

Limerick City & County Council  
**Baseline Ecology Report**  
Mungret Residential Development

Issue 2 | December 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.







Job number 261585

**Ove Arup & Partners Ireland Ltd**

**Arup**  
50 Ringsend Road  
Dublin 4  
D04 T6X0  
Ireland  
[www.arup.com](http://www.arup.com)

**ARUP**

# Document verification

<b>Job title</b>		Baseline Ecology Report		<b>Job number</b>	
				261585	
<b>Document title</b>		Mungret Residential Development		<b>File reference</b>	
<b>Document ref</b>					
<b>Revision</b>	<b>Date</b>	<b>Filename</b>	Baseline Ecology Report_Issue 1_22012021.docx		
Issue 1	22 Jan 2021	<b>Description</b>	Issue 1		
			Prepared by	Checked by	Approved by
		Name	Naoimh O'Regan	Dan Garvey	Keith Greville
		Signature			
Issue 2	Dec 2023	<b>Filename</b>	Baseline Ecology Report Issue 2.docx		
		<b>Description</b>	Issue 2		
			Prepared by	Checked by	Approved by
		Name	Dan Garvey	Keith Greville	Keith Greville
Signature					
		<b>Filename</b>			
		<b>Description</b>			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		<b>Filename</b>			
		<b>Description</b>			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document verification with document



## Contents

---

	Page
<b>1 Introduction</b>	<b>1</b>
1.1 Description of Proposed Development	1
<b>2 Ecological Baseline</b>	<b>3</b>
2.1 Introduction	3
2.2 Habitats	4
2.3 Records of Protected Species and Invasive Species	6
2.4 Natura 2000 and Other Nature Conservation Sites	6
2.5 Birds	11
2.6 Mammal Species	16
2.7 Invertebrates, Herpetofauna and Reptiles	18
2.8 Water Quality, Hydrological and Hydrogeological Pathways	19
<b>3 References</b>	<b>31</b>

## Appendices

### Appendix 1

Mungret Link Streets Project Ecological Impact Assessment (Mott MacDonald)

### Appendix 2

Figures from Water Quality Assessment Report

### Appendix 3

Photographs from Site Walkover

### Appendix 4

Calculations from Contaminant Concentration Assessment

### Appendix 5

Graphs from Contaminant Concentration Assessment

### Appendix 6

Winter Bird Survey 2022/2023

### Appendix 7

Bat Survey of Lands at Mungret, County Limerick 2023

### Appendix 8

Ecology – Site Assessment December 2023



# 1 Introduction

Limerick City & County Council propose to construct a housing development at Mungret, County Limerick. The purpose of this report is to describe the existing ecology with the proposed development area.

## 1.1 Description of Proposed Development

The proposed development is approximately five kilometres to the west of Limerick City Centre. Mungret Village is located north-west of the subject site and a residential development, Mungret Woods is located to the northeast, and Mungret Gate to the east. Works are well advanced on the 203 homes (Mungret Gate and Baunacloka Heights) to the north east. The LIHAF Road is substantially complete, located to the west, south and east of the subject site.

**Figure 1** shows the location of the proposed development. The proposed development, which is located adjacent to Mungret College, is comprised of 250 residential units, associated roads, carparking, open spaces, local services and ancillary utilities infrastructure. **Figure 2** shows the proposed site layout.

The proposed development will consist of the following:

- Site area of circa 7.2 hectares;
- 250 residential units located in plots A1, A2, A3 and A4;
- Public Open Spaces – POS (A1&A3), and POS (A2);
- Public Square - S1;
- Community Facilities;
- Creche; and
- Public Toilet.



**Figure 1: Site Location** | Not to Scale | Source: Google Maps



**Figure 2: Site Layout** | Not to scale | Based on information provided by: EML Architects

## 2 Ecological Baseline

---

### 2.1 Introduction

This section provides a description of the ecological baseline within the site of the proposed development, and in its immediate vicinity.

The baseline information for this section was gathered by desktop research, site walkovers and surveys, including winter bird surveys for the 2022-2023 period, bat activity surveys in the summer of 2023, and an ecological site walkover in December 2023. In addition, baseline data from an Ecological Impact Assessment (EcIA), which was prepared on behalf of Limerick City & County Council for the proposed LIHAF Road<sup>1</sup> was also used. Refer to **Appendix 1**. The study area of the EcIA included the proposed development site, refer to **Figure 3**. An ecological site walkover was completed in December 2023, to validate the habitat and species records compiled in this report, included as **Appendix 8** to this report.



---

<sup>1</sup> Mott MacDonald (May 2019) *LIHAF Road Ecological Impact Assessment*

**Figure 3: EcIA Study Area (yellow) and proposed development (red site boundary)**  
| Not to Scale | Based on information from: LIHAF Road EcIA, 2019

The habitats and species identified during the desktop study, site walkovers and surveys and EcIA are described below.

As there are no watercourses within and/or directly adjacent to the site of the proposed development there was no requirement to undertake an aquatic survey.

## 2.2 Habitats

As detailed in the EcIA<sup>1</sup> the terrestrial habitats within the proposed development site was classified using the scheme outlined in the Heritage council publication *A Guide to Habitats in Ireland* (Fossitt, 2000). The value of a habitat is site specific and will be partially related to the amount of that habitat in the surrounding landscape. Habitats that are considered to be good examples of Annex I and Priority habitats are classed as being of International or National Importance. Semi-natural habitats with high biodiversity in a county context and that are vulnerable, are of County Importance. Habitats that are semi-natural, or locally important for wildlife, are of Local Importance (higher value) and sites containing small areas of semi-natural habitat or which maintain connectivity between habitats are of Local Importance (lower value).

**Figure 4** shows the habitats located within the boundary of the proposed development. The associated codes are explained below.



**Figure 4: Habitat Mapping showing Site Boundary in Red** | Not to Scale | Based on information from: LIHAF Road EcIA, 2019

### GA1 – Improved Agricultural Grassland

The majority of the proposed development site is comprised of Improved Agricultural Grassland (GA1) and is dominated by rye-grass (*Lolium spp.*). The fields, which are used as grazing for cattle and sheep are of Local Importance (lower value) due to the low species diversity.



## WS1 – Scrub Habitat

Scrub habitat (WS1) is located at the south and eastern fringes of the subject site. This area is predominantly comprised of Blackthorn (*Prunus spinosa*) and Hawthorn (*Crataegus monogyna*) scrub which are of local ecological value.

## WL1 - Hedgerow

The hedgerow (WL1), which is located around the Public Square (S1) area of the proposed development site predominantly comprises Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*), with intermittent Ash (*Fraxinus excelsior*) and Elder (*Sambucus nigra*), with an undergrowth of Bramble (*Rubus fruticosus* agg.). Considering the low species diversity, the hedgerow is of Local Importance (lower value). Beehives were also identified in this area.

## WL2- Treelines

A treeline (WL2) form the boundary of agricultural fields running east-west in the northern part of the subject site. The treeline predominantly comprises Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Horse Chestnut (*Aesculus hippocastanum*) and Elder (*Sambucus nigra*). The treeline was assessed as having Local Importance (lower value) due to the low species diversity.

A tree and hedgerow survey<sup>2</sup> was carried out, which was reviewed and updated in 2023, which identified the location and quality of significant trees and hedgerows within the area. This survey is appended to the Landscape Strategy which is included with the planning documentation. There is a line of Category A (high quality and value making a substantial contribution) trees along the northern boundary of plot A1 and A3 and a number of trees along the western boundary of plot A2, refer to **Photograph 1**. None of the trees are protected by a Tree Preservation Order.

To accommodate construction of the proposed development removal of a single tree and 7,523m<sup>2</sup> of unmanaged hedgerow/ shrub will be required. Hedgerows within the proposed development are predominately native and mature and are in good overall condition, however these unmanaged hedgerows have a low species diversity and there is little evidence to suggest these areas are used by protected species, such as kestrel.

---

<sup>2</sup> Arbor Care (2023) *Arboricultural Impact Assessment Report*



**Photograph 1: Austrian Pine Trees**

## 2.3 Records of Protected Species and Invasive Species

The National Biodiversity Data Centre (NBDC) website ([www.biodiversity.ie](http://www.biodiversity.ie)) contains a mapping tool that indicates known records of legally protected species within a selected OS 1km Grid Square. The proposed development is located within two 1km grid squares R5453 and R5353. Data on these squares was downloaded from the website in December 2020. It is noted that this list is not exhaustive, and an absence of records does not imply that particular species are not present within the given area. The following protected species have been recorded in these two 1km grid squares - Eurasian Badger (*Meles meles*) and the Common Frog (*Rana temporaria*).

No invasive species were recorded within the proposed development site.

## 2.4 Natura 2000 and Other Nature Conservation Sites

The closest European sites (Natura 2000 sites) to the proposed development are the River Shannon and River Fergus Estuaries SPA (004077) and the Lower River Shannon SAC (002165), both of which are located approximately 2km from the proposed development. Refer to **Figure 5**.

Loughmore Common Turlough is a proposed Natural Heritage Area (pNHA) (Site Code 00438) and is located approximately 290m south of the proposed development site. Loughmore Common canal traverses the southern section of the pNHA and forms part of the pNHA. The canal flows to the Barnakyle River, a tributary of the River Maigue (which is part of the Lower River Shannon SAC). Refer to **Figure 6**.

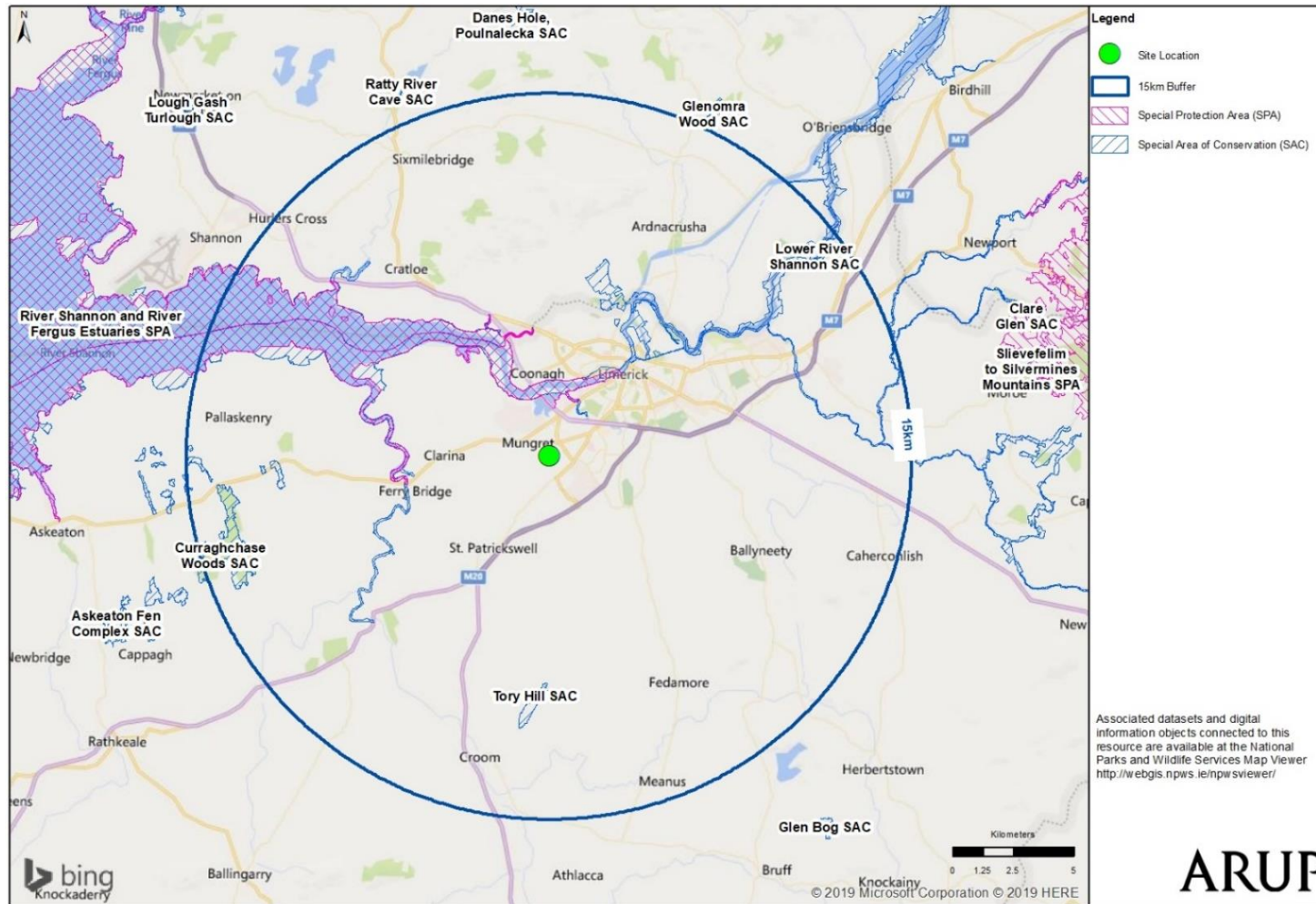
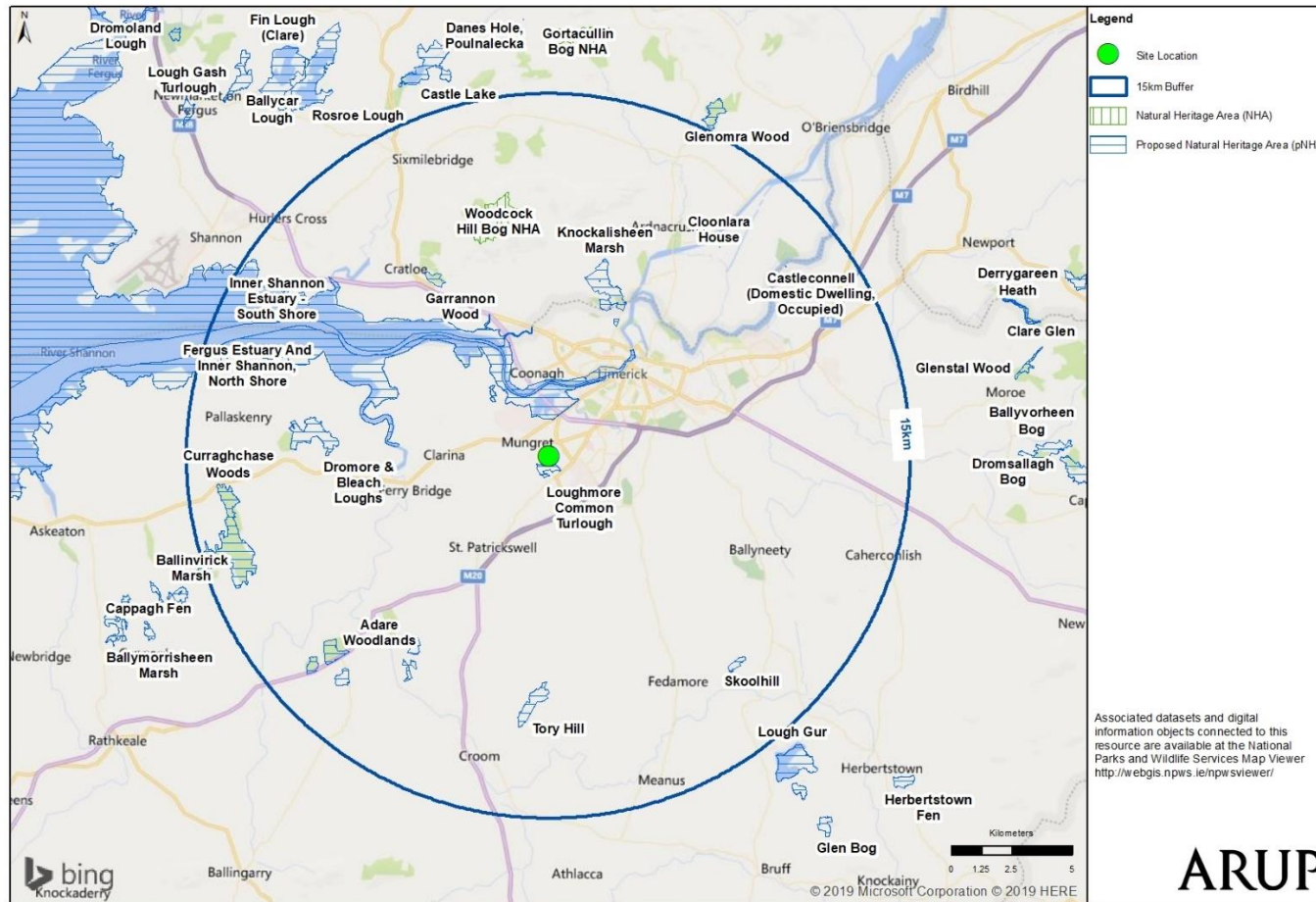


Figure 5: NHAs and pNHAs within 15km of the project area | not to scale



**Figure 6: Natural Heritage Areas within 15km of the Proposed Development | not to scale**

### 2.4.1 Loughmore Common Turlough

Loughmore Common (pNHA) is a turlough / seasonal lake that supports plant and bird species dependent on the shallow flooding patterns.

A habitat survey which was carried out as part of the LIHAF Road<sup>1</sup> noted that the pNHA comprises areas of heavily grazed calcareous grassland comprising Red Fescue (*Festuca rubra*), Creeping Bent (*Agrostis stolonifera*), Silverweed (*Potentilla anserine*), Red Clovers (*Trifolium pratense*), White Clover (*Trifolium repens*), Creeping Buttercup (*Ranunculus repens*), Meadowsweet (*Filipendula ulmaria*), Common Sedge (*Carex nigra*), and Tawny Sedge (*Carex hostiana*). Two Early Marsh Orchids (*Dactylorhiza incarnata*) and three Common Spotted-Orchids (*Dactylorhiza fuchsia*) were also identified within the calcareous grassland habitat. This habitat does not equate to semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) in accordance with the Interpretation Manual of European Union Habitats.

Further west, species typical of wetter conditions were present which included a high frequency of Hard Rush (*Juncus inflexus*), Compact Rush (*Juncus conglomeratus*) Common Sedge (*Carex nigra*), Glaucous Sedge (*Carex flacca*), Hairy Sedge (*Carex hirta*) with occasional Devil's-bit Scabious (*Succisa pratensis*), Quaking Grass (*Briza media*), Crested Dog Tail (*Cynosurus cristatus*) and Black Bog Rush (*Schoenus nigricans*).

Further, an area of large sedge swamp (approx. 0.5ha) occurs immediately south of the Loughmore Common canal, within the pNHA boundary. This habitat is wet under foot and is dominated by Reed Canary-Ggrass (*Phalaris arundinacea*). Other frequently occurring species include Bulrush (*Typha latifolia*), Yellow-Flag Iris (*Iris pseudacorus*), Long-Stalked Yellow-Sedge (*Carex viridula* ssp. *Brachyrrhyncha*), Water Horsetail (*Equisetum fluviatile*), Timothy (*Phleum pratense*), Meadowsweet, Silverweed, Marsh Cinquefoil (*Potentilla palustris*), Glaucous Sedge, Common Vetch (*Vicia sativa*), Water Mint (*Mentha aquatica*), and Short-Fruited Willowherb (*Epilobium obscurum*). This habitat has a high degree of biodiversity and is of national importance given it occurs within the pNHA boundary.

A second smaller patch of large sedge swamp was identified immediately north of the canal and was dominated with Pendulous Sedge (*Carex pendula*). A patch of tall-herb swamp occurs immediately east of the sedge swamp habitat. Species identified within the habitats were dominated with hard rush, compact rush, water horsetail, water mint and occasional Lesser Water-Plantain (*Baldellia ranunculoides*), Water Forget-me-not (*Myosotis scorpioides*). Two adult Common Frogs (*Rana temporaria*) were recorded within the habitat.

An area of rich fen habitat occurs towards the centre of the pNHA site. The habitat is dominated with Black Bog Rush (*Schoenus nigricans*) sedge species (*Carex* spp.) and *Campylium stellatum* in the ground layer. Tussocks of rush, devil's bit scabious and marsh cinquefoil.

Loughmore Common canal traverses the southern section of the pNHA and forms part of Loughmore Common Turlough pNHA.

The canal flows to the Barnakyle River, a tributary of the River Maigue (which is part of the Lower River Shannon SAC about 7.7 river kilometres downstream).

The rare plant species Opposite-Leaved Pondweed (*Groenlandia densa*) has been recorded in the canal in the past<sup>3</sup>. Vegetation within the canal was dominated with Water-Cress (*Nasturtium officinale*) with frequent Pendulous Sedge (*Carex pendula*), Bulrush (*Typha latifolia*), Yellow Iris (*Iris pseudacorus*), Soft Rush (*Juncus effusus*), Water-Plantain. Some individual willow trees are also present on the banks of the canal.

The EcIA Screening Report for the LIHAF Road<sup>1</sup> provides the following site synopsis of Loughmore Common Turlough pNHA.

*“Loughmore Turlough is located about 5km south-west of Limerick City, adjacent to the main Limerick/Cork road (N20) and north of it. It lies in a shallow basin, elongated in an east-west direction, and floods shallowly (30-40cm) in winter”.*

*“A variety of plant communities occur, depending on substrate type and degree of wetness. In the western half of the site, and along the eastern shore, the substrate is peaty, and the vegetation is dominated by sedges (*Carex* spp.), with Tufted Hair-grass (*Deschampsia cespitosa*), Marsh Horsetail (*Equisetum palustre*), Tall Fescue (*Festuca arundinacea*), Early Marsh-orchid (*Dactylorhiza incarnata*), Hard Rush (*Juncus inflexus*) and Yellow Loosestrife (*Lysimachia vulgaris*). Some of these species are more commonly associated with marshes than with turloughs. Also unusual is the occurrence of Greater Bird's-foot-trefoil (*Lotus uliginosus*) and Common Fleabane (*Pulicaria dysenterica*), two species which, although relatively more common here than in other regions, have not been recorded at other Irish turloughs. A calcium-rich environment is evident in places, with the occurrence of the moss species, *Campylium stellatum*, in the ground layer.*

*“The flooding area is largely dominated by Common Sedge (*Carex nigra*), with accompanying grasses and herbs such as Silverweed (*Potentilla anserina*), Creeping Bent (*Agrostis stolonifera*), and creeping Buttercup (*Ranunculus repens*). Wetter areas within the site, e.g. hollows and ditches, support a slightly different vegetation, with Water Horsetail (*Equisetum fluviatile*) and Amphibious Bistort (*Persicaria amphibia*). The vegetation shows a maritime influence with the occurrence of Parsley Water-dropwort (*Oenanthe lachenalii*) and Slender Spike-rush (*Eleocharis uniglumis*). These species are more typically found in upper saltmarsh habitats, and their presence suggests that there may be a slight salt influence in the floodwater, or may be a reflection of the site's location close to the Shannon Estuary.*

*“Standing water on the site is colonised by Water Horsetail, Branched Bur-reed (*Sparganium erectum*), Water-cress (*Nasturtium officinale*) and Broad-leaved Pondweed (*Potamogeton natans*). Small areas of limestone grassland and wet grassland are also present. The rare plant species, opposite-leaved Pondweed (*Groenlandia densa*), occurs on the site, as does Meadow Barley (*Hordeum secalinum*).*

---

<sup>3</sup> Roger Goodwillie undertook a vegetation survey and evaluation of Loughmore Common Turlough in 1992.

*Both of these species are protected under the Flora (Protection) Order, 1999. Loughmore provides suitable winter habitat for Lapwing and Golden Plover, and Snipe breed here.*

*“The main threats to the site are drainage, agricultural reclamation, pollution and afforestation. Loughmore is apparently drier today than it has been in the past, and it seems that drainage of the surrounding land rather than of the site itself may be the reason. There is evidence that bird numbers at the site may have reduced as a result of the dessication.*

*“Turloughs are a rare habitat in Europe, and in Ireland are under threat from agricultural intensification. Although affected by drainage, Loughmore is an unusual example of this habitat type. Due to the site's southerly location, its shallowness, its proximity to the sea and some calcium enrichment, the flora of Loughmore includes some unique elements, which enhance the conservation value of this turlough.”*

## 2.5 Birds

As part of the EcIA which was completed for LIHAF Road<sup>1</sup> and includes the proposed development area, bird surveys were carried out, with a number of bird species recorded. Species recorded included Magpie (*Pica pica*), Woodpigeon (*Columba palumbus*), Robin (*Erithacus rubecula*), Jackdaw (*Corvus*), Swallow (*Hirundo rustica*) and a Buzzard (*Buteo buteo*). All species are Green-listed in Ireland with the exception of Swallow which are Amber-listed in Ireland due to concerns over the entire European population. A winter bird survey was undertaken by Ecofact (as part of the EcIA) in February and March 2018 to assess the bird species using the site. There were two species noted which are on the Bird of Conservation Concern in Ireland (BoCCI) (Colhouns & Cummins 2013) red list: Meadow Pipit (*Anthus pratensis*) and Grey Wagtail (*Motacilla cinerea*)<sup>4</sup>. The 2018 winter bird survey noted that “a number of species found at this site and the species composition are in line with what would be expected in farmland in Co. Limerick. There were no species on Annex 1 of the EU Birds Directive. There were also no species associated with the River Shannon and River Fergus estuaries SPA recorded on the site. It is considered unlikely that they would use the site”.

However, as the Loughmore Common Turlough and the Loughmore Common canal may be of interest from a bird conservation point of view and the site synopsis for Loughmore Common Turlough pNHA notes that “Loughmore provides suitable winter habitat for Lapwing and Golden Plover” Dixon Brosnan Environmental Consultants were commissioned to carry out additional winter bird surveys at Loughmore Common Turlough pNHA over the winter period 2019/2020. A combination of walkover and transect surveys were utilised to ensure that all bird species utilising the site were recorded. An initial walkover survey along the northern site periphery was carried out on 18<sup>th</sup> October 2019.

---

<sup>4</sup> The Meadow Pipit (*Anthus pratensis*) and Grey Wagtail (*Motacilla cinerea*) are currently Red-listed due to the decline in numbers. This decline is thought to be attributed to the severely cold winters between 2009/2010 and 2011/2012.

Line transect surveys were carried out in November and December 2019 and January 2020.

A total of nineteen species were recorded during the site visits between October 2019 and January 2020. One Annex I bird species; Little Egret (*Egretta garzetta*<sup>5</sup>), one Red Listed Species Meadow Pipit (*Anthus Pratensis*) and four Amber Listed Species (Jack Snipe (*Lymnocyptes minimus*), Snipe (*Gallinago gallinago*), Cormorant (*Phalacrocorax carbo*) and Linnet (*Linaria cannabina*)) were recorded.

An additional series of line transect surveys were completed by Dixon Brosnan Environmental Consultants over the winter season 2022-2023. The report summarising these surveys is included as **Appendix 6** to this report.

The birds recorded were typical of the grassland mosaic and hedgerow habitat within the study site. The site does not appear to be an important feeding or roosting site for qualifying interests of the nearby River Shannon and River Fergus Estuaries SPA, and, with the exception of overflying Cormorant, no Special Conservation Interest (SCI) species were recorded at Loughmore Common Turlough during site visits.

The bird survey concluded that the turlough does not provide high value habitat for important bird species. The birds recorded during site surveys are relatively common and no rare or rare assemblages of bird species were recorded.

During the 2023 bat survey (described in more detail below and reported in full in **Appendix 7** to this report), it was noted that there is a likely Kestrel nest on the site boundary, as indicated in **Figure 7**. Kestrel is an endangered, Red-listed Bird of Conservation Concern in Ireland. They are protected under the Wildlife (Amendment) Act, 2000, and it is an offence to intentionally cause disturbance at a nest site or to breeding Kestrels.

The likely Kestrel nest site will not be directly impacted by the proposed development, and all construction work will be completed in accordance the Wildlife Act 1976, as amended, which states that cutting or removal of trees, hedgerows and clearance of ground vegetation shall be restricted between the 1st of March and 31st of August.

Should cutting or removal of trees, hedgerows and clearance of ground vegetation be necessary between the 1st of March and 31st of August, it shall be subject to a pre-clearance survey by a suitably qualified ecologist. If the survey identifies nesting birds, the nest shall not be disturbed while in active use. This will ensure that there will be no adverse impact on breeding birds arising from the proposed development.

As part of the proposed development, a kestrel nesting box will be provided in Treeline 1 as indicated in **Figure 7**, at the optimal height of 6 to 8m. This will be

---

<sup>5</sup> Even though the Little Egret (*Egretta garzetta*) is on Annex I list it is on the BoCCI green list as its breeding population continues to expand with birds occurring in almost every coastal county, as well as at a number of inland sites.



positioned under the supervision of an ecologist and will not be open to the prevailing wind.



- Site Boundary
- Kestrel nest site (likely)
- Barn Owl nest site

Drawn by: Grace Walsh  
Checked by: William O'Connor

Date: 14.07.2023

Location of Proposed Residential Development Site in Mungret, Co. Limerick showing ecological features of interest.



**Figure 7 Location of Likely Kestrel Nest** [source: Ecofact | not to scale]



**Photograph 2: Archway entrance to courtyard. Barn Owl roost/ nest site located underneath the entrance along the sidewalls and ledges**

Barn Owl, (*Tyto alba*) is one of three regularly occurring owl species in Ireland. The species is considered scarce nationally and is largely absent from parts of the west and northwest of the country. Barn Owls are Red-listed on the latest Birds of Conservation Concern in Ireland list (Colhoun & Cummins 2013). Barn Owls experienced significant decline in population in Ireland in recent decades with the losses attributed to loss of habitat, changes in farming practices and the use of rodenticides (Lusby & O'Clery 2014). Recent research has confirmed that Barn Owls may be benefitting from the introduction of Greater White-toothed Shrew, *Crocidura russula*, a non-native mammal species which has spread rapidly since its discovery in Ireland in 2008 (e.g. Smiddy, 2018). Barn Owl numbers and breeding range both seem to have improved somewhat in the past decade (J. Lusby pers comm.).

Barn Owls are largely nocturnal and resident in Ireland. Barn Owls breed in a variety of sites, but typical nest sites include lofted sheds and barns and ruined buildings. They also breed in natural sites including in deep ivy cover and hollow

trees. Radio-tracking has revealed that Irish Barn Owls may travel several kilometres to forage when provisioning chicks (Lusby & O’Clery, 2014).

Barn Owls may use a site to breed and to roost and can return to a breeding site for many years. The availability of suitable prey in the hinterland of the chosen site is believed to be a key determinant in the sustained use of a particular site. Some sites are used intermittently and are preferred at certain times of year. For instance, some sites where nesting has not been recorded are frequent roost sites outside of the breeding season.

A roost site and probable breeding site for Barn Owl was discovered under a stone archway within Mungret College. (**Photograph 2**). This archway, which is located outside of the proposed development site boundary, is located north of the proposed creche.

Follow-up visits to the site in early September 2020 confirmed that there was evidence of previous occupancy by Barn Owl under this archway with several areas of ‘whitewash’ signs under suitable perches at this location (**Photograph 3**).



**Photograph 3: Whitewash and rotten timbers under the stone archway.**

There were also signs of usage of a ledge where holes in a wooden ledge revealed the presence of a build-up of pellets (regurgitate) and compressed droppings (**Photograph 4**).



**Photograph 4: Whitewash under suitable roosting perches.**

These are taken as signs of the historic occupancy of the site by breeding Barn Owl. By early September any young that were present had fledged and there was no indication of continued use of the site. It is possible that Barn Owls will chose to roost at this location, as it remains accessible. However, the continued or sporadic use of this site as a roost site, or as a future nest site is not something that can be predetermined.

The identified Owl roost site and probable breeding site is outside the site of the proposed development and will not be directly impacted by the proposed development. All construction work will be completed in accordance the Wildlife Act 1976, as amended, which states that cutting or removal of trees, hedgerows and clearance of ground vegetation shall be restricted between the 1<sup>st</sup> of March and 31<sup>st</sup> of August.

The proposed development will not preclude the future use of the identified Owl roost site and probable breeding site into the future. As part of the proposed development, a Barn Owl box will be provided, as specified in **Appendix 8** to this report. This will enhance the suitability of the site for this species into the future.

Should cutting or removal of trees, hedgerows and clearance of ground vegetation be necessary between the 1<sup>st</sup> of March and 31<sup>st</sup> of August, it shall be subject to a pre-clearance survey by a suitably qualified ecologist. If the survey identifies nesting birds, the nest shall not be disturbed while in active use. This will ensure that there will be no adverse impact on breeding birds arising from the proposed development.

## 2.6 Mammal Species

### Otter

Otters, along with their breeding and resting places are protected under the provisions of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act, 2000. No evidence of otter (*Lutra lutra*) was recorded within the proposed development area. Further, the canal which is approximately 400m south of the proposed development site is considered unsuitable to support otter due to the low volume of water and lack of fishery value. However, there is potential for Otters to use the canal as a commuting route.

### Badgers

No evidence of badger (*Meles meles*) activity was noted within the proposed development area. One disused badger sett was recorded approximately 500m south-west of the proposed development. Badger paths, snuffle holes and prints were also observed within the scrub habitat located approximately 350m south of the proposed development.

No other non-volant mammal species were noted, however it is likely that fox (*Vulpes vulpes*), Irish hare, pygmy shrew and hedgehog occur within the proposed development area.

### Bats

The National Biodiversity Data Centre (NBDC) provide a “habitat suitability” index for bats, whereby the index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats. **Table 1** below gives the suitability of the study area for the bat species found in Ireland. The overall assessment of bat habitats for the current study area is given as 37.11.

**Table 1: Habitat Suitability for Bats as obtained from the NBDC maps**

Common name	Scientific name	Suitability index	Irish red list status
All bats	-	37.11	
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	50	Least Concern
Brown long-eared bat	<i>Plecotus auritus</i>	58	Least Concern
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	52	Least Concern
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	21	Least Concern
Leisler's bat	<i>Nyctalus leisleri</i>	53	Near Threatened
Whiskered bat	<i>Myotis mystacinus</i>	16	Least Concern
Daubenton's bat	<i>Myotis daubentonii</i>	37	Least Concern
Nathusius's pipistrelle	<i>Pipistrellus nathusii</i>	10	Least Concern
Natterer's bat	<i>Myotis nattererii</i>	37	Least Concern

In August 2020 a bat survey of two buildings within Mungret College was undertaken, Buildings E and Building F. Even though both buildings are located outside of the site and no works will be carried out as part of this proposed development, a bat survey was required given the proximity of the buildings to the site boundary.

The buildings were assessed for potential usage by bats and was inspected both externally and internally where access allowed. The survey determined that bat activity levels near Building E were low indicating that Building E would not be considered to be a significant roost site. Additionally, works to Building E would not have a significant effect in relation to foraging / commuting habitat loss. No

bats were found to be roosting in Building F however the archway was used by some pipistrelles during the survey as a commuting route.

All treelines within the site of the proposed development have negligible suitability as a potential roosting site due to the lack of suitable roost features. The only other features in the wider area (but outside the subject site) which either have the potential for bat roosting or are known to support bats are areas within the existing Mungret College buildings, and a mature treeline approximately 200m west of the proposed development. The proposed development will not directly impact on either of these features. However, it is likely that the treelines on the boundary of the proposed development area are used as foraging and commuting routes by bats and will be retained and integrated into the proposed development.

A further bat survey was carried out in the summer season of 2023, by Ecofact Environmental Consultants. Details of this survey are included as **Appendix 7** to this report. In addition to a desk study, three nights of bat survey work were undertaken, including a dawn survey. The desk study and fieldwork included the site and immediate surrounding areas.

No bats were found roosting in any of the trees or structures within the site boundary during the 2023 survey. However, some of the trees on the boundary site may be used to some degree for roosting by a nominal number of individual bats. This is typical of any trees that have bat roost features such as ivy coverage. However, the main tree lines on the site are composed of non-native Black Pine trees, and they have limited roosting potential.

The number of bats observed foraging and commuting within the site's boundary was relatively low. The species recorded were Common Pipistrelle, Soprano Pipistrelle, Brown Long-eared Bat, and Leisler's Bat. The latter species was seen foraging at a significant altitude over the site but did not rely on it. The report concludes that the site is of relatively low importance to bats. The proposed development has minimised the extent of clearance of internal hedgerows, and incorporated lighting design which minimises light spill and consequent impacts on the relatively low number of bats that forage and commute within the site boundary. The proposed development landscape design substantially retains the main treeline across the site (treeline 2 in **Figure 7** – only a single tree will be removed from this treeline), providing a commuting corridor for bat use into the future.

## 2.7 Invertebrates, Herpetofauna and Reptiles

According to the National Biodiversity Data Centre there are records for Holly Blue (*Celastrina argiolus*), Azure Damselfly (*Coenagrion puella*), Blue-tailed Damselfly (*Ischnura elegans*), Large Red Damselfly (*Pyrrhosoma nymphula*) and Ruddy Darter (*Sympetrum sanguineum*) within the site.

A number of butterflies and damselflies were recorded on the site, which included Red Admiral (*Vanessa atalanta*), Common Blue (*Polyommatus icarus*) and Common Blue Damselfly (*Enallagma cyathigerum*).

## 2.8 Ecology Site Assessment December 2023

Dixon Brosnan Environmental Consultants completed a site walkover and assessment in December 2023. Their assessment report is included as **Appendix 8** to this report.

The report concludes that there have not been any significant changes in baseline ecological conditions since the previous site surveys were completed. The provision of barn owl and kestrel nesting boxes and bat boxes has been specified for the proposed development, and these will provide additional roosting/nesting habitat. The long-term impact on these species due to loss of potential foraging habitat is predicted to be slight and long term.

## 2.9 Water Quality, Hydrological and Hydrogeological Pathways

A desktop study and site walkover were completed to establish if the proposed development is likely to have a significant effect on the Special Areas of Conservation (SAC) and Special Protection Areas (SPA) in the wider area. The following information was examined during the assessment to understand the surface water and groundwater flow paths for the area:

- Historic maps and aerial photographs;
- Topographical data;
- Groundwater monitoring information;
- Flow estimations in a nearby river;
- Surface water outflow locations; and
- Nearby dewatering.

Since the desktop study and site walkover described below were completed, the LIHAF Road has been substantially constructed. This project now provides further containment for stormwater discharges from the site, effectively intercepting water flow from the site in an engineered drainage network.

### 2.9.1 Desk Study

A desk study was carried out to identify the location of surface water and groundwater features for the proposed development and the surrounding area.

The proposed development is located southwest of the village of Mungret and consists primarily of agricultural land (**Figure 1** of **Appendix 2- Water Quality Assessment**). The site is bounded to the north by Mungret College, Mungret Park and Mungret Woods Housing complex and to the south by agricultural lands and Loughmore Common, a low-lying bog which is also noted as a turlough. As previously mentioned, Loughmore Common Turlough is a pNHA located approximately 290m south of the site. The River Shannon and River Fergus Estuaries SPA and the Lower River Shannon SAC are both approximately 2km north of the proposed development. Bunlicky Clayfield Pond located

approximately 1.8km north of the northern boundary of the site, is partially included in the River Shannon and River Fergus Estuaries SPA.

The Ordnance Survey Irelands' (OSI) Historic 25-inch and 6-inch maps were examined on the Geological Survey Irelands' (GSI) Groundwater Data Viewer<sup>6</sup>. No water features were identified in the proposed development site boundary from the OSI Historic maps. The following features were noted in the wider local area:

- Two spring locations were noted to the north and northwest of the site on the Historic 25-inch map, see **Figure 2 - Appendix 2 (Water Quality Assessment)**, both approximately 0.7km from the northern boundary of the proposed development site. The spring water from both locations was noted to be flowing in a north-northwest direction.
- Areas of rock outcrop were also noted to the west of the site approximately 0.9km from the western boundary of the site.
- The Loughmore Common Turlough, which is located to the south of the site, is marked as *Liable to Flood*.
- A *hydraulic ram* and *filter beds* were recorded in Mungret Park, approximately 0.3km to the north of the site on the Historic 6-inch map, see **Figure 3 - Appendix 2 (Water Quality Assessment)**. However, from examining the aerial photography and the site walkover, there appears to be no evidence of these structures in recent history or present day.
- The aerial photography from 2010 shows a north to west running surface water feature, **Figure 4 - Appendix 2 (Water Quality Assessment)**. This feature appears to be groundwater fed as there is no stream discharging from this location. The ground elevation contours show this area to be semi-enclosed by higher topographic areas. This feature was identified during the site walkover as a fenced in area of wetted land.
- The OSI Cartography map delineates the manmade canal in Loughmore Common as discharging to the west-southwest and Barnakyle River (**Figure 5 - Appendix 2 (Water Quality Assessment)**).
- The Barnakyle River outfalls into the Shannon Estuary approximately 10km to the northwest of the proposed development.

## 2.9.2 Site Walkover

The surface water and groundwater features identified from the desk study were located during the site walkover in February 2020 to establish flow direction, and to ascertain the likelihood of the features being impacted upon by the proposed development. This section describes the walkover survey with **Figure 6 - Appendix 2 (Water Quality Assessment)** highlighting the features noted during the visit.

---

<sup>6</sup> GSI, 2020. Groundwater Data Viewer. Ordnance Survey Ireland | Contains Irish Public Sector Data (Geological Survey).



A walkover survey was undertaken at Mungret by Arup and Limerick City and County Council on Thursday 27th February 2020. The purpose of the site visit was to examine the site and surrounding area for surface water and groundwater features to ascertain the flow path and direction of water in the area. **Figure 6 – Appendix 2 (Water Quality Assessment)** shows the locations examined during the site walk over with **Table 2** stating the feature examined at that location. **Appendix 3** presents the photographs taken during the site visit.

**Table 2: Summary of features examined during the site walkover.**

Location No.	Feature to examine
1	Proposed development site and borehole to the east, BH205
2	Canal and turlough
3	Canal discharge location
4	Irish Cement quarry
5	Spring sites to the north
6	Two springs by the church
7	Borehole to the west, BH211
8	Mungret Park
9	N69 for surface water drains

Arup hydrogeologists M. Kabza (P.Geo) and L. Connolly (Design Engineer) completed the walkover. The weather during the site visit was noted to be cold and dry with some passing showers of rain.

The field hedgerows were examined for the presence of culverts or drains. No surface water features were observed on site. A. Malone (Limerick County Council) noted that there had been a lot of rainfall prior to the site visit, with the soil at full saturation. This was observed during the site visit as puddles of water were on the fields as well as water being released from the ground as the soil was walked on.

A borehole (identified as BH205, which is located to the east of the proposed development site) was visited, with the wellhead found to be in good condition with the wooden barriers still erect. The borehole was locked and therefore, a water level reading could not be taken.

The Loughmore Common manmade canal was accessed through the local landowners' property. The landowner informed that the spring to the south of the

canal (see **Figure 6 - Appendix 2 Water Quality Assessment**)) discharges into the toe drain, which further discharges into the manmade canal once it passes through a sluice gate. He noted that the sluice gate has historically overflowed, and he believes the canal is not able to take all the water that it receives.

The landowner further noted that there was dye tracing carried out in the area on a spring in Loughmore Common in the 1970s.

He stated that the dye was found to discharge to the northeast of the site at the location marked at **Figure 6 - Appendix 2 Water Quality Assessment**.

The landowner noted that the water level in the turlough during the time of the visit was high. It was noted that the canal was not lined and, thus, there is a potential connection with the turlough in the adjacent field. The canal is manmade, with the water discharging into it from a nearby industrial estate. The berm between the canal and the toe drain had recently been cleared to prevent it from overflowing into the adjacent fields. A small groundwater inflow was observed in the toe drain bank. The landowner noted that there were six springs in the field north of the canal. He stated that it would not be possible to visit the six springs as they would be submerged in water from the turlough. These spring locations were crosschecked against the karst features mapped by Tynan Environmental, and their locations are presented on **Figure 3 – Appendix 2 Water Quality Assessment**. The canal stream was followed during the site visit, with the stream observed to be flowing to the south-southwest.

Prior to the site visit, three springs were identified from the Ordnance Survey Irelands' Historic 25-inch map. These spring sites were examined during the site visit for any evidence of their presence. It was not possible to confirm the presence of these springs. The spring site to the west of the site of the proposed development, (see **Figure 6 - Appendix 2 (Water Quality Assessment)**), was not able to be walked over as there was heras fencing surrounding the likely location of the spring. It was seen through the fencing, that the ground at this location was marshy with the shrubbery indicating a high water- table.

It was not possible to access the location of the two springs site. The potential location of the springs' discharge stream was examined, and it was not possible to identify any flowing water on the surface for this location, however, some ponding was observed. If these springs were still active, it would be possible to see a stream from the discharging groundwater, particularly given the conditions during the site visit. The ground was however at full saturation due to prolonged periods of heavy rainfall.

The borehole to the west of the site, BH211, was visited with the wellhead found to be in good condition. However, the wooden barrier appeared to have been knocked down. The borehole was locked and therefore, a water level reading could not be taken.

Mungret Park was walked over to examine for any surface water features. No ditches or culverts were observed in the park or along the field hedgerows. However, the ground was heavily saturated with ponding observed in the low-lying areas of the park. A wooden fence approximately 0.15m in height was noted

in Mungret Park. The area the small fence enclosed was observed to have unkept grass with the ground be saturated, but no ponding observed.

The N69 was driven along with the road ditches examined to inspect the presence of water and the direction of flow. Some streams were observed to be running parallel to the road with their flow directions marked on **Figure 6 - Appendix 2 Water Quality Assessment**. It is unclear where the stream water is coming from or flow to, however it is considered likely that the stream water flows under the N69 and discharges into Bunlicky Clayfield Pond.

### 2.9.3 Irish Cement Quarry

The Irish Cement quarry is located approximately 1km to the north of the site. The quarry is a limestone quarry that is actively dewatering the bedrock, a locally important aquifer. The 2017 Industrial Emissions licence for the Irish Cement Limited Castlemungret quarry<sup>7</sup> states that;

*“Water arising at the installation (including groundwater diverted from the quarry, and surface water run-off from the cement works) discharges to Bunlicky Clayfield Pond, part of which is included in the River Shannon and River Fergus Estuaries SPA.”*

The Industrial Emissions licence separates the water discharging from the site into Bunlicky Pond into two emission: SW1 and SW2. SW1 comprises cooling water, storm water and quarry water. The volumes to be emitted under SW1 is a maximum in any one day of 18,000m<sup>3</sup> with a maximum rate per hour of 740m<sup>3</sup>. The SW2 emission comprises the discharge from a pump sump in the limestone quarry which is limited by the Industrial Emissions licence to a maximum of 12,000m<sup>3</sup> in one day with a maximum rate per hour of 500m<sup>3</sup>.

The 2016 Environmental Impact Statement (EIS) for Irish Cement Limited<sup>8</sup> states that all surface water from the site passes through settling tanks and oil interceptors prior to discharge into Bunlicky Clayfield Pond. As part of Irish Cements emissions licence, they are required to monitor the quarry discharge emission point quarterly and the outflow from Bunlicky Pond annually<sup>2</sup>. Bunlicky Clayfield Ponds’ discharge to the River Shannon is controlled via adjustable weir and flap valves<sup>3</sup>.

The EIS records that the level of the quarry floor at the quarry sump is approximately -26.25m Ordnance Datum (OD), with the groundwater level maintained a few metres below this level. On average 6,200m<sup>3</sup>/day is pumped from the quarry sump and discharged to the nearby Bunlicky Clayfield Pond. The EIS states that the deepening of the quarry sump over the years has caused a change in the local groundwater flow pattern. Pre-quarrying, it is thought that the groundwater flow would have flown in the direction of the Shannon Estuary, as it would have acted as the topographic low point for the surrounding catchment. However, as the quarry sump is now located below the level of the Shannon

---

<sup>7</sup> EPA, 2017. Industrial Emissions License P0029-05. Irish Cement Limited, Company Register Number: 9212. Castlemungret, County Limerick.

<sup>8</sup> Brady Shipman Martin, 2016. Environmental Impact Statement. Irish Cement Limited. Use of Alternative Fuels and Alternative Raw Materials at Limerick Cement Works.

Estuary (which is estimated at 0m OD), the groundwater flow is now expected to be towards the quarry sump. Therefore, it is anticipated that groundwater which would have flown towards the Shannon Estuary, now flows towards the quarry sump, from where it is pumped to Bunlicky Clayfield Pond, from where it eventually drains to the Shannon Estuary.

## 2.9.4 Groundwater Monitoring

Groundwater monitoring was carried out by Tynan Environmental in three boreholes in the vicinity of the proposed development (**Figure 5 - Appendix 2 Water Quality Assessment**). Groundwater monitoring commenced in September 2018 with the latest results recorded in February 2019. Data loggers and a barometric logger were installed in the three boreholes with three rounds of manual measurements taken. Tynan Environmental note some uncertainty in the logger data, thus, the manual dips are used in this analysis. **Table 3** records the results of the manual measurements from the groundwater monitoring in each borehole over the five-month period.

**Table 3: Manually dipped groundwater monitoring data recorded by Tynan Environmental between September 2018 and February 2019.**

Borehole No.	BH205	BH211	BH202
Ground level (m OD)	15.72	18.78	9.95
Water level on 18 <sup>th</sup> September 2018 (m OD)	5.198	11.027	5.897
Water level on 10 <sup>th</sup> December 2018 (m OD)	10.976	16.5*	8.575
Water level on 4 <sup>th</sup> February 2019 (m OD)	8.403	15.38	7.916
Average groundwater level (m OD)	8.2	14.1	7.5

*\*value noted by Tynan Environmental as having a maximum error of 0.47m.*

The groundwater flow direction from the three manual records for the three boreholes shows a general groundwater flow direction to the east-southeast. However, the three boreholes are located on either side of a local topographic divide, which is also assumed to represent a local groundwater divide. Therefore, triangulating the levels from three boreholes may not capture the full detail of groundwater flow movements in the area. A conservative approach has therefore been adopted in the assessment to consider that groundwater flows to both the south and north from the site.

## 2.9.5 Surface Water Flow Directions

The groundwater to the north of the proposed development is expected to be influenced by the dewatering at the Irish Cement Quarry, thus, groundwater flow is anticipated to be towards the quarry sump, approximately 1.8km north of the site. The site walkover identified surface water north of the site to flow northwards to Bunlicky Clayfield Pond.

It was established that there are multiple groundwater and surface water features to the south of the site at Loughmore Common, with the manmade canal draining the site to the southwest.

It was unclear during the site walkover where surface water on the site would drain to. The walkover survey was conducted after a period of significant rainfall, so the ground was observed to be highly saturated with some mild ponding occurring on the site. However, there was no culvert or drain found to be discharging this ponding water on the proposed development site. Therefore, a review of the topography of the site was conducted to understand where surface water would drain to on the site.

A detailed topographic survey was previously carried out on the proposed development site and its surrounding area. It was found that the site is situated between approximately 10 to 20m OD with an elevated area to the centre of the site, which is flanked by gently sloping lands to the east and west. To the north and south of the site, at Mungret Park and Loughmore Common, the topography declines more steeply. This indicates that the proposed development site is situated on a watershed divide. Thus, the rainfall that lands on the south of the site drains to the south towards the manmade canal in Loughmore Common, which discharges to the southwest of the site into the Barnakyle River.

To the north of the site, it is unclear where surface water would flow to. There was no evidence from the desk study or the site walkover of surface water on the north of the site draining to the north. There was no clear connectivity identified between the site and the culverts identified along the N69 road. Therefore, it is assumed that all surface water that lands to the north of the site percolates through the soil and discharges to ground. This is in keeping with what was identified during the site walkover, as even after a period of significant heavy rainfall there was no surface water flowing on site.

## 2.9.6 Groundwater Flow Path Assessment

Even though there are no discharges to ground associated with the proposed development, as a conservative assessment, contaminate modelling was carried out to determine the potential impact of an accidental spill of diesel resulting from an overturned construction vehicle.

There are no proposed discharges to ground associated with the site. Therefore, as a conservative assessment, the potential impact of an accidental spill of diesel resulting from an overturned construction vehicle was assessed.

Three organic contaminants representative of diesel spills were examined to monitor their concentrations in the environment; benzene, toluene and xylene.

The hydraulic flow directions or pathways for the site are detailed above, these pathways were analysed to examine the concentration of the diesel in the downgradient receptors.

As previously stated, groundwater underneath the site can potentially flow to the north towards the quarry sump. Therefore, the groundwater flow path assessment analysed the quarry sump as the receptor for the diesel contaminants downgradient of the site.

**Appendix 4** details the calculations used for the assessment with **Table 4** highlighting the predicted concentration of the contaminants at the receptor, the quarry sump.

The values for effective solubility were obtained from the United States Environmental Protective Agency (EPA) for typical diesel total petroleum hydrocarbons (TPH)<sup>9</sup>. The threshold concentrations for the three contaminants were taken as the annual average value from the Irish Surface Water Regulations from the S.I. No. 272 of 2009<sup>10</sup>.

**Table 4: Values used and obtained from the contaminant concentrations assessment**

Concentrations	Benzene	Toluene	Xylenes
Effective Solubility, $C_w$ (mg/L) / Source Concentration	0.138	0.366	0.162 *(for o-xylene)
Threshold Concentration, $C_T$ (mg/L)	0.01	0.01	0.01
Concentration at inflow to the quarry (mg/L)	0.00048	0.0013	0.00056
Concentration in quarry discharge (mg/L)	0.000016	0.000042	0.000019

Graph 1 shows the benzene concentration against down-gradient distance along the flow path. **Appendix 5** presents the graphs for toluene and xylenes. This analysis is completed using the UK Environment Agency Remedial Threshold Model (RTM) which provides 1D fate and transport modelling for groundwater solutes. The analysis excludes any chemical degradation of the contaminant, which would be expected for hydrocarbons, and is solely based on conservative dilution and dispersion along the flow path.

It can be seen that all three contaminants reduce rapidly in concentration within the first 100 m horizontal distance from the source. Note the analysis shows the final concentrations of the contaminants at the quarry were estimated to be at least

<sup>9</sup> EPA, 2016. EPA On-line Tools for Site Assessment Calculation. Link: <https://www3.epa.gov/ceampubl/learn2model/part-two/onsite/es.html>. Accessed on: 05/03/2020.

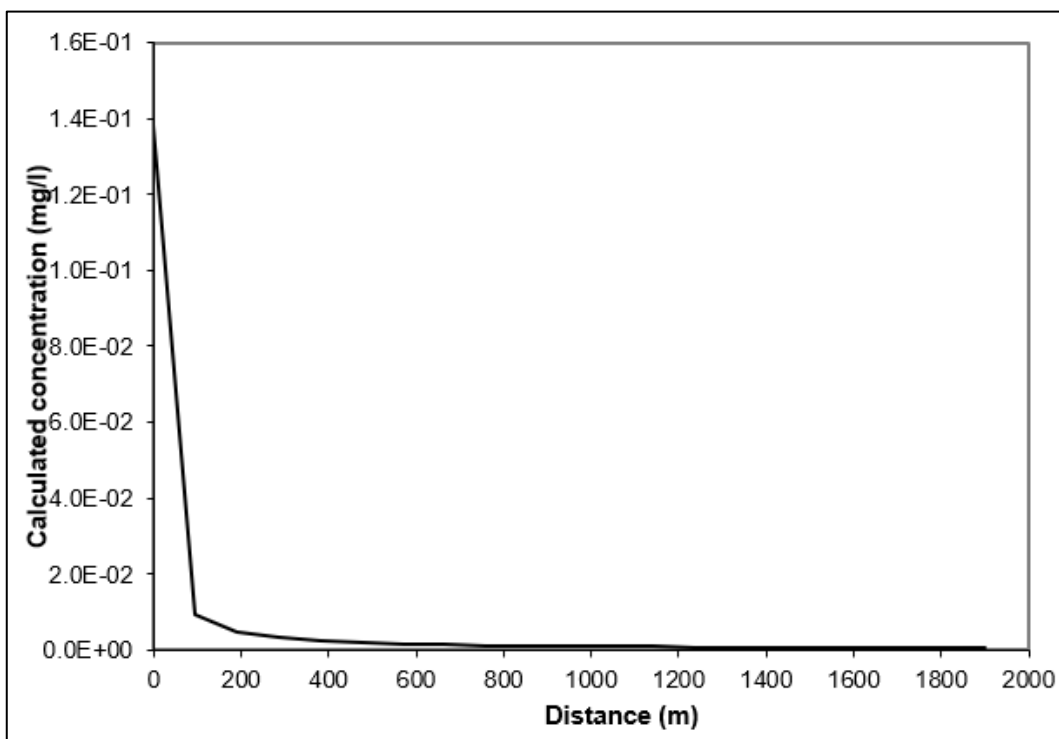
<sup>10</sup> S.I. No. 272, 2009. European Communities Environmental Objectives (Surface Waters) Regulations.

ten times lower below the threshold concentrations (**Table 4**). This indicates that a large amount of dilution occurs in the aquifer to reduce the concentration of the contaminants from the source to quarry over an estimated 1.9km horizontal distance pathway.

Further dilution is provided at the quarry as the groundwater flow from site is 207m<sup>3</sup>/d which is blended with the 6,200m<sup>3</sup>/d total discharge, which is an additional dilution factor of 30.

Additional dilution is then provided as the discharge from the quarry enters the surface water system. Once groundwater reaches the quarry sump, it is pumped into Bunlicky Clayfield Pond, which has an approximate volume of 2.5 million m<sup>3</sup>.

This will act as further dilution for the contaminants before they flow over the weir discharging Bunlicky Clayfield Pond into the River Shannon. Therefore, it is considered likely that if a contaminant entered the groundwater flow path, it would not likely have a significant effect on the Lower River Shannon SAC. No plausible cumulative effects associated with a spill event have been identified.



**Graph 1: Graph showing benzene concentration versus down-gradient distance from source.**

### Northern Surface Water Flow Path

The flow path for surface water on the north of the site is understood to percolate through the soil and discharge into the ground. Therefore, the flow path for surface water on the north of the site will follow that of the groundwater flow path, discharging to the quarry sump.

### Southern Water Flow Path

The area to the south of the site has a steep change in topography. This likely acts as the preferential flow path for surface water to drain from the south of the site, to the lower-lying area of Loughmore Common. Loughmore Common is a highly karstified area with high hydraulic connectivity with the unlined manmade canal draining the area. Therefore, surface water that is situated to the south of the sites' watershed is anticipated to flow south into the canal. The canal discharges to the southwest of the site into the Barnakyle River.

This was also confirmed during the site walkover. The Barnakyle River is a tributary in the River Maigue, which outfalls into the Shannon Estuary.

The southern groundwater flow path from the site is considered to discharge via the springs along the Loughmore Common canal and from there enter the surface water system. Similar groundwater dilution would occur along the flow path from the site to the turlough, and as the analysis has shown for the northern pathway, a significant amount of dilution occurs in the first 100m.

Given the potential hydrological links between the proposed development and watercourses, the possible sources of water contamination arising on the site were reviewed, and the plausible worst-case pollution event was identified and modelled. The results of the contaminant modelling indicate, in the case of an accidental diesel spill on site the water would dilute the concentration of the contaminant to below the threshold concentration within the first 200m horizontal distance from the site. The volume of contaminant modelled is based on the worst-case single spill event of fuel on site, and no plausible cumulative scenario of multiple simultaneous spill events has been identified. To conclude if a diesel spill occurred on the south of the site, it would be below the threshold concentration prior to entering the Loughmore Common canal, so there is no potential for adverse effects at that location, or any consequent impacts on the habitat or species at that location. From there, the flow continues to the Barnakyle River then the River Maigue, and finally the Shannon Estuary. The Shannon Estuary is tidally influenced by the North Atlantic Ocean at the confluence with the River Maigue.

Therefore, it is concluded that if a contaminant entered the southern surface water flow path, it would not likely have a significant effect on the River Shannon and River Fergus Estuaries SPA due to the massive dilution.

## 2.9.7 River Flow Estimation

An evaluation for the flow in the Barnakyle River at the point where the manmade Loughmore Common canal discharges into was calculated using the EPA HydroNet line segment, with the river flow scaled to the target catchment<sup>11</sup>. The catchment area was taken from the Flood Studies Update (FSU) HydroNet<sup>12</sup> and

---

<sup>11</sup> EPA, 2020. EPA HydroNet. Link: <https://www.epa.ie/water/wm/hydronet/> Accessed on: 09/03/2020.

<sup>12</sup> OPW, 2020. OPW And HydroNet Flood Studies Update (FSU) Web Portal. Link: <https://opw.hydronet.com/>. Accessed on: 09/03/2020.



the river water bodies (RWD) catchment from the Water Framework Directive (WFD) catchments<sup>13</sup>.

The flow in the Barnakyle River at the point where the unnamed stream discharging from the Loughmore Common canal joins the river was calculated to have a  $Q_{30}$  of  $0.55\text{m}^3/\text{second}$  ( $47,520\text{m}^3/\text{day}$ ) and a  $Q_{95}$  of  $0.06\text{m}^3/\text{second}$  ( $5,184\text{m}^3/\text{day}$ ). The flow which is equalled to or exceeded for 95% of the flow record ( $Q_{95}$ ) was considered for the assessment of the river water quality in the Barnakyle River.

The  $Q_{95}$  for the Barnakyle at the point where the unnamed stream discharge is a similar magnitude to the abstraction rate at the quarry sump ( $6,200\text{m}^3/\text{day}$ ). A flowrate of this magnitude would have significant dilution for any contaminant in the stream discharging at this location.

## 2.9.8 Influence of the Proposed Development

The flow path assessment analysed the flow directions and dilutions that would occur if a hypothetical spill occurred on site at present. However, the pathways will be altered during and after construction of the proposed development. A description of the expected surface water and groundwater flow directions for the site during and after construction is detailed below.

### During Construction

During construction, it is anticipated that topsoil and some subsoil (sand and gravels or glacial till) may be removed to enable construction works to proceed. From the limited ground investigation data within the vicinity of the site, obtained from the Geological Survey Ireland, limestone bedrock was recorded in boreholes between 0.3m to 3.1m below ground level (bgl).

Groundwater monitoring indicates groundwater levels in the vicinity of the site are approximately 2.5 to 8.0mbgl. As the proposed development has no basements, it is anticipated that dewatering will not be required for the site. Therefore, the groundwater flow direction will not be altered during construction.

### After Construction

The proposed development consists of a network of surface water drains along the roads and in the housing development which will channel the surface water and discharge it into the surface water sewers to the north and east of the site. The groundwater flow path is not envisaged to be impacted by the proposed development.

## 2.9.9 Summary

Arup hydrogeologists completed a desktop study and data compilation including a review of previous groundwater monitoring by Tynan Environmental. This was followed by a site walkover of the proposed development and surrounding area.

---

<sup>13</sup> EDEN, 2020. Water Framework Directive. Link: <https://wfd.edenireland.ie/>. Accessed on: 09/03/2020.

The results of the desk study and site walkover were used to inform an assessment of groundwater and surface water flow paths at the site and form the basis of a 1D contaminant modelling along the assumed flow paths.

The results of the flow path assessment indicate that the site is situated on a water divide with water to the north and the south of the site flowing differently. The groundwater to the north of the site is anticipated to flow to the actively dewatering quarry sump, approximately 1.9km to the northwest of the site. The groundwater that flows to the quarry sump is discharged into Bunlicky Clayfield Pond which outfalls to the River Shannon. Surface water to the north of the site is understood to percolate through the soil and discharge into the ground, thus following the groundwater flow path to the quarry sump.

Surface water that is situated to the south of the site's watershed is anticipated to flow south into the Loughmore Common canal.

The Loughmore Common canal drains to the southwest where it joins the Barnakyle River, and further downstream the River Maigue which discharges into the Shannon Estuary. Groundwater to the south of the site is considered to discharge via the springs along Loughmore Common and from there enters the surface water system at the canal.

The results of the contaminant modelling indicate, in the case of an accidental diesel spill on site which discharged into the groundwater, that the groundwater would dilute the concentration of the contaminant to below the threshold concentration within the first 200m horizontal distance from the site. As the quarry sump and Loughmore Common are approximately 1.9km and 290m respectively, the concentration of the contaminant at these groundwater discharge locations is anticipated to be well below the threshold concentrations.

For the southern surface water flow path that discharges to the Loughmore Common canal, it is understood that the discharge for the canal will receive a large amount of dilution when it flows into the Barnakyle River. The low flow for the Barnakyle River was estimated to be 5,184m<sup>3</sup>/day. The Barnakyle River joins the River Maigue, where it will receive even greater dilution before discharging into the Shannon Estuary. Therefore, the predicted impact on the habitat from any accidental discharge on site is negligible.

### 3 References

---

Arup (2019) *Mungret Geotechnical Desk Study*, April 2019

*Managing Natura 2000 Sites: The Provision of Article 6 of the Habitats Directive 92/43/EEC* (EC Environment Directorate-General, 2000);

*Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodical Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (European Commission Environment Directorate-General, 2001);

*Guidance Document on Article 6(4) of the Habitats Directive 92/43/EEC.* (European Commission, 2007);

*Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities* (Department of Environment, Heritage and Local Government, 2010 revision);

*Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPW 1/10 and PSSP 2/10;*

Goodwillie, R., (1992). *Turloughs Over 10ha, Vegetation Survey & Evaluation*. A report for the National Park & Wildlife Service, Office of Public Works.

*Guidelines for Good Practice Appropriate Assessment of Plans under Article 6(3) Habitats Directive* (International Workshop on Assessment of Plans under the Habitats Directive, 2011);

*Guidelines for Ecological Impact Assessment in the UK and Ireland, Terrestrial, Freshwater, Coastal and Marine* (Institute of Ecology and Environmental Assessment, September 2018).

Limerick Twenty Thirty (2018) *Strategic Masterplan and Urban Design Strategy for Mungret (3<sup>rd</sup> draft Report)*.

Mott MacDonald (May 2019) *LIHAF Road Ecological Impact Assessment*

Mott MacDonald (May 2019) *LIHAF Road Project Environmental Impact Assessment Screening*

Rory Dalton Ecology Services (2017) *Bat Survey of Mungret College*

Tynan Environmental (2019) *Groundwater Monitoring*

## Appendix 1

LIHAF Road (Mungret Link  
Streets Project) Ecological  
Impact Assessment (Mott  
MacDonald)

# Mungret Link Streets Project Ecological Impact Assessment (Mott MacDonald)

---



# **Mungret Link Streets Project**

Ecological Impact Assessment (EclA)

14 May 2019



Mott MacDonald  
South Block  
Rockfield  
Dundrum  
Dublin 16 D16 R6V0  
Ireland

T +353 (0)1 2916 700  
mottmac.com

Limerick City and County  
Council  
City Hall,  
Merchant's Quay,  
Limerick V94 EH90

# Mungret Link Streets Project

## Ecological Impact Assessment (EclA)

14 May 2019

Directors: C O'Donovan BE MBA CEng  
MIET (Managing), J T Murphy BE  
HDipMM CEng FIEI CMCILT (Deputy  
Managing), D Herlihy BE MSc CEng, K  
Howells BSc MBA CEng MICE MCWEM  
(British), F McGivern BSc DipEnvEng  
CEng MIEI  
Innealtóirí Comhairleach (Consulting  
Engineers)  
Company Secretary: Ian Kilty BA (Hons)  
ACA  
Registered in Ireland no. 53280. Mott  
MacDonald Ireland Limited is a member of  
the Mott MacDonald Group

Limerick City and County Council





# Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P1	18/06/2018	A Sands	R Mansfield	M Murphy	For Client Review
P2	16/11/2018	E. Johnston	R Mansfield	M Murphy	Revised following Whorl Snail Survey
P3	14/05/2019	N. Lynch	R. Mansfield	J. Hawe	Revised following design change

**Document reference:** 229383711-MMD-3000-XX-RP-C-004 P2

## Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Introduction	1
1.2	Project Description	1
1.3	Aims and Objectives	2
<b>2</b>	<b>Methodology</b>	<b>3</b>
2.1	Legislation and Best Practice Guidelines	3
2.2	Study Area	3
2.3	Desktop Assessment	4
2.4	Consultations	5
2.5	Field Assessment	5
2.6	Ecological Assessment	7
2.6.1	Impact Assessment Criteria	9
<b>3</b>	<b>Baseline Environment</b>	<b>11</b>
3.1	Site location	11
3.2	Output of Desktop Assessment	11
3.3	Output of the Field Assessment	14
3.3.1	Habitats and Flora	14
3.3.2	Fauna	18
<b>4</b>	<b>Description of Likely Impacts</b>	<b>24</b>
4.1	Construction Phase	24
4.1.1	Loss of Habitat	24
4.1.2	Noise / Disturbance	25
4.1.3	Pollution	25
4.2	Operational Phase Impacts	25
4.2.1	Pollution	25
4.2.2	Noise / Disturbance	26
4.2.3	Lighting	26
<b>5</b>	<b>Mitigation Measures</b>	<b>27</b>
5.1	Construction Phase	27
5.1.1	Vegetation Clearance	27
5.1.2	Pollution control	28
5.2	Operational Phase	28
5.2.1	Lighting	28
5.3	Residual Impacts	28

6	References	29
	Appendices	30
A.	Wintering Bird Survey	31

# 1 Introduction

## 1.1 Introduction

This Ecological Impact Assessment (EclA) has been prepared by Mott MacDonald on behalf of Limerick City and County Council for the proposed Mungret Link Street Project. The Mungret Link Street Project (hereafter referred to as the Project) consists of the provision of 1.7km of new public road within the Mungret / Loughmore Common area of County Limerick. Further details on the Project are provided in section 1.2.

The report follows the CIEEM (2018) *“Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine”*.

## 1.2 Project Description

The Mungret Link Streets project consists of the provision of ca. 1.7km of new public road within the Mungret / Loughmore Common area of County Limerick. The project includes the following associated infrastructure:

- Driving Lanes,
- Cycleways,
- Footpaths,
- Roadside Parking,
- Surface water drainage / sustainable urban drainage, and
- Street lighting

The purpose of the project is to accommodate the future construction of new residential development in Mungret, Limerick (Limerick 2030 housing), within lands zoned for residential development under the Southern Environs Local Area Plan 2011 – 2017 (Extended until May 2021).

Ducting for the provision of services detailed below will also be installed to facilitate the future implementation of the area masterplan.

- Foul water drainage connection into Limerick Main Drainage Scheme
- Water mains
- Gas Mains
- Telecommunications

The Project will require the excavation of lands which are predominantly in agricultural use. The aim of the design will be to achieve an optimal cut/fill balance such that excavated material is reused on site where possible thereby minimising waste. Several old farm sheds will likely be removed to accommodate the road. A number of field boundaries will be removed to accommodate the road.

The works area will be accessed via the R859 and R510 roads.

Drainage from the road will be to two attenuation basins.; one servicing the eastern extent of the road and one servicing the western extent of the road. The road drainage has been designed to accommodate drainage from future residential development within lands zoned for development

under the Southern Area Local Area Plan 2011-2017 (as extended). The attenuation basins will drain in to the existing drainage networks associated with the R859 and R510 roads.

### 1.3 Aims and Objectives

The main objectives of this assessment are to:

- Identify any habitats or flora of ecological value including those protected under the Wildlife Act (under Flora Protection Order) or the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) which could be impacted by the proposed development.
- Identify fauna (and/or their breeding and resting places) protected under the Wildlife Act or the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) which could be impacted by the proposed development.
- Recommend mitigation measures as appropriate to prevent adverse effects to habitats and species of ecological value which might be impacted by the proposed development.

## 2 Methodology

### 2.1 Legislation and Best Practice Guidelines

This EclA was prepared in accordance with the following legislative requirements:

- Planning and Development Acts and Regulations 2000-2015;
- Wildlife Act 1976 and Wildlife (Amendment) Act 2000;
- Flora (Protection) Order 2015;
- EU Water Framework Directive 2000/60/EC; and
- European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

In addition, the assessment was carried out having regard to the following guidance documents:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018)
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009);
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (National Roads Authority, 2009);
- Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (National Roads Authority, 2005);
- Guidelines for the Treatment of Bats During the Construction of National Road Schemes (National Roads Authority, 2005);
- Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes (National Roads Authority, 2006);
- A Guide to Habitats in Ireland (Fossit, 2000);
- Best Practice Guidance for Habitat Survey and Mapping (Smith et al., 2011); and
- Bat Tree Habitat Key. AECOL, Bridgwater. Andrews, H et al. (2013).

### 2.2 Study Area

The study area comprises all lands located within the zone of influence of the Project. The current guidance on ecological assessments (CIEEM, 2018) states that:

*“The ‘zone of influence’ for a project is the area over which ecological features may be subject to significant effects as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries.”* and that *“The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change.”*

The zone of influence was defined through desk assessment, having regard to the sensitivity of habitats and species likely to be present / previously recorded in the locality of the Project. The main habitats within the proposed development site comprise agricultural grasslands, hedgerows, treelines, a canal and swamp habitat. The main species likely to occur within the habitats include badger (*meles meles*), bat (*Chiroptera*), frog (*Rana temporaria*), breeding bird species and whorl snail (*Vertigo spp.*).

The National Road Authority (NRA) 'Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes' (NRA, 2005) which states that disturbance from construction works can impact breeding badger setts within 150m of the works (this has been construed to pertain to all the protected mammals listed above, with the exception of bats). The study area was therefore defined as the proposed development site plus a 150m buffer zone from the proposed development site boundary. Ecological connectivity (e.g. linear habitats / ecological corridors) and hydrological connectivity (e.g. the canal) were also taken into consideration when defining the zone of influence.

**Figure 1: Survey Area**



### 2.3 Desktop Assessment

A desktop review was carried out to identify features of ecological importance within the zone of influence of the proposed development site. The ecological assessment included designated and sensitive areas in the vicinity of the study area, to enable sufficient assessment to identify and quantify any significant impacts on the habitats, flora and fauna likely to arise with regard to the proposed development.

Principal sources of information utilised for the desktop assessment included:

- Existing relevant mapping and databases e.g. species and habitat distribution etc. (sourced from the Environmental Protection Agency (EPA), the National Biodiversity Data Centre (NBDC) and the National Parks and Wildlife Services (NPWS));



- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports, Species Action Plans and Conservation Management Plans;
- Conservation Status Assessment Reports (CSARs), Backing Documents and Maps prepared in accordance with Article 17 of the Habitats Directive;
- Published data from Bat Conservation Ireland;
- Published data from BirdWatch Ireland; and
- Published documents from Inland Fisheries Ireland.

## 2.4 Consultations

A consultation letter was issued to the Development Applications Unit (DAU) on 31/10/2017 (DAU reference: G Pre00222/2017). A formal response was not received via the DAU, rather a meeting was arranged with NPWS Conservation Ranger Pat Foley in January 2018. Mr Foley identified the requirement for winter bird survey. A bird survey was therefore carried out in February and March 2018 (the survey report is presented in Appendix A).

## 2.5 Field Assessment

An ecological field assessment was undertaken on the 15<sup>th</sup> of September 2017 and on the 6<sup>th</sup> and 7<sup>th</sup> of June 2018 by Mott MacDonald Ecologists. Weather on all three days was warm and dry. Equipment used for the surveys included base maps, iPad, template target notes, digital camera, Explorer Premium wireless inspection endoscope (Model 8003AL) and binoculars.

The aim of the survey was to determine the presence or absence of habitats and species of ecological value/significance, including Annex I habitats and Annex II and IV species, Wildlife Act species and Flora Protection Order species. The survey was also undertaken to assess the suitability of the habitats along the proposed development site to support protected species. The methodologies employed during the field survey are set out hereunder.

### Habitats and Flora Survey

Habitat survey was carried out with regard to '*Best Practice Guidance for Habitat Survey and Mapping*' (Heritage Council, 2011). Habitats were classified in accordance with '*A Guide to Habitats in Ireland*' (Fossitt, 2000).

The area was searched for evidence of invasive plant species listed in Part 1 of the Third Schedule of S.I No. 477 of 2011, European Communities (Birds and Natural Habitats) Regulations 2011.

Species protected under Flora (Protection) Order, 2015 (S.I. No. 356 of 2015) were also searched for.

### Volant Mammals<sup>1</sup> Survey

Bat surveys comprised a daytime visual assessment survey and an emergency/re-entry survey which were carried out in accordance with *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn)* (Collins, 2016).

The daytime ground level visual assessment was carried out in line with *Bat Tree Habitat Key* (Andrews, H et al., 2013) to determine potential roost features. Trees were examined for potential roost features which included:

- Horizontal / vertical cracks along tree limbs / trunk

---

<sup>1</sup> Mammals capable of flight

- Knot holes and cankers in trees
- Voids in trees
- Crevices including lifting bark or thick ivy growth (where stems are a minimum of 50mm diameter)

Similarly, buildings / structures were assessed externally for potential access points, gaps, cracks, voids, and crevices. The internal features of the buildings were not examined for health and safety reasons. The suitability of habitat features for bats, within the survey area, were assessed in accordance with Collins (2016) as described in Table 1 below.

**Table 1: Guidelines for Assessing Potential Bat Roosts**

Suitability	Description/Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	<p>A structure with one or more potential roost sites that could be used by individual bats opportunistically.</p> <p>However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions, and/or suitable surrounding habitat likely to be used on a regular basis by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).</p> <p>A tree of sufficient size and age to contain potential roost features but with none seen from the ground or with features seen only with very limited roost potential.</p>	<p>Habitats, that could be used by small numbers of commuting bats such as gappy hedgerows or unvegetated streams, but are isolated, i.e. not very well connected to the surrounding landscape by other habitat.</p> <p>Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.</p>
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions, and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	<p>Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens.</p> <p>Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland, or water.</p>
High	A structure with one or more potential roost sites that could be used that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions, and surrounding habitat.	<p>Continuous high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edges.</p> <p>High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses, and grazed parkland.</p> <p>Site is close to and connected to known roosts.</p>

Source: Collins, 2016

The emergence/re-entry survey was undertaken on the 6<sup>th</sup> and 7<sup>th</sup> of June 2018. The emergency/dusk survey was started 15 minutes before sunset until 1.5 – 2 hours after sunset and the re-entry/dawn survey was commenced 1.5 – 2 hours before sun rise until approximately 15 minutes after sunrise in accordance with *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn) (Collins, 2016)*. Bat activity was recorded using a bat detector (Bat

Box Duet) and visual observations were made to determine whether potential roost features (PRF) were being used.

### **Non-Volant Mammal Surveys**

Mammal surveys were carried out with regard to Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA 2009) and included surveys for breeding and resting places of protected mammal species and survey for direct evidence of mammals.

The methodologies and assessment criteria used were based on current published guidance.

Badger survey followed *Surveying Badgers (Harris et. al. 1989)* Signs of badger were searched for which included:

- Latrines and dung pits
- Hair
- Path and footprints
- Scrapes
- Snuffle holes
- Setts including:
  - A description of the sett location: hedgerows, earth banks, woodland or scrub habitat
  - Type of sett and level of usage: main, maternity, ancillary, abandoned etc.
  - Signs of activity: discarded bedding, spoil heaps etc.)

The proposed development site was determined as unsuitable to support otter. The Loughmore Canal which traverses the site has a low volume of water (depth of approximately 5cm) and no fishery value.

The potential for the study area to support additional protected mammal species such as Irish hare (*Lepus timidus*), pine marten (*Martes martes*), red squirrel (*Sciurus vulgaris*), pygmy shrew (*Sorex minutus*), Irish stoat (*Mustela erinea Hibernica*), hedgehog (*Erinaceus europaeus*) etc. was assessed during the field surveys.

### **Aquatic Habitat & Fisheries**

Aquatic habitat assessments in relation to fish and aquatic ecological interests were carried out using the methodology given in the Environment Agency's '*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual*' (EA, 2003).

### **Bird Survey**

Observations of ornithological activity within the study area were made during the field survey. The bird species recorded were typical farmland bird species.

A wintering bird survey was undertaken between February and March 2018.

## **2.6 Ecological Assessment**

The criteria used in evaluating ecological features as set out in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)* is described in Table 2 below.

**Table 2: Site Evaluation Criteria**

Ecological Valuation	Description
Internationally Important	<ul style="list-style-type: none"> <li>● Sites designated (or qualifying for designation) as an SAC or SPA under the EU Habitats or Birds Directives</li> <li>● Undesignated sites that fulfil criteria for designation as a European Site</li> <li>● Features essential to maintaining the coherence of the Natura 2000 network</li> <li>● Sites containing ‘best examples’ of the habitat types listed in Annex I of the Habitats Directive</li> <li>● Resident or regularly occurring populations of birds listed in Annex I of the Birds Directive and species listed in Annex II and/or Annex IV of the Habitats Directive</li> <li>● Ramsar Sites</li> <li>● World Heritage Sites</li> <li>● Biosphere Reserves</li> <li>● Sites hosting significant species populations under the Bonn Convention</li> <li>● Sites hosting significant populations under the Berne Convention</li> <li>● Biogenetic Reserves</li> <li>● European Diploma Sites</li> <li>● Salmonid waters</li> </ul>
Nationally Important	<ul style="list-style-type: none"> <li>● Sites or waters designated or proposed as an NHA</li> <li>● Statutory Nature Reserves</li> <li>● Refuge for fauna and flora protected under the Wildlife Acts</li> <li>● National Parks</li> <li>● Undesignated sites fulfilling criteria for designation as a NHA; Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act and/or a National Park</li> <li>● Resident or regularly occurring populations (assessed to be important at the national level) of species protected under the Wildlife Acts and/or species listed on the relevant Red Data list)</li> <li>● Site containing viable areas of the habitat types listed in Annex I of the Habitats Directive.</li> </ul>
County Importance	<ul style="list-style-type: none"> <li>● Areas of Special Amenity</li> <li>● Area subject to a Tree Preservation Order</li> <li>● Area of High Amenity, or equivalent, designated under the County Development Plan</li> <li>● Resident or regularly occurring populations (assessed to be important at the County level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed on the relevant Red Data list</li> <li>● Site containing area(s) of the habitat types listed in Annex I of the Habitats Directive that do not fulfil criteria for valuation as of International or National Importance</li> <li>● County important populations of species, or viable area of semi-natural habitats or natural heritage features identified in the National or Local Biodiversity Action Plan</li> <li>● Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county</li> <li>● Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level</li> </ul>
Local Importance (higher value)	<ul style="list-style-type: none"> <li>● Locally important populations of priority species or habitats or natural heritage features identified in the Local Biodiversity Action Plan</li> <li>● Resident or regularly occurring populations (assessed to be important at the Local level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed in the relevant Red Data list</li> <li>● Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality</li> <li>● Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value</li> </ul>
Local Importance (lower value)	<ul style="list-style-type: none"> <li>● Sites containing small areas of semi-natural habitat that are of some local importance for wildlife</li> <li>● Sites of features containing non-native species that are of some importance in maintaining habitat links</li> </ul>

Source: NRA 2009

### 2.6.1 Impact Assessment Criteria

Impacts were assessed and characterised in accordance with the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' EPA (May 2017)* as described in Table 3.

**Table 3: Impact Magnitude and Duration Criteria**

Impact magnitude	Definition
<b>Quality of Effects</b>	<b>Positive Effects</b> A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	<b>Neutral Effects</b> No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	<b>Negative/adverse Effects</b> A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
<b>Significance of Effects</b>	<b>Imperceptible</b> An effect capable of measurement but without significant consequences.
	<b>Not significant</b> An effect which causes noticeable changes in the character of the environment but without significant consequences.
	<b>Slight Effects</b> An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	<b>Moderate Effects</b> An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	<b>Significant Effects</b> An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	<b>Very Significant</b> An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	<b>Profound Effects</b> An effect which obliterates sensitive characteristics
<b>Duration and Frequency of Effects</b>	<b>Momentary Effects</b> Effects lasting from seconds to minutes
	<b>Brief Effects</b> Effects lasting less than a day
	<b>Temporary Effects</b> Effects lasting less than a year
	<b>Short-term Effects</b> Effects lasting one to seven years
	<b>Medium-term Effects</b> Effects lasting seven to fifteen years.
	<b>Long-term Effects</b> Effects lasting fifteen to sixty years.
	<b>Permanent Effects</b> Effects lasting over sixty years
	<b>Reversible Effects</b> Effects that can be undone, for example through remediation or restoration

**Impact magnitude**

**Definition**

	<b>Frequency of Effects</b>
	Once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually

Source: EPA, 2017

## 3 Baseline Environment

### 3.1 Site location

The proposed Project will be located within agricultural grasslands within the Mungret / Loughmore Common area, approximately 4.5km south-west of Limerick city.

The proposed development site is currently used for agricultural purposes and the fields are lightly grazed by cattle. Residential development occurs to the east and south-west of the survey area. The R526 regional road is located to the south-east of the survey area and the R859 regional to the north of the survey area. Mungret House and Woods occur towards the centre of the survey area. A school and sport fields are located at the north-western area of the survey area. Loughmore Common Turlough pNHA (000438) and Loughmore Canal are located along the southern section of the survey area. Loughmore Canal which forms part of the pNHA site and flows in east to west direction.

### 3.2 Output of Desktop Assessment

#### Designated Sites of International Importance

The Birds Directive (2009/147/EC) and the Habitats Directive (92/42/EEC) put an obligation on EU Member States to establish the Natura 2000 network of sites of highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites comprises Special Areas of Conservation (SACs, including candidate SACs) and Special Protection Areas (SPAs, including proposed SPAs). SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and other regularly occurring migratory birds and their habitats.

Mott MacDonald prepared a report for Screening for Appropriate Assessment which investigated the potential for the proposed Mungret Link Street Project to have significant effects on all European Sites. This screening report is included as part of the planning package.

The screening assessment concluded that there is no source-pathway-receptor connectivity between the Project and European Sites, there is therefore no potential for significant effects.

#### Designated Sites of national Importance

Natural Heritage Areas (NHA) are the basic wildlife designation in Ireland. The areas are considered important for the habitats present or which holds species of plants and animals whose habitats needs protection. Under the Wildlife Amendment Act (2000), NHAs are legally protected from damage from the date they are formally proposed for designation (source: [www.npws.ie](http://www.npws.ie)). Proposed Natural Heritage Areas (pNHA) were published on a non-statutory basis in 1995 and have not since been statutorily proposed or designated.

All NHA's and pNHA's located within 15km of the Project site, or where connectivity exists (physically, ecologically or hydrologically), were identified using GIS Software. Table 4 shows the location of the Mungret Link Streets Project in relation to these sites, the features of interests for which they have been designated and identifies source-pathway-receptors for each.

No source-pathway-receptor was identified between the project and Natural Heritage Areas.

**Table 4: National Sites within 15km or with connectivity to the Project**

Site Name and Code	Distance to National Site	Feature of Interests	Source-Pathway-Receptor
<b>National Heritage Sites</b>			
Woodcock Hill Bog NHA (002402)	8.8km north of the Project. There is no hydrological connectivity to the site.	Peatlands	There is no potential for impact to the site due to distance and lack of connectivity to the Project site.
<b>Proposed National Heritage Site</b>			
Loughmore Common Turlough (000438)	180m south of the Project.	Turlough habitat	The proposed road will be constructed approximately 180m to the north of the pNHA. The road drainage will connect to the existing road drainage. There will be no discharge to ground. There is no physical or hydrological connectivity to the turlough.
Inner Shannon Estuary – South Shore (000435)	Located ca. 1km north of the Project	Estuarine complex supporting wintering and migrating waterfowl.	There is no hydrological or physical connectivity between the pNHA and the project. Bird survey did not identify any wetland birds using the proposed development site. There is no potential for impact to the pNHA.
Fergus Estuary and Inner Shannon, North Shore (002048)	Located ca. 2.5km north of the Project.	Estuarine complex supporting wintering and migrating waterfowl. Triangular Clubrush	There is no hydrological or physical connectivity between the pNHA and the project. Bird survey did not identify any wetland birds using the proposed development site. There is no potential for impact to the pNHA.
Knockalisheen Marsh (002001)	Located ca. 6.2km north of the Project. There is no hydrological connectivity to the site.	Wet grassland and fen communities	There is no potential for effects due to distance between the sites.
Garrannon Wood (001012)	Located ca. 8.3km north-west of the Project. There is no hydrological connectivity to the site.	Oak woodland habitat	There is no potential for effects due to distance between the sites.
Dromore & Bleach Loughs (001030)	Located ca. 8.6km west of the Project. There is no hydrological connectivity to the site.	Lake habitat	There is no potential for effects due to distance between the sites.
Adare Woodlands (000429)	Located ca. 9km west of the Project. There is no hydrological connectivity to the site.	Broad-leaved woodland habitat	There is no potential for effects due to distance between the sites.
Tory Hill (000439)	Located ca. 9km south of the Project. There is no hydrological connectivity to the site.	Wooded limestone Orchid-rich calcareous grassland	There is no potential for effects due to distance between the sites.
Skoolhill (001996)	Located ca. 11km south-east of the Project. There is no hydrological connectivity to the site.	<i>Festuca heterophylla</i>	There is no potential for effects due to distance between the sites.
Curraghchase Woods (000174)	Located ca. 13km south-west of the Project. There is no hydrological connectivity to the site.	Woodland and grassland habitats	There is no potential for effects due to distance between the sites.

Source: NPWS



### 3.2.1.1 Records of protected species and habitats

#### National Biodiversity Data Centre

A review of records from National Biodiversity Data Centre (NBDC) within the two 2km square grids (R55L and R55G) which encompasses the Project site was undertaken and is presented in Table 6 below.

**Table 5: Records of protected and invasive species within the 2km square grids (R55L and R55G) which encompass the Project**

Name	Date of record Title of dataset	Title of Dataset	Location in relation to the Project site	Designation
Common Frog ( <i>Rana temporaria</i> )	31/07/1974	Reptiles and Amphibians Distribution Atlas 1978 (An Foras Forbartha)	Frog have been recorded within the 10km square grid which encompasses the Project.	Protected Species: EU Habitats Directive    Protected Species: EU Habitats Directive >> Annex V    Protected Species: Wildlife Acts
Common Linnet ( <i>Carduelis cannabina</i> )	31/12/2011	Bird Atlas 2007 - 2011	Linnet have been recorded within the 10km and 2km square grids which encompasses the Project.	Protected Species: Wildlife Acts    Threatened Species: Birds of Conservation Concern    Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Wood Pigeon ( <i>Columba palumbus</i> )	31/12/2011	Bird Atlas 2007 - 2011	Wood pigeon have been recorded within the 10km and 2km square grids which encompasses the Project.	Protected Species: Wildlife Acts    Protected Species: EU Birds Directive    Protected Species: EU Birds Directive >> Annex II, Section I Bird Species    Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
Meadow Barley ( <i>Hordeum secalinum</i> )	31/12/1998	BSBI tetrad data for Ireland	Meadow Barley was previously recorded approximately 600m south-east of the Project site boundary.	Protected Species: Flora Protection Order    Threatened Species: Endangered
Opposite-leaved Pondweed ( <i>Groenlandia densa</i> )	31/12/1999	BSBI tetrad data for Ireland	Opposite-leaved pondweed has been recorded within Loughmore Common Canal.	Protected Species: Flora Protection Order    Threatened Species: Endangered
Eurasian Badger ( <i>Meles meles</i> )	24/03/2010	Road Kill Survey	A dead badger was recorded on the R510 regional road 20m south of the Project.	Protected Species: Wildlife Acts
Eurasian Red Squirrel ( <i>Sciurus vulgaris</i> )	31/12/2012	Irish Squirrel Survey 2012	A red squirrel was previously recorded approximately 700m south-east of the Project site boundary.	Protected Species: Wildlife Acts
European Otter ( <i>Lutra lutra</i> )	23/04/2009	Road Kill Survey	A dead otter was recorded on the R526 regional road approximately 200m south-east of the Project site boundary.	Protected Species: EU Habitats Directive    Protected Species: EU Habitats Directive >> Annex II    Protected Species: EU Habitats Directive >> Annex IV    Protected Species: Wildlife Acts

Name	Date of record Title of dataset	Title of Dataset	Location in relation to the Project site	Designation
Pipistrelle ( <i>Pipistrellus pipistrellus sensu lato</i> )	16/06/2014	National Bat Database of Ireland	Soprano pipistrelle bat was previously recorded 1.2km south-east of the Project site boundary.	Protected Species: EU Habitats Directive    Protected Species: EU Habitats Directive >> Annex IV    Protected Species: Wildlife Acts
Soprano Pipistrelle ( <i>Pipistrellus pygmaeus</i> )	16/06/2014	National Bat Database of Ireland	Soprano pipistrelle bat was previously recorded 1.2km south-east of the Project site boundary.	Protected Species: EU Habitats Directive    Protected Species: EU Habitats Directive >> Annex IV    Protected Species: Wildlife Acts
Eastern Grey Squirrel ( <i>Sciurus carolinensis</i> )	31/12/2012	Irish Squirrel Survey 2012	An Eastern grey squirrel was previously recorded approximately 700m south-east of the Project site boundary.	Invasive Species: Invasive Species    Invasive Species: Invasive Species >> High Impact Invasive Species    Invasive Species: Invasive Species >> EU Regulation No. 1143/2014    Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)

Source: NBDC

A review of past ecological surveys which were carried out within the study area was also undertaken. Roger Goodwillie undertook a vegetation survey and evaluation of Loughmore Turlough in 1992. Goodwillie described the turlough as dry and likely fed from a swallow hole located at the north-eastern end. Salt marsh plants were identified within the turlough which suggests either a slight salt influence in the floodwater or might be due to the turlough's close proximity to the Shannon Estuary. Goodwillie identified the presence of the rare species; slender spikerush (*Eleocharis uniglumis*), greater bird's-foot-trefoil (*Lotus pedunculatus*) and opposite-leaved pondweed (*Groenlandia densa*) within the turlough.

### 3.3 Output of the Field Assessment

#### 3.3.1 Habitats and Flora

A description of the habitats within the site are presented hereunder. Habitats were described in accordance with Fossitt (2000). A habitat map of the proposed development is provided in Figure 2 below.

#### Improved Agricultural Grassland (GA1)

The Project site predominantly comprises improved agricultural grassland which is dominated by rye-grass (*Lolium spp.*). The fields are currently used as grazing for beef cattle and sheep. The habitat was assessed as having Local Importance (lower value) due to the low species diversity.

#### Hedgerows (WL1)

The agricultural fields are separated by mature hedgerows which predominantly comprise hawthorn (*Crataegus monogyna*) and blackthorn (*Prunus spinose*), with intermittent ash (*Fraxinus excelsior*) and elder (*Sambucus nigra*), and with an undergrowth of bramble (*Rubus fruticosus agg.*). Sections of hedgerows will be required to be removed to facilitate the proposed

road. The hedgerow habitat was assessed as having Local Importance (lower value) due to the low species diversity.

### Treelines (WL2)

A number of treelines form the boundary of the grassland fields. The treelines predominantly comprise ash, sycamore (*Acer pseudoplatanus*), horse chestnut (*Aesculus hippocastanum*) and elder (*Sambucus nigra*). The treelines within the study area were assessed as having Local Importance (lower value) due to the low species diversity.

A mature treeline which comprised beech (*Fagus sylvatica*), sycamore, horse-chestnut and cypress (*Cupressus x leylandii*) occur along towards the rear of the school. This treeline was assessed as having Local Importance (higher value) as it was confirmed to support bats.

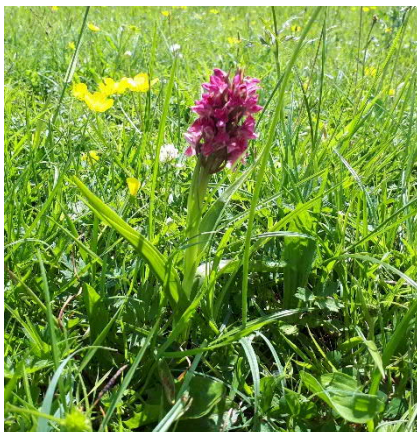
### Loughmore Canal Turlough pNHA (000438)

Loughmore Common **Turlough (FL6)** is located, at its nearest point, 180m south of the proposed road.

The pNHAh comprises areas of heavily grazed **calcareous grassland (GS1)** comprising red fescue (*Festuca rubra*), creeping bent (*Agrostis stolonifera*), silverweed (*Potentilla anserine*), red clovers (*Trifolium pratense*), white clover (*Trifolium repens*), creeping buttercup (*ranunculus repens*), meadowsweet (*Filipendula ulmaria*), common sedge (*Carex nigra*), and tawny sedge (*Carex hostiana*). Two early marsh orchids (*Dactylorhiza incarnata*) and three common spotted-orchids (*Dactylorhiza fuchsia*) were also identified within the calcareous grassland habitat. This habitat does not equate to Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) in accordance with the Interpretation Manual of European Union Habitats - EUR28.

Further west, species typical of wetter conditions were present which included a high frequency of hard rush (*Juncus inflexus*), compact rush (*Juncus conglomeratus*) common sedge (*Carex nigra*), glaucous sedge (*Carex flacca*), hairy sedge (*Carex hirta*) with occasional devil's-bit scabious (*Succisa pratensis*) quaking grass (*Briza media*) crested dog tail (*Cynosurus crstatus*) and black bog rush (refer to Image 2).

### Image 1 Orchids within Calcareous Grassland



Source: Mott MacDonald 06/06/2018

### Image 2 Calcareous grassland GS1



Source: Mott MacDonald 15/09/2017

### Reed and large sedge swamp (FS1)

An area of large sedge swamp (Image 3) occurs immediately south of the Loughmore Canal, within the pNHA boundary. This swamp is ca. 0.5ha in area. The road is not located in proximity to this habitat. This habitat is wet under foot and is dominated by reed canary-grass (*Phalaris arundinacea*). Other frequently occurring species include bulrush (*Typha latifolia*), yellow-flag iris (*Iris pseudacorus*), long-stalked yellow-sedge (*Carex viridula* ssp. *Brachyrrhyncha*), water horsetail (*Equisetum fluviatile*), timothy (*Phleum pratense*), meadowsweet (*Filipendula ulmaria*), silverweed, marsh cinquefoil (*Potentilla palustris*), glaucous sedge, common vetch (*Vicia sativa*), water mint (*Mentha aquatica*), and short-fruited willowherb (*Epilobium obscurum*). This habitat has a high degree of biodiversity and is of National importance given it occurs within the pNHA boundary.

A second smaller patch of large sedge swamp was identified immediately north of the canal and was dominated with pendulous sedge (*Carex pendula*). A patch of **tall-herb swamp (FS2)** occurs immediately east of the sedge swamp habitat. Species identified within the habitats were dominated with hard rush, compact rush, water horsetail, water mint and occasional lesser water-plantain (*Baldellia ranunculoides*), water forget-me-not (*Myosotis scorpioides*). Two adult common frogs (*Rana temporaria*) were recorded within the habitat.

### Rich Fen and flush (PF1)

An area of rich fen habitat occurs towards the centre of the pNHA site. The habitat is dominated with black bog rush (*schoenus nigricans*) sedge species (*Carex spp.*) and *Campylium stellatum* in the ground layer. Tussocks of rush, devil's bit scabious and marsh cinquefoil.

### Canal (FW3)

Loughmore Canal traverses the southern section of the pNHA and forms part of Loughmore Common Turlough pNHA. The canal flows to the Barnakyle River, a tributary of the River Maigue (which is part of the Lower River Shannon SAC: some 7.7 river kilometres downstream).

The rare plant species opposite-leaved pondweed (*Groenlandia densa*) has been recorded in the canal in the past. None however, was recorded during the survey. The water in the canal was stagnant and approximately 5cm deep. Vegetation within the canal was dominated with water-cress (*Nasturtium officinale*) with frequent pendulous sedge (*Carex pendula*), bulrush (*Typha latifolia*), yellow iris (*Iris pseudacorus*), soft rush (*Juncus effusus*), water-plantain. Some individual willow trees are also present on the banks of the canal (refer to Image 4).

**Image 3 Sedge swamp habitat**



Source: Mott MacDonald 06/06/2018

**Image 4 Loughmore Canal**



Source: Mott MacDonald 06/06/2018

### **Scrub Habitat (WS1) and Mature Trees**

There are several areas of blackthorn (*Prunus spinose*) and hawthorn (*Crataegus monogyna*) scrub within the site which are of local ecological value. Many of these are associated with archaeological features e.g. ringfort LI013-011, ringfort LI013-007, enclosure LI013-133 and enclosure LI013-008. The ringforts and enclosures are included on the National Monument Service Records. The road alignment is outside of the zone of notification for these records. A disused cattle path at Baunacloka (Image 5) will be removed to accommodate the road.

The scrub habitats within the site are in use by badger and act as stepping stones within the agricultural lands. The ringforts and enclosures will not be affected by the Project. A section of the cattle path will be removed to accommodate the road. The scrub and ringfort/enclosure habitats were assessed as having Local Importance (higher value) due to the potential for the habitats to support badger.

**Image 5 Disused cattle path**



Source: Mott MacDonald 15/09/2017

**Image 6 Treeline within the study area**



Source: Mott MacDonald 06/06/2018

### **Woodlands**

The pNHA encompasses an area of planted ash (*Fraxinus excelsior*) woodland with a boundary of Pedunculate Oak (*Quercus robur*) to the south of the canal. Immediately east of the ash woodland is planted conifer. The habitats were assessed as having Local Importance (higher value).

### Buildings (BL3)

Mungret House occurs towards the centre of the study area. The proposed new road link will be located approximately 100m south of the building. A primary school and sport fields (**amenity grassland GA2**) occurs towards the north-west boundary of the site.

There are a number of derelict farm sheds located to the south-west of the school, which will be removed to facilitate the proposed works (refer to Image 10). The sheds were assessed as having 'Moderate' bat roost potential. Due to the building's potential to support protected bat species, the habitat was assessed as having Local Importance (higher value).

Residential developments occur towards the north-eastern boundary of the site, either side of the proposed road.

### Protected and invasive plant species

No Floral Protection Order (FPO) species or invasive plant species were recorded within the survey area.

## 3.3.2 Fauna

### Badger

Badgers and their setts are protected under the Wildlife Act. One disused badger sett (annex set with one entrance) was observed within the ringfort LI013-01 located approximately 500m south-west of the proposed road link (refer to Image 7). No other badger setts were identified during the surveys. Badger paths, snuffle holes and prints (refer to Image 8) were also observed within scrub habitat, particularly in proximity to Mungret House.

Scrub habitat, particularly in proximity to Mungret House and along the western boundary of the site boundary was identified as important habitats for badgers.

**Image 7 Badger Sett Entrance**



Source: Mott MacDonald 15/09/2017

**Image 8 Badger Prints**



Source: Mott MacDonald 15/09/2017

### Other Mammal Species

No evidence of otter was recorded within the study area. The canal was identified as unsuitable to support otter due to the low volume of water and lack of fishery value.

No other mammal species were recorded during the surveys. It is likely however that fox (*Vulpes Vulpes*), Irish hare, pygmy shrew and hedgehog occur within the study area.

## Bats

All bat species in Ireland are protected under both national and European legislation. There is additional protection for lesser horseshoe bat (*Rhinolophus ferrumequinum*).

The suitability of the landscape associated with the proposed Project site to support bat species was determined with regard to the bat 'habitat suitability' index presented on [www.maps.biodiversityireland.ie/#/Map](http://www.maps.biodiversityireland.ie/#/Map). The bat 'habitat suitability' index is the research outcome of a study by (Lundy *et al.* 2011) examining the relative importance of landscape and habitat associations across Ireland for bats. The 'habitat suitability' index ranges from 0 to 100 with 0 being least favourable and 100 most favourable for various bat species. The habitat / landscape at the Project site has a high bat suitability index score of 37.11. The bat 'habitat suitability' index score was referred to in scoping the field assessment for bats and bat habitat.

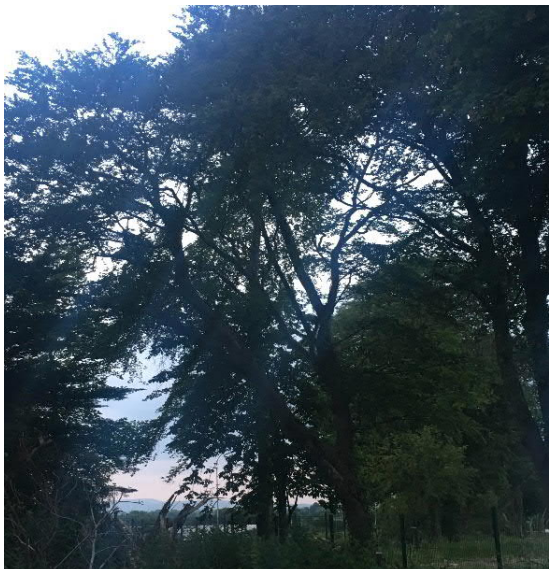
A daytime ground-level visual assessment of the treelines and derelict sheds within the Project site was undertaken. Only the mature treeline located immediately west of the school and sports fields was assessed as having 'High' bat roost potential. All other treelines within the study area were assessed as having 'Negligible' suitability to support bats due to the lack of suitable roost features. It is likely however that the treelines within the study area are used as foraging and commuting routes by bats. The derelict farm sheds were assessed as having 'Moderate' bat roost potential.

The emergency/dusk survey was therefore undertaken at the treeline line west of the school and sports field and at the derelict farm sheds.

Sunset was at 21:53 so the survey was commenced at 21:35 (15 minutes prior to sunset). The first bat, a soprano pipistrelle (*Pipistrellus pygmaeus*), was recorded at 22:20 foraging along the tree line. Two more soprano pipistrelles were recorded a short time later also foraging along the tree line. A fourth soprano pipistrelle was observed emerging from a roost within the beech tree, which confirmed the tree as an active bat roost. Two common pipistrelles (*Pipistrellus pipistrellus*) were recorded foraging along the southern section of the tree line. No bats were recorded emerging from the derelict farm sheds during the emergency survey.

The re/entry dawn survey was commenced at 03:45 (1.5 hours before sunrise). Both soprano pipistrelle and common pipistrelles were again observed foraging along the treeline.

**Image 9 Treeline located along the north-western boundary of the site confirmed as an important foraging and commuting route for bats**



Source: Mott MacDonald, 06/06/2018

**Image 10 Derelict farm buildings**



Source: Mott MacDonald, 06/06/2018

## Birds

All wild bird and their nests are protected under the Wildlife Act (1976 and 2000). The study area comprises numerous hedgerows and treeline which are likely to provide suitable nesting sites for breeding bird species.

During the field surveys undertaken by the Mott MacDonald Ecologists a number of bird species were recorded within the study area. Species recorded included magpie (*pica pica*), woodpigeon (*Columba palumbus*), robin (*Erithacus rubecula*), jackdaw (*Corvus*), swallow (*Hirundo rustica*) and a buzzard (*Buteo buteo*). All species are Green-listed in Ireland with the exception of swallow which are Amber-listed in Ireland due to concerns over the entire European population (source: [www.birdwatchireland.ie](http://www.birdwatchireland.ie)).

A winter bird survey was undertaken by Ecofact in February and March 2018 assess the bird species using the site. The survey report is presented in Appendix A. There were 2 species on the BoCCI red list, Meadow Pipit and Grey Wagtail.

The Loughmore Common turlough area and the Loughmore canal have the better ecological value within the survey area from a bird conservation point of view.

## Invertebrates, Herpetofauna and Reptiles

A number of butterflies and damselflies were recorded during the survey which included Red admiral (*Vanessa Atalanta*), common blue (*Polyommatus icarus*) and common blue damselfly (*Enallagma cyathigerum*).

Two common frogs were recorded in the tall-herb swamp habitat located adjacent to the canal. Both the canal and fen habitats are likely to provide optimal habitat for frogs. The spawning season for frogs occurs between 1<sup>st</sup> of March – 31<sup>st</sup> June inclusive. No frog spawn was



recorded during the survey however there is potential that tadpoles had already hatched at this point. Frogs are listed on Annex V of the EU Habitat Directive (92/42/EEC) and are protected under the Wildlife Act.

The sedge swamp habitat within the pNHA site was identified as suitable habitat for whorl snail species. Three species of whorl snail, (*Vertigo geyeri*), (*V. angustior*) and (*V. moulinsiana*) are protected under Annex II of the Habitat Directive. A whorl snail survey of the swamp habitat was carried out on 18<sup>th</sup> of October 2018 (within the ideal survey window for *Vertigo*). Weather conditions at the time of the survey were clear and dry, 16°C. Liaison with National Parks and Wildlife confirmed that there is no requirement for license to undertake this survey.

The survey was carried out as per Moorkens & Killeen (2011). Initially a transect through the suitable habitat was identified, with defined intervals every 5m. Evidence of any management of the site overall was recorded eg grazing, weed cutting, or grass mowing. At each interval, the habitat condition was recorded. This required recording vegetation height and dominant plant species. Ground moisture classes (on a scale of 1-5 with 1 being dry, and 5 being standing water over 5cm deep) were also recorded at each interval.

At each interval a 1m<sup>2</sup> beating sheet was placed on the ground. The vegetation above was then agitated. This was repeated on either side of the transect line at each 5m interval. Any whorl snails which fell on to the sheet were identified and recorded on site using a hand lens, and the key "*Identifying British Vertiginidae*" (Buckle 2012). To allow for identification, the key makes use of features including the direction of coiling of shell, the shape of the apertural lip, overall size and shape of shell, and the number and position of the "teeth".

The results from the survey are presented in Table 1. Location refers to the defined 5m intervals, while A and B corresponds to the left and right sides of the transect respectively. Moisture level corresponds to the scale provided in Morkens & Killeen (2011).

**Table 6 Whorl snail survey results**

Location	Replicate	Height of vegetation	Dominant plant species	Moisture level	Vertigo recorded
0m	A	1m	Reed canary grass ( <i>Phalaris arundinacea</i> )	1	None
	B	1m	Reed canary grass	1	None
5m	A	1m	Reed canary grass	1	None
	B	1m	Reed canary grass	1	None
10m	A	1m	Reed canary grass	2	None
	B	1m	Reed canary grass	2	None
15m	A	1m	Reed canary grass	2	None
	B	1m	Reed canary grass	2	None
20m	A	1.3m	Reed canary grass	2	None
	B	1.3m	Reed canary grass	2	None

Location	Replicate	Height of vegetation	Dominant plant species	Moisture level	Vertigo recorded
25m	A	1m	Bulrush ( <i>Typha latifolia</i> )	2	None
	B	1m	Bulrush	2	None
30m	A	1.3m	Bulrush	2	None
	B	1.3m	Bulrush	2	None
35m	A	1.3m	Pedunculate Sedge ( <i>Carex pedunculata</i> ) and Bulrush	3	4 adult striated whorl snail ( <i>Vertigo substriata</i> )
	B	1.3m	Pedunculate Sedge ( <i>Carex pedunculata</i> ) and Bulrush	3	1 adult striated whorl snail
40m	A	1m	Pedunculate Sedge ( <i>Carex pedunculata</i> ) and Bulrush	3	None
	B	1m	Pedunculate Sedge ( <i>Carex pedunculata</i> ) and Bulrush	3	None

Conditions within the study area on the day of the survey were generally very dry, with conditions as per the scale ranging from 1-Dry (No visible moisture on ground surface) to 3- Wet (water rises under light pressure). No standing water was recorded along the transect. The water table was likely below typical levels as a result of the extremely dry summer experienced this year. There was no evidence of any grazing or cutting of vegetation within the suitable habitat at the time of the survey.

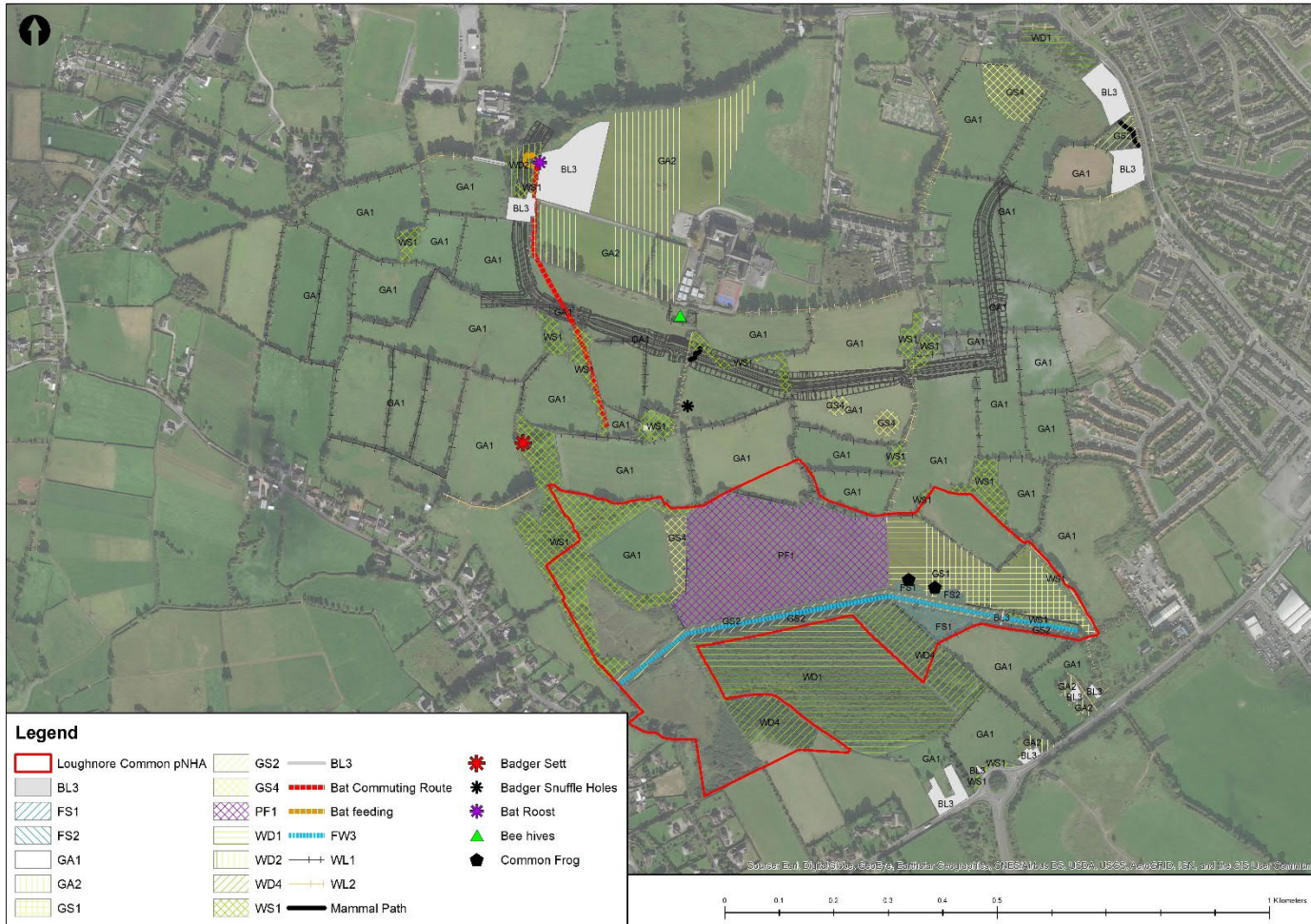
A total of 5 adult striated whorl snail (*Vertigo substriata*) were recorded along the transect. These were recorded within the mixed pedunculate sedge and bulrush portion of the turlough. Striated whorl snails are listed as “Near Threatened” in the Irish Red List of species. The species is not listed under Annex II of the Habitat’s Directive.

No whorl snails listed under Annex II of the Habitat’s Directive were recorded during the survey.

The striated whorl snail is listed as “Near Threatened” in the Irish Red List for Non-Marine Molluscs. The habitats with which the species is associated, sedge swamps and other wetland habitats, are rare in the wider landscape. Within the sedge swamp striated whorl snail (*Vertigo striata*) were only recorded within a very small area. The restriction of the snails to this pocket may be due to low water tables. The lower water tables caused by summer drought may have resulted in individuals remaining low down in the vegetation. They may therefore have been missed during the survey. However, it is of note that the outer fringes of the habitat appeared degraded, possibly caused by nitrification of adjacent watercourses, and draining of surrounding lands.

Given the rarity of sedge swamps within the wider landscape, the listing of striated whorl snails as “near threatened” on the Red List, both the snails and associated habitat are considered to be of **Local Importance (Higher Value)**.

Figure 2: Habitat Map



## 4 Description of Likely Impacts

The impact assessment and significance of impacts during both the construction and operational phases was assessed with respect to the key ecological receptors identified within the proposed study area.

### 4.1 Construction Phase

#### 4.1.1 Loss of Habitat

The proposed Project will be approximately 1.7km in length. No protected plant species of conservation value were identified within the study area. There will be no direct damage to protected flora or to habitats protected under the Habitat Directive.

Habitat required to be removed will include agricultural grassland, scrub habitat, sections of hedgerows and treelines and a number of derelict buildings. These habitats were assessed as having Local Importance (higher and lower value). The loss of habitat within the study area will not constitute a significant effect.

The road will not pass through Loughmore Common Turlough pNHA. Loughmore Common Turlough pNHA which is assessed as having National Importance. The road is located 180m north of the turlough at its closest point, and is separated from the habitat by treelines, hedgerows and agricultural grassland. There will be no dust effects or surface water runoff to the turlough during construction given the distance from the site and the intervening habitat which will form a natural barrier.

Sections of hedgerows and treelines will be removed to facilitate the proposed road link. The treelines and hedgerows were identified as important foraging and commuting sites for bats. The loss of foraging and commuting route has the potential to impact local bat populations within the area. The treeline located immediately west of the school and sports fields was identified as having High bat roost potential. A beech tree located within the treeline was confirmed as an active bat roost during the emergency survey.

The derelict farm sheds located south-west of the school will be removed to facilitate the proposed Project. The sheds were identified as having 'Moderate' bat roost potential. No bats were recorded emerging or entering the sheds during the bat surveys, however there is potential that bats may utilise the sheds in the future.

Treelines and hedgerows within the study area are also likely to provide suitable nesting sites for breeding birds. Removal of hedgerows and treelines within the study area would have a moderate effect (depending on the area vegetation cleared) on the carrying capacity of the local environment for nesting birds.

The canal and tall-herb swamp habitats were identified as optimal habitat for common frog. These areas will not be disturbed to facilitate the works. There will be no impact on frogs.

No invasive species listed under Part 1 of the Third Schedule of S.I No. 477 of 2011 were recorded within the study area during the field surveys. Machinery and material movement between sites however can result in the introduction of invasive species. The risk of spreading / translocating invasive species during construction works must be controlled and managed.

#### 4.1.2 Noise / Disturbance

During the construction phase, there will be a temporary increase in noise. The existing background noise levels within the study area is low and characteristic of rural-agricultural areas. The background noise levels increase slightly towards the outer site boundaries which are located in proximity to regional roads and residential areas.

A badger sett was identified approximately 320m from the proposed road. The sett was not in use however there is potential that the sett may be utilised in the future. The NRA guidelines (NRA, 2005) state that no construction works should be undertaken within 50m of active setts and no blasting or piling should be undertaken within 150m of active setts. As the sett occurs 320m from the proposed works area there is no potential for disturbance.

A bat roost was confirmed within a beech tree located at the north-western corner of the site. The treeline is also used as a foraging and commuting route by two species of bat. All other treelines within the study area were identified as having Negligible suitability to support bat roosts but are used as foraging and commuting routes by bats. The derelict farm sheds were identified as having 'Moderate' bat roost potential. Highway sounds, both from construction and operation can create a loud noise environment that may potentially interfere with bats' abilities to hear and respond to the many other biologically important sounds that surround them (The California Department of Transportation, 2016). Therefore, in the event that construction works are undertaken after sunset and before sunrise when bats are active, in proximity to the treelines and confirmed bat roost, there is potential for disturbance to the bats. However, this would not be considered significant given the ample availability of alternative high quality hedgerows for foraging and commuting in the locality.

#### 4.1.3 Pollution

During the construction phase there is potential for spills and leaks of oils, fuels and chemicals from storage areas, plant, and equipment used during construction to impact on the surrounding habitats. Accidental spills of fuels, oils and construction materials (e.g. concrete) can affect habitat quality through deposition of materials in the environment. The works are removed from any habitats of significant ecological value. The surrounding agricultural grasslands will form a natural swale to any accidental spill.

The excavation activities are likely to generate small amounts of dust within the works area. The deposition of dust on habitats can inhibit effective photosynthesis and transpiration. The proposed road is located at such a distance from sensitive ecological receptors that dust deposition will not occur within such habitats.

The use of lighting is likely to be necessary during the construction phase of the Project. Any direct illumination of a bat roost would constitute a significant effect as it could affect bat emergence from the roost.

### 4.2 Operational Phase Impacts

#### 4.2.1 Pollution

Drainage will be to attenuation basins which will connect to existing road drainage. The proposed drainage system will be designed in accordance with the NRA guidelines *Drainage Design for national Road Schemes – Sustainable Drainage Options (NRA, 2014)* which will ensure effective surface water drainage. There is no potential for impact to the receiving waters during the operational phase.

#### 4.2.2 Noise / Disturbance

The operation of the road link will result in a change in noise levels within the area due to the redistribution in traffic along the new roads. The roads however are located in proximity to existing regional roads and residential area and existing background noise are likely to be slightly elevated. The increase in noise level is therefore unlikely to have a significant impact on the surrounding environment.

The risk of traffic related mortality of mammals during the operation of the road is considered low. Traffic on the roads will be slow flowing due to the presence of a number of roundabouts.

#### 4.2.3 Lighting

Street lighting will be installed along the proposed roads which will result in an increase of artificial lighting within the immediate surrounding area. An increase in light can deter nocturnal fauna, in particular bat species. Lighting can impact bats' roosting sites, commuting routes and foraging areas (Bat Conservation Ireland, 2010). A treeline located west of the school was assessed as having high bat roost potential. A bat roost was confirmed within the beech within the treeline. The treeline was also confirmed to be used as a foraging and commuting route by two species of bat. Direct illumination of a bat roost or commuting and foraging routes is likely to affect bat emergence from the roost, alter feeding patterns, and deter bats from commuting along affected corridors, ultimately affecting the bat population.

## 5 Mitigation Measures

Mitigation which should be employed to ensure no significant effects on biodiversity from the Project are described hereunder.

Mitigation is prescribed in accordance with the hierarchical hierarchy set out in the CIEEM guidelines; *Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater and Coastal (2016)* which states that a sequential process should be adopted to avoid, mitigate and compensate ecological impacts.

### 5.1 Construction Phase

#### 5.1.1 Vegetation Clearance

##### Birds

Under subsection 1 of Section 40 of the Wildlife Acts 1976 to 2012, it is not an offence to clear vegetation in the course of road or other construction works or in the development of preparation of sites on which any building or other structure is intended to be provided. However, the Contractor shall aim to limit disturbance to breeding birds and their nests/eggs as far as possible. Where feasible, vegetation clearance should be carried out outside of the bird breeding season. If this is not possible, a pre-construction survey must be undertaken by an ecologists/ornithologist who will identify any nests present along the proposed road route. Where an amber or red listed species nest is identified, the nest will be isolated until such a time that the chicks have fledged or where breeding has failed.

##### Bats

A bat roost was confirmed within a beech tree located immediately west of the primary school and sports field. In the event that the tree is required to be removed to facilitate the proposed road link a derogation license under the Wildlife Act should be sought from NPWS prior to the works commencing. Proposed mitigation measures agreed with NPWS as part of the derogation license will be implemented to minimise impacts to bats.

The remaining trees within the treeline were identified as having high bat roost potential and should be retained where possible. If the trees are required to be felled a pre-construction bat survey of the remaining trees within the treeline should be undertaken to determine the presence or absence of bat roosts. If a bat roost is confirmed a derogation license should be sought from NPWs in order to fell the tree(s).

All trees required to be felled to facilitate the Project should be felled in accordance with NRA guidelines.

In the event that the derelict farm sheds are required to be removed to facilitate the Project, a pre-construction bat survey of the derelict farm sheds should also be undertaken to determine the presence of any new bat roosts. If a bat roost is confirmed within the derelict sheds a derogation license to destroy the building will be required from NPWS.

It is recommended that bat boxes are installed to provide alternative, safe roosting sites for bats. The bat boxes should be designed in accordance with Bat Conservation Ireland guidelines; *Bats and Bat Boxes Guidance Notes for: Agri-environmental Scheme (2015)*. The bat boxes should

be erected prior to the construction works commencing and should not be placed in lit up areas or areas of future development.

## Frog

No impacts on frog are likely.

## Rare and protected plant species

No protected plant species were recorded within the study area, however opposite-leaved pondweed has previously been recorded within the pNHA site. No works will take place in proximity to the canal. No mitigation is required.

A number of early marsh orchids and common spotted orchids were identified within the calcareous grassland. The two species of orchid are not protected but are considered rare. These will not be affected directly or indirectly by the road. As such no mitigation is necessary.

### 5.1.2 Pollution control

For the purpose of general environmental protection, pollution control measures should be employed during construction. These should be designed, installed and maintained in accordance with the CIRIA (C648) guidelines; *Control of water pollution from linear construction projects Technical guidance*.

In order to comply with regulations under 49 and 50 of the European Communities (Birds and Natural Habitat) Regulations (2011) the appointed Contractor should ensure biosecurity measures are implemented during the construction phase to ensure the introduction and translocation of invasive species is prevented. The biosecurity measures should include the visual inspection of vehicles for evidence of attached plant or animal material prior to entering and leaving the works area. All machinery and equipment should be dry and disinfected (if previously used in a contaminated site).

## 5.2 Operational Phase

### 5.2.1 Lighting

Lighting requirements in proximity to the confirmed bat roost (if retained) or to the bat boxes should be designed in accordance with the Bat Conservation Ireland guidelines; *Bats and Lighting Guidance Notes: Planners, engineers, architects and developers*. It is of note the lighting will likely be LED lights. Directional lighting and light shields should be used where possible to minimise light spill.

## 5.3 Residual Impacts

It is anticipated that with the implementation of mitigation measures (as detailed above), the construction and operational phases of the proposed Mungret Link Streets Project is unlikely to impact significantly on the fauna and flora of the study area and surroundings.



## 6 References

- Andrew H., et al (2013) *Bat Tree Habitat Key A Ecol*, Brightwater
- *Bat Conservation Ireland (2015) Bats and Bat Boxes Guidance Notes for: Agri-environmental Scheme.*
- *Bat Conservation Ireland (2010) Bats and Lighting Guidance Notes for: Planners, engineers, architects and developers.*
- *CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater and Coastal.*
- *CIRIA C741(2015) Environmental good practice on site guide (fourth edition).*
- *Environmental Agency (2003) Field Survey Guidance manual: 2003 Version.*
- *Fossit (2000) A Guide to Habitats in Ireland*
- *Goodwillie, R., (1992). Turloughs Over 10ha, Vegetation Survey & Evaluation. A report for the National Park & Wildlife Service, Office of Public Works.*
- *NRA (2014) Drainage Design for National Road Scheme – Sustainable Drainage Options*
- *NRA (2009a) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*
- *NRA (2009b) Guidelines for Assessment of Ecological Impacts of National Road Schemes*
- *NRA (2005a) Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes*
- *NRA (2005b) Guidelines for the Treatment of Bats During the Construction of National Road Schemes*
- *NRA 2006) Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes*
- *The California Department of Transportation. (2016). Technical Guidance for the Assessment and Mitigation of the Effects of Traffic Noise and Road Construction Noise on Bats. July. (Contract 43A0306.) Sacramento, CA.*
- *Smith et al., (2011) Best Practice Guidance for Habitat Survey and Mapping*

# Appendices

A. Wintering Bird Survey

31

## A. Wintering Bird Survey

# Winter Bird Survey of lands at Mungret, Co. Limerick



Version: 19<sup>th</sup> June 2018



Environmental Consultants

Tait Business Centre, Dominic Street,  
Limerick City, Ireland.  
t. +353 61 419477, f. +353 61 414315  
e. [info@ecofact.ie](mailto:info@ecofact.ie)  
w. [www.ecofact.ie](http://www.ecofact.ie)

## TABLE OF CONTENTS

INTRODUCTION .....	3
METHODOLOGY .....	3
RESULTS.....	3
DESK STUDY .....	3
FIELD SURVEY .....	3
OTHER ECOLOGICAL OBSERVATIONS .....	4
CONCLUSIONS AND RECOMMENDATIONS.....	5
REFERENCES.....	9
APPENDIX 1 .....	14

## **INTRODUCTION**

This report outlines the results of a winter bird survey completed at lands at Mungret, Co Limerick, during February and March 2018. The purpose of the survey was to assess the bird species using the site during this period using a combination of walkover and vantage point surveys. Figure 1 illustrates the location of the lands at Mungret, Co. Limerick. The site consists mainly of grass fields bounded by hedgerows. To the south of the site there is an area of rough/wet grassland and a small area of planted broadleaved woodland.

## **METHODOLOGY**

A desktop study was undertaken to identify bird species that have the potential to occur on the proposed development site.

A review of records of birds from the area was undertaken by reviewing the websites of the National Biodiversity Data Centre (NBDC) and the National Parks and Wildlife Service (NPWS). The Bird Atlas 2007-2011 was also used to gather information on bird species that may occur in the Mungret Area (Balmer, D.E., *et al.*, 2013). A full bibliography of information sources reviewed is given in the reference section.

The site was visited on the 17<sup>th</sup> February 2018, 23<sup>rd</sup> February 2018, 8<sup>th</sup> March and 24<sup>th</sup> March 2018. On these days site the site was surveyed using a combination of vantage point watching and walkover surveying from dawn to the early afternoon. The surveys coincided with dry bright days and were considered to be ideal survey conditions. All bird species seen and heard were recorded. A dusk survey was also completed on the 17<sup>th</sup> February 2018. The surveys were completed by Kevin Collins and Dr. Will O'Connor.

## **RESULTS**

### **Desk study**

A full list of bird records from the NBDC online maps for the lands at Mungret, Co. Limerick and the likelihood of these species occurring on the site is included in Appendix 1.

Desk study involved review of available data from the most recent Atlas 2007-2001. The site falls into two tetrads, R55G and R55L. For R55G there were no winter records. Breeding season records were of a Cuckoo in song. For R55L there were 10 species in winter; Woodpigeon, Collared Dove, Blackcap, Great Tit, Magpie, Rook, Chaffinch, Goldfinch, Linnet and Redpoll. There was a record of Buzzard present during the breeding season.

### **Field survey**

The lands at Mungret, Co. Limerick are located approximately 360m south of Mungret, covering a wide area consisting mostly of agricultural grassland with small sections of woodland and buildings. The south and south-east of the site borders part of the R526 for ca. 2.3km, the east of the site roughly borders the R510 for ca. 1.6km, the north of the site with the R859 for ca. 2km and the west of the site cuts through farmland areas for approximately 3.3km. Mungret Woods housing estate is located in the middle of the site with Mount Mungret Estate to the east in the Liskelly townland. No watercourses occur on the site, but a large drain runs through the south of the site. No Natura 2000 Sites, including SPAs, occur within the lands at Mungret, Co. Limerick. The locations of the Lower

River Shannon SAC and River Shannon and River Fergus Estuaries SPA, in relation to the site, are indicated in Figure 2.

Overall, a total of 34 bird species were recorded during this site visit. Details of the species recorded, their BoCCI status (Colhoun & Cummins 2013), and which habitat they are associated with, are given in Table 1.

The bird species recorded were considered to be typical farmland bird species. Buzzards were recorded during all site visits are likely to breed on the site. Kestrels were also regularly noted and will breed on the proposed development site.

Snipe were observed in the wet grassland area to the north of the lands at Mungret. Coot, Sparrowhawk and Mallard were some of the other species noted to occur on the site.

Most species are associated with hedgerows and fields. Many of these species are also associated with woodland. Hedgerow birds are really birds of the woodland edge. Most of the species associated with the area of wet/rough grassland are classed as either amber or red on the BoCCI list.

A section of broadleaved woodland is present to the south of the site which would provide suitable habitat and shelter for woodland bird species such as Cuckoo, which could potentially occur during the breeding season.

There is a large drain to the south of the site just north of the section of broadleaved woodland. The drain was noted to be heavily overgrown with vegetation and is likely to have poor water quality. There are various other small drains scattered around the lands at Mungret. These drains are likely to contribute to insect production in the area serving as an attraction for bird species. Coot, Mallard, Grey Heron and Snipe were recorded along this drain.

The hedgerows on the site are considered to be of good quality, with dense coverage and scattered mature trees. This provides suitable habitat for farmland birds which occur on the site. The woodland and hedgerows present on site support bird species such as Blue Tit, Great Tit, Coal Tit, Blackbird, Rook, Jackdaw, Song Thrush, Wren, Blackbird, Dunnock and many others.

Wet grassland is present in the southern part of the site which provides suitable habitat for bird species such as Snipe.

### **Other ecological observations**

The site is used by Hares and they are likely to breed on the site.

## CONCLUSIONS AND RECOMMENDATIONS

The number of species found at this site and the species composition are in line with what would be expected in farmland in Co. Limerick. There were no species on Annex 1 of the EU Birds Directive. There were also no species associated with the River Shannon and River Fergus estuaries SPA recorded on the site. It is considered unlikely that they would use the site.

There were 2 species on the BoCCI red list, Meadow Pipit and Grey Wagtail. These two species were added because of a steep decline in their numbers during the severe winters of 2009/10 and 2010/11. These populations have since recovered.

Grey Wagtails were recorded along the drain on the south-eastern side of the site. These are common and widespread breeding birds in Ireland but suffered a severe decline following the very cold winters of 2009/10 to 2011/12. This species has shown a strong recovery since then (Crowe *et al.* 2017). As the decline in the breeding population of Grey Wagtails was due to severe winter conditions, and not habitat loss, I do not believe that mitigation measures are required.

The numbers of Snipe on the site, roughly 20, is well short of the threshold for national importance of 100.

The area of wet/rough grassland is the most important from a bird conservation point of view, but it is too small and isolated to support important populations of species of concern.



The most important habitat on the site for birds is the wet grassland habitat. The hedgerows and treelines are also of importance. Water quality in the drain on the site is poor but if that was improved this would be an important ecological feature on the site. Any development on the site should try to protect the wet grassland area, protect hedgerows and mature trees and also address the apparent water quality problems in the drain.



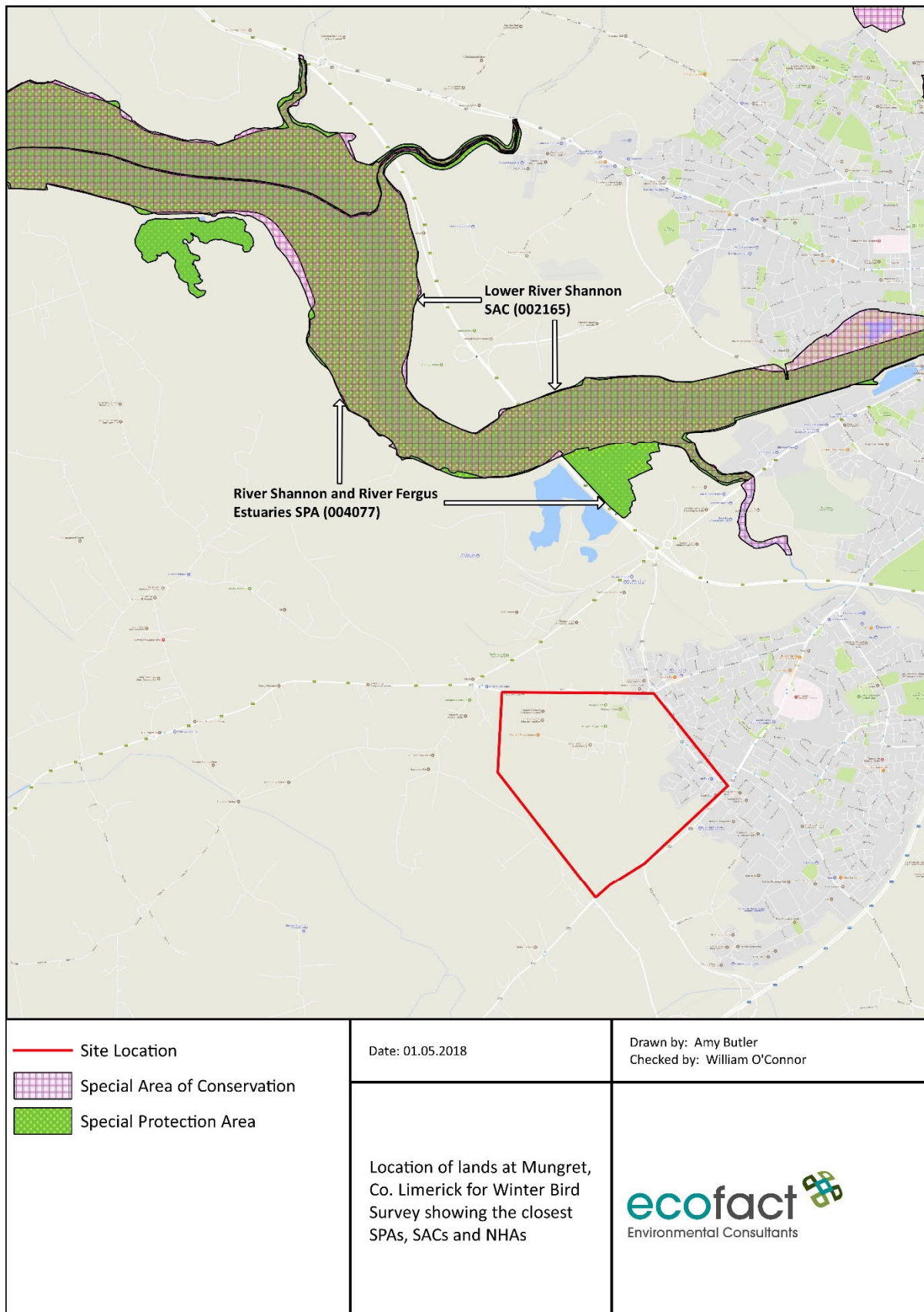
**Table 1** Result of the winter bird survey at the lands at Mungret, Co Limerick.

	BoCCI status	Fields/Hedgerows	Rough/Wet Grass	Woodland	Drain
Grey Heron			*		*
Common Buzzard		*	*	*	
Kestrel	Amber	*	*		
Sparrowhawk	Amber			*	
Snipe	Amber		*		
Wood Pigeon		*		*	
Magpie		*			
Jackdaw		*			
Rook		*			
Hooded Crow		*			
Great Tit		*		*	
Long-tailed Tit		*		*	
Blue Tit		*		*	
Wren		*		*	
Goldcrest	Amber	*		*	
Starling	Amber	*			
Blackbird		*		*	
Mistle Thrush	Amber	*		*	
Redwing		*			
Fieldfare		*	*		
Song Thrush		*		*	
Stonechat	Amber		*		
Robin	Amber	*			
Duncock		*			
Pied Wagtail		*			
Grey Wagtail	Red		*		
Meadow Pipit	Red		*		
Chaffinch		*		*	
Goldfinch		*		*	
Linnet	Amber	*			
Bullfinch		*			
Coot					*
Mallard					*
Snipe					*



 Site Location	Date: 20.02.2018	Drawn by: Amy Butler Checked by: William O'Connor
	Location of lands at Mungret, Co. Limerick for Winter Bird Survey	

**Figure 1** Location of Lands at Mungret, Co. Limerick for Winter Bird Survey.



**Figure 2** Locations of the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA, in relation to the lands at Mungret.

## REFERENCES

Balmer, D.E., Gillings, S., Caffrey, B.J., Swann, R.I., Downie, I.S. & Fuller, R.J. (2013). *Bird Atlas 2007-11: the breeding and wintering birds of Britain and Ireland*. BTO Books, Thetford.

Colhoun, K. Cummins, S.2 (2013) Birds of Conservation Concern in Ireland 2014-2019. *Irish Birds* 9, 523-544.

Crowe, O. Coombes, R. Tierney, T. Walsh, A. OHalloran, J. (2017). *Countryside Bird Survey Report 1998-2016*, BirdWatch Ireland, Wicklow.

## PLATES



**Plate 1** Wet grassland at the Mungret site.



**Plate 2** Large drain bordering planted broadleaved woodland at the Mungret site.



**Plate 3** Improved agricultural grassland at the Mungret site.



**Plate 4** Improved agricultural grassland at the south of the Mungret site.



**Plate 5** Planted broadleaved woodland.



**Plate 6** Buzzard flying over site, February 2018.



**Plate 7** Grey Heron on wet grassland on the site, February 2018.



**Plate 8** Fieldfare on the Mungret site, February 2018.



**Plate 9** Redwing are also winter visitors and were recorded during the current survey.



**Plate 10** Redwing and Mistle thrush on the Mungret site, February 2018.



**Plate 11** Sparrowhawk flying into woodland on the site.



**Plate 12** Stonechat on the Mungret site, February 2018.



## APPENDIX 1

**Table A.1** The NBDC online maps show records of the bird species below found in the 10km Grid Square R55 which includes the lands at Mungret, Co. Limerick.

Common Name	Scientific Name	Likely to occur on the site
Mute Swan	<i>Cygnus olor</i>	
Whooper Swan	<i>Cygnus cygnus</i>	
Greylag Goose	<i>Anser anser</i>	
Common Shelduck	<i>Tadorna tadorna</i>	
Wigeon	<i>Anas penelope</i>	
Gadwall	<i>Anas strepera</i>	
Teal	<i>Anas crecca</i>	
Pintail	<i>Anas acuta</i>	
Shoveler	<i>Anas clypeata</i>	
Pochard	<i>Aythya ferina</i>	
Tufted Duck	<i>Aythya fuligula</i>	
Scaup	<i>Anas marila</i>	
Goldeneye	<i>Bucephala clangula</i>	
Red-breasted Merganser	<i>Mergus serrator</i>	
Goosander	<i>Mergus merganser</i>	
Pheasant	<i>Phasianus colchicus</i>	✓
Cormorant	<i>Phalacrocorax carbo</i>	
Little Egret	<i>Egretta garzetta</i>	
Grey Heron	<i>Ardea cinerea</i>	✓
Little Grebe	<i>Tachybaptus ruficollis</i>	
Great Crested Grebe	<i>Podiceps cristatus</i>	
Hen Harrier	<i>Circus cyaneus</i>	
Sparrowhawk	<i>Accipiter nisus</i>	✓
Kestrel	<i>Falco tinnunculus</i>	✓
Merlin	<i>Falco columbarius</i>	
Peregrine	<i>Falco peregrinus</i>	
Water Rail	<i>Rallus aquaticus</i>	
Moorhen	<i>Gallinula chloropus</i>	✓
Coot	<i>Fulica atra</i>	✓
Oystercatcher	<i>Haematopus ostralegus</i>	
Ringed Plover	<i>Charadrius hiaticula</i>	
Golden Plover	<i>Pluvialis apricaria</i>	
Lapwing	<i>Vanellus vanellus</i>	
Dunlin	<i>Calidris alpina</i>	
Jack Snipe	<i>Lymnocyptes minimus</i>	
Snipe	<i>Gallinago gallinago</i>	✓
Woodcock	<i>Scolopax rusticola</i>	
Black-tailed Godwit	<i>Limosa limosa</i>	
Curlew	<i>Numenius arquata</i>	
Greenshank	<i>Tringa nebularia</i>	
Redshank	<i>Tringa totanus</i>	
Turnstone	<i>Arenaria interpres</i>	
Black-headed Gull	<i>Larus ridibundus</i>	
Common Gull	<i>Larus canus</i>	
Lesser Black-backed Gull	<i>Larus fuscus</i>	
Herring Gull	<i>Larus argentatus</i>	
Great Black-backed Gull	<i>Larus marinus</i>	
Rock Dove / Feral Pigeon	<i>Columba livia</i>	✓
Stock Dove	<i>Columba oenas</i>	✓
Woodpigeon	<i>Columba palumbus</i>	✓
Cuckoo	<i>Cuculus canorus</i>	✓
Barn Owl	<i>Tyto alba</i>	
Long-eared owl	<i>Asio otus</i>	
Kingfisher	<i>Alcedo atthis</i>	

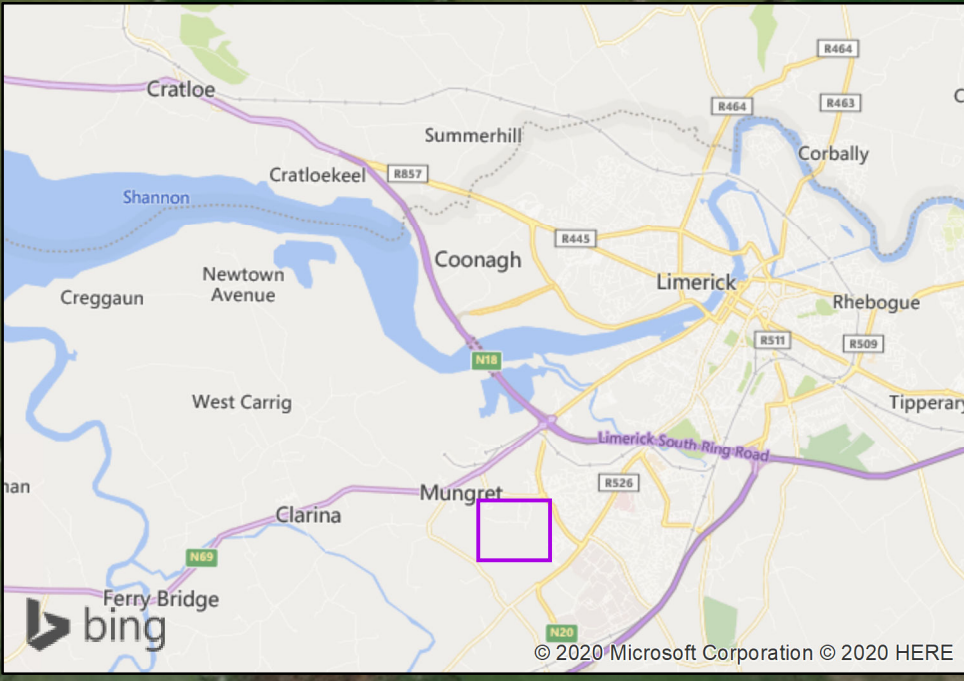
Common Name	Scientific Name	Likely to occur on the site
Magpie	<i>Pica pica</i>	✓
Swift	<i>Apus apus</i>	✓
Jay	<i>Garrulus glandarius</i>	✓
Skylark	<i>Alauda arvensis</i>	✓
Sand Martin	<i>Riparia riparia</i>	
House Martin	<i>Delichon urbicum</i>	✓
Treecreeper	<i>Certhia familiaris</i>	✓
Dipper	<i>Cinclus cinclus</i>	
Brambling	<i>Fringilla montifringilla</i>	✓
Linnet	<i>Carduelis cannabina</i>	✓
Lesser Redpol	<i>Carduelis flammea cabaret</i>	✓
Jackdaw	<i>Corvus monedula</i>	✓
Rook	<i>Corvus frugilegus</i>	✓
Hooded Crow	<i>Corvus cornix</i>	✓
Raven	<i>Corvus corax</i>	✓
Goldcrest	<i>Regulus regulus</i>	✓
Blue Tit	<i>Parus caeruleus</i>	✓
Great Tit	<i>Parus major</i>	✓
Coal Tit	<i>Parus ater</i>	✓
Swallow	<i>Hirundo rustica</i>	✓
Long-tailed Tit	<i>Aegithalus caudatus</i>	✓
Chiffchaff	<i>Phylloscopus collybita</i>	✓
Willow Warbler	<i>Phylloscopus trochilus</i>	✓
Blackcap	<i>Sylvia atricapilla</i>	✓
Whitethroat	<i>Sylvia communis</i>	✓
Grasshopper Warbler	<i>Locustella naevia</i>	✓
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>	✓
Wren	<i>Troglodytes troglodytes</i>	✓
Starling	<i>Sturnus vulgaris</i>	✓
Blackbird	<i>Turdus merula</i>	✓
Fieldfare	<i>Turdus pilaris</i>	✓
Song Thrush	<i>Turdus philomelos</i>	✓
Redwing	<i>Turdus iliacus</i>	✓
Mistle Thrush	<i>Turdus viscivorus</i>	✓
Spotted Flycatcher	<i>Muscicapa striata</i>	✓
Robin	<i>Erithacus rubecula</i>	✓
Stonechat	<i>Saxicola torquata</i>	
Dunnock	<i>Prunella modularis</i>	✓
House Sparrow	<i>Passer domesticus</i>	✓
Grey Wagtail	<i>Motacilla cinerea</i>	✓
Pied Wagtail	<i>Motacilla alba yarrellii</i>	✓
Meadow Pipit	<i>Anthus pratensis</i>	✓
Chaffinch	<i>Fringilla coelebs</i>	✓
Greenfinch	<i>Carduelis chloris</i>	✓
Goldfinch	<i>Carduelis carduelis</i>	✓
Siskin	<i>Carduelis spinus</i>	✓
Bullfinch	<i>Pyrrhula pyrrhula</i>	✓
Reed Bunting	<i>Emberiza schoeniclus</i>	✓



## Appendix 2

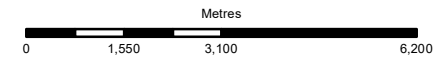
### Figures from Water Quality Assessment Report

## Figures from Water Quality Assessment Report



— Site Boundary

Coordinate System: IRENET95 Irish Transverse Mercator



Rev	Date	By	Chkd	Appd
D1	2020-09-09	LC	MK	GB

# ARUP

50 Ringsend Road  
 Dublin D04 T6X0  
 t: +353 1 233 4304  
 www.arup.com

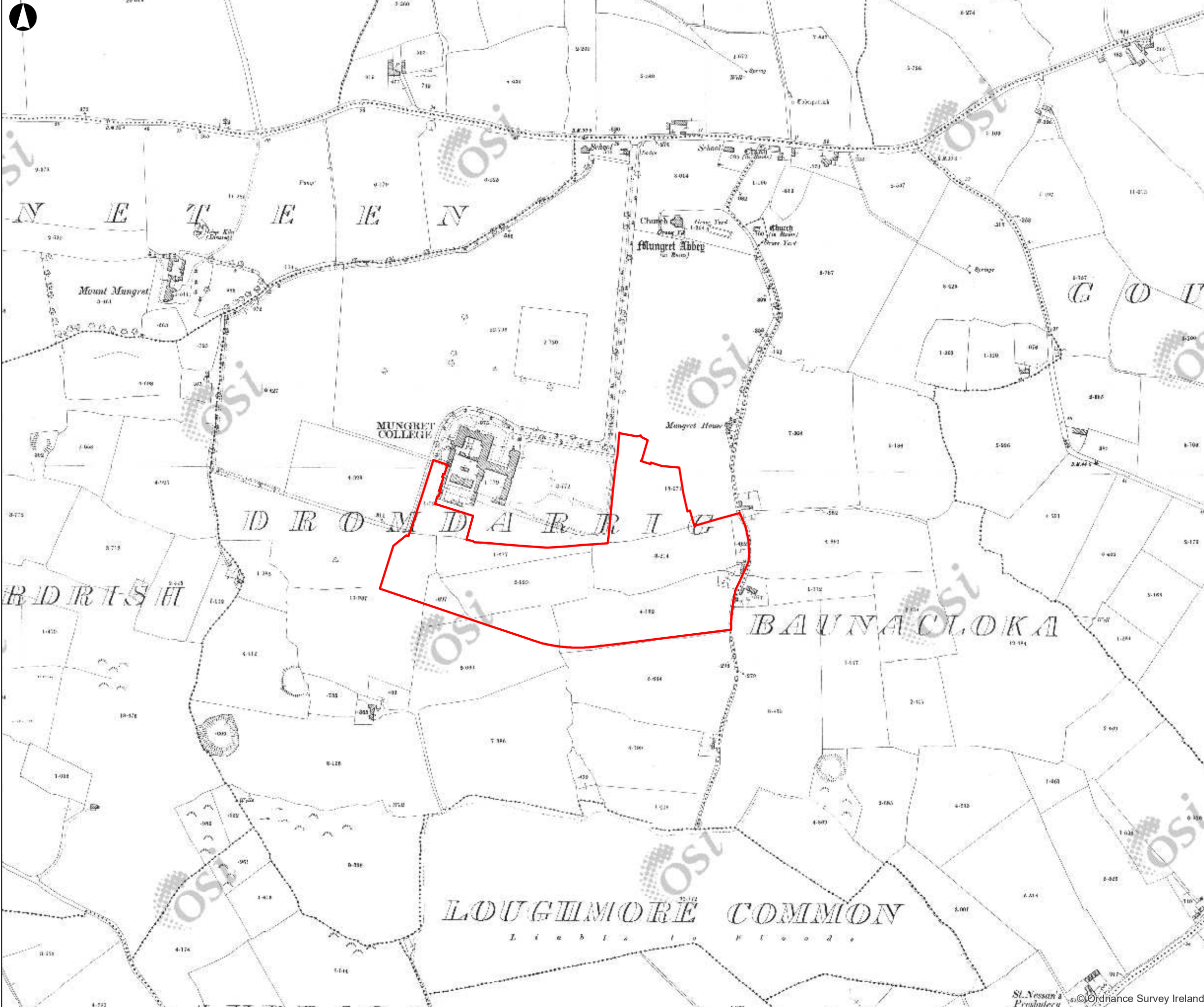
Client  
**Limerick City and County Council**

Project Title  
**Appropriate Assessment Screening  
 for Mungret Residential  
 Development**

Drawing Title  
**Figure 1: Site location**

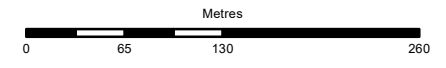
Scale at A3  
**1:120,000**

Role	
<b>Hydrogeology</b>	
Suitability	
<b>Issue</b>	
Arup Job No	Rev
<b>261585</b>	<b>Issue</b>
Name	
<b>001</b>	



— Site Boundary

Coordinate System: IREN95 Irish Transverse Mercator



Rev	Date	By	Chkd	Appd
D1	2020-09-09	LC	MK	GB

# ARUP

50 Ringsend Road  
Dublin D04 T6X0  
t: +353 1 233 4304  
www.arup.com

Client  
**Limerick City and County Council**

Project Title  
**Appropriate Assessment Screening  
for Mungret Residential  
Development**

Drawing Title  
**Figure 2: OSI historic 25 inch map  
(1888-1913)**

Scale at A3  
**1:5,000**

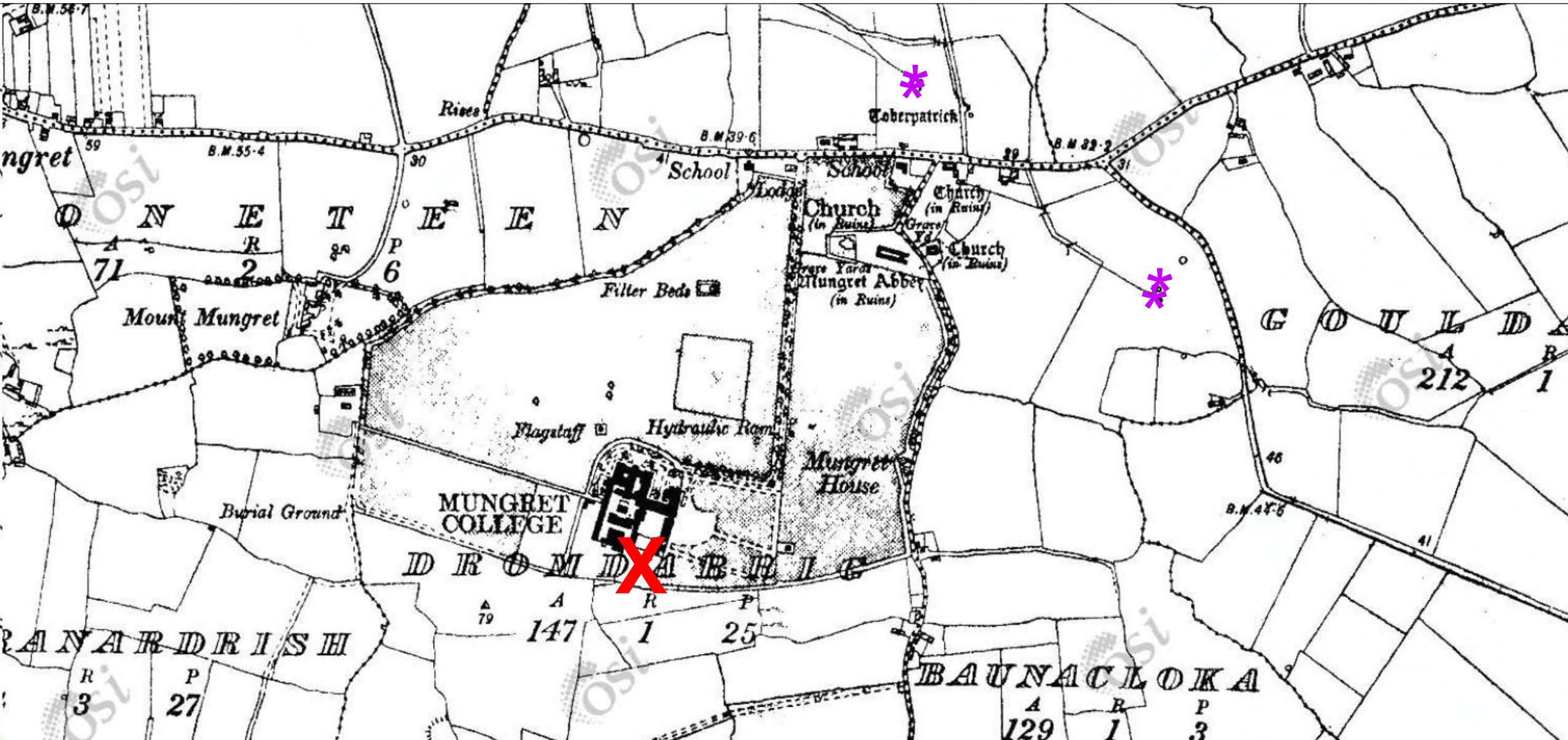
Role  
**Hydrogeology**

Suitability  
**Issue**

Arup Job No  
**261585**

Rev  
**Issue**

Name  
**002**



- X Site Boundary
- \* Spring Features

Coordinate System: IRENET95 Irish Transverse Mercator

D1	2020-09-09	LC	MK	GB
Rev	Date	By	Chkd	Appd

# ARUP

50 Ringsend Road  
Dublin D04 T6X0  
t: +353 1 233 4304  
www.arup.com

Client  
**Limerick City and County Council**

Project Title  
**Appropriate Assessment Screening  
for Mungret Residential  
Development**

Drawing Title  
**Figure 3: OSI historic 6 inch map  
(1888-1913)  
Not to Scale**

Scale at A3

Role  
**Hydrogeology**

Suitability  
**Issue**

Arup Job No <b>261585</b>	Rev <b>Issue</b>
------------------------------	---------------------

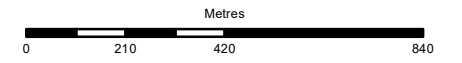
Name  
**003**





- Legend**
- Site Boundary
  - Ⓟ Groundwater monitoring boreholes
  - Karst features
  - ➡ Canal / stream flow direction
  - ➡ N69 surface water drains
  - ▭ Surface water features
  - ➡ River flow direction arrows
- SAC and SPA**
- ▭ Lower River Shannon SAC
  - ▭ A999 Wetlands and Waterbirds

Coordinate System: IRENET95 Irish Transverse Mercator



D1	2020-09-09	LC	MK	GB
Rev	Date	By	Chkd	Appd

# ARUP

50 Ringsend Road  
Dublin D04 T6X0  
t: +353 1 233 4304  
www.arup.com

Client  
**Limerick City and County Council**

Project Title  
**Appropriate Assessment Screening for Mungret Residential Development**

Drawing Title  
**Figure 4: Surface water flow directions, groundwater monitoring boreholes and karst features in Loughmore Common**

Scale at A3  
**1:16,000**

Role  
**Hydrogeology**

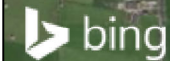
Issue

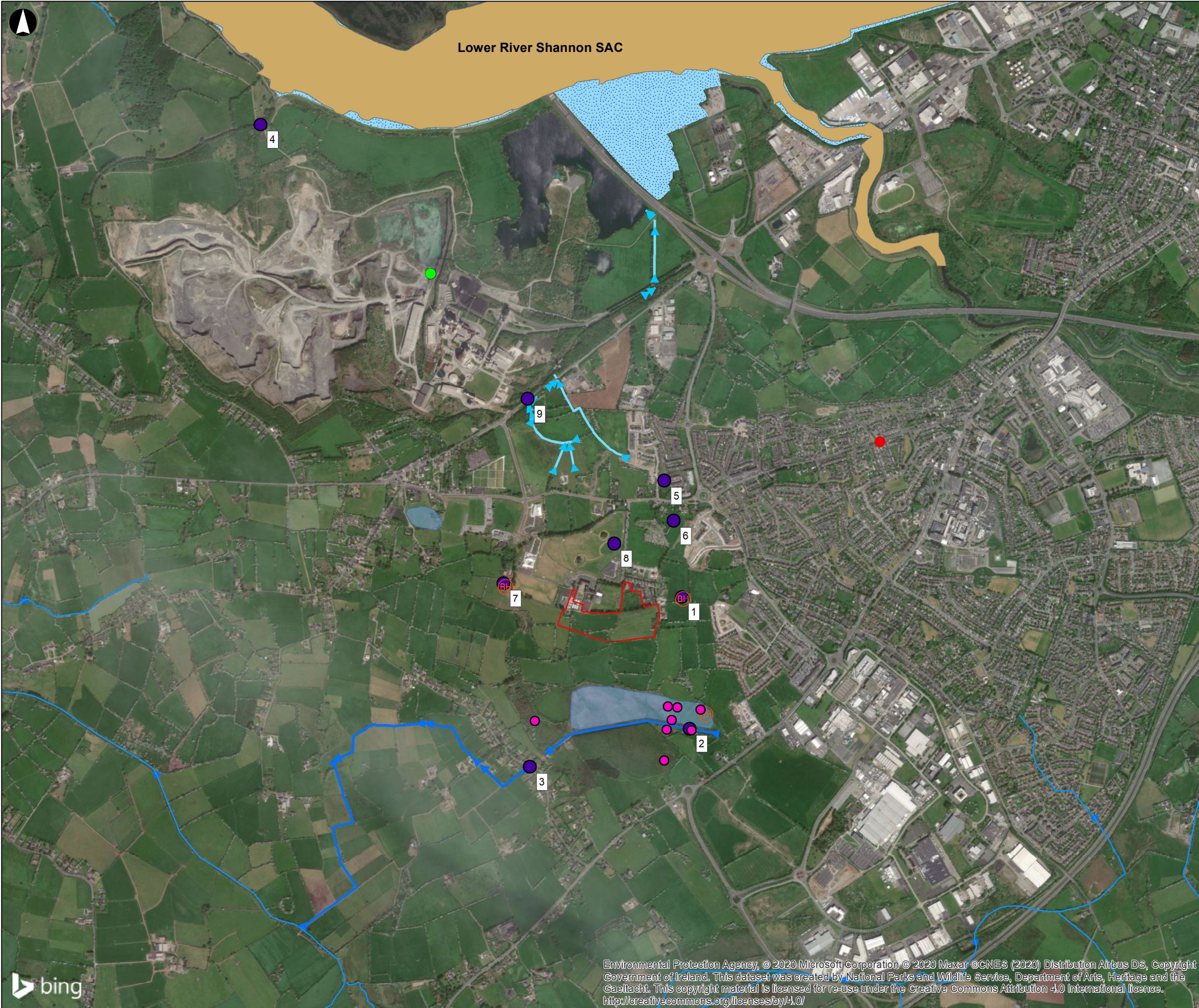
Arup Job No  
**261585**

Rev  
**Issue**

Name  
**004**

Environmental Protection Agency, © 2020 Microsoft Corporation © 2020 Maxar ©CNES (2020) Distribution Airbus DS, Copyright Government of Ireland. This dataset was created by National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. This copyright material is licensed for re-use under the Creative Commons Attribution 4.0 International licence. <http://creativecommons.org/licenses/by/4.0/>





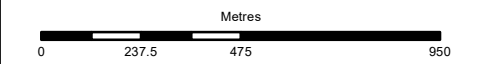
**Legend**

- Site Boundary
- Quarry sump
- Karst Features
- BH Groundwater monitoring boreholes
- Site Features
- Dye outfall location
- ➔ Canal / stream flow direction
- ➔ N69 surface water drains
- Surface water features
- ➔ River flow direction arrows

**SAC and SPA**

- Lower River Shannon SAC
- A999 Wetlands and Waterbirds

Coordinate System: IREN95 Irish Transverse Mercator



Rev	Date	By	Chkd	Appd
D1	2020-09-09	LC	MK	GB

# ARUP

50 Ringsend Road  
Dublin D04 T6X0  
t: +353 1 233 4304  
www.arup.com

Client  
**Limerick City and County Council**

Project Title  
**Appropriate Assessment Screening for Mungret Residential Development**

Drawing Title  
**Figure 5: Location of features identified during site walkover**

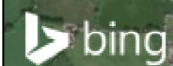
Scale at A3  
**1:18,000**

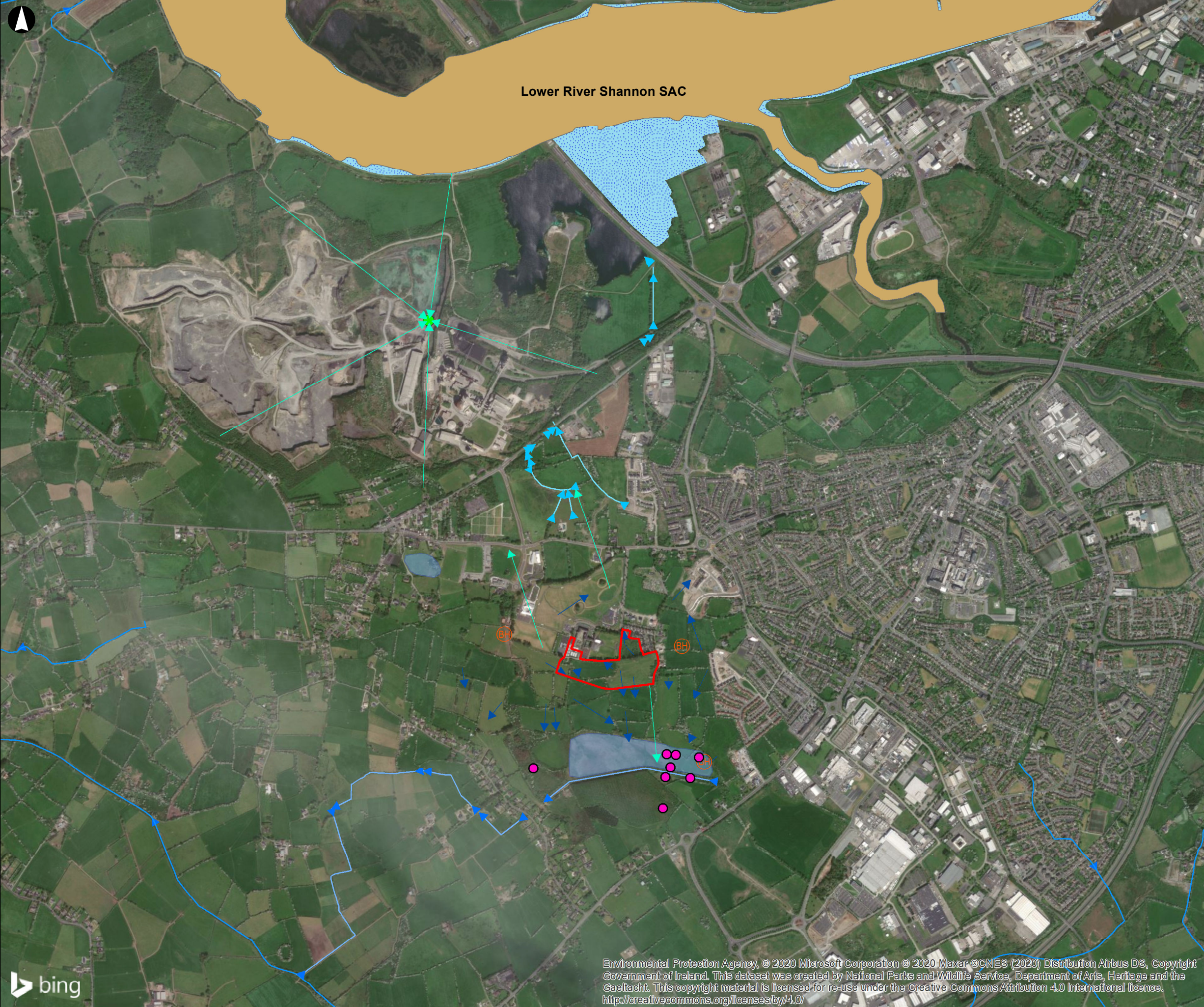
Role  
**Hydrogeology**

Suitability  
**Issue**

Arup Job No	Rev
<b>261585</b>	<b>Issue</b>
Name	
<b>005</b>	

Environmental Protection Agency, © 2020 Microsoft Corporation © 2020 Maxar ©CNES (2020) Distribution Airbus DS, Copyright Government of Ireland. This dataset was created by National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. This copyright material is licensed for re-use under the Creative Commons Attribution 4.0 International licence. <http://creativecommons.org/licenses/by/4.0/>





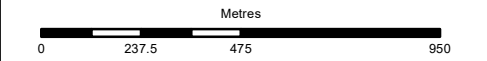
**Legend**

- Site Boundary
- Surface water pathway
- Groundwater pathway
- ★ Quarry sump
- Karst Features
- BH Groundwater monitoring boreholes
- Canal / stream flow direction
- N69 surface water drains
- Surface water features
- River Flow Direction Arrows

**SAC and SPA**

- Lower River Shannon SAC
- A999 Wetlands and Waterbirds

Coordinate System: IRENET95 Irish Transverse Mercator



D1	2020-03-09	LC	MK	GB
Rev	Date	By	Chkd	Appd

# ARUP

50 Ringsend Road  
 Dublin D04 T6X0  
 t: +353 1 233 4304  
 www.arup.com

Client  
**Limerick City and County Council**

Project Title  
**Appropriate Assessment Screening  
 for Mungret Residential  
 Development**

Drawing Title  
**Figure 6: Surface water and  
 groundwater flow directions**

Scale at A3  
**1:18,000**

Role  
**Hydrogeology**

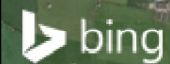
Issue

Arup Job No  
**261585**

Rev  
**Issue**

Name  
**006**

Environmental Protection Agency, © 2020 Microsoft Corporation © 2020 Maxar ©CNES (2020) Distribution Airbus DS, Copyright Government of Ireland. This dataset was created by National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. This copyright material is licensed for re-use under the Creative Commons Attribution 4.0 International licence. <http://creativecommons.org/licenses/by/4.0/>



## Appendix 3

### Photographs from Site Walkover

## Photographs from Site Walkover (27<sup>th</sup> February 2020)

---



**Image 1: Photograph taken on the proposed development site. Ponding observed on site after prolonged period of rainfall.**



**Image 2: Photograph taken on the proposed development site.**



**Image 3: Photograph taken of BH205. Wellhead is secure with protective fencing erected.**



**Image 4: Photograph of manmade canal and toe drain**



**Image 5: Water features from left to right: turlough, manmade canal and toe drain.**



**Image 6: Historic spring site beside housing development fenced-off at time of site visit.**



**Image 7: Photograph taken of BH211. Wellhead is locked, protective fencing can be seen on the ground.**





**Image 8: Photograph taken in Mungret Park. Ponding observed in the lower gradients of the site.**



**Image 9: Photograph taken in Mungret Park showing fenced off feature.**



**Image 10: Photograph taken from the N69 showing culvert perpendicular to the road flowing north**

## Appendix 4

### Calculations from Contaminant Concentration Assessment

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)	Variable	Value	Unit	Source
Contaminant		Benzene		from Level 1
Target Concentration	C <sub>T</sub>	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

**Domenico - Steady state** Equations in HRA publication

Approach for simulating vertical dispersion:

**Simulate vertical dispersion in 1 direction**

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

**Apply degradation rate to pollutants in all phases (e.g. field derived value)**

Variable	Value	Unit	Source of parameter value
Initial contaminant concentration in groundwater at plume core	C <sub>0</sub>	1.38E-01	mg/l
Half life for degradation of contaminant in water	t <sub>1/2</sub>	9.00E+99	days
Calculated decay rate	λ	7.70E-101	days <sup>-1</sup>
Width of plume in aquifer at source (perpendicular to flow)	Sz	5.00E+01	m
Plume thickness at source	Sy	5.00E+00	m
Saturated aquifer thickness	da	5.00E+01	m
Bulk density of aquifer materials	ρ	2.00E+00	g/cm <sup>3</sup>
Effective porosity of aquifer	n	1.10E-02	fraction
Hydraulic gradient	I	2.30E-02	fraction
Hydraulic conductivity of aquifer	K	3.60E-01	m/d
Distance to compliance point	x	1.90E+03	m
Distance (lateral) to compliance point perpendicular to flow direction	z		m
Distance (depth) to compliance point perpendicular to flow direction	y		m
Time since pollutant entered groundwater	t	1.00E+100	days
Parameters values determined from options			time variant options only
Partition coefficient	Kd	0.00E+00	l/kg
Longitudinal dispersivity	ax	1.90E+02	m
Transverse dispersivity	ay	1.90E+01	m
Vertical dispersivity	ay	1.90E+00	m

Calculated Parameters

Variable	Value	Unit
Groundwater flow velocity	V	7.53E-01 m/d
Retardation factor	Rf	1.00E+00
Decay rate used	λ	7.70E-101 d <sup>-1</sup>
Rate of contaminant flow due to retardation	u	7.53E-01 m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C <sub>ED</sub>	4.80E-04 mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	2.87E+02

Remedial Targets

Remedial Target	Value	Unit	For comparison with measured groundwater concentration.
Domenico - Steady state	2.87E+00	mg/l	
Distance to compliance point	1900	m	
Concentration of contaminant at compliance point	C <sub>ED</sub> /C <sub>0</sub>	4.80E-04	mg/l

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

**User specified value for partition coefficient**

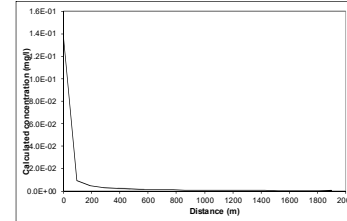
Entry if specify partition coefficient (option)	Kd	0.00E+00	l/kg
Soil water partition coefficient	K <sub>d</sub>		l/kg
Entry for non-polar organic chemicals (option)	foc		fraction
Fraction of organic carbon in aquifer	K <sub>oc</sub>		l/kg
Organic carbon partition coefficient	K <sub>oc</sub>		l/kg
Entry for ionic organic chemicals (option)	K <sub>oc,ion</sub>		l/kg
Sorption coefficient for related species	K <sub>oc,ion</sub>		l/kg
Sorption coefficient for ionised species	pH		fraction
pH value	pKa		fraction
acid dissociation constant	foc		fraction
Fraction of organic carbon in aquifer	Kd	0.00E+00	l/kg
Soil water partition coefficient			

Define dispersivity (click brown cell and use pull down list)

**Dispersivities 10%, 1%, 0.1% of pathway length**

Variable	Enter value	Calc. value Xu & Eckstein	Unit
Longitudinal dispersivity	ax	1.90E+02	m
Transverse dispersivity	ay	1.90E+01	m
Vertical dispersivity	ay	1.90E+00	m

Note values of dispersivity must be > 0  
For calculated value, assumes ax = 0.1 \* x, az = 0.01 \* x, ay = 0.001 \* x  
Xu & Eckstein (1995) report ax = 0.83(log<sub>10</sub>x)<sup>0.41</sup>; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O<sub>2</sub>, NO<sub>3</sub>, SO<sub>4</sub> etc than an alternative solution should be used

Calculated concentrations for distance-concentration graph

Domenico - Steady state  
From calculation sheet

Distance	Concentration	mg/l
0		1.4E-01
95.0		9.24E-03
190.0		4.71E-03
285.0		3.16E-03
380.0		2.38E-03
475.0		1.91E-03
570.0		1.59E-03
665.0		1.37E-03
760.0		1.20E-03
855.0		1.06E-03
950.0		9.58E-04
1045.0		8.71E-04
1140.0		7.98E-04
1235.0		7.38E-04
1330.0		6.85E-04
1425.0		6.40E-04
1520.0		6.00E-04
1615.0		5.65E-04
1710.0		5.33E-04
1805.0		5.05E-04
1900.0		4.80E-04

Site being assessed:	Mungret
Completed by:	Lindsay Connolly
Date:	#####
Version:	1

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)	Variable	Value	Unit	Source
Contaminant		Toluene		from Level 1
Target Concentration	C <sub>T</sub>	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

**Domenico - Steady state** Equations in HRA publication

Approach for simulating vertical dispersion:

**Simulate vertical dispersion in 1 direction**

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

**Apply degradation rate to pollutants in all phases (e.g. field derived value)**

Variable	Value	Unit	Source of parameter value
Initial contaminant concentration in groundwater at plume core	C <sub>0</sub>	3.66E-01	mg/l
Half life for degradation of contaminant in water	t <sub>1/2</sub>	9.00E+99	days
Calculated decay rate	λ	7.70E-101	days <sup>-1</sup>
Width of plume in aquifer at source (perpendicular to flow)	Sz	5.00E+01	m
Plume thickness at source	Sy	5.00E+00	m
Saturated aquifer thickness	da	5.00E+01	m
Bulk density of aquifer materials	ρ	2.00E+00	g/cm <sup>3</sup>
Effective porosity of aquifer	n	1.10E-02	fraction
Hydraulic gradient	I	2.30E-02	fraction
Hydraulic conductivity of aquifer	K	3.60E-01	m/d
Distance to compliance point	x	1.90E+03	m
Distance (lateral) to compliance point perpendicular to flow direction	z		m
Distance (depth) to compliance point perpendicular to flow direction	y		m
Time since pollutant entered groundwater	t	1.00E+100	days
Parameters values determined from options			time variant options only
Partition coefficient	Kd	0.00E+00	l/kg
Longitudinal dispersivity	ax	1.90E+02	m
Transverse dispersivity	ay	1.90E+01	m
Vertical dispersivity	ay	1.90E+00	m

Calculated Parameters

Variable	Value	Unit
Groundwater flow velocity	V	7.53E-01 m/d
Retardation factor	Rf	1.00E+00
Decay rate used	λ	7.70E-101 d <sup>-1</sup>
Rate of contaminant flow due to retardation	u	7.53E-01 m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C <sub>ED</sub>	1.27E-03 mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	2.87E+02

Remedial Targets

Remedial Target	Value	Unit	For comparison with measured groundwater concentration.
Domenico - Steady state	2.87E+00	mg/l	
Distance to compliance point	1900	m	
Concentration of contaminant at compliance point	C <sub>ED</sub> /C <sub>0</sub>	1.27E-03	mg/l Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

**User specified value for partition coefficient**

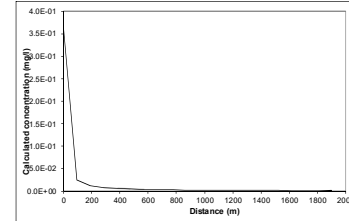
Soil water partition coefficient	Kd	0.00E+00	l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc		fraction
Organic carbon partition coefficient	Koc		l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	K <sub>oc,rel</sub>		l/kg
Sorption coefficient for ionised species	K <sub>oc,i</sub>		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	0.00E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

**Dispersivities 10%, 1%, 0.1% of pathway length**

Variable	Value	Unit	Enter value	Calc. value Xu & Eckstein
Longitudinal dispersivity	ax		1.90E+02	1.90E+02 m
Transverse dispersivity	ay		1.90E+01	1.90E+01 m
Vertical dispersivity	ay		1.90E+00	1.90E+00 m

Note values of dispersivity must be > 0  
For calculated value, assumes ax = 0.1 \* x, az = 0.01 \* x, ay = 0.001 \* x  
Xu & Eckstein (1995) report ax = 0.83(log<sub>10</sub>x)<sup>0.41</sup>; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O<sub>2</sub>, NO<sub>3</sub>, SO<sub>4</sub> etc than an alternative solution should be used

Calculated concentrations for distance-concentration graph

Distance	Concentration
0	3.7E-01
95.0	2.45E-02
190.0	1.25E-02
285.0	8.39E-03
380.0	6.31E-03
475.0	5.06E-03
570.0	4.22E-03
665.0	3.62E-03
760.0	3.17E-03
855.0	2.82E-03
950.0	2.54E-03
1045.0	2.31E-03
1140.0	2.12E-03
1235.0	1.96E-03
1330.0	1.82E-03
1425.0	1.70E-03
1520.0	1.59E-03
1615.0	1.50E-03
1710.0	1.41E-03
1805.0	1.34E-03
1900.0	1.27E-03

Site being assessed:	Mungret
Completed by:	Lindsay Connolly
Date:	#####
Version:	1

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note



Input Parameters (using pull down menu)	Variable	Value	Unit	Source
Contaminant	Xylenes			From Level 1
Target Concentration	C <sub>T</sub>	1.00E-02	mg/l	From Level 1

Select Method for deriving Partition Co-efficient (using pull down menu)

User specified value for partition coefficient

Entry if specify partition coefficient (option)	Kd	0.00E+00	l/kg
Soil water partition coefficient	K <sub>d,sw</sub>		l/kg
Entry for non-polar organic chemicals (option)	f <sub>oc</sub>		fraction
Fraction of organic carbon in aquifer	K <sub>oc</sub>		l/kg
Organic carbon partition coefficient	K <sub>oc,ion</sub>		l/kg
Entry for ionic organic chemicals (option)	K <sub>oc,i</sub>		l/kg
Sorption coefficient for related species	pH		
Sorption coefficient for ionised species	pKa		
pH value	f <sub>oc</sub>		fraction
acid dissociation constant	K <sub>d</sub>	0.00E+00	l/kg
Fraction of organic carbon in aquifer			
Soil water partition coefficient			

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state Equations in HRA publication

Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to pollutants in all phases (e.g. field derived value)

Initial contaminant concentration in groundwater at plume core	C <sub>0</sub>	1.62E-01	mg/l	US EPA Effective solubility calculator
Half life for degradation of contaminant in water	t <sub>1/2</sub>	9.00E+99	days	Assume no decay
Calculated decay rate	λ	7.70E-101	days <sup>-1</sup>	
Width of plume in aquifer at source (perpendicular to flow)	Sz	5.00E+01	m	Assumed spill area
Plume thickness at source	Sy	5.00E+00	m	Assumed plume depth
Saturated aquifer thickness	da	5.00E+01	m	From Conceptual Understanding of Aquifers
Bulk density of aquifer materials	ρ	2.00E+00	g/cm <sup>3</sup>	Assumed typical rock density
Effective porosity of aquifer	n	1.10E-02	fraction	GSJ 2015 Irish Aquifer Properties
Hydraulic gradient	I	2.30E-02	fraction	See calculation sheet
Hydraulic conductivity of aquifer	K	3.60E-01	m/d	GSJ 2015 Irish Aquifer Properties
Distance to compliance point	x	1.90E+03	m	Measured from approx. centre of site.
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	0.00E+00	l/kg	see options
Longitudinal dispersivity	ax	1.90E+02	m	see options
Transverse dispersivity	ay	1.90E+01	m	see options
Vertical dispersivity	ay	1.90E+00	m	see options

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

Longitudinal dispersivity	ax	Enter value	Calc. value Xu & Eckstein	m
Transverse dispersivity <td>ay</td> <td>1.90E+02</td> <td>1.90E+02</td> <td>1.90E+02</td>	ay	1.90E+02	1.90E+02	1.90E+02
Vertical dispersivity <td>ay</td> <td>1.90E+01</td> <td>1.90E+01</td> <td>1.90E+01</td>	ay	1.90E+01	1.90E+01	1.90E+01
Vertical dispersivity <td>ay</td> <td>1.90E+00</td> <td>1.90E+00</td> <td>1.90E+00</td>	ay	1.90E+00	1.90E+00	1.90E+00

Note values of dispersivity must be > 0  
For calculated value, assumes ax = 0.1 \* x, az = 0.01 \* x, ay = 0.001 \* x  
Xu & Eckstein (1995) report ax = 0.83(log<sub>10</sub>x)<sup>0.44</sup>; az = ax/10, ay = ax/100 are assumed

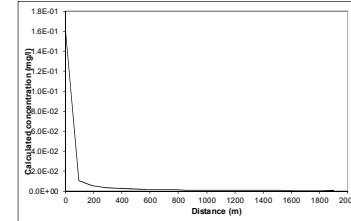
Calculated Parameters

Variable	Value	Unit
Groundwater flow velocity	v	7.53E-01 m/d
Retardation factor	Rf	1.00E+00
Decay rate used	λ	7.70E-101 d <sup>-1</sup>
Rate of contaminant flow due to retardation	u	7.53E-01 m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C <sub>ED</sub>	5.63E-04 mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	2.87E+02

Remedial Targets

Remedial Target	2.87E+00	mg/l	For comparison with measured groundwater concentration.
Domenico - Steady state			
Distance to compliance point	1900	m	
Concentration of contaminant at compliance point	C <sub>ED</sub> /C <sub>0</sub>	5.63E-04	mg/l Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.



Calculated concentrations for distance-concentration graph

Distance	Concentration
0	1.62E-01
95.0	1.00E-02
190.0	5.63E-03
285.0	3.71E-03
380.0	2.79E-03
475.0	2.24E-03
570.0	1.87E-03
665.0	1.60E-03
760.0	1.40E-03
855.0	1.25E-03
950.0	1.12E-03
1045.0	1.02E-03
1140.0	9.38E-04
1235.0	8.66E-04
1330.0	8.04E-04
1425.0	7.51E-04
1520.0	7.04E-04
1615.0	6.63E-04
1710.0	6.26E-04
1805.0	5.93E-04
1900.0	5.63E-04

Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O<sub>2</sub>, NO<sub>3</sub>, SO<sub>4</sub> etc than an alternative solution should be used

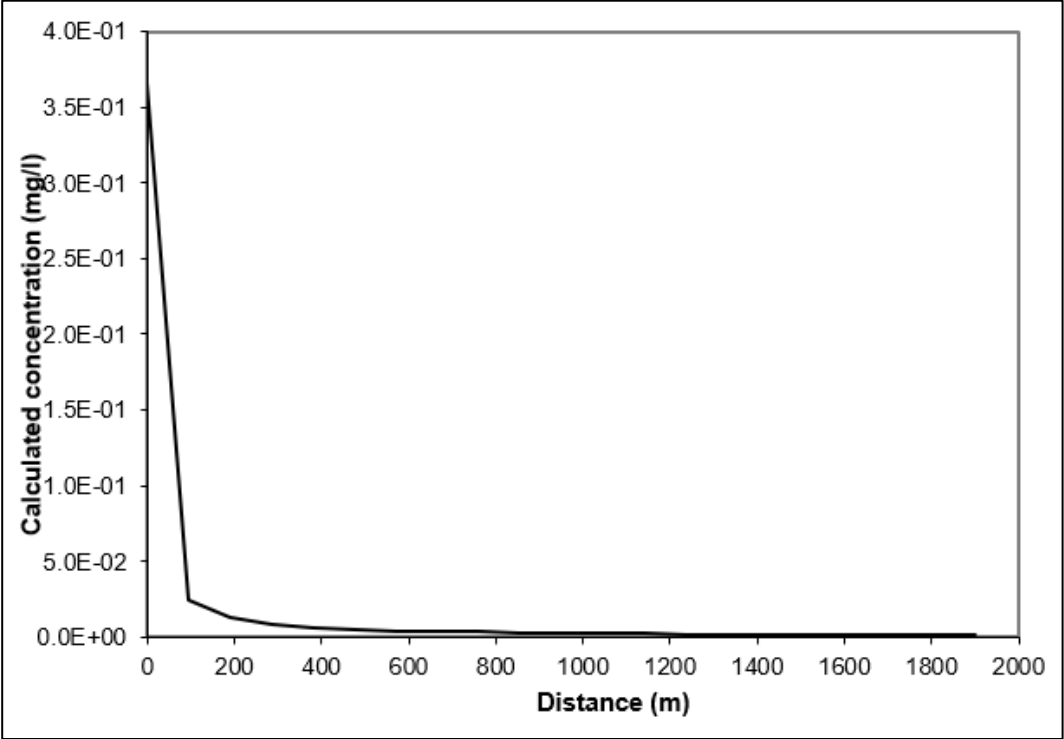
Site being assessed:	Mungret
Completed by:	Lindsay Connolly
Date:	#####
Version:	1

## Appendix 5

### Graphs from Contaminant Concentration Assessment

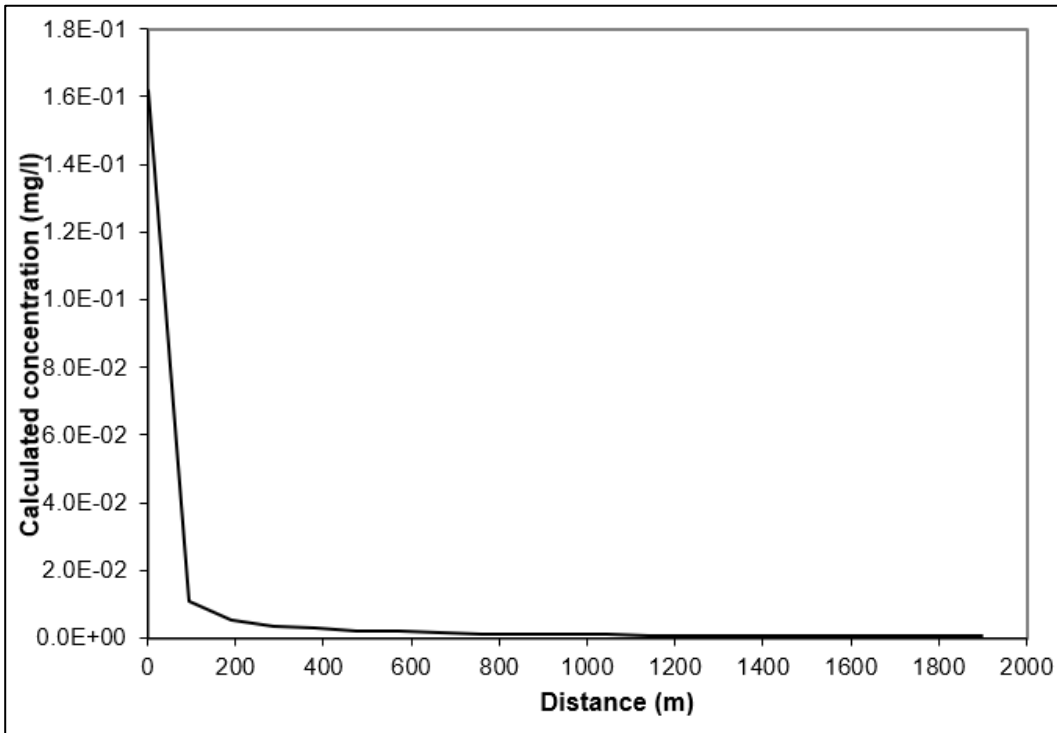
# Graphs for toluene and benzene from contaminant concentration assessment

---





**Graph 2: Graph showing toluene concentration versus distance from source**



**Graph 3: Graph showing xylene concentration versus distance from source**

## Appendix 6

Winter Bird Survey 2022/2023

**DixonBrosnan**  
environmental consultants

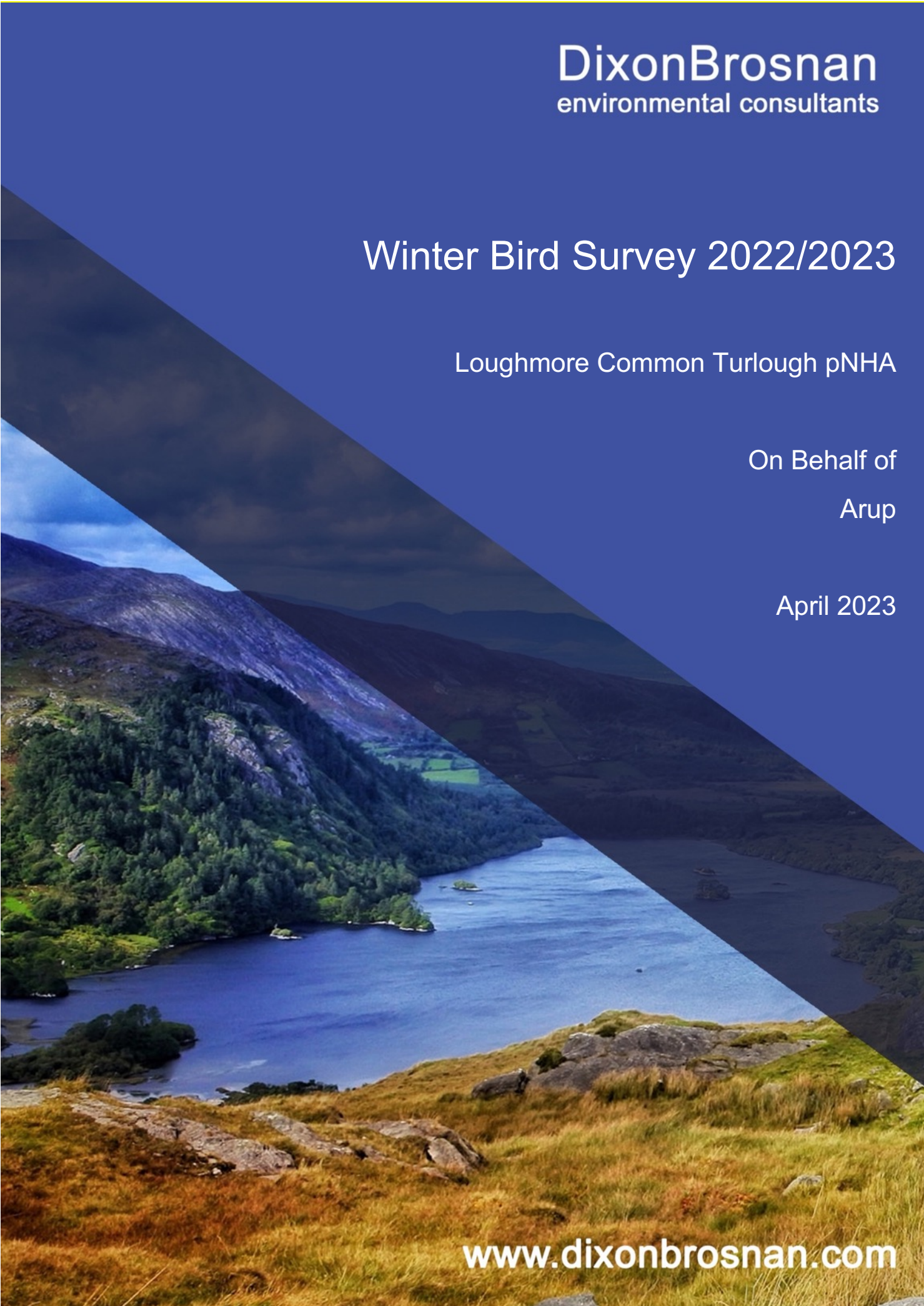
# Winter Bird Survey 2022/2023

Loughmore Common Turlough pNHA

On Behalf of  
Arup

April 2023

[www.dixonbrosnan.com](http://www.dixonbrosnan.com)



# DixonBrosnan

environmental consultants

<b>Project</b>	<b>Winter Bird Survey 2022/2023 Loughmore Common Turlough pNHA</b>	
Client	Arup	
Project Ref.	23034	
Report No.	23034.01	
Client Ref.	-	
<b>Date</b>	<b>Revision</b>	<b>Prepared By</b>
25/04/23	First draft	Carl Dixon BSc MSc
26/05/23	Issue to client	Sorcha Sheehy BSc PhD
DixonBrosnan Lios Ri Na hAoine, 1 Redemption Road, Cork. Tel 086 851 1437   <a href="mailto:carl@dixonbrosnan.com">carl@dixonbrosnan.com</a>   <a href="http://www.dixonbrosnan.com">www.dixonbrosnan.com</a>		
This report and its contents are copyright of DixonBrosnan. It may not be reproduced without permission. The report is to be used only for its intended purpose. The report is confidential to the client, and is personal and non-assignable. No liability is admitted to third parties. ©DixonBrosnan 2023.		

## Table of Contents

<b>1. Introduction</b> .....	<b>4</b>
<b>2. Desktop Review</b> .....	<b>4</b>
2.1. Designated sites .....	4
2.2 NPWS Winter bird survey – River Shannon & River Fergus Estuaries SPA.....	8
2.3 Important Bird Areas – Shannon & Fergus Estuaries .....	8
2.4 NBDC Records.....	9
2.5 Study site Loughmore Common Turlough pNHA .....	14
<b>3. Previous winter bird counts</b> .....	<b>15</b>
3.1 Ecofact surveys 2018 .....	16
<b>4. DixonBrosnan Winter Bird Surveys 2019/2020 and 2021/22</b> .....	<b>18</b>
4.1 Study site .....	18
4.2 Survey Methodology.....	20
4.3 Survey Results 2019/2020 .....	22
4.4 Survey results 2022/2023 .....	23
<b>6. Discussion of results</b> .....	<b>26</b>
<b>7. Summary/Conclusion</b> .....	<b>29</b>
<b>References</b> .....	<b>29</b>

# 1. Introduction

DixonBrosnan was commissioned by Arup to carry out an appraisal of the potential effects of the proposed development, on wintering birds utilising the Loughmore Common Turlough proposed Natural Heritage Area (pNHA).

The Loughmore Common Turlough pNHA whilst not a Natura 2000 site, is potentially a groundwater-dependent habitat. There is a potential for karst-related features in the bedrock, and there is therefore a potential hydrological/hydrogeological connection between the proposed development and Loughmore Common Turlough. This site is listed as providing potential winter habitat for Lapwing and Golden Plover (both of which are Special Conservation Interests (SCIs) of the River Shannon and River Fergus Estuaries SPA).

The information in this report will be used to help determine the potential effects on bird populations and also inform the conclusions of the ecological appraisal of the proposed development.

Results are discussed in the context of the study site as a whole, in relation to nearby designated sites and in the context of available online data and previous winter bird surveys.

## 2. Desktop Review

A desktop review was carried out to identify designated sites in the surrounding landscape and any previous records of water birds (waders and wildfowl) from the study site i.e., Loughmore Common Turlough pNHA and surrounding region.

A review of records of birds from the area was undertaken by reviewing the websites of the National Biodiversity Data Centre (NBDC) and the National Parks and Wildlife Service (NPWS).

From the information identified in the desktop review and a site inspection, it was concluded that winter bird counts would be required at Loughmore Common Turlough pNHA to accurately assess any potential ecological impacts on birds which might accrue from the proposed development.

### 2.1. Designated sites

Ireland is required under the terms of the EU Birds Directive (2009/147/EC) to designate Special Protection Areas (SPAs) for the protection of endangered species of wild birds. Sites that meet any of the following criteria may be selected as SPAs:

- A site regularly supporting 20,000 waterbirds or 10,000 pairs of seabirds;
- A site regularly supporting 1% or more of the all-Ireland population of an Annex I species;
- A site regularly supporting 1% or more of the biogeographical population of a migratory species;

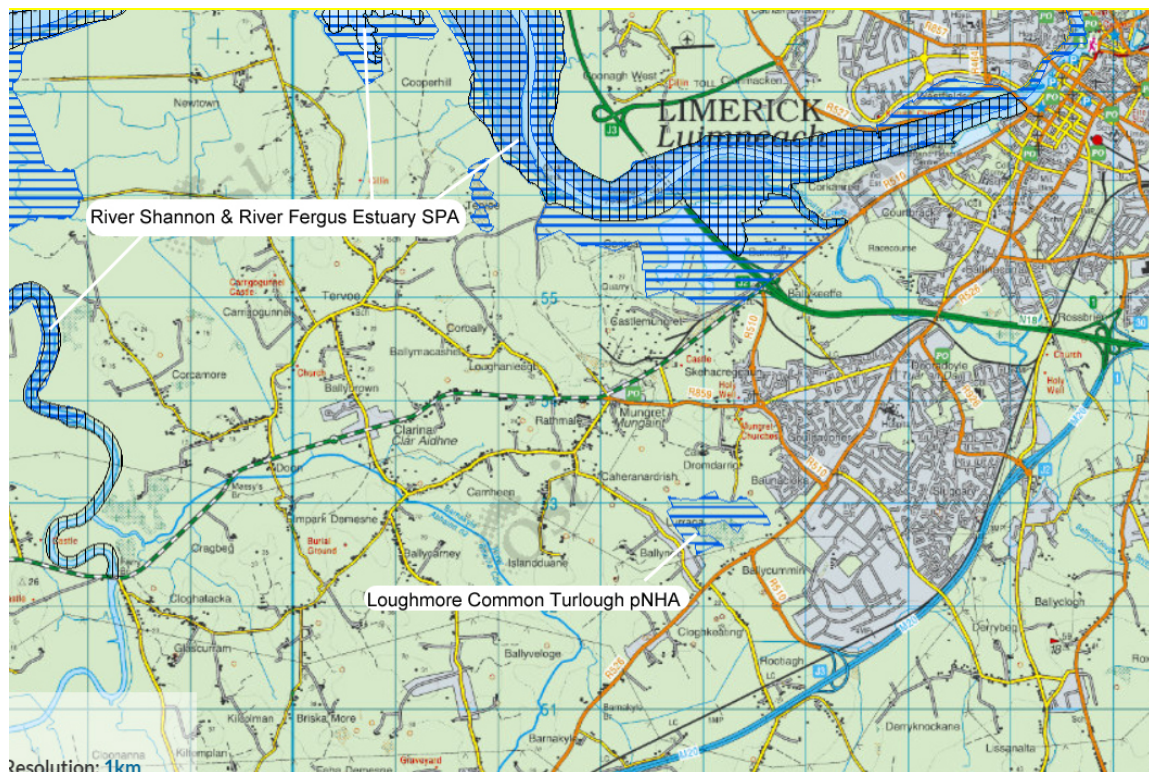
- A site that is one of the 'n' most suitable sites in Ireland for an Annex I species or a migratory species (where 'n' is a variable which is related to the proportion of the total biogeographic population of a species held by Ireland).

In Ireland a programme to identify and designate these SPA sites has been in place since 1985. It is our typical mild and wet winters that make the wetlands of Ireland such an important resource for over three-quarters of a million of these waterbirds each year. Over 50 species of waterbird migrate here either on passage to more southerly resorts or to spend the entire winter here. They seek out the relatively undisturbed wetland areas for ice-free feeding conditions and for safe roosting opportunities. In some cases, significant proportions of the biogeographic populations of waterbird overwinter here (e.g., Light-bellied Brent Goose, Black-tailed Godwit, Whooper Swan, Greenland White-fronted Goose and Ringed Plover).

Ireland's SPA Network encompasses over 570,000 hectares of marine and terrestrial habitats. The marine areas include some of the productive intertidal zones of our bays and estuaries that provide vital food resources for several wintering wader species including Dunlin, Knot and Bar-tailed Godwit. Marine waters adjacent to the breeding seabird colonies and other important areas for sea ducks, divers and grebes are also included in the network.

The majority of the breeding seabirds and wintering waterbirds are considered to be regularly occurring migratory birds; over 60% of 25 Annex I listed species that now occur in Ireland on a regular basis belong to the breeding seabird and wintering waterbird groups. This has in part led to the situation that the majority (> 80%) of Ireland's SPAs are designated for these two bird groups (NPWS, Special Protection Areas (SPA)).

The study site does not lie within any SPAs for birds and the closest such site, namely the River Shannon & River Fergus Estuaries SPA (Site code 004077) is located approximately 2.3 km north and 5.4 km west of the study site at Loughmore Common Turlough (**Figure 1**).



**Figure 1. Location of study site at Loughmore Common Turlough pNHA**

**Table 1** lists the qualifying interests the River Shannon & River Fergus Estuaries SPA. The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The SPA comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry. The site has vast expanses of intertidal flats which contain a diverse macroinvertebrate community, e.g. *Macoma-Scrobicularia-Nereis*, which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches.

**Table 1: Qualifying interests for the River Shannon & River Fergus Estuaries SPA**

Species code	Species	Scientific name	Conservation objective
A017	Cormorant	<i>Phalacrocorax carbo</i>	Maintain
A038	Whooper Swan	<i>Cygnus cygnus</i>	Maintain
A046	Light-bellied Brent Goose	<i>Branta bernicla hrota</i>	Maintain
A048	Shelduck	<i>Tadorna tadorna</i>	Maintain
A050	Wigeon	<i>Anas penelope</i>	Maintain
A052	Teal	<i>Anas crecca</i>	Maintain
A054	Pintail	<i>Anas acuta</i>	Maintain
A056	Shoveler	<i>Anas clypeata</i>	Maintain
A062	Scaup	<i>Anas marilla</i>	Maintain
A137	Ringed Plover	<i>Charadrius hiaticula</i>	Maintain
A140	Golden Plover	<i>Pluvialis apricaria</i>	Maintain
A141	Grey Plover	<i>Pluvialis squatarola</i>	Maintain
A142	Lapwing	<i>Vanellus vanellus</i>	Maintain
A143	Knot	<i>Calidris canutus</i>	Maintain
A149	Dunlin	<i>Calidris alpina</i>	Maintain
A156	Black-tailed Godwit	<i>Limosa limosa</i>	Maintain
A157	Bar-tailed Godwit	<i>Limosa lapponica</i>	Maintain
A160	Curlew	<i>Numenius arquata</i>	Maintain
A162	Redshank	<i>Tringa tetanus</i>	Maintain
A164	Greenshank	<i>Tringa nebularia</i>	Maintain
A179	Black-headed Gull	<i>Chroicocephalus ridibundus</i>	Maintain
A999	Wetland and Waterbirds		Maintain

Restore = Restore favourable conservation condition, Maintain = Restore favourable conservation condition

The selection of species listed as Special Conservation Interests for the River Shannon & River Fergus Estuaries SPA was based on the following:

The Selection Species listed for the River Shannon and River Fergus Estuaries SPA are as follows:

1. 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.
2. 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.



3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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 2,015 individuals.
12. 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.
13. 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.
14. 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.
15. 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.
16. 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.

17. 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.

The following species are identified as additional Special Conservation Interests (SCIs) for the River Shannon and River Fergus Estuaries SPA as they were recorded in numbers of all-Ireland importance during the baseline period (1995/96 – 1999/00):

- Pintail (*Anas acuta*)
- Shoveler (*Anas clypeata*)
- Scaup (*Aythya marila*)
- Cormorant (*Phalacrocorax carbo*) (breeding population)
- Black-headed Gull (*Chroicocephalus ridibundus*).

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. Therefore, the wetland habitats are considered to be an additional Special Conservation Interest.

## **2.2 NPWS Winter bird survey – River Shannon & River Fergus Estuaries SPA**

During 2010/2011 a waterbird survey programme was conducted by the NPWS within the River Shannon & River Fergus Estuaries. This waterbird survey programme was designed to investigate how waterbirds are distributed across coastal wetland sites during the low tide period. The surveys ran alongside and are complementary to the Irish Wetland Bird Survey (I-WeBS) which is a nationwide survey undertaken primarily on a rising tide or at high tide.

Following a reconnaissance visit by fieldworkers in September 2010, it was decided to divide the site into two halves, and to count the site over two days on each survey occasion.

The behaviour of waterbirds during counts was attributed to one of two categories (foraging or roosting/other) while the position of the birds was recorded as per one of four broad habitat types (intertidal, subtidal, supratidal and terrestrial). A total of up to 66 count sections (subsites) were used, comprising of up to 35 subsites on day one and up to 30 subsites on day two on each survey occasion.

A total of 57 waterbird species were recorded during the 2010/11 survey programme at the River Shannon and River Fergus Estuaries. Average subsite percentage occupancy is defined as the average percentage of subsites in which a species occurred during low tide counts. This varied greatly across the SCI species and ranged from an average two percent only (Pintail and Scaup) to a peak average occupancy of over 70% (Black-headed Gull). Only five species (Teal, Dunlin, Curlew, Redshank and Blackheaded Gull) were on average, recorded in over 50% of subsites, and nearly half of all species occurred in less than 20% of subsites counted. Percentage occupancy and percentage area occupancy results were relatively low for Whooper Swan but it should be noted that this species forages predominantly within grassland habitats which were largely outside of the count area covered by the 2010/11 Waterbird Survey programme.

## **2.3 Important Bird Areas – Shannon & Fergus Estuaries**

Important Bird and Biodiversity Areas (IBAs) are sites selected as important for bird conservation because they regularly hold significant populations of one or more globally or regionally threatened, endemic or congregator bird species or highly representative bird assemblages. The European IBA programme aims to identify, monitor and protect key sites

for birds all over the continent. It aims to ensure that the conservation value of IBAs in Europe (now numbering more than 5,000 sites or about 40% of all IBAs identified globally to date) is maintained, and where possible enhanced. The programme aims to guide the implementation of national conservation strategies, through the promotion and development of national protected-area programs. Through their designation they aim to form a network of sites ensuring that migratory species find suitable breeding, stop-over and wintering places along their respective flyways.

The function of the Important Bird Area (IBA) programme is to identify, protect and manage a network of sites that are important for the long-term viability of naturally occurring bird populations, across the geographical range of those bird species for which a site-based approach is appropriate. Loughmore Common Turlough is located 2.3 km south of the Shannon & Fergus Estuaries IBA (Site Code IE 068).

The Shannon & Fergus Estuaries IBA is a large estuarine complex with islands, saltmarshes, mudflats, raised saltmarsh and wet meadows. The site encompasses the Fergus River estuary from Clarecastle (where it becomes tidal) to the junction with the Shannon estuary and includes the estuary inland as far as Limerick city. The estuary lies within Counties Clare, Limerick and Kerry, and contains the largest port and most extensive areas of industrial development in mid-west Ireland.

This is one of the most important sites in Ireland for wintering and migrating waterfowl, supporting 10 species in numbers of international importance. A further 13 species occur in numbers of national importance, including *Anser anser* (216 birds, 1996), *Tadorna tadorna* (1,060 birds, 1996), *Anas penelope* (6,935 birds, 1996), *Anas crecca* (2,590 birds, 1995), *Anas acuta* (48 birds, 1995), *Anas clypeata* (84 birds, 1996), *Vanellus vanellus* (28,194 birds, 1995), *Numenius arquata* (2,896 birds, 1995) and *Tringa nebularia* (36 birds, 1996). A 2002 survey of breeding *Falco peregrinus* reported a nesting pair in the vicinity of the site.

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

- A4iii - The site is known or thought to hold congregations of  $\geq 1\%$  of the global population of one or more species on a regular or predictable basis.
- B1i - The site is known or thought to hold  $\geq 1\%$  of a flyway or other distinct population of a waterbird species.,
- B3- Species with a favourable conservation status in Europe. The site is one of the 'n' most important in the country for a species with a favourable conservation status in Europe but concentrated in Europe (Non-SPECE [previously, SPEC4]) and for which the site-protection approach is thought to be appropriate.
- C2 - Concentrations of a species threatened at the European Union level. The site is known to regularly hold at least 1% of a flyway population or of the EU population of a species threatened at the EU level (listed on Annex I and referred to in Article 4.1 of the EC Birds Directive).
- C4 - Congregatory – large congregations. The site is known to regularly hold at least 20,000 migratory waterbirds and/or 10,000 pairs of migratory seabirds of one or more species.

## 2.4 NBDC Records

The National Biodiversity Data Centre's (NBDC) online database provides data on the distribution of species within 10km grid squares. The site of the proposed development lies within 10km grid square (hectad) R55 of Ordnance Survey Ireland's National Grid System. Bird species recorded by the NBDC in R55 are included in **Table 2**.

**Table 2. NBDC bird records for grid square R55 and conservation status**

Species name	Conservation Status*
Barn Owl ( <i>Tyto alba</i> )	Red List
Barn Swallow ( <i>Hirundo rustica</i> )	Amber List
Bean Goose ( <i>Anser fabalis</i> )	
Black Redstart ( <i>Phoenicurus ochruros</i> )	
Black Swan ( <i>Cygnus atratus</i> )	
Black-billed Magpie ( <i>Pica pica</i> )	
Blackcap ( <i>Sylvia atricapilla</i> )	
Black-headed Gull ( <i>Larus ridibundus</i> )	Amber List
Black-tailed Godwit ( <i>Limosa limosa</i> )	Red List
Blue Tit ( <i>Cyanistes caeruleus</i> )	
Blue-winged Teal ( <i>Anas discors</i> )	
Bohemian Waxwing ( <i>Bombycilla garrulus</i> )	
Brambling ( <i>Fringilla montifringilla</i> )	
Chaffinch ( <i>Fringilla coelebs</i> )	
Citrine Wagtail ( <i>Motacilla citreola</i> )	
Coal Tit ( <i>Parus ater</i> )	
Common Blackbird ( <i>Turdus merula</i> )	
Common Bullfinch ( <i>Pyrrhula pyrrhula</i> )	
Common Buzzard ( <i>Buteo buteo</i> )	
Common Chiffchaff ( <i>Phylloscopus collybita</i> )	
Common Coot ( <i>Fulica atra</i> )	Amber List
Common Cuckoo ( <i>Cuculus canorus</i> )	
Common Goldeneye ( <i>Bucephala clangula</i> )	Red List
Common Grasshopper Warbler ( <i>Locustella naevia</i> )	
Common Greenshank ( <i>Tringa nebularia</i> )	
Common Kestrel ( <i>Falco tinnunculus</i> )	Red list
Common Kingfisher ( <i>Alcedo atthis</i> )	Amber List

Species name	Conservation Status*
Common Linnet ( <i>Carduelis cannabina</i> )	Amber List
Common Moorhen ( <i>Gallinula chloropus</i> )	
Common Pheasant ( <i>Phasianus colchicus</i> )	
Common Pochard ( <i>Aythya ferina</i> )	Red List
Common Raven ( <i>Corvus corax</i> )	
Common Redshank ( <i>Tringa totanus</i> )	Red List
Common Sandpiper ( <i>Actitis hypoleucos</i> )	Amber List
Common Shelduck ( <i>Tadorna tadorna</i> )	Amber List
Common Snipe ( <i>Gallinago gallinago</i> )	Red List
Common Starling ( <i>Sturnus vulgaris</i> )	Amber List
Common Swift ( <i>Apus apus</i> )	Red List
Common Whitethroat ( <i>Sylvia communis</i> )	
Common Wood Pigeon ( <i>Columba palumbus</i> )	
Corn Crane ( <i>Crex crex</i> )	Annex I; Red List
Dunlin ( <i>Calidris alpina</i> )	Annex I; Red List
Dusky Warbler ( <i>Phylloscopus fuscatus</i> )	
Eurasian Collared Dove ( <i>Streptopelia decaocto</i> )	
Eurasian Curlew ( <i>Numenius arquata</i> )	Red List
Eurasian Jackdaw ( <i>Corvus monedula</i> )	
Eurasian Jay ( <i>Garrulus glandarius</i> )	
Eurasian Oystercatcher ( <i>Haematopus ostralegus</i> )	Red List
Eurasian Siskin ( <i>Carduelis spinus</i> )	
Eurasian Sparrowhawk ( <i>Accipiter nisus</i> )	
Eurasian Spoonbill ( <i>Platalea leucorodia</i> )	
Eurasian Teal ( <i>Anas crecca</i> )	Amber List
Eurasian Treecreeper ( <i>Certhia familiaris</i> )	
Eurasian Wigeon ( <i>Anas penelope</i> )	Amber List
Eurasian Woodcock ( <i>Scolopax rusticola</i> )	Red List

Species name	Conservation Status*
European Golden Plover ( <i>Pluvialis apricaria</i> )	Annex I; Red List
European Goldfinch ( <i>Carduelis carduelis</i> )	
European Greenfinch ( <i>Carduelis chloris</i> )	Amber List
European Robin ( <i>Erithacus rubecula</i> )	
Fieldfare ( <i>Turdus pilaris</i> )	
Gadwall ( <i>Anas strepera</i> )	Amber List
Garganey ( <i>Anas querquedula</i> )	Amber List
Glaucous Gull ( <i>Larus hyperboreus</i> )	
Glossy Ibis ( <i>Plegadis falcinellus</i> )	
Goldcrest ( <i>Regulus regulus</i> )	Amber List
Goosander ( <i>Mergus merganser</i> )	Amber List
Great Black-backed Gull ( <i>Larus marinus</i> )	Amber List
Great Cormorant ( <i>Phalacrocorax carbo</i> )	Amber List
Great Crested Grebe ( <i>Podiceps cristatus</i> )	Amber List
Great Tit ( <i>Parus major</i> )	
Greater Scaup ( <i>Aythya marila</i> )	Red List
Grey Heron ( <i>Ardea cinerea</i> )	
Grey Wagtail ( <i>Motacilla cinerea</i> )	
Greylag Goose ( <i>Anser anser</i> )	Amber List
Hedge Accentor ( <i>Prunella modularis</i> )	
Hen Harrier ( <i>Circus cyaneus</i> )	Annex I; Amber List
Herring Gull ( <i>Larus argentatus</i> )	Amber List
Hooded Crow ( <i>Corvus cornix</i> )	
House Martin ( <i>Delichon urbicum</i> )	Amber List
House Sparrow ( <i>Passer domesticus</i> )	Amber List
Iceland Gull ( <i>Larus glaucooides</i> )	
Jack Snipe ( <i>Lymnocyptes minimus</i> )	
Lesser Black-backed Gull ( <i>Larus fuscus</i> )	Amber List

Species name	Conservation Status*
Lesser Redpoll ( <i>Carduelis cabaret</i> )	
Little Egret ( <i>Egretta garzetta</i> )	Annex I
Little Grebe ( <i>Tachybaptus ruficollis</i> )	
Long-eared Owl ( <i>Asio otus</i> )	
Long-tailed Tit ( <i>Aegithalos caudatus</i> )	
Mallard ( <i>Anas platyrhynchos</i> )	Amber List
Meadow Pipit ( <i>Anthus pratensis</i> )	Red List
Mediterranean Gull ( <i>Larus melanocephalus</i> )	Amber List
Merlin ( <i>Falco columbarius</i> )	Red List
Mew Gull ( <i>Larus canus</i> )	
Mistle Thrush ( <i>Turdus viscivorus</i> )	
Mute Swan ( <i>Cygnus olor</i> )	Amber List
Northern Lapwing ( <i>Vanellus vanellus</i> )	Red List
Northern Pintail ( <i>Anas acuta</i> )	Amber List
Northern Shoveler ( <i>Anas clypeata</i> )	Red List
Northern Wheatear ( <i>Oenanthe oenanthe</i> )	Amber List
Peregrine Falcon ( <i>Falco peregrinus</i> )	Annex I
Pied Wagtail ( <i>Motacilla alba subsp. yarrellii</i> )	
Red-breasted Merganser ( <i>Mergus serrator</i> )	Amber List
Red-crested Pochard ( <i>Netta rufina</i> )	
Red-necked Phalarope ( <i>Phalaropus lobatus</i> )	Annex I; Red List
Red-throated Diver ( <i>Gavia stellata</i> )	Annex I; Amber List
Redwing ( <i>Turdus iliacus</i> )	Red List
Reed Bunting ( <i>Emberiza schoeniclus</i> )	
Ring-billed Gull ( <i>Larus delawarensis</i> )	
Ringed Plover ( <i>Charadrius hiaticula</i> )	Amber List
Ring-necked Duck ( <i>Aythya collaris</i> )	
Rock Pigeon ( <i>Columba livia</i> )	

Species name	Conservation Status*
Rook ( <i>Corvus frugilegus</i> )	
Ruddy Turnstone ( <i>Arenaria interpres</i> )	
Sand Martin ( <i>Riparia riparia</i> )	Amber List
Sandwich Tern ( <i>Sterna sandvicensis</i> )	Annex I; Amber List
Sedge Warbler ( <i>Acrocephalus schoenobaenus</i> )	
Short-eared Owl ( <i>Asio flammeus</i> )	Annex I; Amber List
Sky Lark ( <i>Alauda arvensis</i> )	Amber List
Song Thrush ( <i>Turdus philomelos</i> )	
Southern Cormorant ( <i>Phalacrocorax carbo subsp. sinensis</i> )	
Spotted Flycatcher ( <i>Muscicapa striata</i> )	Amber List
Stock Pigeon ( <i>Columba oenas</i> )	Red List
Stonechat ( <i>Saxicola torquata</i> )	
Tufted Duck ( <i>Aythya fuligula</i> )	Amber List
Tundra Swan ( <i>Cygnus columbianus</i> )	
Water Rail ( <i>Rallus aquaticus</i> )	
White Wagtail ( <i>Motacilla alba</i> )	
White-throated Dipper ( <i>Cinclus cinclus</i> )	
White-winged Tern ( <i>Chlidonias leucopterus</i> )	
Whooper Swan ( <i>Cygnus cygnus</i> )	Annex I; Amber
Willow Warbler ( <i>Phylloscopus trochilus</i> )	
Winter Wren ( <i>Troglodytes troglodytes</i> )	
Yellowhammer ( <i>Emberiza citrinella</i> )	Red List
Yellow-legged Gull ( <i>Larus michahellis</i> )	

\*Gilbert et al. 2021; Black=Green List

## 2.5 Study site Loughmore Common Turlough pNHA

The Loughmore Common Turlough is located in County Limerick approximately 1.2km southeast of Mungret village and 400m south of Mungret Community College. Industrial and housing developments, including Raheen Business Park, are located 300m east of the study site.



Turloughs are karst wetland ecosystems that are virtually unique to Ireland. Flooding annually in autumn through springs and fissures in the underlying limestone and draining in the springtime, often through the same fissures or swallow-holes, they have been described as 'temporal ecotones'. Over 300 have been documented in Ireland. They are priority habitats in the EU Habitats Directive and support a variety of wet grassland and fen type vegetation. Though the vegetation has been recorded and mapped for over 80 turloughs, records for invertebrates are more sporadic. Characteristic species include some aquatic species-often benefiting from the absence of fish-, and many wetland terrestrial species, including carabid beetles that are rare on a European scale. Due to their shallow nature and the full vegetation cover of the basin, turloughs can host internationally significant numbers of visiting winter wildfowl, particularly Whooper Swans. The variety of plant and invertebrate communities between turloughs is primarily due to different hydro-geomorphological characteristics, but also depends on the range of grazing practices on turloughs. Since these often vary within a turlough basin, this helps maintain within-turlough biodiversity. The main threat to turloughs in the past was drainage, but pollution by nutrients is also now potentially detrimental. However, a more recent and important threat may be the cessation of farming within turloughs.

The Loughmore Common Turlough is designated as a proposed Natural Heritage Area (pNHA) (site code 000438). NHAs are the basic designation for wildlife in Ireland and, under the Wildlife Amendment Act (2000), are legally protected from damage from the date they are formally proposed for designation.

Goodwillie (1992) undertook a vegetation survey and evaluation of Loughmore Turlough. This described the turlough as dry and likely fed from a swallow hole located at the north-eastern end and noted that it seems that water from the stream which is now taken westwards over the turlough floor in a raised ditch may have once reached the basin. It does so no longer, however, though there appears to be enough groundwater present for limited flooding (less than 50cm).

Salt marsh plants were identified within the turlough which suggests either a slight salt influence in the floodwater or might be due to the turlough's close proximity to the Shannon Estuary. Goodwillie identified the presence of the rare species; Slender Spikerush (*Eleocharis uniglumis*), Greater Bird's-foot-trefoil (*Lotus pedunculatus*) and Opposite-leaved Pondweed (*Groenlandia densa*) within the turlough.

The Limerick Development Plan notes the following about the Loughmore Common Turlough:

*Closely associated with the turlough itself are species, which depend on the shallow flooding patterns that are a feature of this site. Recent surveys have indicated that the wintering birds, which had been feature of the site in the past, are now much diminished. Such a site is of course also of interest to the Common Frog, while in the drier portions of the site migrants such as fieldfares also frequent its hedgerows in the winter months.*

*The plant communities of the turlough are more typical of those of marsh than other turloughs, and this is one of the reasons for the ecological importance of the site. This site is a relatively small and lies entirely within the boundaries of the Southern Environs area.*

and

*The main danger to ecological sites in the plan area is the gradual encroachment of housing and other development. For turloughs this can bring changes in hydrology. The functioning of*

*their hydrological regime is poorly understood and for this reason caution in terms of development in close proximity to these sites is advised. Loughmore Common status as a Proposed Natural Heritage area is reflected in the zoning. Some on site flora in this location are dependent on salt in the water feeding the turlough, which reaches the site from the tidal movements of the River Shannon, itself a Special Area of Conservation.*

### 3. Previous winter bird counts - Ecofact surveys 2018

Ecofact Environmental Consultants completed a winter bird survey at lands at Mungret, Co Limerick, during February and March 2018. The Loughmore Common Turlough pNHA is located to the south of this study site. The purpose of the survey was to assess the bird species using the site during this period using a combination of walkover and vantage point surveys. **Figure 2** illustrates the location the Ecofact study site at Mungret, Co. Limerick. The Ecofact study site consisted mainly of grass fields bounded by hedgerows. To the south of the site there was an area of rough/wet grassland and a small area of planted broadleaved woodland within the Loughmore Common Turlough pNHA.



**Figure 2. Location of lands at Mungret, Co.Limerick for Ecofact winter bird survey**

The site was visited on the 17<sup>th</sup> February 2018, 23<sup>rd</sup> February 2018, 8<sup>th</sup> March and 24<sup>th</sup> March 2018. On these days the site was surveyed using a combination of vantage point watching and walkover surveying from dawn to the early afternoon. The surveys coincided with dry bright days and were considered to be ideal survey conditions. All bird species seen and heard were recorded. A dusk survey was also completed on the 17<sup>th</sup> February 2018. The surveys were completed by Kevin Collins and Dr. Will O'Connor.

The lands at Mungret, Co. Limerick are located approximately 360 m south of Mungret, covering a wide area consisting mostly of agricultural grassland with small sections of woodland and buildings (**Figure 2**). The south and south-east of the site borders part of the R526 for ca. 2.3km, the east of the site roughly borders the R510 for ca. 1.6km, the north of the site with the R859 for ca. 2km and the west of the site cuts through farmland areas for approximately 3.3km. Mungret Woods housing estate is located in the middle of the site with Mount Mungret Estate to the east in the Liskelly townland.

Overall, a total of 34 bird species were recorded during the Ecofact site visit. Details of the species recorded, their BoCCI status (Gilbert *et al.* 2021), and which habitat they are associated with, are given in **Table 3**. The status of birds based on the previous BOCCI 2014-2019 (Colhoun and Cummins 2013) is also shown in this table i.e., bird's conservation status at the time of survey.

The bird species recorded were considered to be typical farmland bird species. Buzzards were recorded during all site visits are likely to breed on the site. Kestrels were also regularly noted and will breed on the proposed development site. Snipe were observed in the wet grassland area to the north of the lands at Mungret. Coot, Sparrowhawk and Mallard were some of the other species noted to occur within the site.

Most species were associated with hedgerows and fields. Many of these species were also associated with woodland. Most of the species associated with the area of wet/rough grassland are classed as either amber or red on the BoCCI list. A section of broadleaved woodland present to the south of the site would provide suitable habitat and shelter for woodland bird species such as Cuckoo, which could potentially occur during the breeding season.

A large drain was noted to the south of the site just north of the section of broadleaved woodland. The drain was heavily overgrown with vegetation and was likely to have poor water quality. Various other small drains were scattered around the lands at Mungret. These drains are likely to contribute to insect production in the area serving as an attraction for bird species. Coot, Mallard, Grey Heron and Snipe were recorded along this drain.

The hedgerows on the site were considered to be of good quality, with dense coverage and scattered mature trees. They provide suitable habitat for farmland birds which occur on the site. The woodland and hedgerows present on-site support bird species such as Blue Tit, Great Tit, Coal Tit, Blackbird, Rook, Jackdaw, Song Thrush, Wren, Blackbird, Dunnock. Wet grassland was present in the southern part of the site which provides suitable habitat for bird species such as Snipe.

**Table 3. Results of Ecofact Winter Bird Survey at Mungret, Co. Limerick**

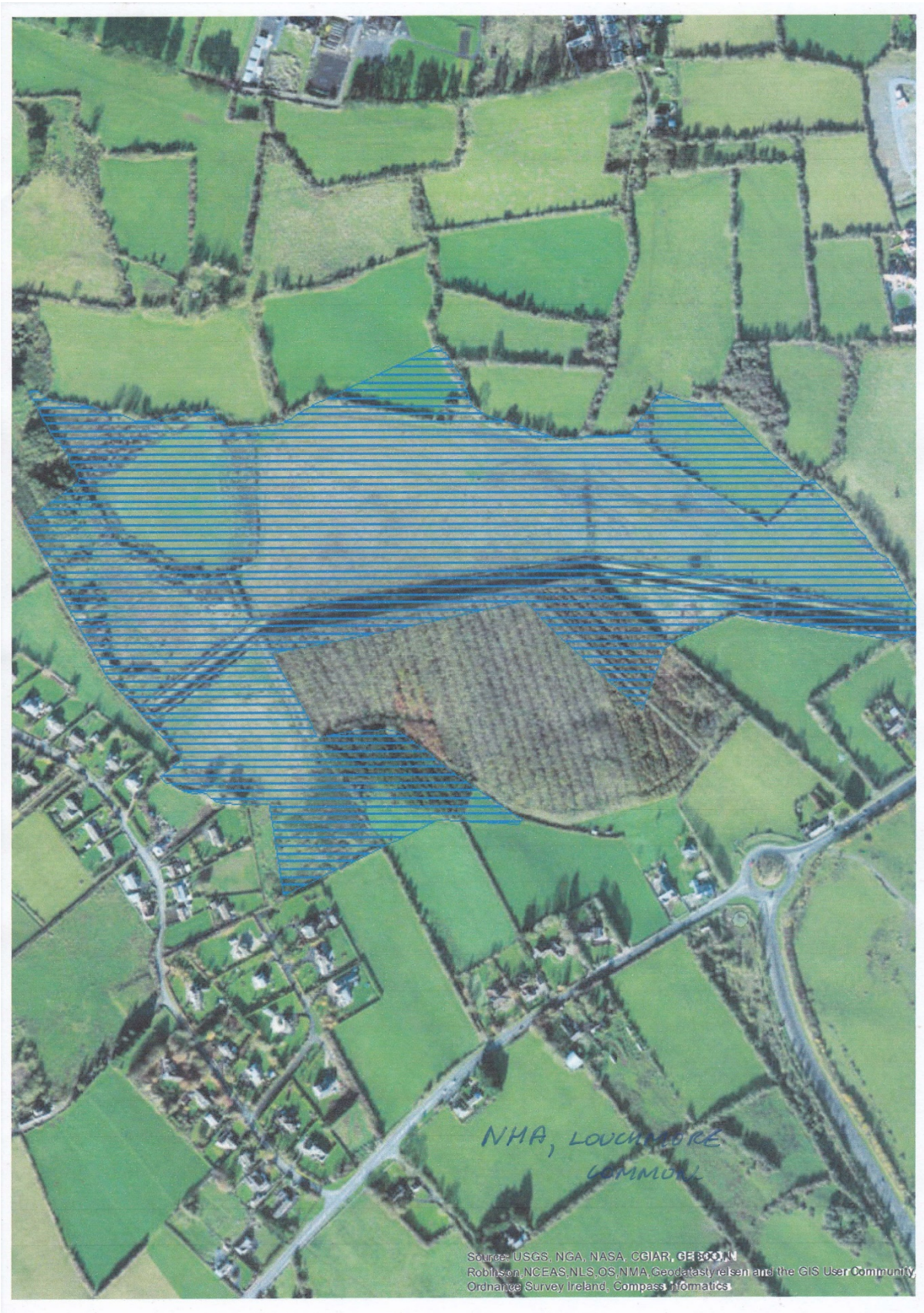
	BOCCI Status * (2023)	BoCCI Status **(2018)	Fields/Hedgerows	Rough/Wet Grassland	Woodland	Drain
Blackbird			*		*	
Blue Tit			*		*	
Bullfinch			*			
Chaffinch			*		*	
Common Buzzard			*	*	*	
Coot	Amber					*
Dunnock			*			
Fieldfare			*		*	
Goldcrest	Amber	Amber	*		*	
Goldfinch			*		*	
Great Tit			*		*	
Grey Heron				*		*
Grey Wagtail	Red	Red		*		
Hooded Crow			*			
Jackdaw			*			
Kestrel	Red	Amber	*	*		
Linnet	Amber	Amber	*			
Long-tailed Tit			*		*	
Magpie			*			
Mallard						*
Meadow Pipit	Red	Red		*		
Mistle Thrush		Amber	*		*	
Pied Wagtail			*			
Redwing	Red		*			
Robin		Amber	*			
Rook			*			
Snipe	Red	Amber		*		*
Song Thrush			*		*	
Sparrowhawk		Amber			*	
Starling	Amber	Amber	*		*	
Stonechat		Amber		*		
Woodpigeon			*		*	
Wren			*		*	

\*Gilbert et al. (2021) \*\* Colhoun and Cummins (2013)

## 4. DixonBrosnan Winter Bird Surveys 2019/2020 and 2021/22

### 4.1 Study site

DixonBrosnan were commissioned by Arup to conduct winter bird surveys at the Loughmore Common Turlough pNHA in winter 2019/2020 (**Figure 3**). The study site at Loughmore Common Turlough is located 1.2km southeast of Mungret village and 400m south of Mungret Community College. Industrial and housing developments, including Raheen Business Park, are located 300m east of the study site.



**Figure 3. Study site at Loughmore Common Turlough pNHA (blue hatching)**

The site is a shallow turlough set in flat agricultural land, predominantly improved grassland. The turlough is dry for most of the year however up to 30cm depth of flooding from

groundwater was observed during site visits. A raised drain/aqueduct crosses from east to west preventing additional flooding from a natural stream emerging from a swallow hole to the northeast. It drains into the River Shannon Estuary, 3.5km north. Lying at 12m ASL the turlough extends to approximately 12ha. It is adjacent to 10ha of former sedge heath (wet grassland) which is now 20-year-old plantation woodland, a low priority during the survey.

## 4.2 Survey Methodology

An initial walkover survey along the northern site periphery was carried out on 18th October 2019. Line transect surveys were carried out on the 9<sup>th</sup> November 2019, 16<sup>th</sup> December 2019, 30<sup>th</sup> January. 2020, 2<sup>nd</sup> December 2022, 14<sup>th</sup> January 2023, 28<sup>th</sup> February 2023 and 26<sup>th</sup> March 2023.

A combination of walkover and transect surveys were utilised to ensure that all bird species utilising the site were recorded. The initial walkover survey was used to identify habitats of potential value for birds and identify suitable line transect locations. Line transect sampling involves an observer travelling along a designated line of given length recording, in this case, the number of birds seen or heard (Bibby *et al* 2000). In addition, birds overflying the site during the transect survey are recorded. Line transects are particularly suited to open habitats and in this case enable the flushing of birds which otherwise would not be recorded e.g., Snipe.

The survey was carried out using a line transect 900m in length, running east to west (**Figure 4**). Birds were noted in three distance categories, measured at right angles to the transect line (within 0-50m, between 50-100m, or over 100m from the transect line), as well as those seen in flight only. Recording birds in distance bands gives a measure of bird detectability and allows relative population density to be estimated. The perpendicular distance in metres from the transect of observed birds was estimated and recorded both north and south of the line in the following bands:

- North of transect line – 0-50m  
50-100m  
100m +
- South of transect line - 0-50m  
50+ (includes low priority plantation).



Figure 4. Line Transect location at Loughmore Common Turlough pNHA

### 4.3 Survey Results 2019/2020

Bird species recorded as well as weather conditions are described below in **Tables 4-7**.

The transect running east to west passes through limestone grassland (Dry calcareous grassland GS1) for the first 100m. Species include greater Birds-foot Trefoil (*Lotus uliginosus*) and Field Scabious (*Knautia arvensis*). The lower lying turlough comprises a mosaic of wet grassland (GS4) including Sedge (*Carex hostiana*) and Quacking Grass (*Briza media*).

On the northern periphery there is a mosaic of limestone grassland and wet grassland. There are unmanaged hedges around the perimeter with improved grassland beyond. The raised drain has populations of Greater Pond Sedge (*Carex riparia*), Bulrush (*Typha latifolia*) and Lesser-water Plantation (*Baldelia ranunculoides*).

A plantation woodland has been established since the NWPS survey and assessment in 1992 (Goodwillie 1992). This consists of approximately 10ha of Ash (*Fraxinus excelsior*), Oak (*Quercus petraea*) and Alder (*Alnus glutinosa*).

**Table 4. DixonBrosnan Bird Survey October 2019 (preliminary survey)**

Walkover Survey, 18 <sup>th</sup> October 2019	
Following northern boundary of unimproved wet and calcareous grassland. Weather: Sunny spells, southerly wind, 10°C	
Bird species observed.	
Goldcrest x 2	
Wren	
Blackbird	
Snipe x 2	
Bullfinch x 2	
Linnet x 5	
Hooded crow x 4	
Rooks x 5	
Cormorant x2	

**Table 5. DixonBrosnan Bird Survey November 2019**

Date & Time	9 <sup>th</sup> November 2019. 2-4 p.m.				
Weather	Dry, bright, light breeze (southerly) 12°C				
Position along transect (East – West, m)	Distance bands from Transect (m)				
	North of Transect			South of Transect	
	0-50	50-100	100+	0-50	50+
0-100				Blackbird Robin	
100-200		Snipe			
200-300					
300-400	Jack Snipe Snipe			Sparrowhawk	
400-500					
500-600					
600-700					
700-800					
800-900					Moorhen
Overflying	Rooks 20+				
	Hooded Crow 3				



	Jackdaw 5+
	Heron 1

**Table 6. DixonBrosnan Bird Survey December 2019**

Date & Time	16 <sup>th</sup> Dec 2019 . 1-3 p.m.				
Weather	Dry, dull, light wind, 6C				
Position along transect (East – West, m)	Distance bands from Transect (m)				
	North of Transect			South of Transect	
	0-50	50-100	100+	0-50	50+
0-100	Wren				Moorhen
100-200		Meadow Pipit			
200-300			Grey Heron	Meadow Pipit	
300-400		Snipe X2			
400-500					
500-600	--- Snipe				
600-700		Meadow Pipit			
700-800					
800-900	Heron			Blackbird Robin	
Overhead	Rooks 20+				
	Hooded Crow 6				

**Table 7. DixonBrosnan Bird Survey January 2020**

Date & Time	30 <sup>th</sup> Jan 2020. 2-4 p.m.				
Weather	Dry 10C				
Position along transect (East – West, m)	Distance bands from Transect (m)				
	North of Transect			South of Transect	
	0-50	50-100	100+	0-50	50+
0-100				Moorhen x2 Blackbird	
100-200		White Egret			---- x2
200-300	Jack Snipe			Meadow Pipit	
300-400	Jack Snipe				Song Thrush
400-500		Snipe x2			
500-600					
600-700	Pied Wagtail Jack Snipe			Jack Snipe	Robin Blackbird
700-800					
800-900				Reed Bunting Moorhen	
Overflying	Rooks 20+				
	Hooded Crow 3				
	Jackdaw 2				
	Cormorant 2				

#### 4.4 Survey results 2022/2023

Line transect surveys were carried out on the 2<sup>nd</sup> December 2022, 14<sup>th</sup> January 2023, 28<sup>th</sup> February 2023 and 26<sup>th</sup> March 2023.

**Table 8. DixonBrosnan Bird Survey December 2022**

Date & Time	2 <sup>nd</sup> December 2022				
<b>Weather</b>	Dry, bright, light breeze				
<b>Position along transect (East – West, m)</b>	Distance bands from Transect (m)				
	North of Transect			South of Transect	
	0-50	50-100	100+	0-50	50+
<b>0-100</b>	Starling 1				
<b>100-200</b>	Blue Tit 1	Robin 1, Great Tit 1,			
<b>200-300</b>			Song Thrush	Magpie	
<b>300-400</b>		Snipe 3			
<b>400-500</b>					Blackbird 2
<b>500-600</b>	Redwing				
<b>600-700</b>		Woodpigeon			Meadow Pipit
<b>700-800</b>					
<b>800-900</b>	Hooded Crow	Snipe 5	Snipe 4		
<b>Overhead</b>	Woodpigeon 4, Goldfinch 9, Rook 12, Grey Rook 2, Blackheaded gull 1, Redwing 20, Chaffinch 1, Lesser Black Backed Gull 1, Raven 1, Fieldfare 1				

**Table 9. DixonBrosnan Bird Survey January 2023**

Date	14 <sup>th</sup> January 2023				
<b>Weather</b>	Cloudy, dry, light breeze				
<b>Position along transect (East – West, m)</b>	Distance bands from Transect (m)				
	North of Transect			South of Transect	
	0-50	50-100	100+	0-50	50+
<b>0-100</b>	Rook, Robin	Starling 2			
<b>100-200</b>			Redwing 11		
<b>200-300</b>				Goldfinch 1	
<b>300-400</b>	Snipe 4	Blackbird, Snipe 3			
<b>400-500</b>	Meadow Pipit		Magpie		
<b>500-600</b>	Wren 2	Snipe 5			
<b>600-700</b>				Greenfinch	
<b>700-800</b>					
<b>800-900</b>			Chaffinch	Chaffinch	
<b>Overflying</b>	Goldfinch 38, Rook 10, Blackbird 2, Redwing 15, Fieldfare 10, Raven 1, Buzzard 1, Woodpigeon 5				

**Table 10. DixonBrosnan Bird Survey February 2023**

Date & Time	February 28 <sup>th</sup> 2023				
<b>Weather</b>	Dry, bright, light breeze				
<b>Position along transect (East – West, m)</b>	Distance bands from Transect (m)				
	North of Transect			South of Transect	
	0-50	50-100	100+	0-50	50+
<b>0-100</b>	Redwing 15	Hooded Crow 2		Magpie 4	
<b>100-200</b>			Blackbird 1		
<b>200-300</b>					

<b>300-400</b>	Great tit, Blue Tit				Redpoll 3
<b>400-500</b>		Snipe 5			Woodpigeon 4
<b>500-600</b>					
<b>600-700</b>					
<b>700-800</b>			Blackbird 1		
<b>800-900</b>					
<b>Overhead</b>	Redwing 30, Rook 8, Grey Heron 1, Fieldfare 8				

**Table 11. DixonBrosnan Bird Survey March 2023**

<b>Date &amp; Time</b>	<b>26<sup>th</sup> March 2023</b>				
<b>Weather</b>	Dry, bright, light breeze				
<b>Position along transect (East – West, m)</b>	Distance bands from Transect (m)				
	North of Transect			South of Transect	
	0-50	50-100	100+	0-50	50+
<b>0-100</b>	Chaffinch				
<b>100-200</b>		Bluetit, Blackbird	Woodpigeon		
<b>200-300</b>					
<b>300-400</b>	Meadow Pipit 2	Meadow Pipit 2		Goldfinch	Robin
<b>400-500</b>					
<b>500-600</b>				Redpoll 5	
<b>600-700</b>					
<b>700-800</b>	Robin				
<b>800-900</b>	Great Tit		Blackbird		
<b>Overhead</b>	Rook 25, Buzzard 1, Goldfinch 9, Grey Rook 2, Jackdaw 2, Hooded Crow 2				

## 6. Discussion of results

Nineteen species in total were recorded during the DixonBrosnan site surveys. One Annex I species Little Egret was recorded. Three BOCCI red list species were recorded i.e., Meadow Pipit, Snipe and Redwing. Eight BOCCI amber list species were recorded i.e., Black-headed Gull, Cormorant, Goldcrest, Greenfinch, Lesser Black-backed Gull, Linnet and Starling.

BirdWatch Ireland and the Royal Society for the Protection of Birds (RSPB) have listed priority bird species suffering decline in the Irish/European and global context. The Birds of Conservation Concern in Ireland (BoCCI) list classifies birds as Red (high conservation concern) or Amber (medium conservation concern) based on their conservation status and hence conservation priority. All other regularly occurring species are classified as Green List and are not considered threatened. Listed species must meet one or more of the following criteria:

**Red List:** Their breeding population or range has declined dramatically in recent years, or their breeding population has undergone a significant decline since 1800, or they are of global conservation concern. Red listed species automatically qualify for Amber status.

**Amber List:** Their population or range has declined moderately in recent years, or they are rare or sporadically breeding species, or their breeding or wintering population is internationally important and/or localised, or they have an unfavourable conservation status in Europe.

**Green List:** Do not meet Red or Amber-listing criteria.

**Table 8: Species recorded along with their conservation status**

Species		Birds Directive Annex 1	BOCCI Amber List	BOCCI Red List
Black headed gull	<i>Larus ridibundus</i>		X	
Blackbird	<i>Turdus merula</i>			
Blue Tit	<i>Cyanistes caeruleus</i>			
Bullfinch	<i>Pyrrhula pyrrhula</i>			
Buzzard	<i>Buteo buteo</i>			
Chaffinch	<i>Fringilla coelebs</i>			
Cormorant	<i>Phalacrocorax carbo</i>		X	
Fieldfare	<i>Turdus pilaris</i>			
Goldcrest	<i>Regulus regulus</i>		X	
Goldfinch	<i>Carduelis carduelis</i>			
Great Tit	<i>Parus major</i>			
Greenfinch	<i>Loxia chloris</i>		X	
Grey Heron	<i>Ardea cinerea</i>			
Hooded Crow	<i>Corvus cornix</i>			
Jack Snipe	<i>Lymnocyptes minimus</i>			
Jackdaw	<i>Corvus monedula</i>			
Lesser Black Backed Gull	<i>Larus fuscus</i>		X	
Linnet	<i>Carduelis cannabina</i>		X	
Little Egret	<i>Egretta garzetta</i>	X		
Magpie	<i>Pica pica</i>			
Meadow Pipit	<i>Anthus pratensis</i>			X
Moorhen	<i>Gallinula chloropus</i>			

Species		Birds Directive Annex 1	BOCCI Amber List	BOCCI Red List
Woodpigeon	<i>Columba palumbus.</i>			
Raven	<i>Corvus corax</i>			
Redpoll	<i>Carduelis flammea cabaret</i>			
Redwing	<i>Turdus iliacus</i>			X
Reed Bunting	<i>Emberiza schoeniclus</i>			
Robin	<i>Erithacus rubecula</i>			
Rook	<i>Corvus frugilegus</i>			
Snipe	<i>Gallinago gallinago</i>			X
Song Thrush	<i>Turdus philomelos</i>			
Sparrowhawk	<i>Accipiter nisus</i>			
Starling	<i>Sturnus vulgaris</i>		X	
Wren	<i>Troglodytes troglodytes</i>			

Little Egret was considered rare in Ireland until it first started breeding here in 1997. It has since expanded and now occurs in almost every coastal county, as well as at a number of inland sites. A raised drain, which runs from east to west within the site provides suitable foraging habitat for both Grey Heron and Little Egret. Little Egret is an Annex I species under the EU Birds Directive. This species is listed under Annex I due to the loss and deterioration its habitats from drainage and to agricultural practices in the wider European context. Although this is an Annex I species, Little Egret is a Green List species under the BOCCI and is not under threat in Ireland.

One Natura 2000 site (River Shannon & River Fergus Estuaries SPA site code 004077) is deemed relevant to the study site. The qualifying interests for River Shannon & River Fergus Estuaries SPA are shown in **Table 1** with the conservation objectives for each species. Only one species listed as a qualifying interest for the River Shannon & River Fergus Estuaries

SPA was recorded during the site surveys, i.e., Cormorant. These were recorded overflying the site and none were recorded using the study site. Although the study area could potentially provide suitable foraging grounds for terrestrial wading bird species e.g., Golden Plover, Whooper Swan and Lapwing, none of these species were recorded during the winter bird surveys.

Generally, the species recorded during the site visits were typical of the mosaic of grassland and hedgerow/woodland habitats within the site. The majority of species recorded are common in the Irish landscape i.e., Robin, Goldfinch, Blackbird, Song Thrush and Bullfinch. Amber list species such as Linnets and Greenfinch were also recorded within these common habitats. Snipe and Meadow Pipit, both of which are red list species, are typically found in wet grassland and these were recorded within the study site. Severe declines have been recorded in Snipe and Meadow Pipit breeding and wintering populations in Ireland, resulting in its move to the Red-List in the most recent BoCCI assessment (Gilbert *et al.* 2021). Both are ground nesting species and are particularly vulnerable to changes in agricultural practice such as intensive mowing and draining of wetland areas.

## 7. Summary/Conclusion

A total of nineteen species were recorded from the site visits during the DixonBrosnan winter bird surveys.

One Annex I bird species was recorded i.e., Little Egret. Three red list species were recorded i.e., Snipe, Meadow Pipit and Redwing were recorded as well as a number of amber list species i.e., Black-headed Gull, Cormorant, Goldcrest, Greenfinch, Lesser Black-backed Gull, Linnets and Starling.

Birds recorded were typical of the grassland mosaic and hedgerow habitat within the study site. The site does not appear to be an important feeding or roosting site for qualifying interests of the nearby River Shannon and River Fergus Estuaries SPA and, with the exception of overflying Cormorant, no QI species were recorded at Loughmore Common Turlough during site visits.

The semi-natural grassland provides valuable habitat for the red list species Meadow Pipit and Snipe. Both species are suffering significant declines due to reduction in habitat. The site also supports a range of common bird species.

## References

Bibby, C.J., Burgess, N.D., Hill, D.A. & Mustoe, S.H. 2000. Bird Census Techniques. Academic Press, London.

Colhoun, K. & Cummins, S. 2013. Birds of conservation concern in Ireland. Irish Birds 9:523–544.

Gilbert, G., Gibbons, D.W. & Evans, J. (1998) Bird Monitoring Methods - a Manual of Techniques for Key UK Species. RSPB: Sandy.

Gilbert G, Stanbury A and Lewis L (2021), "Birds of Conservation Concern in Ireland 2020 – 2026". Irish Birds 9: 523—544

Goodwillie, R. (1992) Turloughs over 10 hectares: Vegetation survey and evaluation. Unpublished report to the National Parks and Wildlife Service, Dublin.

NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments Volume 2. Version 1.1. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland



## Appendix 7

Bat Survey of Lands at Mungret,  
County Limerick 2023

# Bat survey of lands at Mungret, Co. Limerick



Version: 16<sup>th</sup> August 2023



Tait Business Centre, Dominic Street,  
Limerick City, Ireland.

t. +353 61 419477, f. +353 61 414315

e. [info@ecofact.ie](mailto:info@ecofact.ie)

w. [www.ecofact.ie](http://www.ecofact.ie)



## EXECUTIVE SUMMARY

This report presents the findings of a bat survey carried out in Mungret, Co Limerick. The study was undertaken on lands where a residential housing project is being planned. The objective of this survey was to ascertain whether bats or their roosts were present on the site and to determine if bats use the site for foraging or commuting. The results of the current survey will inform the design of the scheme and the impact assessment of same. This survey was completed during June and July 2023.

A desk study of bat records in the area was undertaken and this was followed by a daytime walkover survey to assess bat habitats on the site. Three nights of bat survey work were then undertaken, including a dawn survey. The desk study and survey work included the site and immediate surrounding areas.

The site is characterized by improved agricultural grassland, certain parts of which have become rank, as well as tree lines, hedgerows, and scrubland. The tree lines predominantly comprise non-native Black Pine. Part of the site has some temporary prefabricated buildings which are being used as a school. There is also a small building with no roof, and a shed, on the site. At the time of the survey a new road and associated development was being constructed on the southern boundary of the site, and also runs near the western and eastern boundaries. The site is bordered on the northwest by the existing Mungret College and its grounds, and residential areas on the northeast. Given these factors, the site is somewhat fragmented from the surrounding countryside and was being subjected to some construction-related noise and disturbance during the survey.

There are previous records of bats roosting in the Mungret college building. Common Pipistrelles, Soprano pipistrelles, and Brown Long-eared bats were recorded previously roosting in this building. However, the roosts were disturbed in 2020, negatively impacting the population of bats on the site. The overall bat landscape suitability rating of the site is relatively low. However, the rating for species recorded here in this area previously is moderate.

No bats were found roosting in any of the trees or structures within the site boundary during the current survey. However, some of the trees on the site may be used to some degree for roosting by a nominal number of individual bats. This is typical of any trees that have bat roost features such as ivy coverage. However, the main tree lines on the site are composed of non-native Black Pine trees and they have limited roosting potential.

The numbers of bats observed foraging and commuting within the site's boundary was relatively low. The species recorded were Common Pipistrelle, Soprano Pipistrelle, Brown Long-eared Bat, and Leisler's Bat. The latter species was seen foraging at a significant altitude over the site but did not rely on it. The other species, while not roosting onsite, were present in relatively low numbers. These bats were originating from roosts beyond the site boundaries and were entering the site for foraging and commuting purposes. Overall, the site is of relatively low importance to bats, with no roosts recorded during the current survey. While it is utilized by four bat species for foraging and commuting, their numbers and activity levels are generally low.

A likely Kestrel nest site was within the proposed development area and there is a Barn Owl nest site just outside the site boundary. As both species are endangered and Red-listed Birds of Conservation Concern in Ireland, their habitats will warrant careful consideration in any future development of the site.



## TABLE OF CONTENTS

<b>1. INTRODUCTION .....</b>	<b>4</b>
1.1 BAT SPECIES IN IRELAND.....	4
1.2 LEGISLATION RELATING TO BATS.....	4
1.2.1 Wildlife Act 1976.....	5
1.2.2 EU Habitats Directive .....	5
1.2.3 Bern and Bonn Conventions .....	5
1.2.4 Derogation licences.....	5
<b>2. METHODOLOGY .....</b>	<b>8</b>
2.1 GUIDELINES .....	8
2.2 DESK STUDY .....	8
2.3 FIELD SURVEYS.....	8
<b>3. RESULTS.....</b>	<b>10</b>
3.1 DESK STUDY .....	10
3.2 FIELD SURVEY .....	10
3.2.1 Daytime Inspection.....	10
3.2.2 Emergence Watch.....	10
3.2.3 Other observations .....	14
<b>4. CONCLUSIONS AND RECOMMENDATIONS.....</b>	<b>15</b>
<b>REFERENCES.....</b>	<b>16</b>
<b>PLATES .....</b>	<b>17</b>



## 1. INTRODUCTION

This report outlines the results of a bat survey that was completed on lands in Mungret, Co Limerick. The bat surveys were completed on a site where a residential housing development is planned. The purpose of the survey was to identify whether any bats or their roosts are present on site or whether and/or not bats utilise the site for foraging or commuting. Details of the proposed development at the site were not available at the time of completing the current survey. The results of the current survey will inform the design of the scheme and the impact assessment of same.

This survey was completed during June and July 2023. A desk study of bat records in the area was undertaken and this was followed by a daytime walkover survey to assess bat habitats on the site. Three nights of bat survey work were then undertaken. The location of the proposed development site and wider area considered is shown in Figures 1 and 2. The desk study and survey work included the site and immediate surrounding areas. The survey was completed by Ecofact on behalf of Limerick 2030 and Arup.

All bats and their roosts are **strictly protected** in Ireland and listed under Annex IV of the EU Habitats Directive. The EU Habitats Directive has been transposed into Irish law with the *European Communities (Birds and Natural Habitats) Regulations (2011)* (S.I. No. 477/2011). All bat species are also protected here under the *Wildlife Act (1976)* and *Wildlife (Amendment) Act (2000)* (S.I. No. 38 of 2000). Impacts on bats may also be the subject of claims under the *European Communities (Environmental Liability) Regulations (2008)* (S.I. No. 547/2008) where bat and their roosts may have been adversely affected by unauthorised activities.

### 1.1 Bat species in Ireland

There are eleven recorded bat species in Ireland, nine of which are considered resident on the island. Eight resident bat species and one of the vagrant bat species are members of the Vespertilionidae family. The ninth resident species is the Lesser Horseshoe Bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidae family.

The resident Irish bat species are:

- Daubenton's bat (*Myotis daubentonii*)
- Whiskered bat (*Myotis mystacinus*)
- Natterer's bat (*Myotis nattereri*)
- Leisler's bat (*Nyctalus leisleri*)
- Nathusius' Pipistrelle (*Pipistrellus nathusii*)
- Common Pipistrelle (*Pipistrellus pipistrellus*)
- Soprano Pipistrelle (*Pipistrellus pygmaeus*)
- Brown Long-eared bat (*Plecotus auritus*)
- Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

Other bat species (vagrants) recorded are:

- Brandt's bat (*Myotis brandtii*)
- Greater horseshoe bat (*Rhinolophus ferrumequinum*)

### 1.2 Legislation Relating to Bats

Bats are strictly protected under both national and international law. The purpose of this legislation is to maintain and restore bat populations within their natural range. This implies that the habitats on which



they rely and the ecology of their life cycles should not be compromised by human activities. Where activities have the potential to compromise bat populations, measures are required to be put in place to avoid impacts or compensate and mitigate for those impacts. The key legislation which provides protection to bats is outlined below.

### 1.2.1 Wildlife Act 1976

In the Republic of Ireland, all bats and their roosts are protected under Schedule 5 of the *Wildlife Act 1976* (amended 2000). It is unlawful to disturb either without the appropriate Licence.

### 1.2.2 EU Habitats Directive

In addition to domestic legislation bats are also protected under the *EC Directive on the Conservation of Natural habitats and of Wild Fauna and Flora* (Habitats Directive 1992). This Directive seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All bat species are protected under Annex IV of the EU Habitats Directive, while the lesser horseshoe bat (*Rhinolophus hipposideros*) is listed under Annex II. Member states are required to designate Special Areas of Conservation for all species listed under Annex II in order to protect them. The EU Habitats Directive has been transposed into Irish law with the European Communities (Birds and Natural Habitats) Regulations 2011. A total of 41 SACs have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310).

### 1.2.3 Bern and Bonn Conventions

Ireland has also ratified two international conventions which afford protection to bats amongst other fauna. These are known as the 'Bern' and 'Bonn' Conventions. *The Convention on the Conservation of European Wildlife and Natural Habitats* (Bern Convention 1982), in relation to bats, exists to conserve all species and their habitats. *The Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries, which covers certain species of bat.

### 1.2.4 Derogation licences

Any works interfering with bats and especially their roosts, may only be carried out under a derogation Licence granted by National Parks and Wildlife Service (NPWS) pursuant to Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law).

The destruction, alteration or evacuation of a known bat roost is a notifiable action and can only be carried out with a derogation licence from the National Parks and Wildlife Service. Any works that might interfere with bats or their roost sites can only be carried out under licence to derogate from Regulation 23 of the Habitats Regulations 1997 and Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish Law). Details with regards to Appropriate Assessments, procedures and parameters under which derogation licences may be obtained are outlined in Circular Letter NPWS 2/07 '*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species / applications for derogation licences*' issued on the 16<sup>th</sup> of May 2007 on behalf of the Minister of the Environment, Heritage and Local Government.



Figure 1 Location of the study area at Mungret, Co. Limerick.



Figure 2 Location of Proposed Development Site in Mungret, Co. Limerick.





## 2. METHODOLOGY

### 2.1 Guidelines

The survey and assessment had regard to the methodology outlined in:

- *Bat Mitigation Guidelines for Ireland v2* by Marnell *et al.*, (2022)
- *Bat Tree Habitat Key (BTHK)* by Andrews, H (2018).
- *Bat Surveys for Professional Ecologists: Best Practice Guidelines 3<sup>rd</sup> Edition* by Collins (2016)
- *Guidance on the strict protection of certain animal and plant species under the Habitats Directive in Ireland* by NPWS (2021)
- *Bat Workers' Manual 3<sup>rd</sup> Edition* by JNCC (2004) and
- *British Bat Calls: A Guide to Species Identification* (Russ, 2012).

**Table 1** Definition of bat roost types adapted from Collins (2016).

Roost Type	Definition
Day Roost	A place where individual bats, or small groups of males, rest or shelter in the day but are rarely found by night in the summer.
Night Roost	A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single individual on occasion or it could be used regularly by the whole colony.
Feeding Roost	A place where individual bats or a few individuals rest or feed during the night but are rarely present by day.
Transitional/occasional Roost	Used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.
Swarming Site	Where large numbers of males and females gather during late summer to autumn. Appear to be important mating sites.
Mating Sites	Where mating takes place from late summer and can continue through winter.
Maternity Roost	Where female bats give birth and raise their young to independence.
Hibernation Roost	Where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.
Satellite Roost	An alternative roost found in close proximity to the main nursery colony used by a few individual breeding females to small groups of breeding females throughout the breeding season.

### 2.2 Desk study

The bat suitability of habitat in the study area for bats was obtained using the National Biodiversity Data Centre (NBDC) database. This map provides a picture of the broad scale geographic patterns of occurrence and local roosting habitat requirements for Irish bat species. The maps are a visualization of the results of the analyses based on a 'habitat suitability' index. The index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats (Lundy *et al* 2011). The NBDC online National Bat Database of Ireland was also accessed to review bat records in the study area.

### 2.3 Field Surveys

The site was visited for an initial inspection on the 20<sup>th</sup> of June 2023. This survey involved a daytime inspection of the site during daylight hours. All trees were inspected for their potential to have bats, using visual observations to examine the trees for knotholes, dense ivy coverage, woodpecker holes, damaged limbs, lifting bark or impact shatters. Any Potential Roost Features (PRFs) were recorded. The site was also inspected to assess its potential use and value as suitable bat foraging habitat and potential commuting routes. Any other features relevant to the usage by bats including existing lighting was recorded. Additional observations were made in advance of the bat activity surveys. The tree bat roost category classification system used in the survey is given in Table 2 below.



There are a number of buildings on the site also and these were inspected during the daytime surveys to assess their potential to be used by bats. The surveys involve looking for evidence of roosting bats including live bats, remains of dead bats, droppings, staining, and feeding remains. Following this initial bat survey and assessment the building is assessed for their potential to be used by roosting bats. A former known Barn Owl nest site was also inspected during the daytime surveys.

**Table 2** Tree Bat Roost Category Classification System (adapted from Collins, 2016).

Tree Category	Description
1 High	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts
2 Moderate	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats;
3 Low	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features (PRFs) which may have limited potential to support bats;
4 Negligible	Trees have no potential.

Emergence and activity surveys were undertaken on the 28<sup>th</sup> to 29<sup>th</sup> of June 2023 and 9<sup>th</sup> to 10<sup>th</sup> July 2023. The surveys were completed from 30 minutes before dusk to 2 hours after dusk. The surveys involved the use of handheld bat detectors (Elekon Batscanner, Echo Meter Touch Pro 2, and Anabat Express units). Particular attention was given to assessing the treelines to identify whether any bats were roosting on the site. Bat species using the site during the course of the survey and notes on their behaviour and flight paths were recorded. General observations of bat activity in the area were also made. The site was then revisited on the 11<sup>th</sup> of July 2023 for a dawn survey and general walkover survey.

Overall, the surveys completed were considered to be appropriate for the site and included habitat surveys and three activity surveys (including one dawn survey). This level of survey work is in line with the recommended guidelines. The weather conditions were ideal for all the surveys completed. The surveys were also undertaken during the recommended bat activity survey season. No limitations were recorded in relation to the surveys and full site could be accessed – apart from the temporary school buildings which were surveyed from the outside and ruled out for bat potential.



### 3. RESULTS

#### 3.1 Desk study

The National Biodiversity Data Centre (NBDC) maps landscape suitability for bats based on Lundy *et al.*, (2011). The maps are a visualisation of the results of the analyses based on a 'habitat suitability' index. The index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats. Table 1 below gives the suitability of the study area for the bat species found in Ireland (based on NBDC) along with their Irish Red List Status (from Marnell *et al.*, 2009). The overall assessment of bat habitats for the current study area is given as 37.11.

**Table 3** Bat Suitability for habitats in the study area of the proposed development, as obtained from NBDC maps. Irish red list status also indicated.

Common name	Scientific name	Suitability index	Irish red list status
All bats	-	37.11	
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	50	Least Concern
Brown long-eared bat	<i>Plecotus auritus</i>	58	Least Concern
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	52	Least Concern
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	21	Least Concern
Leisler's bat	<i>Nyctalus leisleri</i>	53	Near Threatened
Whiskered bat	<i>Myotis mystacinus</i>	16	Least Concern
Daubenton's bat	<i>Myotis daubentonii</i>	37	Least Concern
Nathusius's pipistrelle	<i>Pipistrellus nathusii</i>	10	Least Concern
Natterer's bat	<i>Myotis nattererii</i>	37	Least Concern

There are previous records of bats roosting in the Mungret college building. Common Pipistrelles, Soprano pipistrelles, and Brown Long-eared bats were recorded previously roosting in this building. This building was subject to disturbance of the roosts in 2020 and this has affected the numbers of bats using the site.

#### 3.2 Field survey

##### 3.2.1 Daytime Inspection

The habitats on the site consist of improved agricultural grassland, parts of which have become rank, tree lines, hedgerows, and scrub. The tree lines mainly consist of non-native Black Pine (*Pinus nigra*). Part of the site has some temporary prefabricated buildings present which are being used as a school. There is also a small building with no roof, and a shed, on the site. At the time of the survey a new road and associated development was being constructed on the southern boundary of the site, and this will also run near the western and eastern boundaries. The site is bounded to the northwest by the existing Mungret college and associated grounds. The site is bordered to the northeast by residential areas. The site is therefore somewhat fragmented from the surrounding countryside and was subject to some noise and construction disturbance at the time of the survey.

##### 3.2.2 Emergence Watch

A total of four bat species were recorded on the proposed development site. These were Common Pipistrelle, Soprano Pipistrelle, Brown Long-eared Bat, and Leisler's Bat. No bats were recorded



roosting within the red line boundary. The numbers of bats recorded foraging and commuting within the site boundary was relatively low. Table 4 presents a summary of survey results from different areas of the site. In Tables 5-7 summaries of the results of the surveys completed over the three survey periods are provided.

**Table 4** Summary of survey results from different areas of the site.

Bat Species	Survey results	Roosting habitat	Foraging and commuting habitats
Field A	This was the only field where Brown Long-eared Bats were recorded. Probably still roosting in Mungret College. Numbers were very low.	No roosts recorded and very low potential in trees, none in the building.	Suboptimal foraging and commuting for Pipistrelle species. Occasional Leisler's recorded over the site. BLEs recorded.
Field B	Low level of activity of Pipistrelles and an odd Leisler's bat.	No roosts recorded and relatively low potential in trees.	Suboptimal foraging and commuting for Pipistrelle species. Occasional Leisler's recorded over the site.
Field C	Low level of activity of Pipistrelles and an odd Leisler's bat.	No roosts recorded and relatively low potential in trees.	Suboptimal foraging and commuting for Pipistrelle species. Occasional Leisler's recorded over the site.
Field D	Pipistrelles were feeding around security lights (low numbers).	No roosts recorded and relatively low potential in trees.	Suboptimal foraging and commuting for Pipistrelle species.
Temporary school buildings	No bats were recorded in this area.	No potential – all well sealed and illuminated.	None.

Occasional individual Common Pipistrelles and Soprano Pipistrelles were recorded throughout the site. The numbers were relatively low. It is noted that Pipistrelle species tend to forage as they commute and regularly fly up and down a tree line or hedgerow before moving on in the landscape. This will often result in multiple passes being recorded for an individual bat. Therefore, the actual number of bats recorded on the site was relatively low and, in many cases, it was multiple passes of the same bat that was recorded.

Leisler's bats fly high in the sky and therefore can be observed flying fast through the landscape, occasionally foraging over treetops as they commute. The Leisler's bats were less likely to be encountered multiple times and in the current survey the Leisler's bats recorded were flying high over the site and were not seen to depend on the site in any way.

Brown Long-eared bats were seen / heard briefly in Field A on the survey completed on the 9<sup>th</sup> to 10<sup>th</sup> July. The numbers recorded on the site are again very low. This species has a faint call and can be difficult to detect. Brown long-eared bats are known to be very quiet and will only be picked up by a handheld detector at close range. A Brown long-eared bat roost of approximately 10 individuals was recorded in Mungret College in 2017 (Abbott Ecology, 2017). It is likely that there is still a roost of this species in this building. Following the disturbance, a small number of bat tiles were installed in the roof of this building and it is hoped that this species is using this access (Ecofact, 2020). However, the numbers of tiles and access provided is nominal. Only two bat tiles were visible in the current survey which is not adequate.



No bats were observed to emerge from any trees or buildings on the site. As with any trees with features such as ivy it is possible that any tree like this is used on some occasion as a roost by bats. But the current survey did not detect any bats roosting on the site. Most of the trees on the site are non-native Black Pines and they are less suitable for bats than native deciduous species. None of the buildings within the red line boundary have any bat potential and no signs of bat usage were recorded.

The dawn survey completed on the 11<sup>th</sup> of July 2023 focused on Tree lines 1 and 2. These trees are non-native however many of them are mature and covered in ivy, and some do have at least some bat roosting potential. A dawn survey is more likely to be productive than a dusk one as swarming bats returning to the roost are much more visible than those leaving the roost. It was confirmed that no bats were roosting in any of these trees. Indeed, overall bat activity at this time on the site was very low as bats were likely to have left the site for their day roosts (which are not on the site).

**Table 5** Bats recorded during the survey completed at the subject lands at Mungret on the 28<sup>th</sup> to 29<sup>th</sup> of June 2023 (dusk to two hours after).

Species	Passes	
	Number	%
Common pipistrelle <i>Pipistrellus pipistrellus</i>	25	49.02
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	18	35.29
Brown Long-eared Bat <i>Plecotus auritus</i>	0	0.00
Leisler's Bat <i>Nyctalus leisleri</i>	8	15.69
<b>Total</b>	51	-

**Table 6** Bats recorded during the survey completed at the subject lands at Mungret on the 9<sup>th</sup> to 10<sup>th</sup> July 2023 (dusk to two hours after).

Species	Passes	
	Number	%
Common pipistrelle <i>Pipistrellus pipistrellus</i>	30	44.12
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	20	29.41
Brown Long-eared Bat <i>Plecotus auritus</i>	6	8.82
Leisler's Bat <i>Nyctalus leisleri</i>	12	17.65
<b>Total</b>	68	-

**Table 7** Bats recorded during the survey completed at the subject lands at Mungret on the 11<sup>th</sup> of July 2023 (dawn only).

Species	Passes	
	Number	%
Common pipistrelle <i>Pipistrellus pipistrellus</i>	3	37.50
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	5	62.50
Brown Long-eared Bat <i>Plecotus auritus</i>	0	0.00
Leisler's Bat <i>Nyctalus leisleri</i>	0	0.00
<b>Total</b>	8	-



**Figure 2** Location of Proposed Development Site in Mungret, Co. Limerick, with features referred to in this report indicated.



### 3.2.3 Other observations

#### 3.2.3.1 Kestrels

Kestrels (*Falco tinnunculus*) were recorded breeding on the site during the current survey. A juvenile was heard begging for food in Treeline 1 and both adults were seen on the site during each visit. The Kestrels were recorded perching in Treelines 1 and 2. The male was seen foraging over Fields A and B. Only one juvenile was confirmed to be present on the site but the tree where the begging was recorded was not approached.

Kestrel is an endangered, Red-listed Bird of Conservation Concern in Ireland due to extensive population declines over recent decades (Gilbert *et al.*, 2021). The decline is thought to be related to changes in land use and farming practices, reductions in prey availability as a result of this habitat loss, persecution, and also secondary rodenticide poisoning (Nakayama *et al.* 2018). There are outdoor rodent poisoning stations within 100m of this nest site.

Kestrels are protected under the Wildlife (Amendment) Act, 2000. It is an offence to intentionally cause disturbance at a nest site or to breeding Kestrels.

#### 3.2.3.2 Barn Owls

Barn Owls (*Tyto alba*) were recorded nesting on the northwestern border of the site in 2020 by Ecofact (2020a &b). The nest site was located in the arch on the entrance to Mungret college. The nest site was inspected during the current survey and no definite signs of current Barn Owl occupancy were recorded. There were no pellets, moulted feathers, etc. in the archway and the white wash on the walls could have been made by other birds. Barn Owls were also not recorded during the bat activity survey. The current indications are that the Barn Owls may have abandoned this nest site. However, this would require further investigation.

The Barn Owl (*Tyto alba*) is also a Red-listed Bird of Conservation Concern in Ireland due to extensive population declines over recent decades (Gilbert *et al.*, 2021). The intensification of agriculture, in particular the reduction of prey rich foraging habitat, is likely to be the main driver of long-term Barn Owl population declines in Ireland. The loss of nesting sites, increases in the use and exposure to rodenticides, and the expansion of road networks have also been recognised as factors which are impacting on Barn Owl populations.

Barn Owls are protected under the Wildlife (Amendment) Act, 2000. It is an offence to intentionally cause disturbance at a nest site or to breeding Barn Owls.

It was reported at the time of the Ecofact (2020 a&b) surveys that this nest site was being disturbed by building works. It was recommended that 2 no. artificial Barn Owl Nest boxes be erected on site. This has not been completed. There are outdoor rodent poisoning stations in the immediate vicinity of the Barn Owl nest site. New wiring seems to have been installed in the area where the owls used to perch.



## 4. CONCLUSIONS AND RECOMMENDATIONS

The current survey has concluded that there are no bat roosts on the site. The site is used by small numbers of Common pipistrelles, Soprano pipistrelles, Leisler's Bats, and Brown Long-eared Bats. However, none of the species were recorded roosting on the site.

There are some trees on the site with bat potential and any tree with potential could potentially be used by bats in the future. However, the majority of the trees on the site are non-native Black Pines and this is likely to reduce their suitability of use by roosting bats. The small numbers of bats present use the site for foraging and commuting purposes only.

**Table 8** Bat Ecological Evaluation Results for the proposed development site.

Bat Species	Survey Results	Evaluation Value	Roost Evaluation
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	Low numbers use the site for foraging and commuting. Low roosting potential and none observed.	Local importance	Not applicable
Common pipistrelle <i>Pipistrellus pipistrellus</i>	Low numbers use the site for foraging and commuting. Low roosting potential and none observed.	Local importance	Not applicable
Brown Long-eared Bat <i>Plecotus auritus</i>	Very low numbers use the site for foraging and commuting. Low roosting potential and none observed.	Local importance	Not applicable
Leisler's bat <i>Nyctalus leisleri</i>	Occasional use of areas high over the site. Low roosting potential and none observed.	Local importance	Not applicable

The site is already fragmented, and a road was being constructed to the west, south, and east of the site at the time of the current survey. The main bat roost feature in the area is Mungret College on the northern boundary of the site, and the bat roosts here were disturbed in 2020. These impacts in areas adjoining the site will have affected the results of the current survey – due to the loss / disturbance of a local bat roost, and habitat fragmentation. The development of the subject site could also have potential indirect impacts on the remaining and possibly recovering bat roosts at Mungret college. Light sensitive brown Long-eared bats were detected on the site during the current survey and potential foraging areas for this species will have to be maintained. The darkest remaining areas around Mungret College are on the proposed development site. The viability of this bat roost can be maintained by retaining bat foraging and commuting corridors and minimizing light spill. It is noted that for a bat commuting corridor to work the corridor must lead somewhere.

The development of the site will also need to take the requirements of red-listed Barn Owls and Kestrels into account. The current development site could indirectly affect the Barn Owl nesting site – which is immediately on the site boundary - and also further reduce Barn Owl foraging and commuting areas. It is not clear whether Barn owls are currently nesting at this site – and if they are not, it is clearly down to disturbance that should not have happened. Efforts will therefore have to be made to maintain / restore this site for breeding owls. It will be necessary to provide nest boxes and habitat enhancement measures to ensure that these species are not lost from this general area.





## REFERENCES

- Abbott Ecology (2017) Bat Assessment of Mungret College, Dromdarrig, Mungret, Co. Limerick.
- Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists. Good Practice Guidelines. Bat Conservation Trust, London. <http://www.bats.org.uk/pages/batsurveyguide.html>
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) 1982.  
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 1979.  
EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive) 1992. <http://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/104>
- Ecofact (2020a) Bat Survey Report for Mungret College (Buildings E and F), Mungret, Co. Limerick. Ecofact Environmental Consultants Ltd, Tait Business Centre, Dominic St., Limerick. August 2020.
- Ecofact (2020b) Bat and Barn Owl Survey Report (Daytime Assessment & Emergence Watch). Mungret College, Mungret, Co. Limerick. Ecofact Environmental Consultants Ltd, Tait Business Centre, Dominic St., Limerick. September 2020.
- Gilbert G., Stanbury A., and Lewis L. (2021) Birds of Conservation Concern in Ireland 2020 –2026. *Irish Birds* 9: 523–544. <https://birdwatchireland.ie/publications/birds-of-conservation-concern-in-ireland-bocci-2020-2026/>
- 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 <https://www.npws.ie/sites/default/files/publications/pdf/IWM134.pdf>
- Lundy, MG, Aughney T, Montgomery WI, Roche N (2011) Landscape conservation for Irish bats & species-specific roosting characteristics. Bat Conservation Ireland. [http://www.batconservationireland.org/wp-content/uploads/2013/09/Landscape\\_Conservation\\_Irish\\_Bats.pdf](http://www.batconservationireland.org/wp-content/uploads/2013/09/Landscape_Conservation_Irish_Bats.pdf)
- Marnell, F., Kingston, N. & Looney, D. (2009) Ireland Red List No.3: Terrestrial Mammals, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland. <https://www.npws.ie/sites/default/files/publications/pdf/RL3.pdf>
- Nakayama, S.M., Morita, A., Ikenaka, Y., Mizukawa, H. & Ishizuka, M. (2018) A review: poisoning by anticoagulant rodenticides in nontarget animals globally. *Journal of Veterinary Medical Science* 81:298–313.
- Rory Dalton Ecology Services, (2017). Bat Survey of Mungret College, prepared for Limerick City & County Council. Rory Dalton Ecology Services.
- Wilson-Parr, R. & O'Brien, I. (Eds.) (2019) Irish Raptor Study Group Annual Review 2018.



## PLATES



**Plate 1** Bat surveys completed included habitat surveys and handheld detector surveys.



**Plate 2** Mungret college building viewed from Field C. Pipistrelle and Leisler's bats were recorded in this area.



**Plate 3** Field A as indicated in Figure 2. This is located on the northwest end of the site. The treelines, scrub, and rank grassland areas are used by foraging and commuting Pipistrelle bats.



**Plate 4** Building located in Field A as indicated in Figure 2. This building has no roof and has low bat potential. No bats were recorded using this structure. Bats forage in this field.



**Plate 5** Mungret college building viewed from Field A. This is known bat roost for Pipistrelles and BLE bats. However, the roosts here have been subject to disturbance due to building works.



**Plate 6** The proposed development site viewed from the eastern boundary. This is Field B as indicated in Figure 2. Leisler's bats were recorded foraging over this field.



**Plate 7** Treeline 2 (see Figure 2). This is at the eastern side of the site between Field A and B. This treeline is used by foraging and commuting Pipistrelle species and has some roosting potential.



**Plate 8** Ivy covered trees in Treeline 2 with some roosting potential. No bats were recorded roosting in these trees during the current survey but they have potential.



**Plate 9** Field C as indicated in Figure 2. This is located on the western side of the site.



**Plate 10** Mungret college building viewed from Field C. Pipistrelle and Leisler's bats were recorded in this area.



**Plate 11** Treeline 1 in Field C. Kestrels are thought to have nested in this treeline. This treeline is also used by foraging and commuting Pipistrelle species. It has low bat roosting potential.



**Plate 12** Road and associated infrastructure under construction on the southern boundary of the site (Planning Reference 19/8011). This development has already fragmented the site.



**Plate 13** Road and associated infrastructure under construction on the southern boundary of the site (Planning Reference 19/8011).



**Plate 14** Ivy covered tree on the western side of the site.



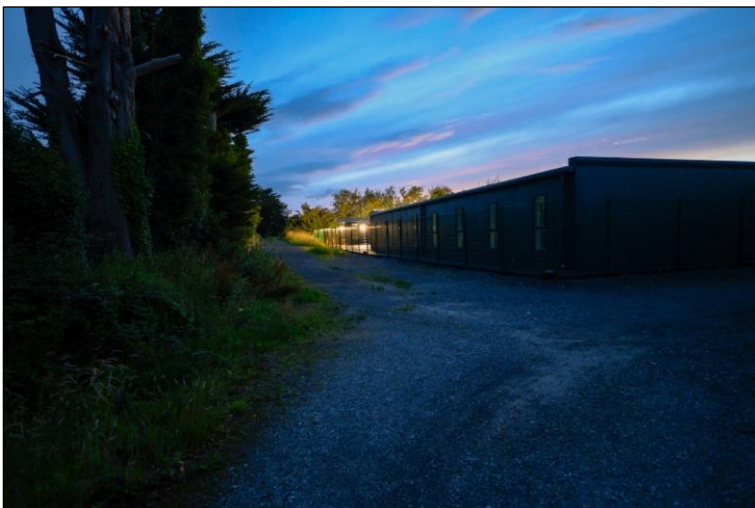
**Plate 15** Treeline 1 in field C is also used by individual Pipistrelle bats. These non-native Black Pines have limited bat roosting potential.



**Plate 16** Treeline 1 viewed from Mungret college grounds.



**Plate 17** Temporary school buildings on the site – no evidence that they are being used by bats.



**Plate 18** Pipistrelle bats were recorded foraging along the road between the temporary school buildings and Field D. Insects were being attracted by the security lights.



**Plate 19** Road between the temporary school buildings and Field D.



**Plate 20** Shed with beehives at the western side of the site. This shed is not being used by bats.



**Plate 21** Beehives at the western side of the site.





**Plate 22** Western boundary hedgerow/treeline and Field D with the road construction works in the background.



**Plate 23** Mungret college is still being used as a bat roost (not surveyed). However, bat numbers present appear to be low.



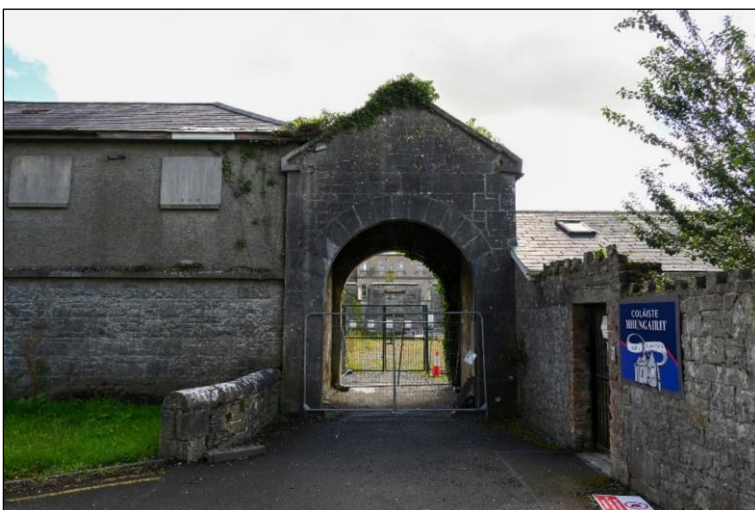
**Plate 24** School buildings adjacent to the site – no evidence that they are being used by bats.



**Plate 25** Lighting around Mungret college. There is no lighting on the site itself.



**Plate 26** There are outdoor rodent poisoning stations in the immediate vicinity of the Barn Owl nest site.



**Plate 27** Barn Owl nest site at Mungret College. This nesting site has been disturbed by building works in the past and Barn Owls were not recorded during the current survey.



**Plate 28** The Barn Owl nest site. No definite signs of occupancy were recorded, and Barn Owls were not seen during the bat surveys – however more surveys would be required to assess their status. Previous mitigation recommended for Barn Owls has not been implemented.



**Plate 29** Ledge previously used by the Owls with new wiring installed. There is some whitewash on the walls, but this could be from a previous nesting season.



**Plate 30** Likely Kestrel nest site – a juvenile was recorded begging for food in this tree (Treeline 1).



**Plate 31** Adult Female Kestrel perching on the site (Tree line 2).



**Plate 32** Adult male Kestrel foraging on the site (Field B).



**Plate 33** Adult male Kestrel perching on the site (Tree line 1).

## Appendix 8

Ecology – Site Assessment  
December 2023

**DixonBrosnan**  
environmental consultants

## Ecology – Site Assessment

Mungret, Co. Limerick

On Behalf of  
ARUP

December 2023

[www.dixonbrosnan.com](http://www.dixonbrosnan.com)



# DixonBrosnan

environmental consultants

<b>Project</b>	<b>Ecology – Site Assesment</b>	
Client	ARUP	
Project Ref.	23131	
Report No.	23131	
Client Ref.	-	
<b>Date</b>	<b>Revision</b>	<b>Prepared By</b>
18/12/23	Issue to client	Sorcha Sheehy BSc PhD
		Carl Dixon BSc MSc
DixonBrosnan, Lios Ri Na hAoine, 1 Redemption Road, Cork. Tel 086 851 1437  <a href="mailto:carl@dixonbrosnan.com">carl@dixonbrosnan.com</a>   <a href="http://www.dixonbrosnan.com">www.dixonbrosnan.com</a>		
<small>This report and its contents are copyright of DixonBrosnan. It may not be reproduced without permission. The report is to be used only for its intended purpose. The report is confidential to the client and is personal and non-assignable. No liability is admitted to third parties. ©DixonBrosnan 2023.</small>		

## Table of Contents

<b>1. Introduction.....</b>	<b>4</b>
1.1 Background .....	4
1.2 Authors of Report .....	4
<b>2. Site Context .....</b>	<b>5</b>
<b>3. Survey results .....</b>	<b>6</b>
3.1 Habitats.....	6
3.2 Birds.....	7
3.3 Mammals .....	10
<b>4. Enhancement Measures.....</b>	<b>11</b>
4.1 Bat boxes .....	11
4.2 Bird nest boxes .....	12
<b>5. Conclusions.....</b>	<b>13</b>



# 1. Introduction

## 1.1 Background

Arup has prepared an Appropriate Assessment (AA) Screening Report, Baseline Ecology Report and EIA Screening report on behalf of Limerick City & County Council for a proposed housing development at Mungret, County Limerick. An ecological reassessment was carried out by DixonBrosnan on 13<sup>th</sup> December 2023 to determine if any changes in baseline ecology had occurred in the intervening period. Additional ecological mitigation/enhancement measures have also been included in this report.

## 1.2 Authors of Report

This report was prepared by Carl Dixon MSc (Ecological Monitoring) and Sorcha Sheehy PhD (Ecology/ornithology).

Carl Dixon holds an Honours Degree (BSc) in Ecology and a Masters (MSc) in Ecological Monitoring from UCC. He is a senior ecologist who has over 25 years' experience in ecological assessment. Prior to setting up DixonBrosnan Environmental Consultants in 2000, Carl set up and ran Core Environmental Services which included REPS planning for landowners and ecological assessments.

Carl has particular experience in freshwater ecology including electrofishing fish stock assessments and water quality assessments. He also has considerable experience in habitat mapping and mammal ecology including survey work and reporting in relation to badgers and bats. Other competencies include surveys for invasive species and bird surveys.

Carl has extensive experience with regards to EIAR and NIS mitigation and impact assessment. He has particular experience in large-scale industrial developments with extensive experience in complex assessments as part of multi-disciplinary teams. Such projects include gas pipelines, incinerators, electrical cable routes, oil refineries and quarries.

Sorcha Sheehy PhD (ecology/ornithology) is an ecologist and ornithologist who has worked for 15 years in environmental consultancy. She has worked on Screening/NISs for a range of small and large-scale projects with expertise in assessing impacts on birds.

Sorcha's PhD research focused on bird behaviour at airports, where she studied bird avoidance behaviour and collision risk to aircraft. Her research involved field observations, post-mortem analysis and radar surveys. Sorcha has worked on bird collision risk assessments at airports throughout Ireland including Dublin airport, Cork airport, Shannon airport and Kerry airport.

During her consultancy work Sorcha carried out field-based surveys and environmental reports including NIS, AA screening and EIARs. Notable projects include the Arklow Bank Wind Park, Indaver Ireland Waste Management Facility at Ringaskiddy, Irving Oil Whitegate Refinery (IOWR), Shannon LNG and Greenlink Interconnector.

## 2. Site Context

The proposed development which is located adjacent to Mungret College, will comprise 250 residential units, associated roads, carparking, open spaces, local services and ancillary utilities infrastructure. The land within the site of the proposed development is mostly undeveloped agricultural fields and includes a hardstanding area where the proposed creche and community facility will be located (See **Figures 1 and 2**)



**Figure 1. Site location | Not to Scale | Source: Google Maps**



**Figure 2. Red line boundary of proposed development**

### 3. Survey results

#### 3.1 Habitats

As detailed in the ecological reporting for this project (*Limerick City & County Council Baseline Ecology Report Mungret Residential Development ARUP 2023, Limerick City & County Council Mungret Residential Development Report for Screening for Appropriate Assessment, Arup 2023*) the terrestrial habitats within the proposed development site were classified using the scheme outlined in the Heritage council publication *A Guide to Habitats in Ireland* (Fossitt, 2000). Habitats within the proposed development included GA1 Improved Agricultural Grassland, WS1 Scrub, WL1 Hedgerow and WL2 Treelines. In general, no significant changes to the habitats on site were recorded during the December 2023 survey. In the absence of active management the improved agricultural grassland is now taller and denser, with some encroachment of blackthorn and bramble scrub. The road development, including a new access track, has resulted in some planned loss of habitat. No other impacts on habitats have occurred.



**Plate 1. Track within grassland associated with road construction**



**Plate 2. Denser, taller grassland with some scrub encroachment.**

### **3.2 Birds**

As part of the Ecological Impact Assessment (EclA) which was completed for LIHAF Road, lands within the proposed development site were surveyed for breeding birds. A number of bird species recorded. Species recorded included Magpie (*Pica pica*), Woodpigeon (*Columba palumbus*), Robin (*Erithacus rubecula*), Jackdaw (*Corvus*), Swallow (*Hirundo rustica*) and a Buzzard (*Buteo buteo*). All species are Green-listed in Ireland with the exception of Swallow which are Amber-listed due to concerns over the entire European population. A winter bird survey was undertaken by Ecofact (as part of the EclA) in February and March 2018, and further surveys were completed in 2022/2023. Two species were noted on the Bird of Conservation Concern in Ireland (BoCCI) (Colhouns & Cummins 2013) red list: Meadow Pipit (*Anthus pratensis*) and Grey Wagtail (*Motacilla cinerea*). The 2018 winter bird survey noted the following:

*“a number of species found at this site and the species composition are in line with what would be expected in farmland in Co. Limerick. There were no species on Annex 1 of the EU Birds Directive. There were also no species associated with the River Shannon and River Fergus estuaries SPA recorded on the site. It is considered unlikely that they would use the site”.*

The walkover survey in December 2023 recorded a number of bird species within the proposed development area namely Blue Tit, Great Tit, Long Tailed Tit, Redwing, Mistle Thrush, Rook, Jackdaw, Stonechat, Goldfinch, Chaffinch, Dunnock, Hooded Crow, Raven, Wren, Feral Pigeon, Robin, Meadow Pipit and Kestrel. These species are typical species of mixed grassland with treelines, hedges and scrub. Overall, the proposed development site is of local value for terrestrial bird species that are relatively common in the Irish countryside.

Two species of note were noted during previous surveys of the proposed development site and the surrounding area, namely Kestrel and Barn Owl.

Kestrel is a Red-listed Bird of Conservation Concern in Ireland. They are protected under the Wildlife (Amendment) Act, 2000, and it is an offence to intentionally cause disturbance at a nest site or to breeding Kestrels. A possible nesting site was identified in the prominent treeline of pine during a previous survey by Ecofact (*Bat survey of lands at Mungret, Co. Limerick Ecofact, 2023*) which notes the following:

*Kestrels (Falco tinnunculus) were recorded breeding on the site during the current survey. A juvenile was heard begging for food in Treeline 1 and both adults were seen on the site during each visit. The Kestrels were recorded perching in Treelines 1 and 2. The male was seen foraging over Fields A and B. Only one juvenile was confirmed to be present on the site but the tree where the begging was recorded was not approached.*

This species was recorded by DixonBrosnan in December 2023. However, this survey was conducted outside the breeding season for this species and therefore breeding was not assessed and could not be confirmed.

Barn Owl (*Tyto alba*) is also a Red-listed Bird of Conservation Concern in Ireland due to extensive population declines over recent decades (Gilbert et. al., 2021). The intensification of agriculture, in particular the reduction of prey rich foraging habitat, is likely to be the main driver of long-term Barn Owl population declines in Ireland. The loss of nesting sites, increases in the use and exposure to rodenticides, and the expansion of road networks have also been recognised as factors which are impacting on Barn Owl populations. Barn Owls are protected under the Wildlife (Amendment). Barn Owls experienced significant decline in population in Ireland in recent decades with the losses attributed to loss of habitat, changes in farming practices and the use of rodenticides (Lusby and O'Clery 2014). Recent research has confirmed that Barn Owls may be benefitting from the introduction of Greater White-toothed Shrew, *Crocidura russula*, a non-native mammal species which has spread rapidly since its discovery in Ireland in 2008 (e.g. Smiddy, 2018). Barn Owl numbers and breeding range both seem to have improved somewhat in the past decade (J. Lusby pers comm.)

A roost site and probable breeding site for Barn Owl was discovered under a stone archway within Mungret College to the north of the proposed development site during previous surveys in this area. The report *Bat survey of lands at Mungret, Co. Limerick Ecofact, 2023* which relates to this project notes the following:

*Barn Owls (Tyto alba) were recorded nesting on the northwestern border of the site in 2020 by Ecofact (2020a &b). The nest site was located in the arch on the entrance to Mungret college. The nest site was inspected during the current survey and no definite signs of current Barn Owl occupancy were recorded. There were no pellets, moulted feathers, etc. in the archway and the white wash on the walls could have been made by other birds. Barn Owls were also not recorded during the bat activity survey. The current indications are that the Barn Owls may have abandoned this nest site.*

A survey of this area (outside the site) in December 2023 did not find new evidence of usage. This survey was conducted outside the breeding season for this species and therefore breeding was not directly assessed. No evidence such as pellets were recorded.

It is noted that the treeline within which Kestrel is potentially nesting will be largely retained and this potential nesting site will not be directly affected. However, if there are high levels of disturbance this may deter this species from nesting at this location. Barn Owl was recorded potentially nesting at Mungret College outside and to the north of the proposed development and this potential nesting/roosting site will not be affected.

There will be a loss of potential foraging habitat arising from the proposed development. The grassland and scrub within the site have increased in potential foraging value for both species due to the lack of intensive management. This has allowed denser grassland and scrub to develop and increased the value for the site for rodents and birds, which are prey sources for predatory birds such as Kestrel and Barn Owl.

If the development proceeds, there will still be significant foraging habitat for these species in the area, within the agricultural landscape and within the parkland landscape associated with Mungret College. In the absence of development the subject site would likely be restored to agricultural management and its foraging value for Kestrel and Barn Owl would decrease.

As a habitat enhancement measure a Kestrel box and a Barn Owl box will be provided within the existing treeline to provide additional potential roosting sites for these species.

Overall the proposed development will have a negative, localised, slight residual impact on these species due to loss of potential foraging habitat and potential disturbance of nesting Kestrel.



**Plate 3. Potential barn owl nesting location. No pellets or evidence of recent usage noted.**



**Plate 4. Mature treeline of pine which may support nesting Kestrel.**

### **3.3 Mammals**

A bat survey was carried by Ecofact in 2023 and four species were recorded namely Common Pipistrelle, Soprano Pipistrelle, Brown Long-Eared bat and Leislars Bat. The number of bats recorded foraging and commuting within the site boundary was relatively low and no roosting was recorded within the redline boundary. The Ecofact report noted the following:

*The current survey has concluded that there are no bat roosts on the site. The site is used by small numbers of Common pipistrelles, Soprano pipistrelles, Leisler's Bats, and Brown Long-eared Bats. However, none of the species were recorded roosting on the site.*

*There are some trees on the site with bat potential and any tree with potential could potentially be used by bats in the future. However, the majority of the trees on the site are non-native Black Pines and this is likely to reduce their suitability of use by roosting bats. The small numbers of bats present use the site for foraging and commuting purposes only.*

The December 2023 did not record any significant changes in potential bat habitat within the proposed development site. As a habitat enhancement measure it is recommended that four bat boxes be provided within the treeline of mature pines which will be retained. Overall the proposed development will have a negative, localised, slight and long-term impact on bats due to loss of potential foraging habitat. No evidence of usage by other mammal species such as badger was recorded in December 2023.

Potential indirect effects on the remaining and possibly recovering bat roosts outside the site at Mungret College will be mitigated by the use of bat sensitive lighting during construction and operation, the substantial retention of the principal tree line across the site, and the maintenance of dark areas within the site as part of the design of the proposed development.

## 4. Enhancement Measures

A number of enhancement measures are recommended to minimise impacts and to enhance the ecological value of the site.

### 4.1 Bat boxes

It is recommended that an additional four bat boxes be provided on mature pines. The boxes must be located high enough to minimise the risk of human interference and should be located in the darker areas where lighting levels are lowest.

#### ***Vincent Pro Bat Box***

Three Vincent Pro bat boxes are recommended. This box features three vertical chambers of different sizes, providing ideal roosting space for a variety of species. Beneath the crevice entrances is a ladder which provides a rough surface for bats to land. Limited cleaning is required for these boxes as the droppings will fall out of the bottom of the chambers. The front and top of the box are black which helps the box to absorb heat. This bat box can be used by Leisler's, Common Pipistrelle, Soprano Pipistrelle, Brown long-eared, Natterer's and Whiskered Bat.

#### ***Improved Roost-Maternity Bat Box***

One improved Roost-Maternity Bat Box is recommended. This box is suitable for larger roosts or maternity groups of the small crevice-dwelling bats such as pipistrelles. This has three separate crevices, each with different temperature characteristics and a wide entrance with accurately sized opening. Ideal for Pipistrelles and deters unwelcome birds etc. Internal ceramic heat sinks ensure improved temperature stability in crevices.



**Plate 5. Vincent pro bat box**



**Plate 6. Improved Roost-Maternity Bat Box**



## 4.2 Bird nest boxes

A barn owl nest box (<https://www.nhbs.com/search?q=barn+owl+nest&qtview=200181> or similar) will be placed on one of the mature pines to be retained. It will be positioned under the supervision of an ecologist to minimise potential disturbance and light levels. A kestrel nesting box (<https://www.nhbs.com/search?q=kestrel+nest+box&qtview=173244> or similar) will also be placed in the same treeline at an optimal height of 6-8m. This will be positioned under the supervision of an ecologist and should not be open to the prevailing wind.



**Plate 7. Barn owl nest box**



**Plate 8. Kestrel nesting box**

## 5. Conclusions

A walkover survey of the site carried out in December 2023 did not indicate that there had been any significant changes in baseline ecological conditions. The provision of barn owl and kestrel nesting boxes and bat boxes will provide additional roosting/nesting habitat. The long-term impact on these species due to loss of potential foraging habitat is predicted to be slight and long term.