence	Assessment of Potential Impact on European Sites
	ambition of the EU Biodiversity Strategy will be considered as part of an evolving work programme across Government. › **Objective 3:** Secure Nature's Contribution to People. Actions highlight the relationship between nature and people in Ireland. These include recognising the tangible and intangible values of biodiversity, promoting nature's importance to our culture and heritage and recognising how biodiversity supports our society and our economy. › **Objective 4:** Enhance the Evidence Base for Action on Biodiversity. This objective focuses on biodiversity research needs, as well as the development and strengthening of long-term monitoring programmes that will underpin and strengthen future decision-making. Action will also focus on collaboration to advance ecosystem accounting that will contribute towards natural capital accounts. › **Objective 5:** Strengthen Ireland's Contribution to International Biodiversity Initiatives. Collaboration with other countries and across the island of Ireland will play a key role in the realisation of this Objective. Ireland will strengthen its contribution to international biodiversity initiatives and international governance processes, such as the United Nations Convention on Biological Diversity.	
Regional Spatial and Economic Strategy 2020-2032	**RPO 126 (a).** Support local authorities acting together with relevant stakeholders in implementing measures designed to identify, conserve and enhance the biodiversity of the Region; seek and support the implementation of the All-Ireland Pollinator Plan, National Biodiversity Action Plan and National Raised Bog SAC Management Plan; **RPO 126 (b).** Local Authorities are required to carry out required screening of proposed projects and any draft land-use plan or amendment/ variation to any such plan for any potential ecological impact on areas designated or proposed for inclusion as Natura 2000/ European Sites and shall decide if an Appropriate Assessment is necessary, of the potential impacts of the project or plan on the conservation objectives of any Natura 2000/European Site; **RPO 126 (d).** Support local authorities to carry out, monitor and review biodiversity plans throughout the Region. Planning authorities should set objectives in their land use plans to implement and monitor the actions as set out in the National and County Biodiversity Plans, as the conservation of biodiversity is an essential component of sustainable development. Local authorities should address the issue of fisheries protection and invasive introduced species and	The strategy was reviewed, with particular reference to Policies and Objectives that relate to European Sites. No potential for cumulative impacts when considered in conjunction with the current proposal were identified. There will be no impact on designated sites or biodiversity as a result of the Proposed Development. Mitigation measures will be implemented as well as bespoke landscaping measures to ensure no net loss to biodiversity.

Plans	Key Policies/Issues/Objectives Directly Related To European Sites In The Zone of Influence	Assessment of Potential Impact on European Sites
	encourage the use of native species for landscape planting in rural areas, in the review of their biodiversity plans; **RPO 126 (e).** Support local authorities to work with all stakeholders to conserve, manage and where possible enhance the Regions natural heritage including all habitats, species, landscapes and geological heritage of conservation interest and to promote increased understanding and awareness of the natural heritage of the Region.	

8.1.2 Planning Applications within the Application Boundary

A review of the Clare County Council Planning Register illustrates that there have been 2 no. planning applications made within or overlapping the Proposed Development boundary, as illustrated in Table 8-2 below.

Table 8-2 Planning Applications within the Application Boundary

Application Reference		Description	Decision
17552		Development of an infill of a previous quarry void from past excavations	Granted, 11/05/2018
Clare County Council (CCC) reference:	23/148	Development of a wind farm with 8 number of turbines, underground cabling to the national grid, turbine delivery accommodation points, onsite 38kV substation, welfare facilities, two temporary construction compounds, access tracks and site entrance.	Granted, 21/03/2024
An Bord Pleanala (ABP) reference:	317227		

- The proposed site boundary for this Proposed Development is located within the red-line boundary of the permitted Fahy Beg Wind Farm. The Wind Farm shares the proposed red-line boundary except for the proposed extraction boundary and the southeastern area of the proposed site boundary. The following Fahy Beg Wind Farm infrastructure will be located within the red-line boundary for the Proposed Development: site entrance, 38kV substation and associated grid connection route, two passing bays, two temporary construction compounds, and existing and new access tracks.
- The Wind Farm's entrance for the construction and operational phases will utilise the existing site entrance to Ballyquin Quarry located within **Buildings and artificial surfaces** (BL3) habitat. The onsite 38kV Substation is located within a sward of **Dry Meadows and Grassy Verges** (GS2), and the grid connection route will be cabled underground from the site entrance connecting to the substation. The two temporary construction compounds will be located within pre-existing hardstanding areas, composed of **Recolonising bare ground** (ED3), **Active quarries and mines** (ED4) and **Scrub** (WS1). The permitted new access tracks for the Wind Farm is located within **Scrub** (WS1), **Immature Woodland** (WS2), **Active quarries and mines** (ED4) and within the proposed infill boundary it traverses **Spoil and bare ground** (ED2), and immature woodland once again. Both passing bays are located within **Immature woodland** (WS2). The Fahy Beg Wind Farm permission will entail the instatement of localised ground works for drainage within the red line boundary to facilitate the onsite infrastructure. This will not have cumulative impacts on the hydrological regime onsite nor will there be potential for cumulative impacts to nearby wetlands or watercourses within the Proposed Development boundary.
- The Biodiversity Enhancement and Management Plan (BEMP) for the Fahy Beg Wind Farm outlines 4.6 ha woodland within Ballyquin quarry, at the northwest of the proposed site boundary to mature naturally. This woodland is outlined within the BEMP to be fenced and signposts erected to prevent any accidental ingress of

machinery or interference within the enhancement area, animal access will not be restricted to the woodland area. The BEMP also recommend the installation of a barn owl box and a kestrel box within the biodiversity area within the quarry boundary. The nesting box are to be installed on suitable trees if present and on poles as an alternative. The boxes will be maintained for the duration of the Wind Farm and replaced if required. A log and refugia pile will also be established within the biodiversity area within the quarry boundaries to avoid disturbance. The refugia/hibernacula will provide shelter for wildlife such as small mammals, reptiles, amphibians and invertebrates and the log piles will be utilised by insects. They Proposed Development will not result in any cumulative impacts on those outlined within the BEMP for the Fahy Beg Wind Farm, and visa-versa the Fahy Beg Wind Farm will not lead to any cumulative impacts on the Biodiversity Enhancement and Management Plan submitted with this Planning Application.

- The Fahy Beg Wind Farm in combination with the Proposed Development will not result in any negative cumulative impacts on the habitats, fauna or flora. Much of the Wind Farm infrastructure utilises pre-existing access roads or are located within existing hardstand areas from past quarrying activities, that offer minimal to low ecological value. The new wind farm infrastructure and access tracks onsite will be small scale in the context of the quarry site, and in combination with the Proposed Development will not arise to any significant or adverse effects within or externally to the Proposed Development site. The BEMP recommendations (Please see Appendix 5-1), will enhance the quarry site and open up new opportunities to species that currently only utilise Ballyquin Quarry on occasion, such as Kestrel, which was recorded foraging over the Proposed Development site during the 2023 surveys, and will now have opportunities to nest onsite. There would therefore be no possibility of cumulative negative effects; rather the Fahy Beg Wind Farm and the Proposed Development will result in significant positive effects on the biodiversity of the site.
- The Fahy Beg Wind Farm has been fully assessed with mitigation applied for the identified pathways including deterioration of water quality, spread of invasive species, and disturbance from lighting on the turbines. Therefore, given the assessment carried out within this NIS report, which includes mitigation for deterioration of water quality, disturbance to otter and spread of invasive species, there is no potential for cumulative effects on European Sites when considered in combination with the Fahy Beg Wind Farm.

There are a number of valid planning applications on record which lie within the vicinity (taken as a 1km radius) of the application site, one of which is related to the quarry itself. These are summarised in Table 8-3 below:

Table 8-3 Planning Applications within the Vicinity of the Application Boundary

Application Reference	Description	Decision
ABP Ref: RP2159	Point of detail regarding condition no. 1(a) and condition no. 4 of SU03.0127	Board Decision- see Board Order, 21/08/2018
ABP Ref: SU0127	Quarry	Granted by ABP, 20/12/2016
ABP Ref: QD0011	Extension to existing sand and gravel quarry	Granted by ABP, 23/12/2015
ABP Ref: 318505	Proposed construction of a 110kV underground grid connection cable connecting the permitted Carrownagowan windfarm to the existing 110kV substation at Ardnacrusha	Live case, decision to be decided by 23/05/2024
18/995	Restoration of 3.76ha of a sand and gravel quarry to agricultural grassland	Granted by CCC, 05/12/2018
21/182	Construct a new dwelling house	Granted by CCC, 14/09/2021

Application Reference	Description	Decision
20/373	Construct a new dwelling house	Granted by CCC, 02/11/2020
17/835	Construct a new dwelling house	Granted by CCC, 26/01/2018
17/863	Construct a new dwelling house	Granted by CCC, 13/11/2017
23/60083	Construct a new dwelling house	Granted by CCC, 20/06/2023
16/66	Construct a new dwelling house	Granted by CCC, 25/04/2016
21/21	Retention of roof alterations to an existing house	Granted by CCC, 23/04/2021
24/60230	Construction of a new sand and gravel quarry	Decision Due Date 16/07/2024
18/182	Construction of a slated shed and cattle crush	Granted by CCC, 26/05/2018
17/994	Construction of a new dwelling house	Granted by CCC, 19/03/2018
18/995	Infill restoration of a sand and gravel quarry	Granted by CCC, 09/03/2019
20/288	Construction of a slatted shed	Granted by CCC, 08/08/2020
17/298	Construction of a shed	Granted by CCC, 18/11/2017

8.1.3 Assessment of Cumulative Effects

Following the detailed assessment provided in the preceding sections, it is concluded that, the Proposed Development will not result in any residual adverse effects on any of the European Sites, their integrity or their conservation objectives when considered on its own. There is therefore no potential for the Proposed Development to contribute to any cumulative adverse effects on any European Site when considered in-combination with other plans and projects.

In the review of the projects that was undertaken, no connection, that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the Proposed Development.

Taking into consideration the reported residual impacts from other plans and projects in the area and the predicted impacts with the current proposal, no residual cumulative impacts have been identified with regard to any European Site.

9. CONCLUDING STATEMENT

This NIS has provided an assessment of all potential direct or indirect adverse effects on European Sites.

Where the potential for any adverse effect on any European Site has been identified, the pathway by which any such effect may occur has been robustly blocked through the use of avoidance, appropriate design and mitigation measures as set out within this report. The measures ensure that the construction, operation and restoration of the Proposed Development does not adversely affect the integrity of European sites.

Therefore, it can be objectively concluded that the Proposed Development, individually or in combination with other plans or projects, will not adversely affect the integrity of any European Site.

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APPENDIX 1

BIODIVERSITY ENHANCEMENT MANAGEMENT PLAN

Planning and Environmental Consultants

Biodiversity Enhancement Management Plan

Proposed Quarry Extraction and Restoration, Ballyquin, Co. Clare

DOCUMENT DETAILS

Client:	**Roadstone Ltd**
Project Title:	**Proposed Quarry Extraction and Restoration, Ballyquin, Co. Clare**
Project Number:	**211137**
Document Title:	**Biodiversity Enhancement Management Plan**
Document File Name:	**BMP - F - 2024.11.12 - 211137**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	02.08.2024	CT	RW
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03	Draft	12.11.2024	CT	RW

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1. INTRODUCTION

1.1 Background

This Biodiversity Enhancement and Management Plan (BEMP) has been prepared in support of the Environmental Impact Assessment Report (EIAR) produced for the Proposed Development.

The BEMP has been prepared to mitigate the loss of Sand Martin (*Riparia riparia)* burrows and suitable breeding habitat, 104m of Hedgerow (WL1) and 186m of Treeline (WL2) habitat. The BEMP will provide additional suitable breeding habitat for Barn Owl (*Tyto alba),* which were recorded nesting onsite. See Figure 3-1 for the loss of linear habitat onsite and Figure 2-3 for the location of the Sand Martin burrows within the Proposed Development site.

The BEMP will also provide additional roosting and nesting opportunities within the Proposed Development for bat and passerine bird species, provide nesting habitat for species that currently use the Proposed Development site to forage that have no suitable nesting habitat onsite, such as Kestrel (*Falco tinnunculus)*, and will provide hibernating and refugia areas for invertebrates, amphibians and reptiles.

The BEMP outlines methods of control for non-native invasive species recorded onsite. This report details the provision of additional roosting structures for bats within the Proposed Development site.

1.1.1 Project Description

The Proposed Development being applied for under this planning application includes for the extraction, processing and washing of sand and gravel from an area measuring approximately 16.3 hectares (ha) which will allow for the extraction of approximately 1,428,571 tonnes of material.

The development proposals also include for the infilling and restoration of an existing and future quarry void back to original land contour levels. It is proposed to fill the void with either inert soil and stone waste (imported inert greenfield and non-greenfield soils and stone, and river dredge spoil) which will be a soil recovery facility and require a waste management licence or soil and stone by-product (i.e., essentially virgin soil or equivalent to virgin soil and stone, and river dredge spoil) which will be notified to the Environmental Protection Agency (EPA) as an Article 27 by-product. The quantity of soil and stone material required for restoration has been estimated to be approximately 4,471,200 tonnes.

The Proposed Development also includes for the construction of a soil inspection shed, refuelling area, settlement ponds, road improvements, drainage network and environmental berms.

A detailed description of the Proposed Development is provided in Chapter 3 of the EIAR.

1.1.2 Objectives of BEMP

The objectives of this Biodiversity Management Plan are as follows:

- To offset the loss of Hedgerow (WL1) and Treeline (WL2) habitat during the construction phase of the Proposed Development by bolstering and creating new hedgerows within the Proposed Site Boundary.
- To restore the habitats within the Proposed Development site to their original condition (prior to extraction works) as agricultural grassland and hedgerow habitats, where the grasslands will be sown with tussocky species creating foraging areas for raptor species that utilize the Proposed Development site.
- To mitigate the loss of Sand Martin (*Riparia riparia)* nesting habitat by providing alternative nesting structures for the species. In addition to providing alternative suitable breeding habitat for Barn Owl (*Tyto alba)* located away from areas that may cause disturbance.

- To provide site specific best practice guideline measures for the control and management of the non-native invasive species within the Proposed Development site and provide additional roosting habitat for bat species.

1.1.3 Statement of Authority

Baseline ecological surveys of the site were undertaken on the 30th of March 2023, 25th of April 2023, 18th of May 2023, 28th of August 2023 and 17th of April 2024 by Brónagh Boylan (BSc. Env), Rachel Minogue (BSc. Env), Aran von der Geest Moroney (BSc. Eco), and David Culleton (BSc. Zoology, M.Sc. Conservation Behaviour). Sara Fissolo (BSc. Eco) and David Culleton (BSc., M.Sc.) undertook bat surveys of the site. All surveyors have extensive experience in ecological assessment and surveying. Cora Twomey (B.Sc. Eco) is the author of this report. Rachel Walsh (B.Sc. Env) has reviewed this report. Rachel has over 5 years of experience in ecological consultancy.

2. ECOLOGICAL BASELINE

Dedicated surveys of the areas within the Proposed Development were undertaken on the 30th of March 2023, 25th of April 2023, 18th of May 2023, 17th of July 2023, 28th of August 2023 and 17th of April 2024 by Brónagh Boylan (BSc.), Aran von der Geest Moroney (BSc.), Rachel Minogue (BSc.) and David Culleton (BSc.).

2.1 Habitats and Flora

The habitats recorded during the site visit are described below (See habitat map below Figure 2-1).

Table 2-1 Habitats recorded at the Proposed Development Site

Habitat	Fossitt Code
Buildings and artificial surfaces	BL3
Active quarries/mines	ED4
Spoil and bare ground	ED2
Depositing/lowland river	FW2
Scrub	WS1
Reed and large sedge swamp	FS1
Recolonising bare ground	ED3
Immature woodland	WS2
Exposed sand, gravel or till	ED1
Other artificial lakes and ponds	FL8
Marsh	GM1
Drainage ditch	FW4
Dry meadows and grassy verges	GS2
Hedgerow	WL1
Improved agricultural grassland	GA1
Treeline	WL2

The site entrance, weighbridge within the site boundary, existing buildings and old quarrying equipment, and hardstand areas are classified under **Buildings and artificial surfaces (BL3)**. The Proposed Development site is an existing quarry that has not operated for a number of years. As a result of previous extraction procedures, there are stockpiles of sand and gravel on site classified under **Active quarries/mines (ED4)**. Areas of the site have been classified as active quarries, despite inactivity within the quarry for several years, as areas of the site have remained uncolonized during the inactive years, and due to the high levels of unconsolidated stockpiles within the quarry. There are multiple unconsolidated roads running through the site classified as **Spoil and bare ground (ED2).**

A **Depositing/lowland river (FW2)** borders the southeast and north of the Proposed Development site. The southern watercourse is heavily encroached by vegetation, primarily bramble (*Rubus fruticosus agg.*) with little standing water and no flow present in the section of the watercourse bordering the grasslands to the southeast of the site. The watercourse continues to the west of the entrance road of the site. The watercourse was bordered by **Scrub (WS1)** habitat. The water was turbid and moderate flowing at the time of the survey with a watercourse width of 1-2m.

To the west of the entrance to the Proposed Development site, is an area of **Reed and Large swamps (FS1)**. The habitat is dominated by common reed (*Phragmites australis*) and bulrush (*Typha latifolia*) in an area of standing water. In areas of the north-west, southeast and centre of the site, areas of **Recolonising bare ground (ED3)** were documented. Species within these areas included colt's foot (*Tussilago farfara*), nettle (*Urtica dioica*), willow herb (*Epilobium* spp.), shepherd's purse (*Capsella bursa-pastoris*), dandelion (*Taraxacum* spp.), common gorse (*Ulex europaeus*), scatterings of conifer & willow saplings (*Sitka* spp.) (*Salix* spp.), hawksbeard (*Crepis capillaris*), daisy (*Bellis perennis*) and ragwort (*Jacobaea vulgaris).*

The majority of the northwest and easternmost extent of the site contained **Immature Woodland (WS2)**, particularly along the west and eastern boundaries of the site. Species of this habitat found on site

included Birch (*Betula* spp.), Willow (*Salix* spp.), with some common gorse (*Ulex europaeus*). Ground flora included: nettle (*Urtica dioica*), foxglove (*Digitalis purpurea*), herb Robert (*Geranium robertianum*), hard shield fern (*Polystichum aculeatum*), ivy (*Hedera hibernica*), bramble (*Rubus fruticosus agg.*).

At times across the site, **Immature Woodland (WS2)** was bordered by **Scrub (WS1)** vegetation with Scrub (WS1) vegetation dominating the south-western corner of the site. Additionally, **Scrub (WS1)** vegetation had recolonised areas between existing sand and gravel piles with common gorse (*Ulex europaeus*) heavily present on site. **Scrub (WS1)** species found within the Proposed Development site included willow (*Salix* spp.), Birch (*Betula* spp.), gorse (*Ulex* spp.), Blackthorn (*Prunus spinosa*), bracken fern (*Pteridium aquilinum*), bramble (*Rubus fruticosus agg.*), nettle (*Urtica dioica*), thistle (*Cirsium vulgare*) and Himalayan Knotweed (*Persicaria wallichii*).

Across the site, there are multiple areas of **Exposed sand, gravel or till (ED1)** in the form of exposed sand cliff faces and earth/gravel till stockpiles. The exposed sand cliff faces were often colonised by gorse and willows and offer suitable nesting habitat to Sand Martin (*Riparia riparia*).

Other artificial lakes and ponds (FL8) are present in the west and north of the Proposed Development with two small ponds found in the south-east of the Proposed Development within the proposed extraction area. Vegetation documented surrounding these ponds included soft rush (*Juncus effusus*), hard rush (*Juncus inflexus*), bulrush (*Typha latifolia),* marsh thistle (*Cirsium palustre*), fire weed (*Chamaenerion angustifolium*), and marsh horsetail (*Equisetum palustre*). The pond present in the northwest of site was heavily encroached by the stockpiles of sand and gravel located to the east of the pond as there is no barrier present between the pond and stockpiles. Additionally, the pond had a muddy substrate with a low number of small rocks/cobbles present and was 0.5 m in depth.

The pond in the far north of site within an associated area of **Marsh (GM1)** was approx. 1m in depth with large boulders present in the water. Surrounding the pond was a high number of both soft rush (*Juncus effusus*) and hard rush (*Juncus inflexus*) with approximately 30% coverage of algae at the surface of the pond. The large pond present to the east of the site was surrounded by bull rush (*Typha latifolia)* and previously listed **Scrub (WS1)** vegetation. As previously stated, the area to the far north of the site is dominated by **Marsh (GM1).** Vegetation recorded in this habitat included watercress (*Nasturtium officinale*), hairy bittercress (*Cardamine hirsute*), soft rush (*Juncus effusus*), marsh horsetail (*Equisetum palustre*), common water-starwort (*Callitriche stagnalis*), yarrow (*Achillea millefolium*), marsh pennywort (*Hydrocotyle vulgaris*), marsh cinquefoil (*Potentilla palustris*), *Calliergon* moss, horsetails (*Equisetum* spp.) bog chickweed (*Stellaria alsine*), and water figwort (*Scrophularia auriculata*).

A **Drainage Ditch (FW4)** is present in the north-west of the Proposed Development site, bordered on both sides by immature woodland (WS2). The **Drainage Ditch (FW4)** had no flow and was heavily encroached by vegetation. The **Drainage Ditch (FW4)** had stagnant water in which pondweed (*Potamogeton natans*), marsh horsetail (*Equisetum palustre*), marsh woundwort (*Stachys palustris*), bull rush (*Typha latifolia*), willow (*Salix* spp.) and beech (*Fagus sylvatica*) were present.

Grasslands recorded as **Dry meadows and grassy verges (GS2)** were present in the south-west of the Proposed Development site separated from one another and the wider site by **Hedgerows (WL1).** Species found in these grasslands were meadow foxtail (*Alopecurus pratensis*), cock's foot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), germain speedwell (*Veronica chamaedrys*), nettle (*Urtica dioica*), pignut (*Conopodium majus*), clovers (*Trifolium* spp.), lesser stitchwort (*Stellaria graminea*), red fescue *(Festuca rubra*), soft rush (*Juncus effusus*), yarrow (*Achillea millefolium*), and creeping buttercup (*Ranunculus repens*). **Hedgerow (WL1)** lines were comprised of Blackthorn (*Prunus spinosa*), hawthorn (*Crataegus monogyna*), Holly (*Ilex aquifolium*), bramble (*Rubus fruticosus agg.*), elder (*Sambucus nigra*), oak saplings (*Quercus* spp.), willow (*Salix* spp.), birch (*Betula* spp.), common gorse (*Ulex europaeus*), nettles (*Urtica dioica*) and bracken (*Pteridium aquilinum.*).

Grasslands present to the far southeast of the site and northwest of the Proposed Development boundary were classified as **Improved agricultural grassland (GA1)** due to the species composition present and the presence of livestock grazing within them. Species recorded within these fields included yorkshire fog (*Holcus lanatus)*, ribwort plantain (*Plantago lanceolata)*, white clover (*Trifolium repens)*, red clover (*Trifolium pratense)*, soft rush (*Juncus effusus*), perennial rye grass *(Lolium perenne)*, creeping buttercup (*Ranunculus repens*), meadow buttercup (*Ranunculus acris*), smooth hawk's-beard (*Crepis vesicaria*), ragwort (*Jacobaea vulgaris)*, yarrow (*Achillea millefolium),* sheep's sorrel (*Rumex acetosella*), fescue

(*Festuca* spp.), *vulgare*), broadleaved dock (*Rumex obtusifolius)*, sweet vernal grass (*Anthoxanthum odoratum*), knapweed (*Centaurea nigra*), common vetch (*Vicia sativa),* and bracken (*Pteridium aquilinum*.).

Within the field in the northwest, the **Treeline (WL2)** habitat surrounding the grassland was bordered by Hawthorn (*Crataegus monogyna*) with ground flora within the treeline consisting of native bluebell (*Hyacinthoides non-scripta)*, lesser celandine (*Ficaria verna*), and wood anemone (*Anemone nemorosa*).

Surrounding the boundary of the Proposed Development site in the northeast of the site and the northern agricultural grassland, **Treelines (WL2)** are present. **Treelines (WL2)** identified bordering the boundary of the Proposed Development site consist primarily of ash (*Fraxinus excelsior*) trees, with the agricultural grassland to the north of the site surrounded by ash (*Fraxinus excelsior*), hazel (*Corylus avellana*) and oak (*Quercus petraea*).

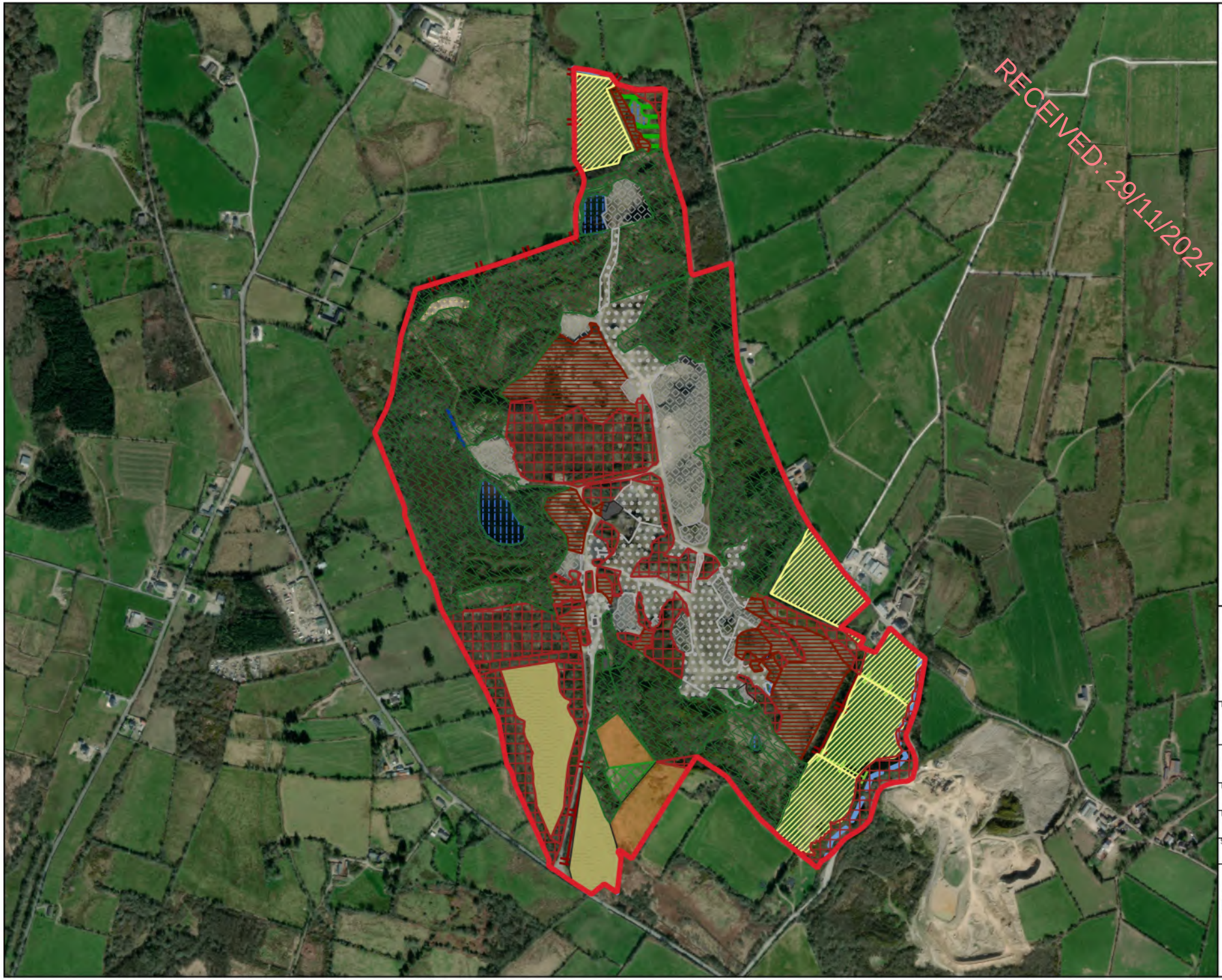
None of the habitats within the Proposed Development site proposed for extraction, infill and restoration conform to habitats listed under Annex I of the EU Habitats Directive.

No botanical species protected under the Flora (Protection) Order (2022) were recorded during the survey.

2.1.1 Invasive species

Himalayan Knotweed (*Koenigia polystachya)*, listed on the Third Schedule of Invasive Species, was recorded within the Proposed Development site boundary. The species will be impacted upon during the works, as there are two stands present within the proposed infill boundary. A further stand was found north of the man-made pond onsite and is outside of any proposed works footprint. Any works within 7m of these stands onsite may cause disturbance to the invasive species and may result in the potential further spread of the Third Schedule species onsite. An Invasive Species Management Plan for this species has been prepared and is included in Appendix 5-3 of the EIAR.

The non-native species Buddleia (*Buddlejia davidii)* was recorded within the Proposed Development site. Control and removal methods are outlined in Section 3.1.5 below to avoid potential impacts associated with the introduction and spread of invasive alien plant species.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Recolonising bare ground
Active quarries and mines
Other artificial lakes and ponds
Reed and large sedge swamps
Improved agricultural grassland
Marsh
Dry meadows and grassy verges
Wet grassland
Scrub
Immature woodland
Depositing/ Lowland Rivers (FW2)
Drainage Ditches (FW4)
Hedgerows (WL1)
Treelines (WL2)
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Microsoft product screen shots reprinted with permission from Microsoft Corporation
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Habitat Map
Project Title
Proposed Quarry Extraction and Restoration, Ballyquin, Co. Clare
Drawn By
CT
Checked By
RW
Project No.
211137
Drawing No.
Figure 2-1
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Date
15.10.24
MKO
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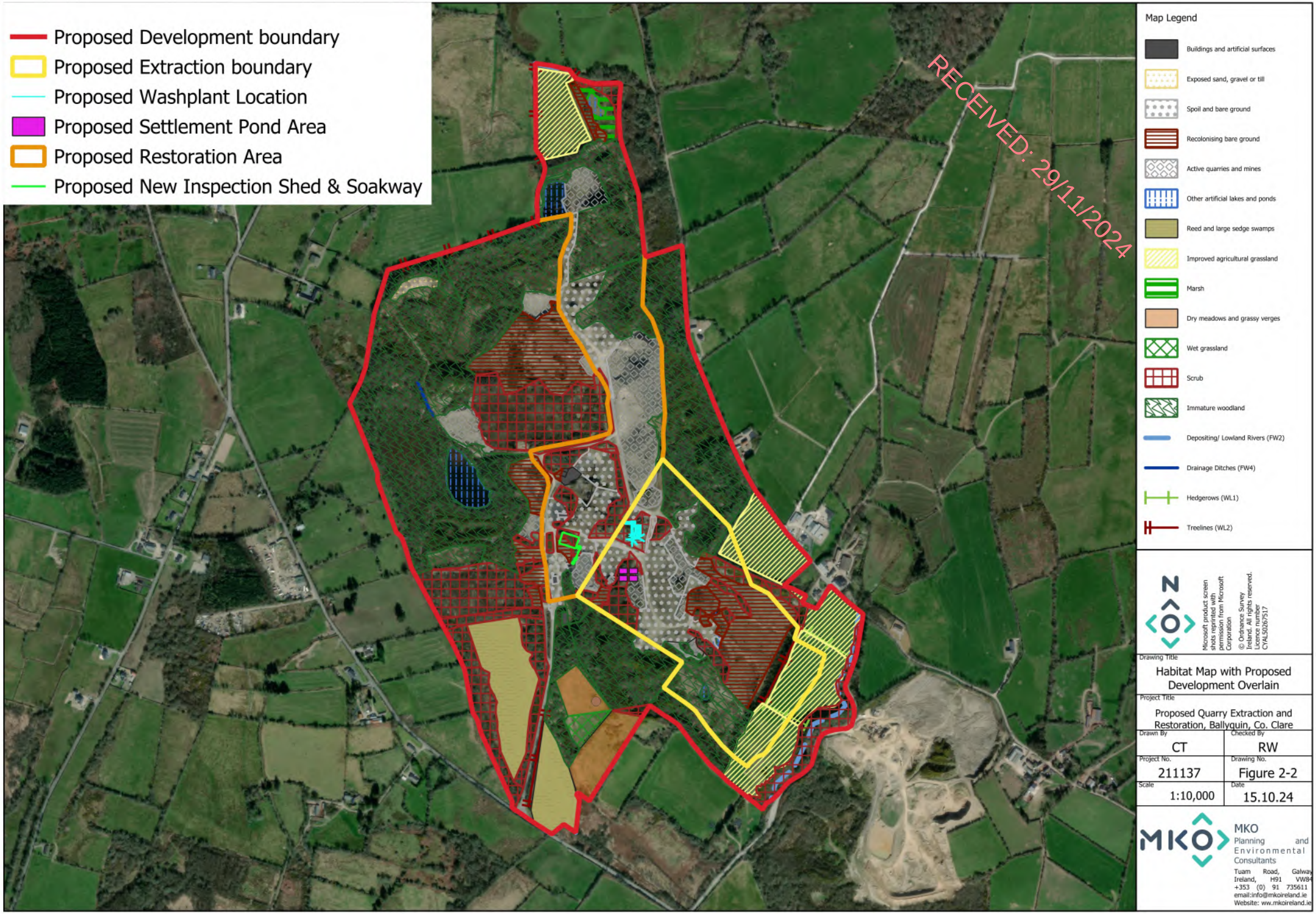
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Proposed Extraction boundary
Proposed Washplant Location
Proposed Settlement Pond Area
Proposed Restoration Area
Proposed New Inspection Shed & Soakway
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Buildings and artificial surfaces
Exposed sand, gravel or till
Spoil and bare ground
Recolonising bare ground
Active quarries and mines
Other artificial lakes and ponds
Reed and large sedge swamps
Improved agricultural grassland
Marsh
Dry meadows and grassy verges
Wet grassland
Scrub
Immature woodland
Depositing/ Lowland Rivers (FW2)
Drainage Ditches (FW4)
Hedgerows (WL1)
Treelines (WL2)
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Microsoft product screen shots reprinted with permission from Microsoft Corporation
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Project Title
Proposed Quarry Extraction and Restoration, Ballyquin, Co. Clare
Drawn By
CT
Checked By
RW
Project No.
211137
Drawing No.
Figure 2-2
Scale
1:10,000
Date
15.10.24
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2.2 Fauna

2.2.1 Badger survey

While some mammal trails, paw prints and snuffle holes were recorded within the site, no indication of significant badger activity was recorded, and no setts were identified within or adjacent to the EIAR Study Area boundary. The EIAR Study Area boundary does, however, provide suitable supporting habitat for this species and it is likely to occur within the site, at least on occasion.

2.2.2 Otter survey

The Bridgetown watercourse present at the southeast boundary of the Proposed Development site offers surface water connectivity to the Lower River Shannon Special Areas of Conservation (SAC), in which otter is a Qualifying Interest (QI). As such, the watercourse was assessed and surveyed for potential foraging and commuting habitat to otter.

No sign of otter was observed. No sign of otter spraints, scat, prints, slides, trails, couches and holts was observed. The watercourse to the southeast was heavily encroached with vegetation primarily bramble, containing a low level of standing water with no flow at the time of survey.

2.2.3 Bat surveys

A detailed bat survey report is provided in Appendix 5-2 of the EIAR. This document provides a detailed description of all survey methodologies as undertaken at the site during 2023. Full details of the survey times and dates and the methodologies followed are provided in the Bat Survey Report, included as Appendix 5-2, along with details of all the surveyors.

2.2.3.1.1 *Bat Habitat Appraisal*

A bat walkover and inspection survey were conducted on the 27th of July 2023. Details of the assessment of existing man-made structures for their suitability to host roosting bats are presented below. Trees within the Proposed Development footprint are also assessed in more detail.

2.2.3.1.2 *Preliminary Roost Assessment*

Potential Roost Features (PRF) Structures

Four structures were identified and inspected as part of the roost assessment effort, the weighbridge office, a large shed, a water pump building and a hopper. The weighbridge office was also the subject of roost emergence surveys. Details of the emergence survey are presented in 2.2.3.1.3.

Weighbridge Office

This structure is an unused office building with a tiled roof (ITM X 562602 669150). The structure is located north of the site entrance gate, and west of the proposed extraction boundary. The building has a separate attic space. Access points were identified underneath gaps in the fascia board, and underneath roof tiles. Bat droppings and feeding remains were found inside the building. It was assigned a *Moderate* roosting potential. The shed was subject to a dusk emergence survey on 27th of July 2023.

Large Shed

The large shed is a corrugated iron structure located southeast of the weighbridge office (ITM X 562622 Y 669067). Panels on the walls and roof illuminate it during the daylight hours. However, the northern end of the building has rooms that are dark throughout. Within these rooms, evidence of feeding bats was found, along with droppings. A single dead bat was found in an old disused toilet during the 27th of July 2023 inspection. No identification (ID) was possible on the carcass. A second dead bat impossible to

ID was found in the same location on the 28th of August. A single feeding bat was also seen inside the structure during the same night following a barn owl survey. The bat's behaviour was indicative of a brown long-eared bat, however no ID was possible. The shed is in regular use by bats, but was assigned a *Low* roosting potential, as it is likely favoured for limited opportunistic roosting, particularly feeding and night roosting.

Water Pump Building

The water pump building is a flat roof concrete building located east of the weighbridge office (ITM X 562631 Y 669182). Numerous access points were identified in the structure, such as gaps in the concrete exterior and open windows. A large number of droppings and feeding remains were found inside the structure. No bats were found. Whilst evidence of bats using the building was evident, there is no capacity for hosting regular or significant roosting, and the building is likely in use as a feeding perch or night roost. It was assigned a *Low* roosting potential.

Hopper

The hopper is a small concrete building once used for funnelling sand and gravel. It is located to the east of the water pump building (IG Ref: ITM X 562654 Y 669205). The interior of the structure is exposed and overgrown. However, a single Leisler's bat was found roosting between the northern wall and concrete support beam. The structure was assigned a *Low* roosting potential.

PRF Trees

The site comprised a network of treelines and hedgerows in the agricultural fields to the southwest of the site. Conifer plantations bordering existing tracks and roads dominated the other areas of the site. These were assessed as having *Negligible* roosting potential for bats. Deciduous treelines identified throughout the site were assessed for their potential to host roosting bats. The majority of linear features comprised hedgerows with sparse, immature trees with *No* potential roosting features.

A number of trees within the site boundary were assessed. Four trees assessed presented, or were likely to present, features suitable for roosting bats. Most of the trees were observed with binoculars and were located in inaccessible areas: the assessment was provided as a precaution. Details of the assessment are presented in Table 2-2. In all four cases, no potential roost features were visible due to heavy ivy cover. Two of the assessed trees (Trees 2 and 3 in Table 2-2) are proposed to be felled as part of the development. Therefore, in the event that felling is required, further assessment will be needed to establish if potential roosting features are present.

Table 2-2 Tree Inspection Results

#	Species	Potential	IG Reference	Notes
1	Unknown	Low	R 63028 69219	Old tree with old ivy covering trunk
2	Unknown	Moderate	R 63073 69148	Mature tree with old ivy cover.
3	Unknown	Low	R 63143 68923	Mature tree with old ivy cover.
4	*Fraxinus spp.*	Moderate	R 62583 69884	Mature trees with heavy ivy cover.

2.2.3.1.3 Bat Activity Surveys

Manual Surveys

Dusk Emergence Survey

Four structures were identified within the site. Bat use was confirmed within three of the structures during the initial inspections carried out on 27th July 2023 and further surveys were not deemed necessary at early design stages. Roosting was also confirmed within the weighbridge office, however as the attic space was not sully accessed, a dusk emergence survey was also carried out. Table 2-3Table 2-3 summarises the survey effort in relation to dusk emergence survey carried out to identify and classify potential roosts. Individual surveys are described below.

Table 2-3 Manual activity surveys at PRFs.

PRF	IG Ref.	Date	Survey Type	Results
Weighbridge Office	R 62647 69121	27th July 2023	Dusk Emergence	Single Leisler's bat emerged at 21:50.

Weighbridge Office

One dusk emergence survey was carried out at the weighbridge office located 500 metres north of the main entrance gate. During the survey, one Leisler's bat was observed emerging from the southwest corner of the office. Leisler's bats, *Myotis* spp. and soprano and common pipistrelles were also recorded foraging during the survey by both surveyors, which were located at the north and south of the office. In particular, social calling by Leisler's bats was recorded, and bats were observed continuously flying in circles above the site's car park early during the survey. Bat activity reduced once barn owls were spotted flying across the site and above the office.

Night Walkover Survey

The manual activity survey also comprised of a night walkover transect at dusk. The night walkover survey followed the dusk emergence survey undertaken on the 27th of July 2023. The survey began at 23:00 and was completed at 00:28. Regular bat activity was recorded on the survey, with a total of 231 bat passes (Table 2-4Table 2-4).

Table 2-4 Night Walkover survey results

Date	Km	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Myotis* spp.	Lesser Horseshoe bat
27/07/2023	4.1	94	91	35	3	2	6

The walkover survey was aimed at assessing the use of linear features and other habitats by bats. The survey followed existing roads throughout the site. Bat activity was dominated by common and soprano pipistrelles. Common pipistrelles were predominantly recorded at the west of the site where immature conifer plantation was abundant. Soprano pipistrelles were principally found at the south of the site. Six Lesser horseshoe bat passes were also recorded during the walkover survey in the southwest of the site.

Static Detectors Surveys

Six SM4 static detectors were deployed on the site for a minimum 10-day period. Three detectors were deployed on 17th July 2023. They were moved on 27th July 2023 to three new locations and were collected on 15th August 2023. These detectors allowed a specified look into species composition, commuting and foraging activities within the site. Locations were chosen to represent areas of likely bat activity.

In total 25,368 bat passes were recorded. Analysis of the detector recordings positively identified five bats to species level with *Myotis* genus also present. Common pipistrelle (*Pipistrellus pipistrellus*) made up the vast majority of the activity recorded within the site (n=15,005), followed by Soprano pipistrelle *(Pipistrellus pygmaeus*) (n=7,842). Leisler's bat (n=1,779) and *Myotis* spp. (n=526) were less frequently recorded, followed by brown long-eared bats (n=151). 65 instances of lesser horseshoe bat were recorded at the site. The Site is located within the current known range for this species. Plate 2-1 shows total bat species composition recorded at the site.

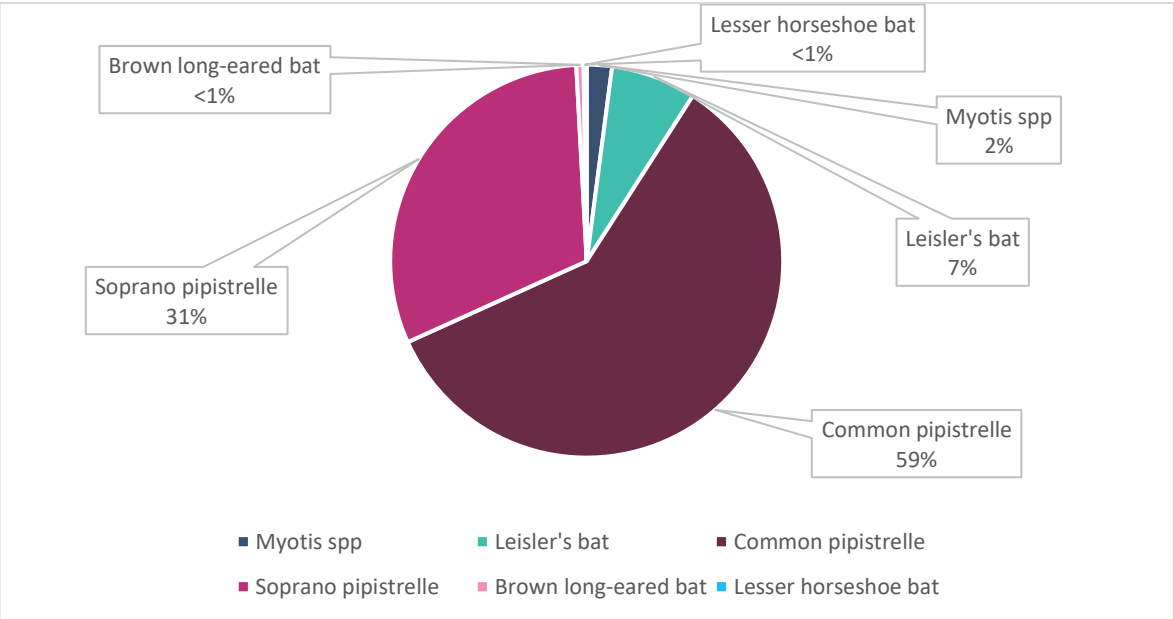


Plate 2-1 Total bat species composition.

The plate below shows total bat passes per detector, which are summarised in Table 2-5.

Table 2-5 Static detector results, total bat passes

Detector	Common Pipistrelle	Soprano Pipistrelle	Leisler's Bat	Brown Long-eared Bat	*Myotis* spp.	Lesser Horseshoe Bat
D01	2066	2435	108	10	214	1
D02	836	312	96	19	68	11
D03	2415	306	190	5	27	11
D04	5882	1973	248	23	72	18
D05	989	2204	941	58	91	24
D06	2817	612	196	36	54	0

Species composition was varied across the detectors. Common pipistrelles were recorded more frequently at locations D02, D03, D04 and D06. Soprano pipistrelle were recorded in higher numbers at D01 and D05, though instances of common pipistrelle were still high. Leisler's bat activity was highest at

D05. Instances of brown long-eared bats (n=151) were rare at across the site. *Myotis* spp. was recorded more often at D01 that at any other location.

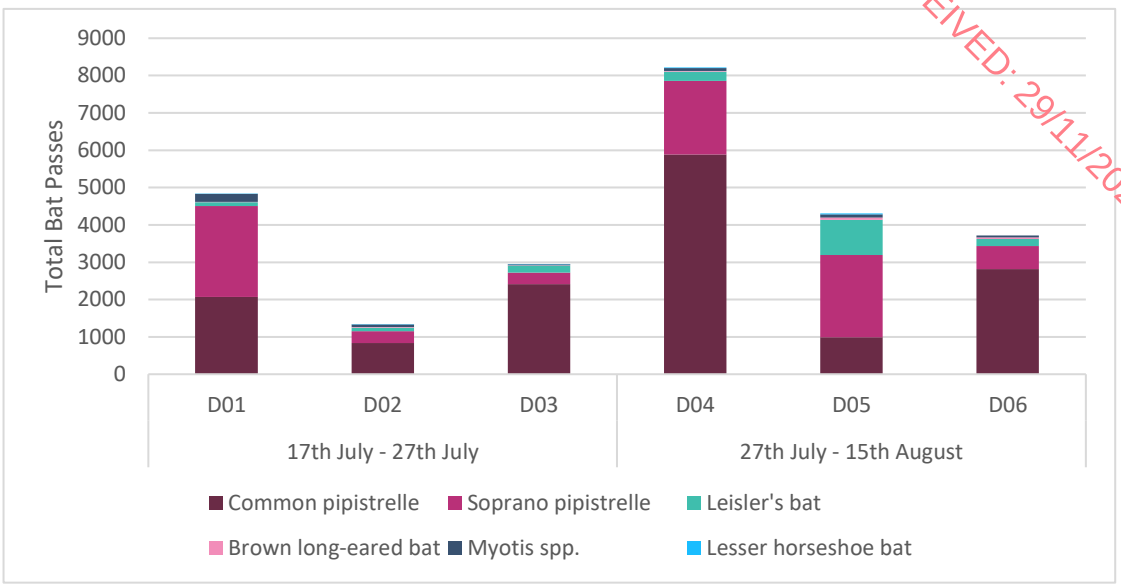
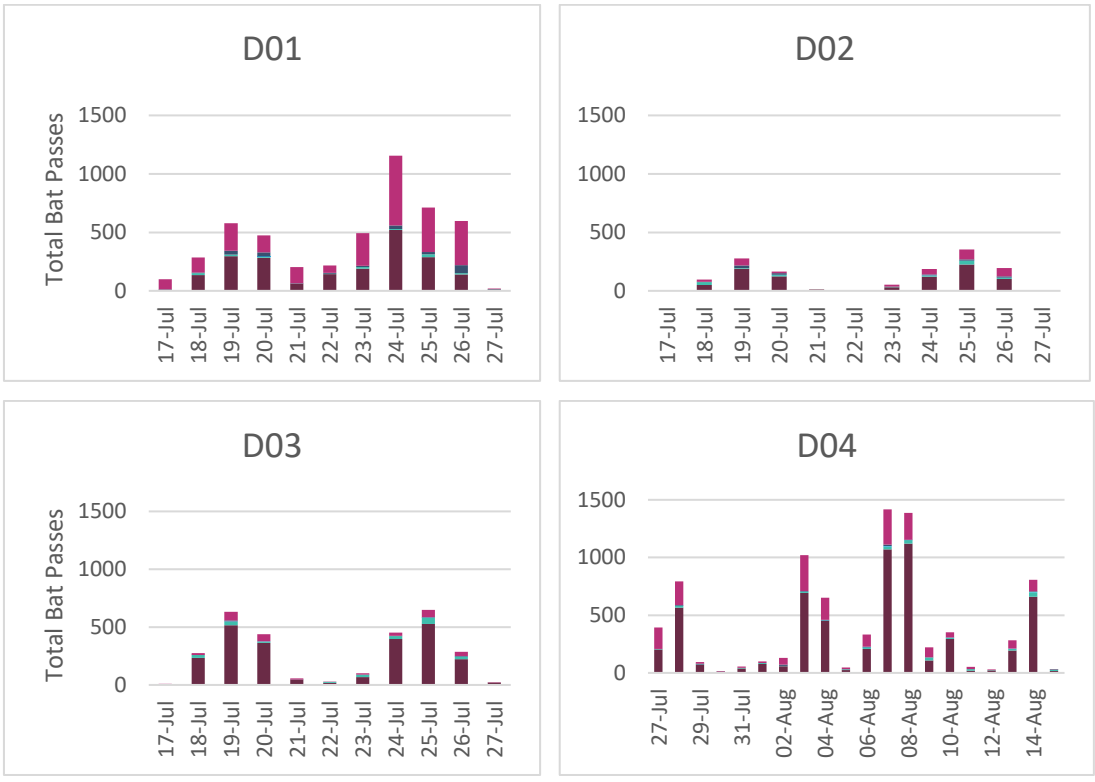


Plate 2-2 Total bat passes per detector.

Analysis of the detector recordings also highlighted the total bat passes per night, per detector. Species composition per night is shown in Plate 2-3 Total Bat Passes per Night, per Detector Location. Activity varied between locations and between nights during the two deployments. Species composition was dominated by common pipistrelles at D02, D03, D04 and D06. D01 and D05 activity was predominantly soprano pipistrelles, though Leisler's bat was more prevalent at this location than at any other. Lesser horseshoe bat was recorded at all detectors, with the exception of D06. Occasional increases in activity were recorded for all other species. The highest activity was recorded at D04 on the 7th and 8th of August.



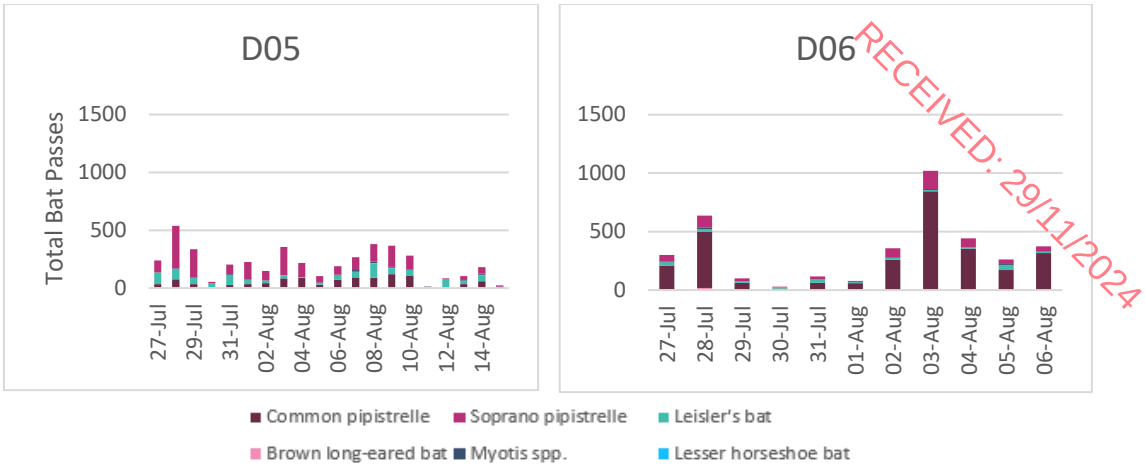


Plate 2-3 Total Bat Passes per Night, per Detector Location

2.2.4 Barn Owl Survey

During the manual bat surveys, an incidental sighting of barn owl was recorded. A barn owl was recorded flying south by the existing office building, and subsequently flying back north to the historical quarry plant. In total, a minimum of three barn owls could be heard calling and flying over the quarry plant and current void.

As a result, a barn owl survey was carried out, to determine the use of the site by barn owl and the potential breeding success of the species within the Proposed Development site. A barn owl survey was undertaken on the 28th of August 2023 by Brónagh Boylan (BSc.), Sara Fissolo (BSc.), Aran von der Geest Moroney (BSc.) and David Culleton (BSc.) of MKO. Each surveyor was positioned at a different vantage point within the site to provide the best scope for identifying the use of the site by the species.

The site infrastructure that the barn owls were recorded flying overhead during the bat surveys was inspected. Signs of barn owl occupancy was recorded in the form of active whitewash located beneath a large cavity within a concrete wall. Pellets were also recorded adjacent to the infrastructure onsite.

The survey began at 20:07 and concluded at 21:50.

A kestrel was spotted by two surveyors at 20:29 and 20:31 flying to the east of the existing quarry plant. At 20:42 the kestrel was seen flying from east to south.

At 21:10 one barn owl was seen flying out from existing quarry plant and resting on a piece of machinery. It then flew off of the machinery in an eastern direction. At 21:13 a second barn owl flew in a southeast direction. At 21:11, 21:18, 21:19, and 21:22, calls from the barn owl were heard by surveyors coming from an eastern direction.

Potential breeding activity by barn owl at this site was therefore recorded.

2.2.5 Other Faunal Species

2.2.5.1 Mammals

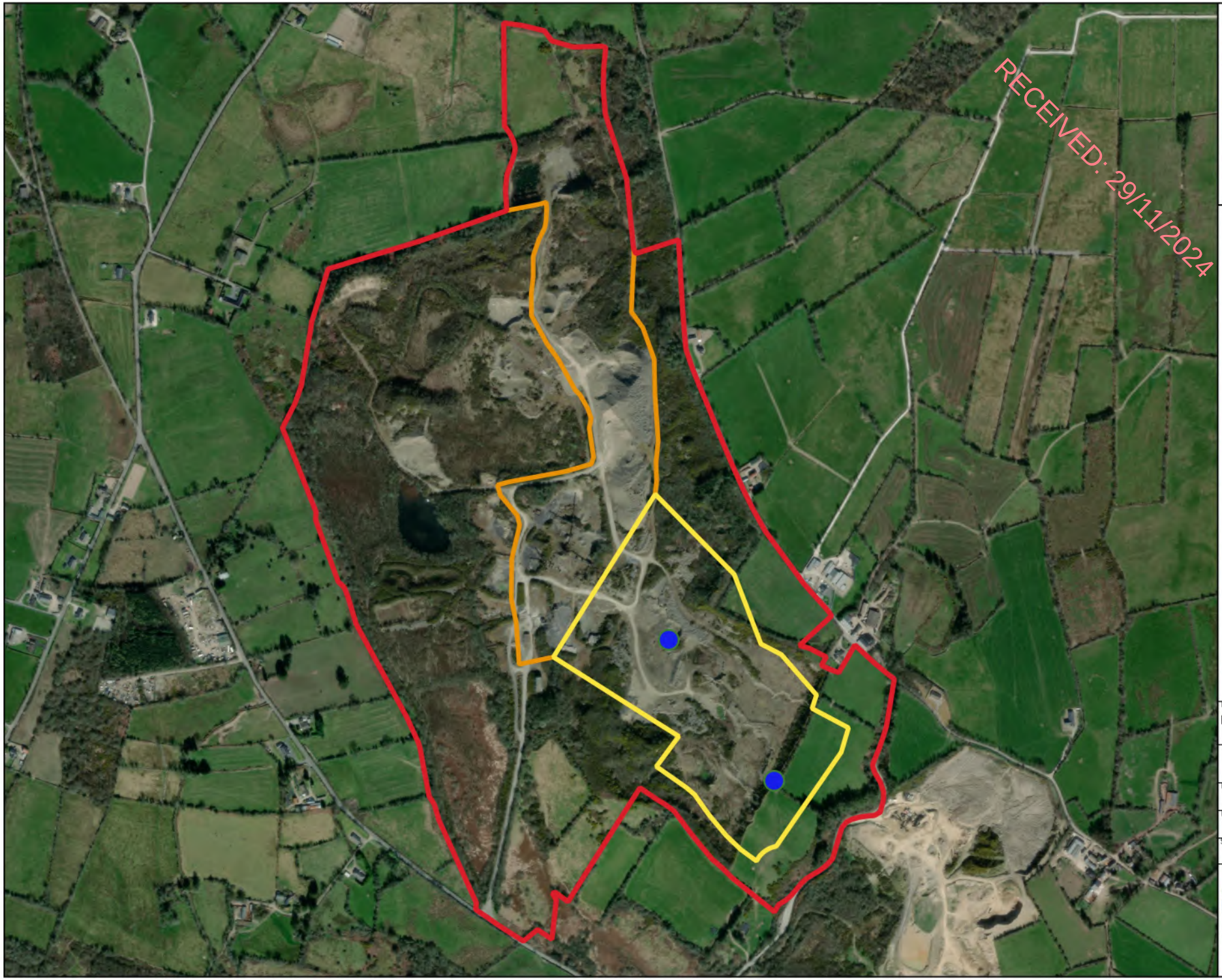
Fox (*Vulpes vulpes*) prints were recorded within the Proposed Development site. Fallow deer (*Dama dama*) were sighted within the EIAR Study Area boundary in addition to deer prints often adjacent or within woodland habitat. Droppings likely to be of pine marten (*Martes martes*) or Irish stoat (*Mustela erminea hibernica*) given the small size (relative to badger), black colour and coiled, discrete shape were

recorded. These scats contained seeds of ivy and blackberry, which are known to make up to 30% of the pine marten's diet (Lynch et al. 2007[1]).

2.2.5.1.1 Invertebrates

A number of invertebrates were recorded within the EIAR Study Area boundary. A small heath (*Coenonympha pamphilus*) caterpillar was recorded, in addition to an orange-tip butterfly (*Anthocharis cardamines*). Furthermore, a peacock butterfly (*Aglais io*), small tortoiseshell (*Aglais urticae*), and emperor dragonfly (*Anax imperator*) were recorded.

[1] *Lynch, Á. B., & McCann, Y. (2007). The Diet Of The Pine Marten (Martes Martes) In Killarney National Park. Biology and Environment: Proceedings of the Royal Irish Academy, 107B(2), 67–76.c*



Map Legend

- Proposed Development boundary
- Proposed Extraction boundary
- Proposed Restoration boundary
- Sand Martins burrowing nests

N

Drawing Title

Location of the Sand Martin Nests Onsite

Project Title

Proposed Quarry Extraction and Restoration Ballyquin, Co. Clare

Drawn By	Checked By
CT	RW
Project No.	Drawing No.
211137	Figure 2-3
Scale	Date
1:9,000	07.11.24

MKO

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3. BIODIVERSITY MEASURES

3.1 Habitats and Flora

3.1.1 Loss of Hedgerow (WL1) and Treeline (WL2) during the Construction Phase

There is a proposed loss of 104 linear metres of Hedgerow (WL1) and 186 linear metres of Treeline (WL2) habitat associated with the Proposed Development. The proposed loss is to facilitate the construction phase clearance of vegetation and topsoil on top of the sand cliff at the south of the proposed extraction boundary. This area will be the location of the excavation works during the operational excavation phase of the Proposed Development.

It is proposed to offset the loss of hedgerow and treeline habitat during the construction phase through infilling current hedgerows and through the creation of new hedgerows along agricultural fields at the southeast of the Proposed Extraction Boundary at the beginning of the operational phase of the Proposed Development. In order to mitigate the loss of hedgerow and treeline habitat as started above, there will be a total of 313 linear metres proposed to infill and bolster current hedgerows onsite and 493 linear metres of hedgerows habitat are proposed for replanting. As this habitat replacement would not be a like for like replacement and would take time to establish and mature into the same condition as that of the habitat being lost, it is proposed to replant trees and shrub specimens of a semi-mature nature to ensure connectivity gains are obtained as soon as possible. All plant species proposed for replanting will be indigenous to the local area. This will result in an increase of linear connectivity and will result in a net gain in this habitat within the Proposed Development Boundary prior to proposed construction works.

3.1.2 Planting of Hedgerow (WL1) and Treeline (WL2) during the Operational Phase

The operational phase of the Proposed Development will result in the replanting of 2,756 linear metres of hedgerow and 160 linear metres of treeline habitat within the proposed restoration boundary. The restoration proposal measures will see the site returning to agricultural use similar to the land use prior to quarrying, with agricultural grasslands delineated by hedgerows and treelines. Whips/bare root stock are recommended for the operational phase planting due to the establishment success rates[2]. The restoration replanting once matured will significantly improve the connectivity onsite in all directions and will provide connecting corridors between the immature woodlands (which will have matured over the 22 years during the operational phase) from the south, west, east and north of the Proposed Development. This gain of habitat onsite will open new shelter, refuges and nesting areas of fauna that utilise the site. All plant species proposed for replanting will be indigenous to the local area.

See Figure 3-1 below for the Landscape Mitigation Plan that includes the location of proposed hedgerow and treeline planting during the operational phase.

3.1.3 Proposed Operational Phase Replanting

3.1.3.1 Replanting New Hedgerows

Planting will be of semi-mature native specimens for the extraction phase to ensure connectivity gains are immediate and will be indigenous to the local area. Bare root plant specimens/whips will be adequate for the operational phase replanting if semi-mature specimens are too costly. Such species include hawthorn (*Crataegus monogyna)*, Blackthorn (*Prunus spinosa)*, Hazel (*Corylus avellana)* which will typically make

[2] *Hedging plating: answers to 18 common questions. Natural England 2008.*

up 60% of a native hedgerow mix[3]. The other 40% will be made of native shrub species found within the local area, that are known to thrive on the soils in the locality[4]. Other species present within the EIAR Study Boundary will be included in the proposed new hedgerows. Such species included:

- Hawthorn (Crataegus monogyna)
- Blackthorn (Prunus spinosa)
- Hazel (Corylus avellana)
- Pedunculate Oak (Quercus robur)
- Sessile Oak (Quercus petraea)
- Downey Birch (Betula pubescens)
- Silver Birch (Betula pendula)
- Elder (Sambucus nigra)

Spindle (*Euonymus europaeus),* Holly (*Ilex aquifolium)*, Wild Cherry (*Prunus avium),* Crab Apple (*Malus sylvestris),* Grey Willow (*Salix cinerea)* and Goat Willow (*Salix caprea)* were not recorded within the EIAR Boundary however these species will be included within the proposed replanting mix due to their importance in supporting pollinators, insects and in some cases mammals.

When planting a new hedgerow, cultivating the ground is recommended, and plant in a double staggered row, which creates extra shelter for wildlife when compared to single hedgerows. Distancing between rows will be a maximum of 50cm for semi-mature plants, and 30-40cm for bare root plants. There will be 4-6 plants sown per metre, and larger trees will be planted 10-15 metres apart, and a grass margin a minimum of 1m away from the hedgerow will be created to allow suitable habitat provisions for ground-nesting birds and for foraging areas. Stakes will be required for any specimens that are over 1m in height and will be required for the first year only.

Should any replanting specimens die within the initial years, new specimens will replace the dead ones to prevent any gaps in the hedgerow forming. The new hedgerow will need to be protected from grazing by livestock, through the erection of a new stockproof fencing, where required, which should be at least 3m away from the hedge, to allow the hedgerow to mature to 2m in width and allow the 1m setback for the grass margin to remain. The placing of the stockproof fence 3m out, allows for easier management, and enables space to reach over the fence to cut grassy verges every few years and the hedgerow. In the hedgerow's initial few years, regular light trimming is encouraged to form dense growth of plants. Mulch (woodchips, composed bark, sheep wool mats and/or straw) or hand cutting with a hand-held hook is recommended to prevent some species from competing with the hedgerow.

3.1.3.2 Infilling of Hedgerows with Shrub Species

The proposed infill of current hedgerows is proposed to screen the site entrance and a locally utilised walking track from the Proposed Development. This hedgerow bolstering covers the distance of 313 linear metres and will be composed of the following species:

- Hawthorn
- Blackthorn
- Hazel
- Wild Cherry
- Crab Apple
- Grey Willow
- Goat Willow

Infilling specimens will be of semi-mature native shrub specimens to ensure the screening effect upon the local walking track will be immediate and species proposed for replanting will be indigenous to the local area. Semi-mature specimens will be replanted every 10-15 metres apart.

[3] *Hedgerows Ireland (https://hedgerows.ie/hedgerow-management/)*
[4] *Hedgerow Planting: Answers to 18 common questions. Natural England (2008),*

When infilling the current hedgerow, care must be taken to ensure the new shrub plants are not shaded by pre-existing species, The All-Ireland Pollinator Plan[5] promotes hedge laying as the recommended choice which retains the flowers on the cut back vegetation which will also reducing shade to the new planted infill specimens. Coppicing the immediately surrounding trees or large shrubs is the alternative recommended method if hedge laying is not feasible. Flailing is not recommended as a form of cutting back surrounding vegetation such as hawthorn, which is common within the EIAR Study Boundary and the wider area, as this species relies on the previous year's growth to produce flowers.

3.1.3.3 Maintenance of Newly Planted and Infilled Hedgerow and Tree Planting

In order to facilitate the successful establishment of the new hedgerow and trees to be planted within the site, and to promote the biodiversity value of the new hedgerow the following maintenance measures are proposed:

- New hedgerow shrub planting will be kept weed and litter free until the new plants are established, particularly from ruderal weeds. Healthy growth will be maintained by allowing the plant to occupy as much of the planting areas as possible to allow them to achieve as close their natural form as possible;
- During spring and autumn maintenance periods all trees and plants will be checked and adjusted/replaced as required, soil firmed, and any dead wood present removed back to healthy tissue and mulch added if required. Where tree stakes and ties are no longer required these will be removed to avoid damage to the tree;
- During the first growing season, all standard trees/ semi-mature trees will be watered regularly during any prolonged dry periods during the growing season (i.e. in April, May, June, July and August). During the second growing season the trees will be kept well-watered as often as required, particularly during June, July and August.
- New hedgerows should be cut annually, with the cutting height raised by 10-15cm each year. This will allow the plants to flower and produce berries whilst preventing the height of the hedgerow from increasing too rapidly.
- Any tree, hedge or shrub that is removed, uprooted, destroyed or that becomes seriously damaged, defective diseased or dead shall be replaced in the same location with another plant of the same species and size as that originally planted. All such replacements shall be carried out within the first planting season following the loss.

3.1.4 Creation of a Grassland Mosaic during the Operational Phase

The proposed restoration phase will see the quarry voids infilled and reprofiled to previous topographic levels prior to excavation. The proposal for restoration is to return the site to previous land uses prior to quarrying, which will see the creation of agricultural grassland bordered by hedgerows and treelines. There is a proposal to create of 15.8ha of agricultural grassland within the Proposed Restoration Boundary. The grassland that will be created will be a mosaic of Dry calcareous and neutral grasslands (GS1) and Dry meadows and grassy verges (GS2), with the establishment of swards with good diversity of grass species. Such grasslands are not currently observed within the Proposed Development boundary and will increase the heterogeneity of habitats within the Proposed Development site and will increase the diversity of species found therein. The grassland will take 1-3 years to establish and once done so, the nature of the species comprising the swards will allow for tussocky grass species to form and create refuges and foraging areas for species that currently breed onsite or forage within the Proposed Development site.

See Figure 3-3 below for the Landscape Mitigation Plan that includes the locations of proposed grassland mosaics during the operational phase.

[5] *All-Ireland Pollinator Plan 2021-2025. National Biodiversity Data Centre Series No. 25, Waterford. March 2021.*

3.1.4.1 Establishing New Grassland Swards

The establishment of new grassland habitats within the Proposed development site will be comprise of a mosaic of species from both Dry calcareous and neutral grasslands (GS1) and Dry meadows and grassy verges (GS2) classified under the Heritage Council's *'Guide to Habitats in Ireland'* (Fossitt, 2000[6]).

The species recommended for sowing into the proposed new grassland areas include:

Grass Species:

- Cock's-foot (Dactylis glomerata)
- Red Fescue (Festuca rubra)
- Yorkshire Fog (Holcus lanatus)
- Creeping Bent Grass (Agrostis stolonifera)
- Sweet Vernal Grass (Anthoxanthum odoratum)
- Crested Dog's Tail (Cynosurus cristatus)
- False Oat Grass (Arrhenatherum elatius)

Broadleaf Species:

- Ribwort Plantain (Plantago lanceolata)
- Red Clover (Trifolium pratense)
- White Clover (Trifolium repens)
- Common Mouse-ear Chickweed (Cerastium fontanum)
- Knapweed (Centaurea nigra)

These grass species will provide a tussocky nature to the new grasslands, especially if *Arrhenatherum elatius* dominates the sward, which will provide a litter layer for small mammals and rodents to shelter within. This is important for the operational phase of the Proposed Development as these grasslands will provide foraging habitat for the breeding raptors currently onsite and colonising species within the wildlife tower and cumulatively the barn owl and kestrel nesting boxes permitted for the Fahy Beg Wind Farm. This proposed tussocky grassland habitat will provide cavities and microhabitats for pollinators such as bumblebees to shelter in and allow for pollinators to burrow or mine. The habitat will allow pollinators to feed and shelter for larvae, which long term will help keep the plant species diverse and abundant[7].

- Establishment of this grassland will be achieved by seeding the infilled and reprofiled quarry voids with the above-mentioned species mixture with certified Irish provenance seed from certified suppliers that conform to suitable agri-environmental schemes, such as Agri-Climate Rural Environmental Scheme (ACRES). Strip seeding is recommended for seeding the swards, due to the success of germinating following this sewing strategy that limits seed removal by foraging species. This strategy is also economically preferred as less seeds are required for seeding, and the method is further beneficial as once the grassland is established, the seeded species will disperse overtime and seed unseeded areas of the sward[8]. Any areas of the infill topsoil that contain compact soils must be removed prior to seeding.

3.1.4.2 Grassland Management Recommendations

This habitat will be managed as a rough grassland to establish a litter layer within the sward of tussocky grass species, this will ensure there is shelter for tunnelling habitats for pollinators and small mammals year-round within the Proposed Development site boundary. In Ireland, these grasslands are threatened

[6] *Fossitt, J. A. (2000). A Guide to Habitats in Ireland. Dublin: The Heritage Council.*
[7] *Creating wild pollinator nesting habitat. All-Ireland Pollinator Plan, How-to-guide 1. National Biodiversity Data Centre Series No. 5. Waterford. May, 2016, updated October 2022*
[8] *Rayburn, A.P. and Laca, E.A., 2013. Strip-seeding for grassland restoration: past successes and future potential.* Ecological Restoration, 31 *(2), pp.147-153.*

by abandonment and improvement. Management of the grasslands is required to prevent unwanted scrub species from encroaching into the new habitat onsite. If scrub species become dominant within the sward this could see a transition of the sward from grassland to scrub and potentially to woodland in the longer-term. Any intense grazing regime, spread of fertiliser or reseeding with highly productive non-native species would see a reduction in species diversity. Therefore, long-term management is required to maintain the litter layer while also eliminating scrub species.

In order to facilitate the successful establishment of the new grasslands to be seeded within the site, and to promote biodiversity value of the new grasslands the following options for management are proposed:

- Low density (0.3-0.4 livestock unit/hectare) cattle grazing of the grasslands will be implemented from late summer to late winter, with caution taking to not overgraze and lose the entire litter layer structure.
- If cattle grazing is not possible, topping of the sward may take place. Max depths of topping must not interfere with the litter layer and therefore the topping height must not be lower than 130mm (4-5inches).
- An alternative topping method includes alternative strip topping of the sward in late July/August. This entails splitting of the field up into equal strips and topping the alternative strips at a height of 80mm one year and repeating the process but cutting the uncut strips from the year before and not cutting the previous year's cut strips. This ensure each strip is cut every two-year cycle.
- If the above methods are not feasible for agricultural purposes, 6m wide riparian strips around all hedgerows and field boundaries will be established and cut to a height of 80mm every second year.

Shrub

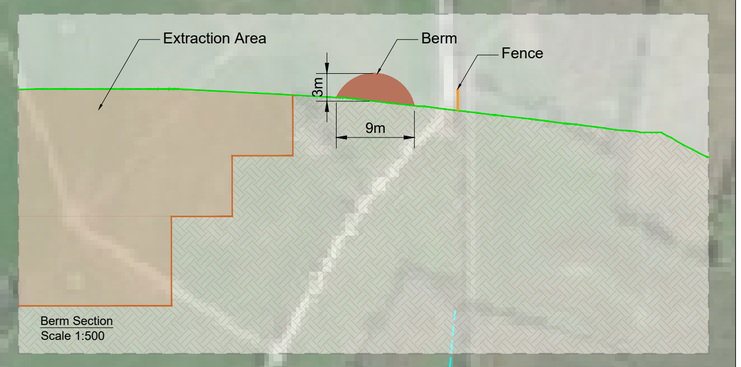
Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Ilex aquifolium	Holly
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow

Trees

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow
Corylus	Hazel
Sambucus	Elder
Quercus robur	Pedunculate Oak
Quercus petraea	Sessile Oak
Betula pubescens	Downey Birch
Betula pendula	Silver Birch

Infill hedgerow & planting by entrance:

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Corylus	Hazel
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow



Agricultural Lands

Settlement Pond

Settlement Pond

Wheelwash

Settlement Pond

Office

Proposed Settlement Ponds

Weighbridge

Settlement Pond Pipe

Processing Area

Stockpiling Area

Quarry Entrance

LEGEND

- Site Boundary
- Landowners Boundary
- Existing Mature Hedgerows to be retained
- Existing Mature Hedgerows to be removed
- **Proposed Native Infill Hedgerow Planting** Gaps in hedgerow alignment to be filled with native vegetation similar to existing species on site. Areas shown correspond to alignments where existing screening is scarce and requires additional planting. Some areas comprise of a dense yet low hedge alignment, therefore existing low hedges on site to be grown to a min. of 2m height.
- **Proposed Native Hedgerow** To screen the Proposed Development from view from adjacent visual receptors. Hedgerow to be planted in double or triple staggered rows as required, with forms, sizes, centres and percentages. Hedgerows are expected to grow to approximately 2.5m in 3-5 years. However, growth is dependent on plant quality, planting conditions, soil and weather, and therefore may be subject to change. The hedgerows within the site are to be maintained to a height of not less than 2 metres and up to 3 metres. Having continuous hedgerows assists the movement of bats and provides additional nesting and feeding opportunities for birds and other animals.
- Proposed Acoustic Barrier
- Fencing
- River
- Existing Scrub to be retained
- Existing Scrub to be removed
- Existing Immature Woodland to be retained
- Existing Immature Woodland to be removed
- Extraction Area
- Existing Grasslands Area to be retained
- Existing Grasslands Area to be removed
- Existing Treelines to be retained
- Existing Treelines to be removed
- Proposed Treelines
- Recolonising Bare Ground
- Bearm

DRAWING TITLE:
Landscape Mitigation Measures during Extraction

PROJECT TITLE:
Roadstone - Ballyquin Sand EIAR & PA

DRAWING BY: GO	CHECKED BY: SF
PROJECT No.: 220125	DRAWING No.: Figure 3-1
SCALE: 1:2,500 @ A1	DATE: 10.06.2024

MKO Planning and Environmental Consultants

Agricultural Lands

Settlement Pond

Wheelwash
Settlement Pond
Office
Proposed Settlement Ponds
Weighbridge
Settlement Pond Pipe

Processing Area

Stockpiling Area

Quarry Entrance

Shrub

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Ilex aquifolium	Holly
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow

Trees

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow
Corylus	Hazel
Sambucus	Elder
Quercus robur	Pedunculate Oak
Quercus petraea	Sessile Oak
Betula pubescens	Downey Birch
Betula pendula	Silver Birch

Infill hedgerow & planting by entrance:

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Corylus	Hazel
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow

Grassland areas:

Botanical Name	Common Name
Dactylis glomerata	Cock's foot
Festuca rubra	Red fescue
Holcus lanatus	Yorkshire Fog
Agrostis stolonifera	Creeping Bent Grass
Anthoxanthum odoratum	Sweet Vernal Grass
Cynosurus cristatus	Crested Dog's Tail
Plantago lanceolata	Ribwort Plantain
Trifolium pratense	Red Clover
Trifolium repens	White Clover
Cerastium fontanum	*mouse*-ear chickweed
Centaurea	Knapweed
Arrhenatherum elatius	False Oat Grass

LEGEND

- Site Boundary
- Landowners Boundary
- Existing Scrub to be retained
- Existing Immature Woodland to be retained
- **Existing Mature Hedgerows** To be retained and protected
- Fencing
- River
- River Buffer 20m
- Infill Areas
- Restoration Area
- Existing Grasslands Area to be retained
- Existing Treelines to be retained
- Proposed Treelines
- Proposed Acoustic Barrier

Proposed Native Hedgerow

To screen the Proposed Development from view from adjacent visual receptors.

Hedgerow to be planted in double or triple staggered rows as required, with forms, sizes, centres and percentages. Hedgerows are expected to grow to approximately 2.5m in 3-5 years. However, growth is dependent on plant quality, planting conditions, soil and weather, and therefore may be subject to change. The hedgerows within the site are to be maintained to a height of not less than 2 metres and up to 3 metres. Having continuous hedgerows assists the movement of bats and provides additional nesting and feeding opportunities for birds and other animals.

DRAWING TITLE:
Landform Restoration During Infilling

PROJECT TITLE:
Roadstone - Ballyquin Sand EIAR & PA

DRAWING BY:	GO	CHECKED BY:	SF
PROJECT No.:	220125	DRAWING No.:	Figure 3-2
SCALE:	1:2,500 @ A1	DATE:	10.06.2024

MKO Planning and Environmental Consultants

Agricultural Lands

Settlement Pond

Wheelwash
Settlement Pond
Office
Proposed Settlement Ponds
Weighbridge
Stockpiling Area
Processing Area
Quarry Entrance

Settlement Pond Pipe

Shrub

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Ilex aquifolium	Holly
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow

Trees

Botanical Name	Common Name
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Prunus spinosa	Blackthorn
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow
Corylus	Hazel
Sambucus	Elder
Quercus robur	Pedunculate Oak
Quercus petraea	Sessile Oak
Betula pubescens	Downey Birch
Betula pendula	Silver Birch

Infill hedgerow & planting by entrance:

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Corylus	Hazel
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow

Grassland areas:

Botanical Name	Common Name
Dactylis glomerata	Cock's foot
Festuca rubra	Red fescue
Holcus lanatus	Yorkshire Fog
Agrostis stolonifera	Creeping Bent Grass
Anthoxanthum odoratum	Sweet Vernal Grass
Cynosurus cristatus	Crested Dog's Tail
Plantago lanceolata	Ribwort Plantain
Trifolium pratense	Red Clover
Trifolium repens	White Clover
Cerastium fontanum	*mouse*-ear chickweed
Centaurea	Knapweed
Arrhenatherum elatius	False Oat Grass

LEGEND

- Site Boundary
- Landowners Boundary
- **Existing Mature Hedgerows** To be retained and protected
- Existing Grasslands Area to be retained
- Grassland to be restored
- Proposed Grassland
- Fencing
- River
- Restoration Area
- Existing Treelines to be retained
- Proposed Treelines
- River Buffer 20m
- **Proposed Native Infill Hedgerow Planting** Gaps in hedgerow alignment to be filled with native vegetation similar to existing species on site. Areas shown correspond to alignments where existing screening is scarce and requires additional planting. Some areas comprise of a dense yet low hedge alignment, therefore existing low hedges on site to be grown to a min. of 2m height.
- Vegetation Naturally
- **Proposed Native Hedgerow** To screen the Proposed Development from view from adjacent visual receptors. Hedgerow to be planted in double or triple staggered rows as required, with forms, sizes, centres and percentages. Hedgerows are expected to grow to approximately 2.5m in 3-5 years. However, growth is dependent on plant quality, planting conditions, soil and weather, and therefore may be subject to change. The hedgerows within the site are to be maintained to a height of not less than 2 metres and up to 3 metres. Having continuous hedgerows assists the movement of bats and provides additional nesting and feeding opportunities for birds and other animals.
- Existing Scrub to be retained
- Existing Immature Woodland to be retained
- Proposed Acoustic Barrier

DRAWING TITLE:
Landcover Restoration and Proposed Planting After Infilling

PROJECT TITLE:
Roadstone - Ballyquin Sand EIAR & PA

DRAWING BY:	GO	CHECKED BY:	SF
PROJECT No.:	220125	DRAWING No.:	Figure 3-3
SCALE:	1:2,500 @ A1	DATE:	10.06.2024

MKO Planning and Environmental Consultants

3.1.5 Management of Invasive Species

Himalayan Knotweed, listed on the Third Schedule of the S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011 was recorded within the Proposed Restoration Boundary. Details on the management and eradication of Himalayan Knotweed can be found within the Invasive Species Management Plan (ISMP) along with this application (Appendix 5-3 of Chapter 5).

Another non-native invasive species recorded on site was butterfly bush (*Buddleja davidii*). Although an invasive species, it is not listed on the Third Schedule, it is recommended to eradicate this species within the Proposed Development Boundary were found, and can be adequately managed during the construction and operational phases of the proposed project. The following measures will be implemented:

- All excavated topsoil will be stored onsite thereby preventing spread of vector material of the species to other sites. The seeds are relatively short-lived in the soil, rarely lasting longer than four years (TII 2020[9]).
- Plants are to be uprooted after flower heads have dried, the plants will be covered with plastic bags before uprooting to prevent spreading falling seeds.
- The uprooted plants themselves should be stored onsite to prevent spread of vector material to other sites. The branches of Buddleia are capable of rooting as cuttings, so care will be taken to ensure material is disposed of in a manner to avoid this risk.

The following measures have been drawn up to avoid potential impacts associated with the introduction and spread of any invasive alien plant species:

- Good construction site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (e.g. Himalayan Balsam, Japanese Knotweed etc.) by thoroughly washing vehicles prior to leaving any site.
- All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species.
- Wheel washing facilities will be provided at the site entrance. All washing must be undertaken in areas with no potential to result in the spread of invasive species.
- All infill material required at the site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present.
- Should despite these measures any invasive alien species be introduced to site, these shall be dealt with in accordance with guidelines issued by the TII - The Management of Invasive Alien Plant Species on National Roads – Technical Guidance GE-ENV-01105 (December 2020).

[9] *TII. (2020). The Management of Invasive Alien Plant Species on National Roads – Technical Guidance GE-ENV-01105. Transportation Infrastructure Ireland, December 2020.*

Plate 3-1 Butterfly Bush. Image Source: TII 2020

3.2 Fauna

3.2.1 Loss of Sand Martin Nesting Habitat

To facilitate the operational phase, there will be a loss of a total of 27 burrow entrances within a stockpile of sand, earth and gravel and an exposed sandy cliff face within the extraction boundary. Given the nature of sand and gravel quarries and the opportunistic nesting behaviour of sand martin, alternative nesting habitat will be made available to the species in the form of temporary stockpiles of sand and fine gravel, as well as sand cliff faces. This habitat will be available for the species for the duration of the lifetime operations within the quarry (approx. 22 years), however as restoration progresses suitable sand martin nesting habitat will be reduced. Therefore, it is proposed to provide long-term suitable habitat for sand martin within the Proposed Development site. This alternative nesting habitat will be provided for the species by utilising a man-made sand martin wall. The sand martin wall will provide permanent stable nesting habitat for sand martin when compared to temporary habitat that becomes available through quarrying activities. The temporary habitat has the potential to result in tunnel collapse with potential direct mortality of adults, eggs, chicks or fledglings. There is also a potential for disturbance to the temporary nesting habitat through quarrying activities and active machinery, however this alternative permanent habitat will provide a stable nesting location for the colony without the chance of tunnel collapse and disturbance, as the sand martin wall will be located away from areas of the quarry with high disturbance levels.

The location of the sand martin colonies onsite can be found in Figure 2-3.

3.2.1.1 Mitigations for Loss of Sand Martin Nesting Habitat

The loss of 27 active burrows within the Proposed Extraction Boundary will be offset by providing alternative suitable nesting habitat elsewhere within the Proposed Development site boundary for this species.

3.2.1.1.1 *Proposed Sand Martin Wall*

Sand martins (*Riparia riparia)* are migratory birds and arrive in Ireland to breed during the summer months from March to September before returning to overwinter in the Sahel. Sand martin are burrowing birds, that construct nesting tunnels in sandy or peat cliff faces of riverbanks, peatlands and

quarries. The birds feed on flying insects mainly over waterbodies. Sand martin are an Amber Listed Species under the Birds of Conservation Concern Ireland (BoCCI).

Quarry sites, especially sand quarries, are very important breeding grounds for this species[10]. Sand martins were recorded feeding within the quarry boundary during the surveys and were also recorded nesting in the sand cliff face at the south of the proposed extraction boundary. The 27 burrows within the stockpile and cliff face will be lost as a result of the Proposed Development. Therefore, it is proposed that alternative roosting and breeding habitat is provided for sand martin within the Proposed Development site boundary. This alternative habitat will be provided in the form of a sand martin wall. This structure can provide capacity for a multitude of burrowing nest chambers, and within the Proposed Development site boundary the wall will host 50 individual burrowing entrances and nests.

The 'Do nothing' impact of this Proposed Development on sand martin would result in the suitable habitat within the site currently diminishing due to vegetation regrowth and soil compaction which hinders tunnel formation.

Albeit suitable habitat will become available to the species during the operational phase of the Proposed Development in the form of temporary sand and gravel stockpiles, the sand martin wall will futureproof suitable nesting habitat onsite for the species following the cease of quarrying within the Roadstone Ballyquin Quarry, as the structure will remain in place during and following the restoration works and restoration of the site.

Naturally this species constructs tunnel entrances within vertical faces, away from areas of regular flooding and out of direct prevailing winds to avoid rain. Sand Martins require wide open spaces in front of nests to fly and forage, with direct access to the tunnel entrances. Furthermore, direct sightlines to foraging areas are hugely beneficial for the success of this species occupying the sand martin wall. For Ballyquin this is the man-made pond onsite, therefore the removal of vegetation is recommended for direct sightlines to the open waters onsite. The removal of 20 linear metres to accommodate the sand martin wall is outlined in Figure 3-1.

Given the nature of sand martin burrows and nests they are prone to tunnel collapse, predation and vegetation growing over banks[11], however, the sand martin wall as it is man-made, will provide security for these circumstances if appropriately maintained (See Section 3.2.1.1.2 below for maintenance measures of the sand martin wall).

The sand martin wall will consist of a double row of cement blocks up to a height of 1.5m, where thereafter, PVC piping will be placed within cavity blocks and surrounded by concrete to set in place to create the tunnels entrances. The blocks with the tunnels are lain on top of the outside row of cement blocks, with cavity blocks placed on the second row to create the nesting cavities. The tunnels to the burrows will be a length of approximately 57cm. The back of the cavity nest will be sealed with timber sheets with cut outs to match each cavity nest for easy access for monitoring the of the sand martin wall, and for cleaning and ringing of the bird species. Blocks will be laid surrounding the wall to form a small walk in room. Plastic or metal sheeting will be placed on top to cover the building and a door or metal sheet will be used to keep any mammals or birds away from accessing the nesting cavities.

The proposed location of the sand martin wall can be found in Figure 3-4.

An NPWS licence[12] for the use of lures will be required for the first breeding season after construction for the broadcast of sand martin calls and songs played from the sand martin wall in mid-March during the first breeding since after construction, to entice the returning sand martin to utilise the nesting cavities.

Predation is the main threat to sand martin walls; therefore, anti-predator measures will be instated to minimise direct predation of the species within the nests. Steel or aluminium sheets will be placed on the cement blocks underneath the tunnel entrances and 1m around the sides of the wall front to hinder predators climbing up the wall and accessing the tunnels and nests. Masonry fittings will be used to hold

[10] *Heneberg, P., 2007.* Sand martin (Riparia riparia) in the Czech Republic at the turn of the millenium. *na.*
[11] *Rohrer, Z., Rebollo, S., Andivia, E., Franco Goyena, J. and Rodriguez Urquia, C., 2020. Restoration and management for cliff-nesting birds in Mediterranean mining sites: the Sand Martin case study.* Restoration Ecology, 28*(3), pp.706-716.*
[12] https://www.npws.ie/licencesandconsents/hunting

the sheeting in place. Vegetation must also be cut back within a 2m radius of the sand martin wall front, particularly of scrub and bracken which rodents can climb onto to gain entry to the nests. Furthermore, a small pond is recommended to be instated directly in front of the sand martin wall. This provides a further deterrent for any potential predators entering the sand martin wall, as any predators will need to swim and climb vertically to access the structure.

A number of case studies where Sand Martin Walls were successfully established in Ireland have been reviewed, and the main findings have been briefly outlined below.

Sand Martin Wall and Extension at Dermot Doran's Thomastown House Project, Co. Kildare

The initial sand martin wall was built in 2019 with a capacity of 32 nesting cavities. The wall overlooks a man-made lake within Dermot Doran's farm, the lake was constructed two years prior to the wall. By 2021 all nests were occupied within the wall and a vast extension took place during the migratory absence of the species in the winter of 2021 and saw the increase of 108 nesting cavities, totalling 140 before the 2022 breeding season.

The design included cement blocks, cavity blocks, recycled sealant tube of sizes 45mm and 50mm to create tunnel mould, and concrete. The wall is vertical which is a preference for sand martin nesting natural in banks and faces of peat or sand. All tunnels were located a minimum of 1.5m from the ground, and tunnels were built to a length of 22cm. The tunnels took into account that natural nests occur at a slope uphill and this was replicated at every other tunnel within Thomastown House. Cavity blocks were lined with 5cm of builder's sand to create the nesting cavity. The sand martin wall at Thomastown House has a passage accessing the back of the nests, the passage is surrounded by walls and is covered with a waterproof membrane and capping stones to keep water out of the nests with corrugated metal secured overhead. The back of the nests are closed off with individual timber planks doors to allow ease of access when cleaning. At Thomastown House, the nests are monitored and inspected, with individual birds ringed onsite. Anti-predator defences in the form of metal sheeting are laid over all the 1.5m layer of cement blocks. The cost of the materials for the extension in 2022 totalled €2,500 approximately, not including digger hire and labour costs.

Further information on this case study can be found in Appendix 1 of this BEMP.

Sand Martin Wall at Harpers Island, Co. Cork

A sand martin wall with a capacity of 24 burrows was constructed at Harpers Island Wetland in 2021, on a grassy bank overlooking the waters at the estuary at the mouth of Lough Mahon, within Cork Harbour SPA. The wall is facing a southernly direction and out of the direct prevailing winds reaching Harpers Island at a southeasterly direction and the tunnel entrances were built approximately 300mm vertically and horizontally apart. The wall follows a design of three rows and 8 columns of tunnels. The design was composed of timber frames, PCV pipe tunnels, Marine Ply, and recycled plastic sheeting and plaster. Each pipe entrance and burrow was 1m in length. Builders sand was inserted into half fill the pipes, and the plaster created a tip at the burrow entrances to retain sand at the burrows.

Flooding measures were considered in the design of this structure, and the back PVC pipe was tilted downwards (5-10°) to prevent the burrow from flooding, and a drainage hole drilled into the pipe just inside the burrow entrance of the wall.

Swift call boxes were used to play looped sand martin songs and call recordings at the end of March in 2022. The recordings were powered by a 12V car battery.

Sand martin colonised the wall and successfully nested within the wall the following breeding season in 2022. An examination of the nesting success took place on the 19th of November 2022 and concluded that all 24 burrows were utilised. Cleaning of the nests took place after the 2022 breeding season, and refilling of builder's sand. The findings of the nesting behaviour during the breeding season included the following:

- 20/24 nests signs were located at the end of the tunnels, and the remaining four nests were based 60-64cm from the tunnel entrance.
- Nesting material included plant material like dead grass, and limited numbers of feathers were found across all 24 nests, however two nests were composed predominantly of feathers as nesting material.
- 21 nests were empty
- Two hatch shells were recorded in one burrow and another three eggs were found unhatched.
- A dead sand martin was found within one nesting cavity. The bird carcass possessed flight feathers, and it is hypothesized that the bird was juvenile but not confirmed.
- Three of the nests had two nest cups directly in from of the other, all other nests had a single cup present.

Further information on this case study can be found in Appendix 2 of this BEMP.

3.2.1.1.2 Maintenance of the Sand Martin Wall

In order to facilitate the successful establishment of the sand martin colony within the sand martin wall, the following maintenance measures are proposed:

- Cleaning of all nesting material will take place after the breeding season (March-September inclusive) for sand martin.
- All signs of breeding and/or use will be recorded at the end of season with data sent to Birdwatch Ireland.
- Prior to the breeding season (March) every year, all vegetation within 2m of the front and sides of the sand martin wall will be removed to limit predation chances.
- All metal/aluminium sheeting will be inspected concurrently, and all repairs of sections will occur place prior to the breeding season each year.

Fresh builders sand will be placed into the nests each year in February prior to the breeding season commencing in March.

3.2.2 Works in proximity to Barn Owl Nest

A Barn Owl nest was recorded onsite within an existing quarry plant. The nest location is located approximately 75m from the proposed extraction boundary. The construction and operational phase of the Proposed Development will result in significant indirect effects on the in-situ nest location, through disturbance to the species from earth movement, noise, concrete and cement pouring, extraction works and an increase in activity onsite, although all work will be carried out between the hours of 7am-7pm. Therefore, alternative nesting habitat for this species will be provided onsite located away from any potential areas of disturbance. This alternative habitat will be provided within a Wildlife Tower, which has a dedicated barn owl cavity, entrance and ledge for the species. The Wildlife Tower will be built at the north of the Proposed Restoration Boundary, within an agricultural field which is located over 650m from the proposed extraction boundary.

The restoration of the Proposed Development will involve the total provision of 15.8 ha of agricultural grasslands and hedgerows and 2,756 linear metres of hedgerows and 160 linear metres of treeline habitat planted on the Proposed Restoration Boundary of the current and future quarry void. The berms which contain a pre-existing natural seedbank from the topsoil, will be spread back over the regraded and re-profiled quarry voids. Additional species are recommended to be sown into the new swards, these species will create tussocky grasslands with a rich litter layer, under grassland management provisions, which will create rodent and small mammal habitat and shelter which will provide foraging opportunities for barn owl post quarry operations and restoration.

The location of the barn owl nest can be found in Confidential Appendix 1.

3.2.2.1 Mitigations for Works in Proximity to a Barn Owl Nest

Barn owl were recorded breeding and nesting within a cavity within an existing quarry plant. During the impact assessment for barn owl, significant impacts due to disturbance were identified, the provision of alternative habitat in the form of a wildlife tower with a dedicated barn owl entrance, cavity and ledge is required to mitigate the impacts to barn owl within the Proposed Development.

3.2.2.1.1 *Proposed Wildlife Tower*

Barn owls are resident and typically sedentary birds in Ireland, located mainly in the midlands and south of the country. This species breeding population is declining significantly and barn owls are categorised as a red listed species on the Birds of Conservation Concern Ireland, with the European populations also following the same declining trend. In Ireland over the last 40 years there has been a 39% decrease in the breeding range, and barn owls can no longer be found breeding in vast sections of the west, east and north of the country[13],[14]. The decline of barn owls in Ireland, follows that of other agricultural bird species, and is contributed by intensification of agriculture leading to the loss of species-rich foraging habitat, increased use of rodenticides and pesticides that bioaccumulate in the food chains[15].

This species breeds in large historical ruins and old derelict buildings, and occasionally in outhouses and large cavities in mature trees. Nest sites can be used for successive breeding seasons, and many suitable nesting sites may also provide nesting opportunities for other species such as Kestrel (*Falco tinninculus),* Raven (*Corvus corax)*, Peregrine falcon (*Falco peregrinus)*, and Jackdaw (*Corvus monedula)* and including many bat species. Despite being able to nest and roost in close proximity to other species, barn owl are highly sensitive to disturbance, and are rarely found breeding in locations of high human activity.

As the Proposed Development will see an increase of human activity and works proposed within approximately 75m of the site plant containing the nest, alternative nesting/roosting habitat will be provided onsite for the barn owl that utilise the Proposed Development site. The alternative habitat will be provided through a Barn Owl Trust wildlife tower. The tower will contain two floors and be 2m width x 2m length x 4.5m in height, which is proposed to be instated at the northern field within the Proposed Restoration Boundary. The floor of the barn owl nest box within the proposed wildlife tower will be located a minimum of 500mm below the access entrance. The dimensions of the barn owl access hole and floor chamber will be 1000m wide x 400mm deep x 500mm high, with an inspection panel. The proposed wildlife tower will provide a barn owl hole that is 150mm width x 250mm in height and will provide a ledge for barn owls to perch directly outside of the barn hole entrance. A tray 2 inches by 2 inches will be fixed to the wall outside the barn owl cavity, slung across the purlins, to aid with monitoring, cleaning and ringing. The barn owl hole will be facing the east, and as a result of the proposed location onsite there will be adequate distance and space for a fly path into the hole and ledge. The tower itself will be located away from all areas of human disturbance onsite during both the excavation and operational phases and is situated away from onsite access tracks and public roadways.

The wildlife tower will not only provide habitat for barn owl, but can also support Kestrel, numerous bat species, passerine bird species, and invertebrates.

- Bat species (both crevice and cavity dwellers) will be accommodated at the north facing walls for cold bat spaces for hibernating and overwintering and south facing walls of the tower for maternity and roosting colonies. Bat slots will be installed into the tower through the stone facing and inner blockwork (but not the roof), with dimensions of 150mm x 350mm. These bat access hole provisions will need to be higher on the north facing wall and lower on the southern facing wall, as shown in Appendix 3 in BTO drawing labelled 'Scheme'. The cold bat space dimensions at the north facing wall will be 250mm in depth x 1350mm in height with the width being as wide as space will allow. The cold space blockwork will have ply inspection panels and roofing tiles over and the bat hole at the top to allow entry and exit. The hot bat spaces at the

[13] *Bird Atlas 2007-11: The Breeding and Wintering Birds of Britain and Ireland.*
[14] *https://birdwatchireland.ie/birds/barn-owl/*
[15] *Lusby, J. and O'Clery, M. 2014 Barn Owls in Ireland: information on the ecology of barn owls and their conservation in Ireland. Kilcoole. BirdWatch Ireland.*

southern wall will be 300mm in width x 1100mm high and as wide as space allows up to the rafters, with a slate instated internally above the cold bat space provision. The hot space specifications will be made with plywood and insulated with celotex also acting as an inspection panel, with a bat hole at the bottom. Hession sacks will be placed around eaves on the inside of the tower to reduce drafts and draped on one side of the provision. 2FN Woodcrete bat boxes will then be instated within the plywood cavity inside the south facing wall. This will allow for warm air to rise. Both hot and cold roost provisions will be made flush to the door frame. Scored untreated rough sawn timber planks will be erected 25mm from the wildlife tower ceiling which will provide space for space for crevice dwelling bat species and roost locations for cavity dwellers. Two 2FN Woodcrete bat boxes will then be erected, one on the north wall and the second within the hot space provision within the tower. All bat boxes will be instated over 3m from ground level. Slates will be placed on end around the internal base of the wildlife tower.

- To accommodate kestrel, a trapezoid access hole 250mm wide (top) x 400mm wide (bottom) x 350mm in height will be created and a stone landing platform and perch will be located directly outside the access hole for kestrel. The kestrel nesting box will be 1000mm wide x 350 mm deep, with the nest floor just below the access hole. Space to the apex will be allocated as kestrel typically nest where they can see out of the nest sites. The nesting box will be made from 12mm plywood that will be fixed to the timber baton that is attached to the blockwork. An inspection panel will be provided through a wooden beam under the nest to aid with cleaning and ringing. The perching stone located on the outside of the wildlife tower will be 400mm wide x 350mm projection from the wall and 50mm in thickness. The kestrel access hole will need to face west. Note the kestrel internal nesting box will be built after the rafters/plywood cavity for bat provisions.
- Multiple cavities of differing sizes and depths within the external blockwork will be incorporated into all walls, with particular focus to the southern wall when building the wildlife tower to provide shelter and nesting opportunities for insects and passerine bird species.

Successful breeding is strongly correlated to suitable prey availability. Barn owls main prey consumption are the invasive Greater White Toothed Shrew (*Crocidura russula)* and Bank Vole (*Myodes glareolus)* and rely heavily and in some cases solely on established populations of these species[16],[17],[18]. Small mammals and occasionally amphibians (frogs) play a key role in barn owl diets when this prey is not available. Barn owls typically forage within 1-2km of the nest site during the breeding season but can travel up to 6km for food[19]. The proposed restoration of the Proposed Development will result in the creation of grassland of a tussocky nature, especially if *Arrhenatherum elatius* dominates the sward. This new habitat will provide a litter layer for small mammals and rodents to shelter within. This is important for barn owls (and other raptors utilising the site or colonising kestrel within the wildlife tower) as these grasslands will provide small mammal rich foraging habitats, which cumulatively will benefit any colonising barn owls and kestrel nesting boxes permitted for the Fahy Beg Wind Farm.

Monitoring measures for the wildlife tower can be found in Section 4.4 below. The proposed location of the wildlife tower can be found in Figure 3-4. See below Figure 3-5 for the proposed wildlife tower layout, and Appendix 3 for drawings and the layout of the bat and kestrel provisions within the wildlife tower.

3.2.2.1.2 Maintenance of the Wildlife Tower

In order to facilitate the successful establishment of breeding habitat of barn owl within the proposed wildlife tower, the following maintenance measures are proposed:

[16] *Lusby, J., Watson, D. and O'Halloran, J. 2008 The ecology of the barn owl Tyto alba in Ireland, with special reference to two introduced small mammal species; the bank vole Myodes glareolus and the greater whitetoothed shrew Crocidura russula. Irish Birds 8, 462.*
[17] *Lusby, J., McCarthy, A., O'Clery, M., Tosh, D., Watson, D., Nagle, T., Lawton, C. and O'Halloran, J. 2017. Using top predators to assess impacts and changes in small mammal communities. Irish Birds 10, 624.*
[18] *Smiddy, P., 2018. Dominance of invasive small mammals in the diet of the Barn Owl Tyto alba in county Cork, Ireland.* In Biology and Environment: Proceedings of the Royal Irish Academy *(Vol. 118, No. 1, pp. 49-53). Royal Irish Academy.*
[19] *Lusby, J. and O'Clery, M. 2014 Barn Owls in Ireland: information on the ecology of barn owls and their conservation in Ireland. Kilcoole. BirdWatch Ireland.*

- Cleaning of all nesting material will take place in November/December each year after the breeding season (March-September inclusive) for barn owl.
- All signs of breeding and/or use will be recorded at the end of season with data sent to Birdwatch Ireland.

Map Legend

- Proposed Development boundary
- Proposed Extraction boundary
- Proposed Restoration boundary
- Location of the Proposed Wildlife Tower
- Location of the Proposed Sand Martin Wall

N

Drawing Title	Location of the Proposed Wildlife Tower and Sand Martin Wall
Project Title	Proposed Quarry Extraction and Restoration, Ballyquin, Co. Clare
Drawn By: CT	Checked By: RW
Project No.: 211137	Drawing No.: Figure 3-4
Scale: 1:10,000	Date: 16.10.24

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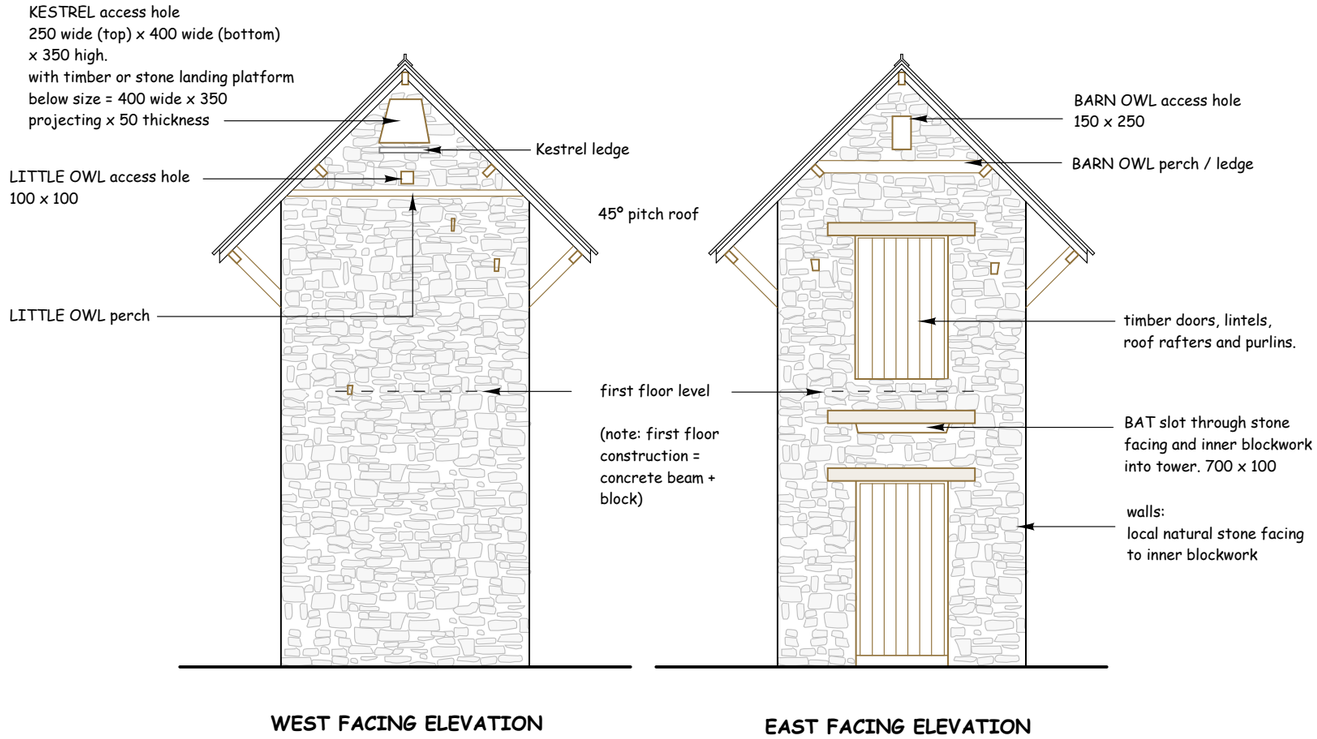
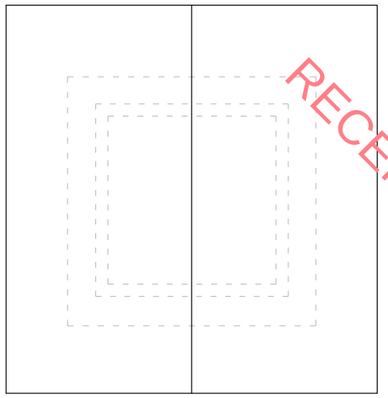


WEST FACING ELEVATION

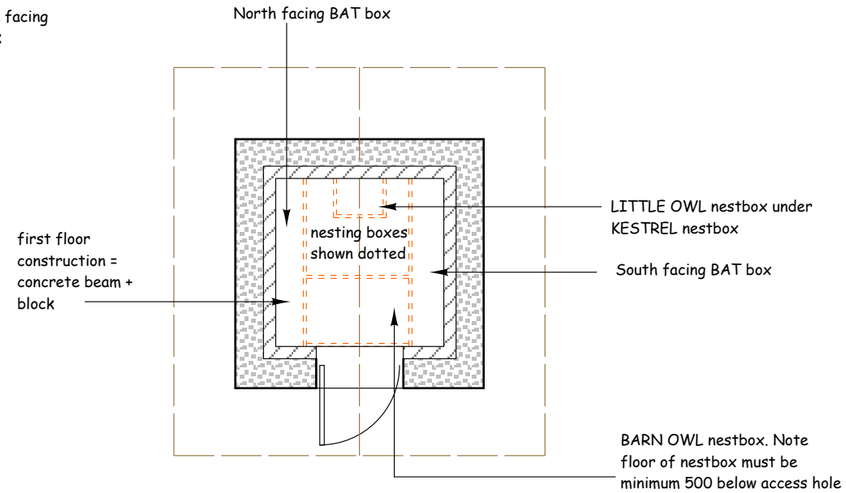
EAST FACING ELEVATION



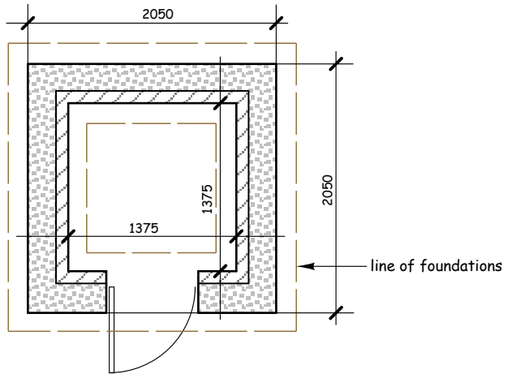
ROOF PLAN

NOTE

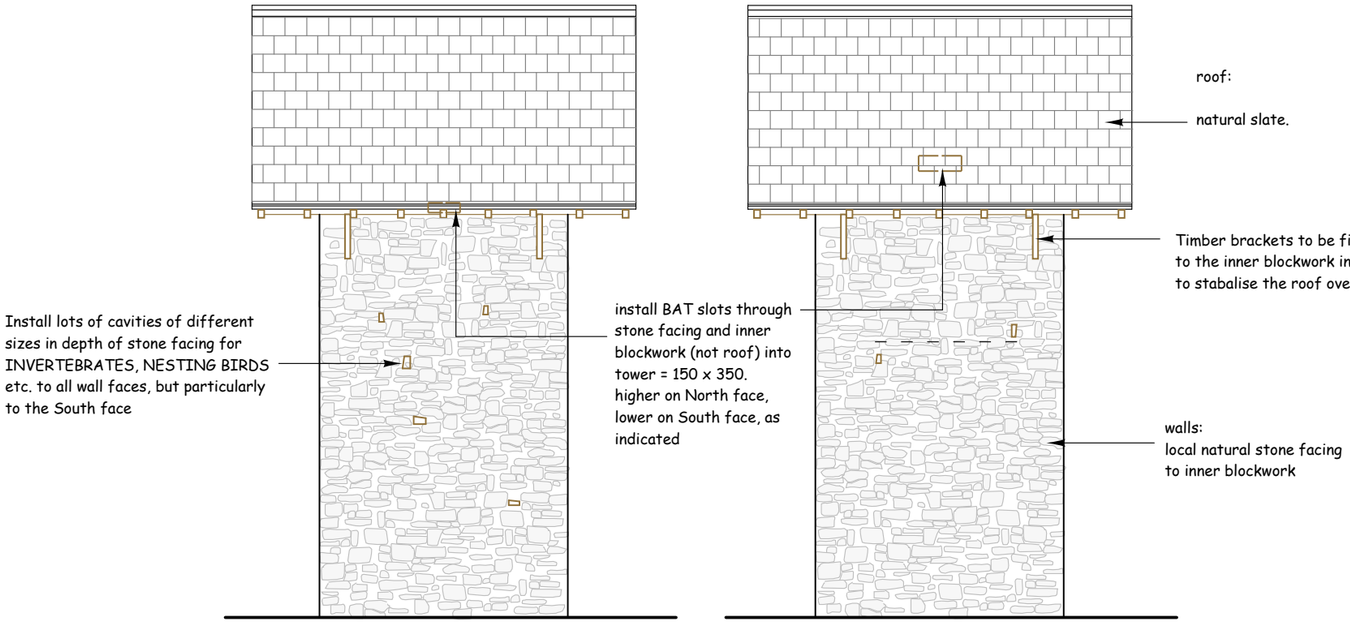
generous roof overhang at each gable end provides required shelter for safe fledging of young birds



FIRST FLOOR LEVEL



GROUND FLOOR LEVEL



SOUTH FACING ELEVATION

NORTH FACING ELEVATION

ALL DIMENSIONS IN MILLIMETRES

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project
BARN OWL TRUST
Proposed Wildlife Tower

drawing
Figure 3-5

project no.	drawing no.	
	04B	

scale	date	drawn
1-50	27 Oct 2010	MDF.

3.2.3 Bat Boxes

Four no. 2FN Woodcrete bat boxes will be erected on mature trees throughout the site to provide additional bat roosting opportunities. Bat boxes should have a southerly orientation and be positioned at least 2m from the ground (ideally 3m), away from artificial lighting. They will be placed adjacent to retained vegetation features such as treelines and hedgerows to ensure they are close to existing flight paths and can avoid wide open spaces (Collins, 2023). The exact location of the bat boxes will be determined by a qualified ecologist; however, they will be placed within the south-eastern area of the site where tree loss is expected. The proposed restoration of the quarry to grassland with hedgerows habitats will also provide improved foraging habitat for bats.

- A minimum of four no. 2FN Woodcrete bat boxes will be installed on suitable trees in accordance with best practice – at least 3m high on mature trees, away from lighting and at various aspects.
- The placement of the boxes is to be agreed with a suitably qualified Ecologist, following best practice guidelines (Kelleher & Marnell 2022, NRA 2006[20]).
- 2FN Schwegler Woodcrete bat boxes are recommended.
- The bat boxes will be placed adjacent to retained vegetation features such as treelines and hedgerows to ensure they are close to existing flight paths and can avoid wide open spaces (Collins, 2023)[21].

Plate 3-2 2FN Schwegler Woodcrete bat box. Image source: NHBS.com

[20] Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland
[21] *Collins, J. (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition). Bat Conservation Trust, London.*

4. MONITORING

4.1 Monitoring of Replanting and Infilled Hedgerow (WL1) and Treeline (WL2)

To confirm that habitat creation and enhancement has been successful, all areas of replanting as shown in Figure 3-3 will be monitored post-restoration. These areas will be inspected following the main growing season (i.e. in September) for the first five years of growth. This will be undertaken in partnership between the developer and the Project Ecologist. The proposed management actions will be conveyed to the developer, and management alterations implemented as required to achieve the targets of the management plan.

Hedgerows and replanted trees will be inspected following the main growing season (i.e. in September) for the first five years of growth, where the requirement for replacement planting will be assessed. If any shrubs are dead or damaged these will be replaced using the same species within the next planting season. Recommendations for ongoing or remedial management required will be specified within an Annual Environmental Report. Inspections of the replanted hedgerows and trees will be carried out once per year around September in years 1, 2, 3, 4 and 5.

4.2 Monitoring of Grassland Establishment

Monitoring should be carried out for the first three years post seeding or until the grassland has been sufficiently established and has given consistent results.

Monitoring will involve the following:

- The extent of the grassland establishment
- Percentage of ground-coverage
- Percentage of bare patches
- Percentage of scrub encroachment (if present)
- Condition of the grassland
- Presence/absence and percentage cover of the litter layer
- Success of the grazing regime

Monitoring is required to inform the grazing regime. Alterations to the grazing regime may be required depending on the condition of the grassland and the litter layer, which offers habitat for prey species of raptors.

4.3 Monitoring of Sand Martin Wall

A post consent monitoring schedule for years 1, 2, 3, 5 and 10 of the sand martin wall will be undertaken by a suitably qualified ornithologist/ecologist.

Monitoring inspections will:

- Quantify the number of nesting cavities that showed signs of occupation and non-occupation.
- Measure the distance that the nests are located from the tunnel entrance.
- Document the bedding material used in each occupied tunnel.
- Record any evidence of hatched eggshells or unhatched eggs .
- Evidence of any dead sand martin chicks, fledglings, juveniles or adults.
- All nesting cavities will be cleaned out after the monitoring inspections have been completed.

- Bespoke maintenance recommendations will be made by the ornithologist/ecologist following the completion of the monitoring surveys and prior to the following breeding season.

All monitoring will take place at the end of the breeding season in the months of October to December, concurrently with the wildlife tower (See Section 3.4). Monitoring results will be shared with Birdwatch Ireland prior to the beginning of the following breeding season.

4.4 Monitoring of Wildlife Tower

Monitoring will be primarily focused the barn owl cavity of the tower, however all species accommodated for will be monitored.

Two dedicated breeding surveys for barn owl following CIEEM and SNH[22] best practice guidelines will be undertaken by a suitably qualified ornithologist/ecologist. Surveys will take place between mid-June to early August in operation years 1, 2, 3, 5, and 10 to check for fledged juveniles. Although it is rare, a second clutch may take place in July and caution must be taken as barn owls are very sensitive to disturbance while breeding. Signs of nest occupancy (whitewash, pellets, evidence of feathers etc.), signs of breeding behaviour (prey pass, or prey brought to the nest etc.) and activity will be monitored during the surveys.

Monitoring inspections will also include:

- Concurrent with the barn owl surveys, the determination of occupation within the kestrel nesting cavities following SNH guidelines will take place and signs of non-occupation will be recorded if required.
- All raptor cavities will be inspected at the end of the breeding season (October to December) by a suitably qualified ornithologist/ecologist concurrently with the sand martin wall. Inspection will include maintenance checks and recommendations will be outlined if required.

Monitoring results will be shared with Birdwatch Ireland prior to the beginning of the following breeding season.

[22] *Hardy, J, Crick, H, Wernham, C, Riley, H, Etheridge, B and Thompson, D. (2009). Raptors: A field guide for surveys and monitoring. Scottish Natural Heritage (SNH), Inverness, UK.*

5. CONCLUSION

This Biodiversity Enhancement Management Plan sets out the measures to be implemented to ensure that the Proposed Development results in the generation of habitats that maximise benefit for local biodiversity. This BEMP has set out measures to be implemented during the monitoring period after restoration and instatement of alternative breeding habitat for barn owl and sand martin, to ensure that the measures are successful, as well as monitoring by an ornithologist/ecologist to ensure the success of the breeding habitat and restoration measures.

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https://www.npws.ie/licencesandconsents/hunting

https://birdwatchireland.ie/birds/barn-owl/

APPENDIX 1

DERMOT DORAN'S THOMASTOWN HOUSE PROJECT - STEP BY STEP GUIDE HOW TO BUILD A SAND MARTIN WALL

HOW TO BUILD A NESTING WALL FOR SAND MARTINS

Step-by-Step Guide

(based on Dermot Doran's Thomastown House Project)

Dermot Doran and his Thomastown House Sand Martin Nesting Wall

This publication is based on the successful Thomastown House Sand Martin Nesting Wall Project created by Dermot Doran on his farm in Co. Kildare with help from Feargal Ó Cuinneagáin and Anthony Mooney.

The information provided has been written and compiled by Lynda Huxley (Nature of Ireland) in close collaboration with Dermot Doran in August 2022. It is aimed at providing guidance to anyone who wants to build a Sand Martin nesting wall but no responsibility can be taken for any such projects. Before undertaking your project you may wish to consult a registered builder and/or a civil engineer.

Cover: photos of Sand Martins © Declan Doran
Photos marked M.P. courtesy of Mike Pearson

Table of Contents

M.P.

About the Sand Martin

Sand Martins *Riparia riparia* are the smallest member of the European hirundine family, which also includes Swallows and House Martins. They are migratory birds that come here to breed from mid-March to September, spending the rest of the year in sub-Saharan Africa.

They feed on flying insects, mainly over wetlands. They will perch on wires and branches. They are colonial nesters and normally breed in burrows dug into riverbanks, peat banks or quarries.

In Ireland, Sand Martins are now classified as an amber-listed bird of Conservation Concern and so providing secure nest sites in purpose-built Sand Martin nesting walls will help with the conservation of this beautiful bird.

M.P.

About the Thomastown Sand Martin Nesting Wall

The Thomastown House Sand Martin nesting wall is built at one end of a man-made lake constructed on Dermot Doran's farm in 2017. You don't need to have a lake to build a Sand Martin wall because many natural colonies are built where there is no lake, however, you must ensure it is safe from predators. The nest entrances for all walls should be at least 1.5 metres above ground level and a sheet of steel added below the entrances (see page 17).

The initial wall was built in 2019 and contained 32 nest chambers. By 2021 all these nest chambers were occupied by Sand Martins so, in the winter of 2021 a further 108 nest chambers were added to give a total of 140 for the 2022 season. When the Sand Martins returned in spring 2022, they immediately adopted the new nest chambers and the colony increased.

The structure is composed of:

- a front wall made up of two rows of cement blocks. Solid blocks up to 1.5 metres and above that an outer row of cavity blocks containing the entrance tunnels and an inner row of cavity blocks containing the nest chambers - see diagram on page 7.
- a passage which runs between the front wall and the back wall. This passage allows the nest sites to be accessed for cleaning, maintenance and research.
- a back wall
- a roof covering the whole structure

Sand Martins are colonial nesters, therefore, we strongly recommend that anyone building a nesting wall for them should provide a minimum of 30 nest chambers and many more if your space and budget allow.

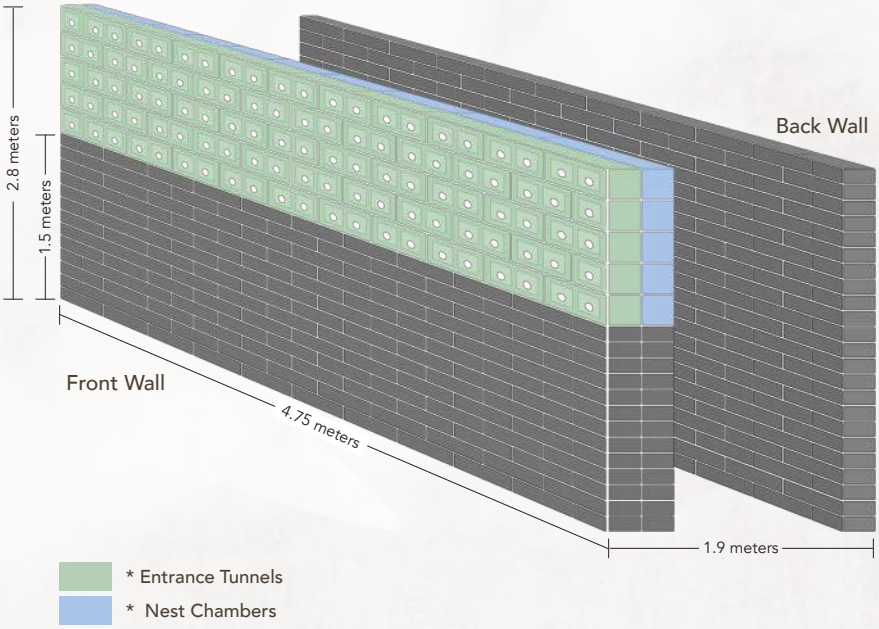
Steps of the wall building process

1) Pre-prepare the nest chamber entrance tunnels in cavity blocks using plastic tubes and cement. One tunnel is needed for every nest cavity e.g. 140 in the case of the Thomastown project.
2) Dig and lay foundations.
3) Build nesting wall using a double row of cavity blocks. The outer row has the cavity blocks with the pre-prepared entrance tunnels and the inner row has the nest chamber.
4) If required, leave a passage way (to enable access the nest chambers) and then build the back wall.
5) Put roof over the whole structure to make it weatherproof.

Dimensions of the Wall

The dimensions of the wall after it was extended in the winter of 2021 are:

- Length: 15.6ft / 4.75 metres
- Height: 9.2 ft / 2.8 metres
- Depth: 1.9 metres (this includes the space for the passage)



Materials used to Build the Thomastown Wall

- Solid cement blocks for base layers of the nesting wall and the parallel back wall
- 9" (215mm) wide cavity blocks for the rest of the wall

Step 1 – Making the Nest Chamber Entrance Tunnels

In the wild Sand Martins build their entrance tunnel so that it slopes slightly uphill, this is to prevent any water entering the nest chamber. At Thomastown House every other tunnel was sloping uphill whilst the one in between was more or less horizontal. It was built in this way to give the wall entrances a more random appearance and so look more like a natural colony.

Pre-prepare the nest chamber entrance tunnels in the cavity blocks before starting any building work. Make as many tunnels as you need e.g. 60 nest chambers equals 60 tunnels.

Entrance Tunnel Dimensions

Tunnel Diameter: two different sizes of silicone sealant tube were used at the Thomastown project 45 and 50mm to make the tunnel.
Note: Instead of silicone sealant tubes you can use 50mm pvc pipe cut to length.

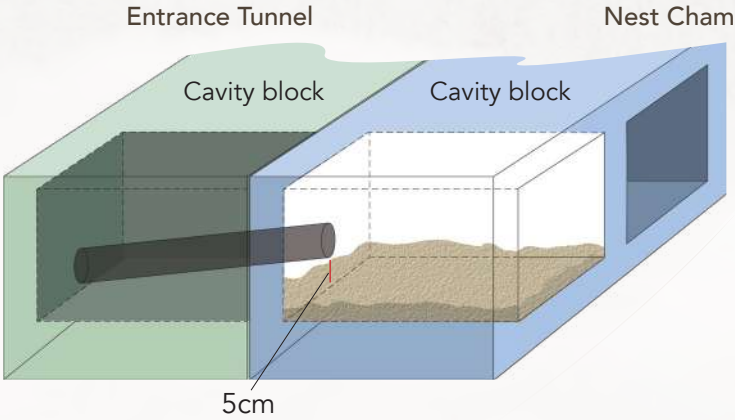
Tunnel Length : 9 inches / 22cm

How to make the Tunnel

1) Place a silicone sealant tube or piece of pvc pipe in a cavity block.

   NOTE: For a sloping tunnel, one end of the tube should be flush with the bottom of the block and then tilted slightly towards the nest chamber. The end result is that the when the tunnel reaches the nest chamber it is approx. 5cm above it and you will have to fill the nest chamber with builders sand until is it at the same level as the tunnel.

2) Make up a quantity of concrete - approx. 5 parts sand to 1 part cement – see instructions on the cement packet. Carefully fill the space around the tube with the concrete to hold the tunnel tube in place – as specified under 1) above.



Cement placed around the tube

3) Before the concrete has fully set remove plastic tube leaving a perfect tunnel with a diameter of 45 or 50 mm depending on the size of tube you have used. Both diameters are being used at the Thomastown project with no obvious preference so far.

Step 2 - Foundations

Dimensions

Dig and lay foundations to the following dimensions :

- length 5.5 m
- width 2.5 m
- depth 0.3m

NOTE: The dimension of the foundations will vary depending on the size of wall you want to build and the terrain you are building on e.g. peaty, rocky, sandy etc. The Thomastown House Project foundations were made to accommodate a nesting wall made up of two rows of cavity blocks, an access tunnel in the centre and a solid back wall, capped off with a corrugated roof. You may wish to get a registered builder to lay the foundations of your own wall depending on size and location of your project.

Step 3 – Building the Nesting Wall

- The face of the wall must be vertical (Sand Martins prefer vertical walls because they know there is a reduced risk of predators being able to access the nest sites)
- Once the base is cured build two rows of solid cement blocks until you reach 1.5 metres above ground level
- From that point onwards use the cavity blocks - see Step 4.

several layers of cement block to 1.5 metres above ground level

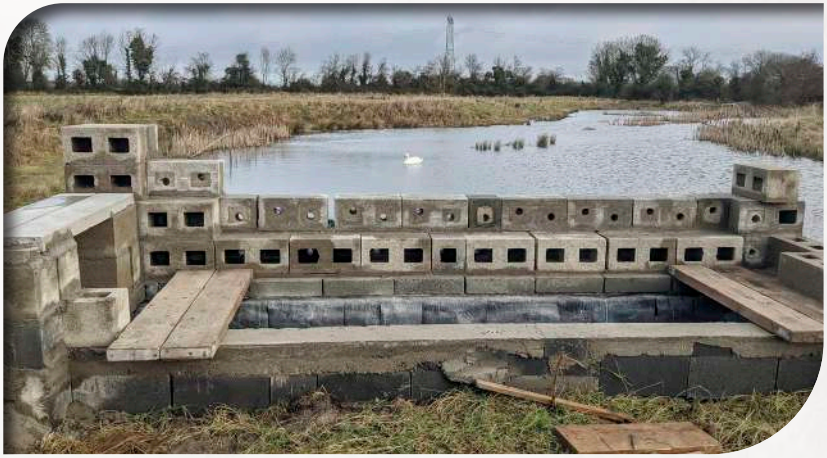
Above 1.5 metres use the cavity blocks

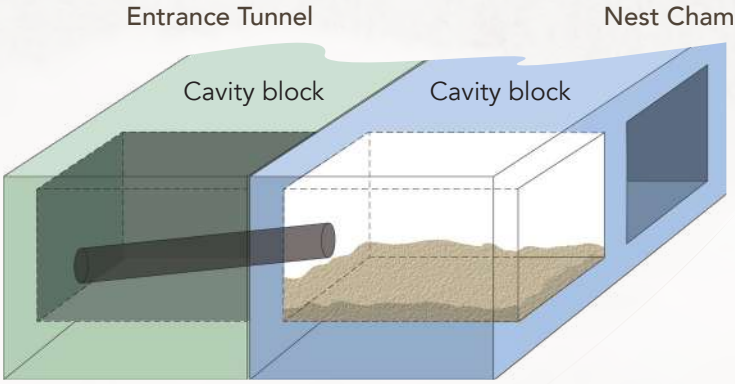
Step 4 – Placement of tunnels and nest chamber

Where to start the first row:
The first row of tunnels should be at least 1.5 metres above ground level or the highest water level.

Outer Cavity Blocks
The outer row is composed of the pre-prepared cavity blocks that contain the entrance tunnels - as per Step 1.

Inner Cavity Blocks
The inner row is composed of the cavity blocks which will be used as the nest chambers - see image below.





The Nest Chamber

Line the floor of the nest chamber with 2"/5 cm of builders sand so that it is level with the bottom of the tunnel.

Closing off the Nest Chamber

- The back of the nest chambers is closed off with a 9x1" timber plank which is fixed securely in place.
- Some of the Thomastown nest chambers have their own individual door which allows access to the nest chamber for cleaning, inspection, ringing and monitoring *(carried out under NPWS licence).*

Small door gives access to one of the nest chambers.

Step 5 – Passage and Rear Wall

If you want to have a passage so that you can access the nest chambers then you'll need to build a parallel wall using solid cement blocks to the same height as the nesting wall.

Passage way

Step 6 – Top of Wall and Front of Wall

TOP OF WALL

Cover the top of the nesting wall with waterproof membrane and capping stones.

FRONT OF WALL

Sheets of steel are fixed to the bottom of the wall (from ground level or the highest water level) to the first row of tunnels - the smooth surface of the sheets makes it difficult for predators to climb up to the nest entrances. Masonry fixings are used to fix the sheets of steel to the wall.

Original wall built in 2019
with the sheets of steel in place under nest entrances

Step 7 - Roof

Place a piece of corrugated sheeting or something similar to act as a roof. This is purely to keep the structure weatherproof and is not for carrying any weight. This should be secured in place.

Approximate cost of the project

The approximate cost for the materials in 2022 was €2,500 which excludes labour and digger hire.

Attracting Sand Martins to the Wall

You can play attraction calls to catch their attention. Don't forget to apply for an NPWS lure licence if you play calls https://www.npws.ie/licencesandconsents

You can download a call from the internet and load it onto a USB stick https://www.xeno-canto.org/species/Riparia-riparia

With Power Source :

If you have a power source at your wall you can :

- play the call from a CD player
- or an amplifier system as used for swift attraction calls

  http://www.swiftconservation.ie/wp-content/uploads/2020/04/2020-Notes-on-sound-system-for-playing-swift-attraction-calls-by-Lynda-Huxley.pdf
- or an old laptop with speakers or any suitable device than can play calls through a speaker

No Power Source :

If you don't have a power source at your wall you can use a battery operated or chargeable device such as multi-media player. For example ;

- Auna multimedia waterproof speaker https://www.hifi-tower.ie/HiFi-TV/Multimedia-Home-Audio/Wireless-Speakers/Bluetooth-Speakers/Beachboy-Portable-Bluetooth-Speaker-USB-SD-AUX-FM-Blue-Blue-L.html?gclid=EAIaIQobChMI88X81O_G8AIVgdPtCh0dKQndEAQYBSABEgIH4PD_BwE

More Information

If you'd like more information you can contact Dermot Doran @ dermot1970.dd@gmail.com

In March 2022 Dermot and his Sand Martin Nesting Wall featured on RTE News. It is available to view on YouTube https://www.youtube.com/watch?v=eZJdmXRo-qY

Additional Notes

- This publication has been prepared to provide advice and guidance only and you may wish to seek professional advice before undertaking your own project.
- Whilst every care has been taken in compiling this document, no responsibility can be taken for any other such Sand Martin Wall projects. Please note that access to nest chambers for research and photographing of birds must be carried out under NPWS licence.
- If you plan to build a Sand Martin nesting wall in a protected area please consult NPWS prior to commencing any work to get their approval.
- Planning permission was not required for the Thomastown House project. However, in certain situations it may be necessary for you to obtain planning permission. Consult your local planning office if you are unsure.
- The methods used in the Thomastown Sand Martin nesting wall Project have been hugely successful. However, we can give no guarantee that Sand Martins will use other such projects – but it's always worthwhile trying because Sand Martins need safe and secure places to nest.

M.P.

M.P.

OPW Oifig na nOibreacha Poiblí Office of Public Works

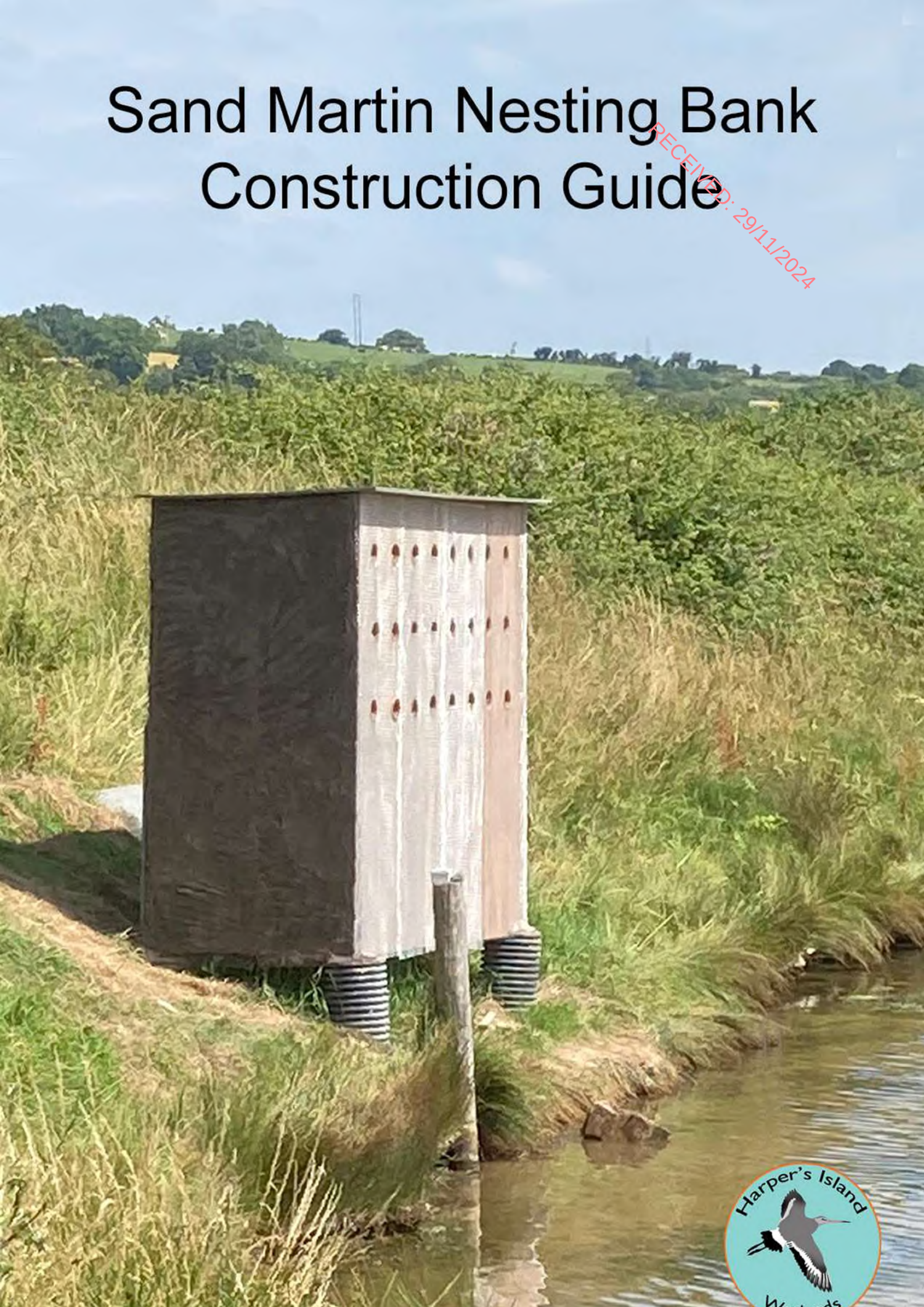
Printing of this leaflet has been made possible with support from the Office of Public Works

Design & Print Bridge Signs, Ballinrobe, Co. Mayo.

APPENDIX 2

HARPERS ISLAND – SAND MARTIN WALL CONSTRUCTION GUIDE

Sand Martin Nesting Bank Construction Guide



Introduction

We built our Sand Martin nesting bank in 2021 and it was used by the birds the following year. This guide describes our own design based on information on the construction of artificial Sand Martin banks found on-line. There are other designs out there which use different materials etc.

Materials

1. Marine Ply six 2440mm x 1220mm x 25mm (8ft x 4ft x 1inch) sheets.
   With the price of marine ply going up a cheaper alternative is cement board. This can also be plastered without the need for wire mesh.

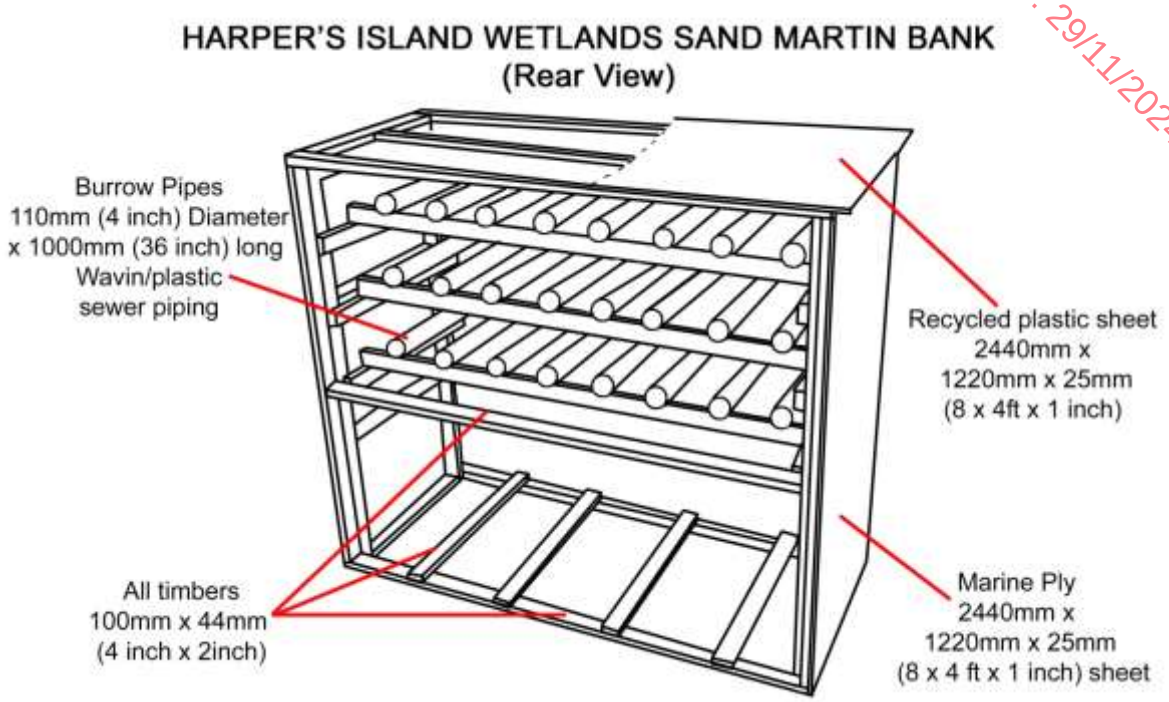
2. Recycled plastic one 2440mm x 1220mm x 25mm (8ft x 4ft x 1inch) sheet. Marine Ply can be used instead of the recycled plastic sheet.

3. 100mm x 44mm (4 inch x 2inch) deal timber
4. 110mm (4 inch) Wavin/plastic sewer piping.
5. 300mm – 380mm (12 – 15inch) plastic drainage pipe for support piles for the bank.
6. Builders mesh for front and sides to support plastering to give the bank a natural look finish.
7. Sand Martin looped call player (NOTE: License is required from NPWS to use this)
8. 12 Volt Car Battery to power the call player.

Locating the bank

Sand Martins like to nest over water with the lowest nest burrow approximately 1m above the water. The Harper's bank is facing south with the prevailing winds from the southwest but apparently there is no preferred direction but would suggest not straight into the prevailing winds to minimise rain getting into the burrows.

Construction



1. We did not have solid ground on which to build the bank so we cut and half buried 12 – 15inch/300mm – 380mm drainage piping in the four corners of the base footprint of the bank and filled them with concrete and inserted fastening bolts to make the support piles for the bank.

2. Once the concrete has set erect the frame for the Sand Martin bank using 100mm x 44mm (4 inch x 2inch) lengths of timber, starting by bolting the base to the concrete piles.

3. Attach vertically two sheets of marine ply to the front and one each vertically to the sides of the frame.

4. We used a 2440mm x 1220mm (8ft x 4ft) recycled plastic sheeting for the roof. Alternatively marine ply can be used for this.

5. Attach builders mesh to the front and sides of the bank to support plastering to give the bank a natural look finish.

6. Cut the 110mm (4 inch) Wavin/plastic sewer piping into 36 inch/1000mm lengths to make the burrow pipes.

7. The front of the bank is 2440mm x 2440mm (8 ft X 8 ft) .The nest holes need to be at least 300mm (12inches) apart both horizontally and vertically. The lowest burrows should be at least 1000mm (3ft) above the summer high water mark/ground. We put our nest holes in the upper half of the front of the bank.

8. Our design allows for three rows of eight burrows.

9. The back of the lengths of burrow piping needs to be angled up about 26mm (1 inch) higher than the front (about 5-10 degrees) to stop water that gets in the front from flooding the burrow. Drill a 12-14mm (1/2 inch) drainage hole in the bottom of the pipe just inside the front of the pipe.

10. The burrow pipes are mounted on 100mm x 44mm (4 inch x 2inch) horizontal timbers and secured to them using screws and galvanised banding.

11. Then plaster the front and sides to give the bank a natural look finish.

12. When plastering the front use some plaster to create a concrete lip at the burrow entrance so it half covers the entrance hole to keep the sand in.

13. Once all the burrow pipes are in place half fill them from the back with builder's sand and cap the back of the burrow pipes with plastic caps or wooden discs in our case. These need to be removable to allow cleaning out and refilling with sand between breeding seasons.

14. The sides and roof 1220mm (4ft) wide so that the pipes are enclosed in the box to keep them steady in the wind.

15. Finally secure two Marine Ply 2440mm x 1220mm x 25mm (8ft x 4ft x 1 inch) sheets horizontally on the back of the bank. Make sure these can be easily removed between breeding seasons to facilitate access to clean the burrow pipes and add sand where needed.

16. To keep rats and other mammals off the bank you can also attach lengths of 450mm (18 inch) aluminium sheeting or similar at a downward 45 degree angle around the base.

17. From the end of March we set up a looped recording broadcasting Sand Martin calls to attract arriving birds. We used Swift Call Boxes (swiftcallboxes@gmail.com) which we found great value for money and resulted in birds nesting in our artificial Sand Martin bank in its first year. It was powered by a 12 volt car battery. IMPORTANT: You will need a license from the National Parks and Wildlife Serve to broadcast.

For more information on looped recording broadcasting equipment:

https://twitter.com/MayoCorncrake77/status/1518196655564238849

https://www.pippahackett.ie/post/sand-martin-wall-design

swift-conservation.org

https://www.swiftconservation.ie/nest-box-advice/

Appendix 1.

Examination of Harper's Sand Martin Nests 19th November 2022.

After an incredibly successful first season, with all 24 nesting burrows occupied, we removed all nests from the nesting burrows in the Sand Martin nesting bank to have the burrows clean and topped up with fresh sand. We took the opportunity to record details of the nests.

- All 24 burrows had evidence of occupation.
- 20 nests were situated at the very back of the one metre nesting tunnels and four were situated 60 - 64cm from the front of the tunnels.
- The majority of nests were composed of dead grass/plant material with very few if any containing feathers.
- Only two nests had substantial amounts of feathers with one made almost exclusively of feathers. The feathers looked like gull feathers, probably feathers dropped by preening Black-headed Gulls.
- 21 nests were empty.
- One nest contained three unhatched eggs and two hatched egg shells.
- One nest contained a hatched egg shell.
- One nest contained a dead Sand Martin with full flight feathers. Possibly a juvenile based on pale edging to some of the visible flight feathers?
- 21 burrows had one nest cup and three had nests with two nest cups, one immediately in front of the other. The three doubles were made from dead grass/plant material.

Cleaning out the nesting burrows.

A nest at the very back of the nesting burrow.

A nest made from mostly feathers at the very back of the nesting burrow.

The nest made mostly of feathers.

Two nests one in front of the other.

22 of the 24 nests showing the variety of materials used.

There is thin buff edging to the visible primaries and secondaries suggesting a young bird?

Three unhatched and two empty shells in this nest.

For more information on Harper's Island Wetlands:

www.harpersislandwetlands.ie

info@harpersislandwetlands.ie

https://www.facebook.com/harpersislandwetland

APPENDIX 3

BTO WILDLIFE TOWER DRAWINGS

KESTREL access hole
250 wide (top) x 400 wide (bottom)
x 350 high.
with timber or stone landing platform
below size = 400 wide x 350
projecting x 50 thickness

Kestrel ledge

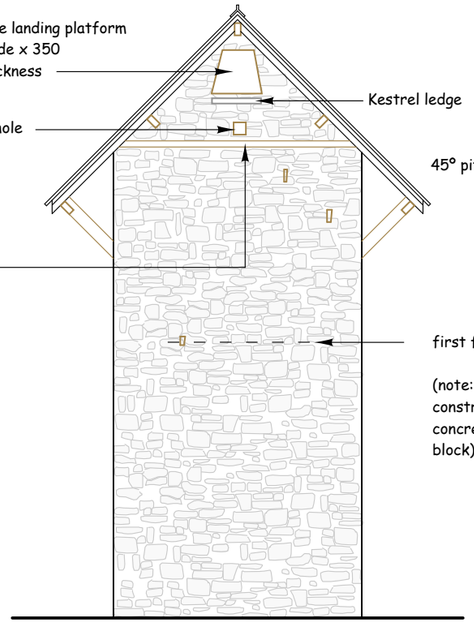
LITTLE OWL access hole
100 x 100

45° pitch roof

LITTLE OWL perch

first floor level

(note: first floor
construction =
concrete beam +
block)



WEST FACING ELEVATION

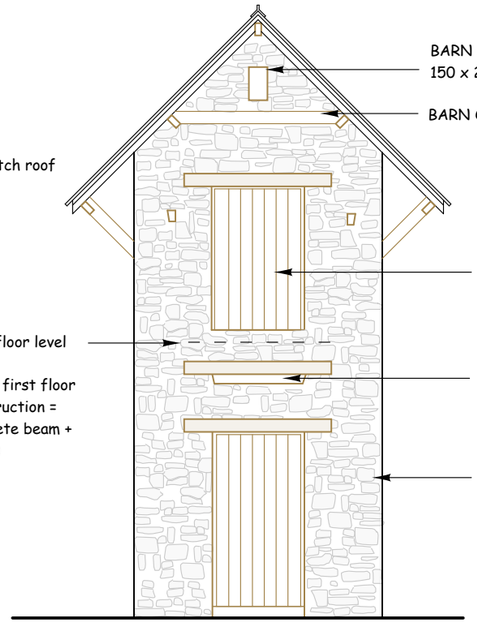
BARN OWL access hole
150 x 250

BARN OWL perch / ledge

timber doors, lintels,
roof rafters and purlins.

BAT slot through stone
facing and inner blockwork
into tower. 700 x 100

walls:
local natural stone facing
to inner blockwork



EAST FACING ELEVATION

roof:

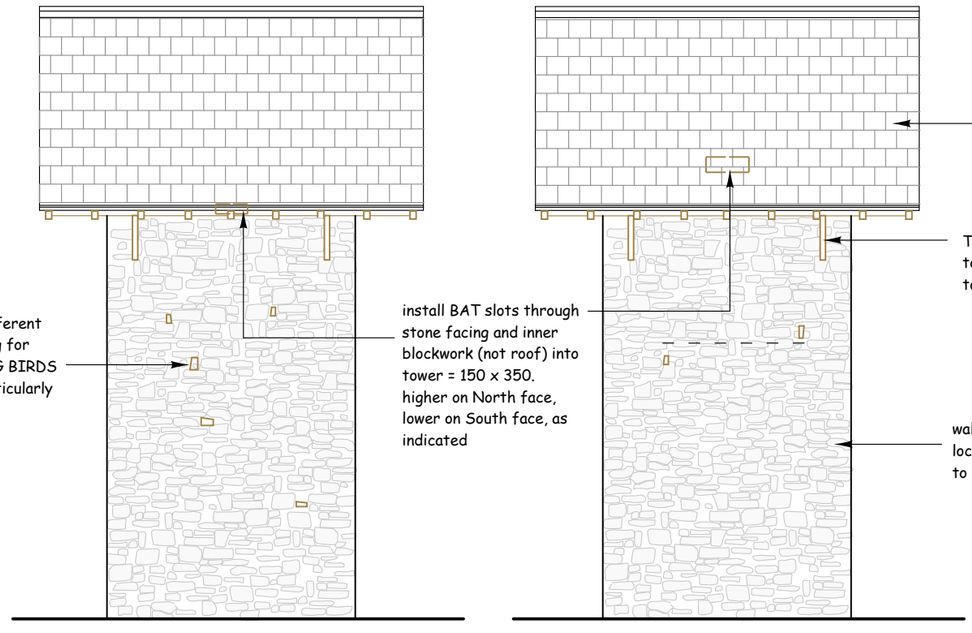
natural slate.

Timber brackets to be fixed
to the inner blockwork in order
to stabalise the roof overhang

Install lots of cavities of different
sizes in depth of stone facing for
INVERTEBRATES, NESTING BIRDS
etc. to all wall faces, but particularly
to the South face

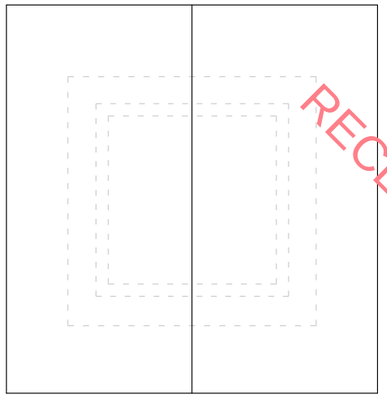
install BAT slots through
stone facing and inner
blockwork (not roof) into
tower = 150 x 350.
higher on North face,
lower on South face, as
indicated

walls:
local natural stone facing
to inner blockwork



SOUTH FACING ELEVATION

NORTH FACING ELEVATION



ROOF PLAN

NOTE

generous roof overhang at each
gable end provides required shelter
for safe fledging of young birds

North facing BAT box

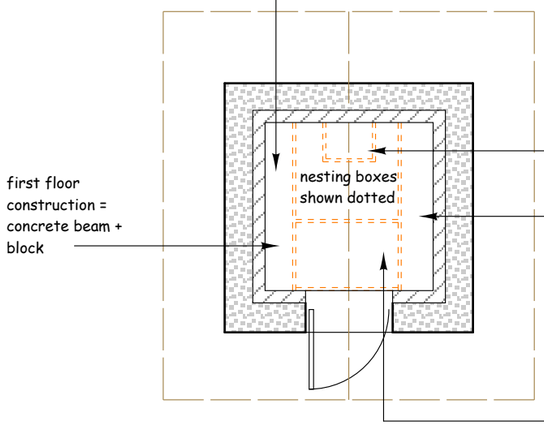
LITTLE OWL nestbox under
KESTREL nestbox

nesting boxes
shown dotted

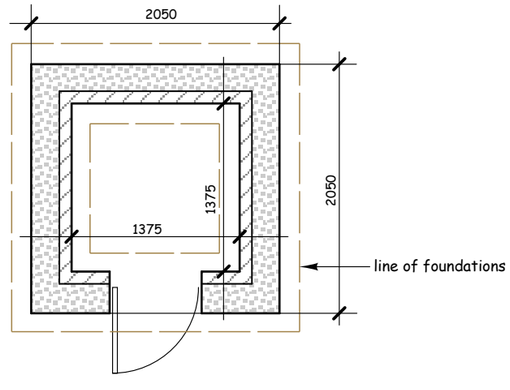
South facing BAT box

first floor
construction =
concrete beam +
block

BARN OWL nestbox. Note
floor of nestbox must be
minimum 500 below access hole



FIRST FLOOR LEVEL



line of foundations

GROUND FLOOR LEVEL

ALL DIMENSIONS IN MILLIMETRES

MICHAEL
DEFRIEZ
ARCHITECT

CARPENTER'S COTTAGE
WAMBROOK
CHARD, SOMERSET.
TA20
3EN

tel. 01460 65504
michael@wambrook.me.uk

project
BARN OWL TRUST
Proposed Wildlife Tower

drawing
scheme

project no.

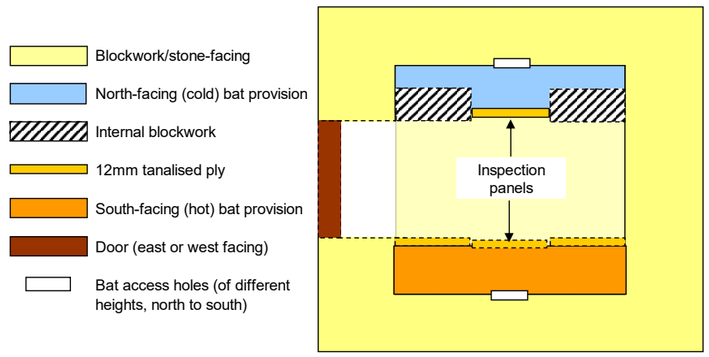
drawing no. **04B**

scale	date	drawn
1-50	27 Oct 2010	MDF.

BAT AND BIRD PROVISIONS (NOT TO SCALE)

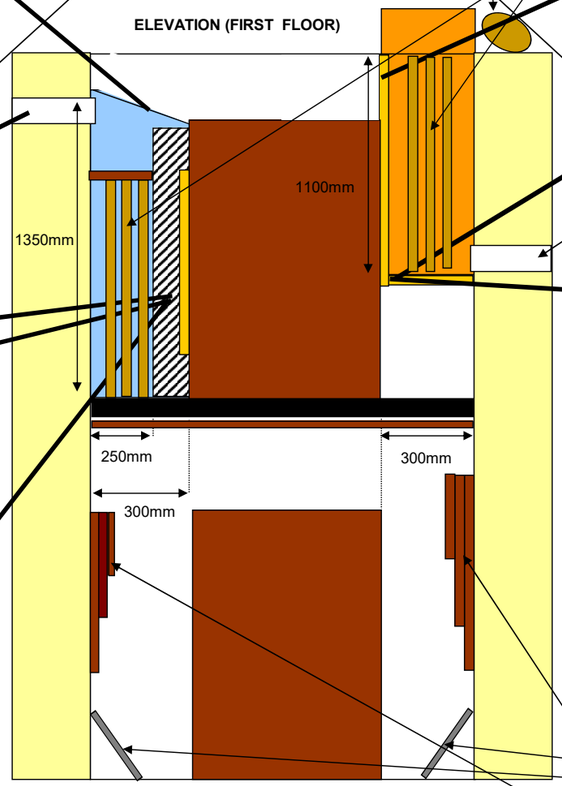
PLAN (FIRST FLOOR)

North



Slates

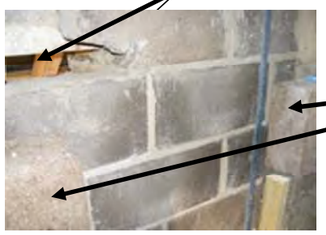
ELEVATION (FIRST FLOOR)



Kent bat box erected in other side from Hessian sacks

Hessian sacks stuffed over eaves to reduce drafts and draped in one side of the provision

Warm plywood space insulated with jablite inspection panel; bat hole at the bottom (warm air rises)



Cold blockwork space with ply inspection panel and roofing tiles over; bat hole at the top.

Showing both cold (left) and hot (right) bat spaces. Provisions made up flush to door frame.

Scored untreated rough sawn timber planks erected 25mm from ceiling to both provide space for crevice dwellers and roost locations for cavity dwellers.

Slates stood on end around base internally

Kent bat boxes erected on all walls

Cold bat space specifications;
250mm deep x 1350mm high, as wide as available space

Hot bat space specifications;
300mm wide x 1100mm high, as wide as available space and up to rafters

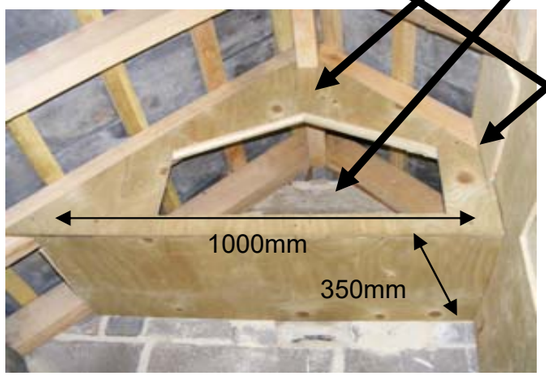
BARN OWL PROVISION

Barn Owl provision built the other side of the tower to the Kestrel provision,
as big as the available space allows but allowing for inspection panel.
Barn Owl provision floor must be a minimum of 500mm below access hole.

Tray outside Barn Owl provision fixed to the wall and a piece of 2" x 2" slung across the purlins.
External timber tanalised and treated with external wood preservative.

Barn Owl provision specifications;
1000mm wide x 400mm deep x 500mm high (from chamber floor to bottom of access hole)

KESTREL AND LITTLE OWL PROVISION



External landing stone leading to Kestrel provision.
Internal box to be built around the rafters after the bat spaces have been finished using 12mm ply fixed to timber baton fixed to blockwork
Space for inspection panel for maintenance/clearing out/ringing etc.

Kestrel box specifications;
1000mm wide x 350mm deep. Floor at or just below access hole, space up to apex (Kestrels like to see out of their nest sites)

Little Owl provision made underneath Kestrel provision.
Little Owl nestbox to wall mounted to wall on 2" x 1" baton, specification and design here;
https://www.barnowltrust.org.uk/barn-owl-nestbox/little-owl-nest-box/

CONFIDENTIAL APPENDIX

LOCATION OF THE BARN OWL NEST ONSITE

Map Legend

- Proposed Development boundary
- Proposed Extraction boundary
- Proposed Restoration boundary
- Barn Owl Nest

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Drawing Title

Location of the Barn Owl Nest Onsite

Project Title

Proposed Quarry Extraction and Restoration Ballyquin, Co. Clare

Drawn By	Checked By
CT	RW
Project No.	Drawing No.
211137	Confidential Figure 1
Scale	Date
1:9,000	07.11.24

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