

Appendix 3. Population & Human Health

No appendices

Appendix 4. Biodiversity

Appendix 4.1 – ‘*Bat Assessment prepared for Proposed Planning Application*’, Bat Eco Services, 2020.

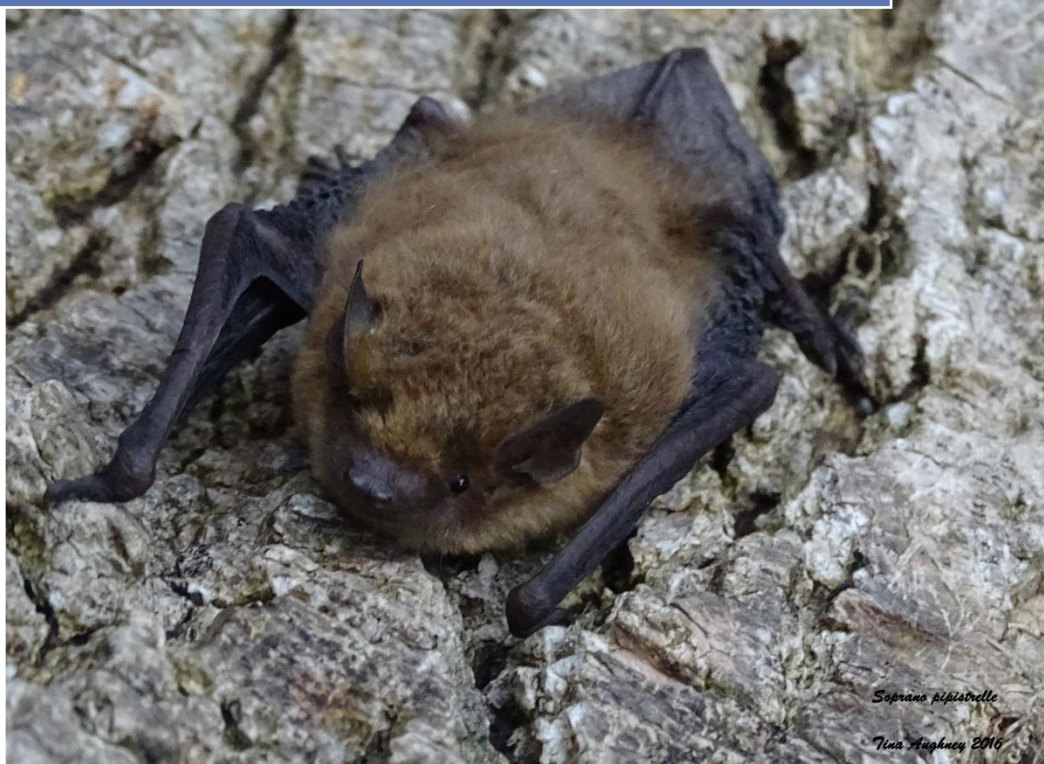
Appendix 4.2 – ‘*LETTER: Lighting Plan for proposed development at Harbour Point, Bray, Co. Wicklow*’, Bat Eco Services, 2022.

Appendix 4.3 – ‘*Bray Coastal Quarter Bat Conservation Plan*’, Atkins 2022.

Appendix 4.1 – *'Bat Assessment prepared for Proposed Planning Application'*, Bat Eco Services, 2020.

2020

Bat Assessment prepared for Proposed
Planning Application



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NPWS licence C13/2020 (Licence to handle bats, expires 31st December 2022)

NPWS licence 08/2020 (Licence to photograph/film bats, expires 31st December 2022)

NPWS licence DER/BAT 2019-138 on expiry (Survey licence, expires 29th March 2022).

Client: Shankill Property Investments Ltd.

Project Name & Location: Harbour Point, Bray, Co. Wicklow.

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
9 th October 2020	Draft 1	Email to Atkins
16 th October 2020	Final	Email to Atkins

Purpose

This document has been prepared as a Report for Atkins. Only the most up to-date report should be consulted. All previous drafts/reports are deemed redundant in relation to the named site.

Bat Eco Service accepts no responsibility or liability for any use that is made of this document other than by the client for the purposes for which it was originally commissioned and prepared.

Carbon Footprint Policy

It is the policy of Bat Eco Services to provide documentation digitally in order to reduce carbon footprint. Printing of reports etc. is avoided, where possible.

Bat Record Submission Policy

It is the policy of Bat Eco Services to submit all bat records to Bat Conservation Ireland database one year post-surveying. This is to ensure that a high level bat database is available for future desktop reviews. This action will be automatically undertaken unless otherwise requested, where there is genuine justification.

Executive Summary

Project Name & Location: Harbour Point, Bray, Co. Wicklow.

Proposed work: Mixed-use housing development.

Executive Summary

The following is a brief summary of the survey results and the bat survey duties completed. Three species of bat was recorded commuting and foraging within the proposed development area while a fourth bat species was recorded foraging along the river adjacent to the proposed development area. Two species of bat was recorded roosting in trees within the proposed development area.

Bat Survey Results – Brief Summary of Results (within survey area)

Bat Species	Roosts	Foraging	Commuting
Common pipistrelle <i>Pipistrellus pipistrellus</i>	√	√	√
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>		√	√
Nathusius' pipistrelle <i>Pipistrellus nathusii</i>			√
Leisler's bat <i>Nyctalus leisleri</i>	√	√	√
Brown long-eared bat <i>Plecotus auritus</i>			
Daubenton's bat <i>Myotis daubentonii</i>		√	
Natterer's bat <i>Myotis nattereri</i>			
Whiskered bat <i>Myotis mystacinus</i>			
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>			

This data was collated through a combination of the bat survey duties undertaken below:

Bat Survey Duties Completed (indicated by red)

Tree PBR Survey	●	Daytime Building Inspection	●
Static Detector Survey	●	Daytime Bridge Inspection	○
Dusk Bat Survey	●	Dawn Bat Survey	●
Walking Transect	●	Driving Transect	○
Trapping / Mist Netting	○	IR Camcorder filming	○
Endoscope Inspection	○	Other	○

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1. Introduction

Bat Eco Services was commissioned by Atkins to complete a bat assessment of the proposed planning application on a site located at Harbour Point, Bray, Co. Wicklow.

1.1 Relevant Legislation & Bat Species Status in Ireland

A small number of these animal and plants species are protected under Irish legislation (Nelson, *et al.*, 2019). The principal Irish legislation is the Wildlife Act 1976. Amendments to the Wildlife Act and its Statutory Instruments have enacted and amended protection of individual species, notably in order to comply with EU legislation or other international agreements. The Birds and Habitats Directives are the primary EU legislation resulting in the legal protection of species in Ireland. The Acts and Statutory Instruments which list species within the broad taxonomic groupings are referred to in the relevant sections.

1.1.1 Irish Legislation

The Wildlife Act 1976 (Number 39 of 1976) was amended on four occasions up to 2019, the principal being the Wildlife (Amendment) Act 2000 (Number 38 of 2000). The Flora (Protection) Order lists the plant species protected by Section 21 of the Wildlife Acts. The regulations that give rise to the protection of animal species under the Wildlife Acts are detailed in the relevant sections. See www.npws.ie/legislation for further information.

The codes used for national legislation are as follows:

- WA = Wildlife Act, 1976, Wildlife (Amendment) Act, 2000 and other relevant amendments
- FPO = Flora (Protection) Order, 2015 (S.I. No. 356 of 2015)

1.1.2 EU Legislation

The primary legislation transposing the Nature Directives (Birds and Habitats Directives) into Irish law is the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended.

The codes used for the EU Nature Directives and Habitats Directives (Council Directive 92/43/EEC) are:

- Annex II Animal and plant species listed in Annex II
- Annex IV Animal and plant species listed in Annex IV
- Annex V Animal and plant species listed in Annex V

The main aim of the Habitats Directive is the conservation of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status. These annexes list habitats (Annex I) and species (Annexes II, IV and V) which are considered threatened in the EU territory. The listed habitats and species represent a considerable proportion of biodiversity in Ireland and the Directive itself is one of the most important pieces of legislation governing the conservation of biodiversity in Europe.

Under Article 11 of the Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In April 2019, Ireland submitted the third assessment of conservation status for 59 habitats and 60 species. There are three volumes with the third listing details of the species assessed (www.npws.ie – for publications).

1.1.3 IUCN Red Lists

The International Union for the Conservation of Nature (IUCN) coordinates the Red Listing process at the global level, defining the categories so that they are standardised across all taxa. Red Lists are also produced at regional, national and subnational levels using the same IUCN categories (IUCN 2012, 2019). Since 2009, Red Lists have been produced for the island of Ireland by the National Parks and Wildlife Service (NPWS) and the Northern Ireland Environment Agency (NIEA) using these IUCN categories. To date, 13 Red Lists have been completed. The Red Lists are an assessment of the risk of extinction of each species and not just an assessment of their rarity. Threatened species are those species categorised as Critically Endangered, Endangered or Vulnerable (IUCN, 2019) – also commonly referred to as ‘Red Listed’.

1.1.4 Irish Red List - Mammals

Red Lists in Ireland refer to the whole island, i.e. including Northern Ireland, and so follow the guidelines for regional assessments (IUCN, 2012, 2019). The abbreviations used are as follows:

- RE Regionally Extinct
- CR Critically Endangered
- EN Endangered
- VU Vulnerable
- NT Near Threatened
- DD Data Deficient
- LC Least Concern
- NA Not Assessed
- NE Not Evaluated

There are 27 terrestrial mammals species in Ireland, which includes the nine resident bat species listed. The terrestrial mammal, according to Marnell *et al.*, 2019, list for Ireland consists of all terrestrial species native to Ireland or naturalised in Ireland before 1500. The IUCN Red List categories and criteria are used to assess that status of wildlife. This was recently completed for the terrestrial mammals of Ireland. Apart from the two following two mammal species (grey wolf *Canis lupus* (regionally extinct) and black rat *Rattus rattus* (Vulnerable)), the remaining 25 species were assessed as least concern in the most recent IUCN Red List publication by NPWS (Marnell *et al.*, 2019).

1.1.5 Irish Bat Species

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the EC Directive on The Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, 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. The Irish government has ratified both these conventions.

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is a notifiable action and a derogation licence has to be obtained from the *National Parks and Wildlife Service* before works can commence. Any works interfering with bats and especially their roosts, may only be carried out under a 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). The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

There are eleven recorded bat species in Ireland, nine of which are considered resident. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species.

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).

Irish bat species list (please see main body of text for more information in individual bat species) is presented in Table 1. The current status of the known bat species occurring in Ireland is given in the Table 1 below.

Table 1: Status of the Irish bat fauna (Marnell *et al.*, 2019).

Species: Common Name	Irish Status	European Status	Global Status
Resident Bat Species ^			
Daubenton's bat <i>Myotis daubentonii</i>	Least Concern	Least Concern	Least Concern
Whiskered bat <i>Myotis mystacinus</i>	Least Concern	Least Concern	Least Concern
Natterer's bat <i>Myotis nattereri</i>	Least Concern	Least Concern	Least Concern
Leisler's bat <i>Nyctalus leisleri</i>	Near threatened	Least Concern	Least Concern
Nathusius' pipistrelle <i>Pipistrellus nathusii</i>	Least Concern	Least Concern	Least Concern
Common pipistrelle <i>Pipistrellus pipistrellus</i>	Least Concern	Least Concern	Least Concern
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	Least Concern	Least Concern	Least Concern
Brown long-eared bat <i>Plecotus auritus</i>	Least Concern	Least Concern	Least Concern

Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	Least Concern	Least Concern	Least Concern
Possible Vagrants ^			
Brandt's bat <i>Myotis brandtii</i>	Data deficient	Least Concern	Least Concern
Greater horseshoe bat <i>Rhinolophus ferrumequinum</i>	Data deficient	Near threatened	Near threatened

^ Roche *et al.*, 2014

1.2 Relevant Guidance Documents

This report will draw on guidelines already available in Europe and will use the following documents:

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

Based on the information collected during the desktop studies and bat surveys, the bat ecologist assigns, where possible, an ecological value to each bat species recorded based on its conservation status at different geographical scales (Table 2). For example, a site may be of national ecological value for a given species if it supports a significant proportion (e.g. 5%) of the total national population of that species.

Table 2: The six-level ecological valuation scheme used in the CIEM Guidelines (2016) Ecological Value

Ecological Value	Geographical Scale of Importance
International	International or European scale
National	The Republic of Ireland or the island of Ireland scale (depending on the bat species)
Regional	Province scale: Leinster
County	County scale: Kildare
Local	Proposed development and immediate surroundings

Negligible	None, the feature is common and widespread
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Impacts on bats can arise from activities that may result in:

- Physical disturbance of bat roosts e.g. destruction or renovation of buildings
- Noise disturbance e.g. increase human presence, use of machinery etc.
- Lighting disturbance
- Loss of roosts e.g. destruction or renovation of buildings
- Modifications of commuting or foraging habitats
- Severance or fragmentation of commuting routes
- Loss of foraging habitats.

It is recognised that any development will have an impact on the receiving environment, but the significance of the impact will depend on the value of the ecological features that would be affected. Such ecological features will be those that are considered to be important and potentially affected by the proposed development.

The guidelines consulted recommend that the potential impacts of a proposed development on bats are assessed as early as possible in the design stage to determine any areas of conflicts.

1.3 Project Description

1.3.1 Site Location

The proposed masterplan residential development is located on the northern side of Bray town centre. The overall masterplan is 44 acres (17.8 hectares (ha)) in size and will be developed via two key phases, namely;

- **Phase 1 - Coastal Quarter (Red Line)**
- **Phase 2 - River Quarter (Blue Line).**

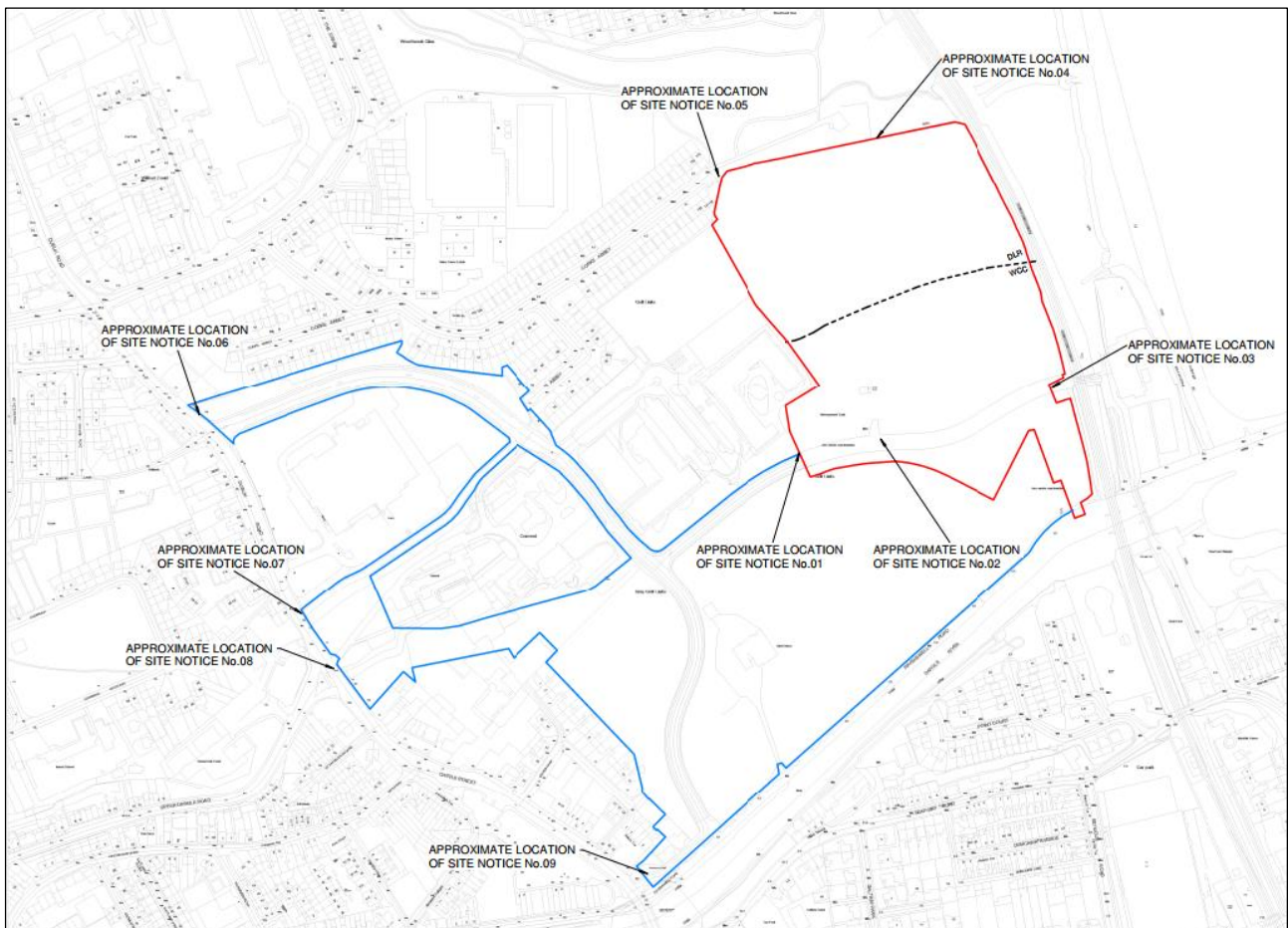


Figure 1a: Location of the proposed development site (red line is an approximate outline of the proposed development site of Phase 1, Coastal Quarter. Blue line is the additional land proposed to be developed and subject of this bat survey in addition to the Red line area (Source: Atkins Ireland).

It is noted in the AA Screening report “that the site for the proposed mixed use development project was subject to a previous SHD planning application which was granted in 2010: - An Bord Pleanála Reference Number: PL39.230246 and An Bord Pleanála Reference Number: PL06D.230215. The site has also been subject to recent development associated with the granted permission. A primary school along with associated sports / recreational areas have been constructed on ca. 5 hectares of the overall site. Significant infrastructural works were also undertaken with a new road network now in situ providing two main access routes; a Northern Access Route which borders the eastern and northern boundaries of the Industrial Yarns site and a Southern Access Road which facilitates access via the Upper Dargle Road”.

The Coastal Quarter (Phase 1) is the area represented in the figure below.

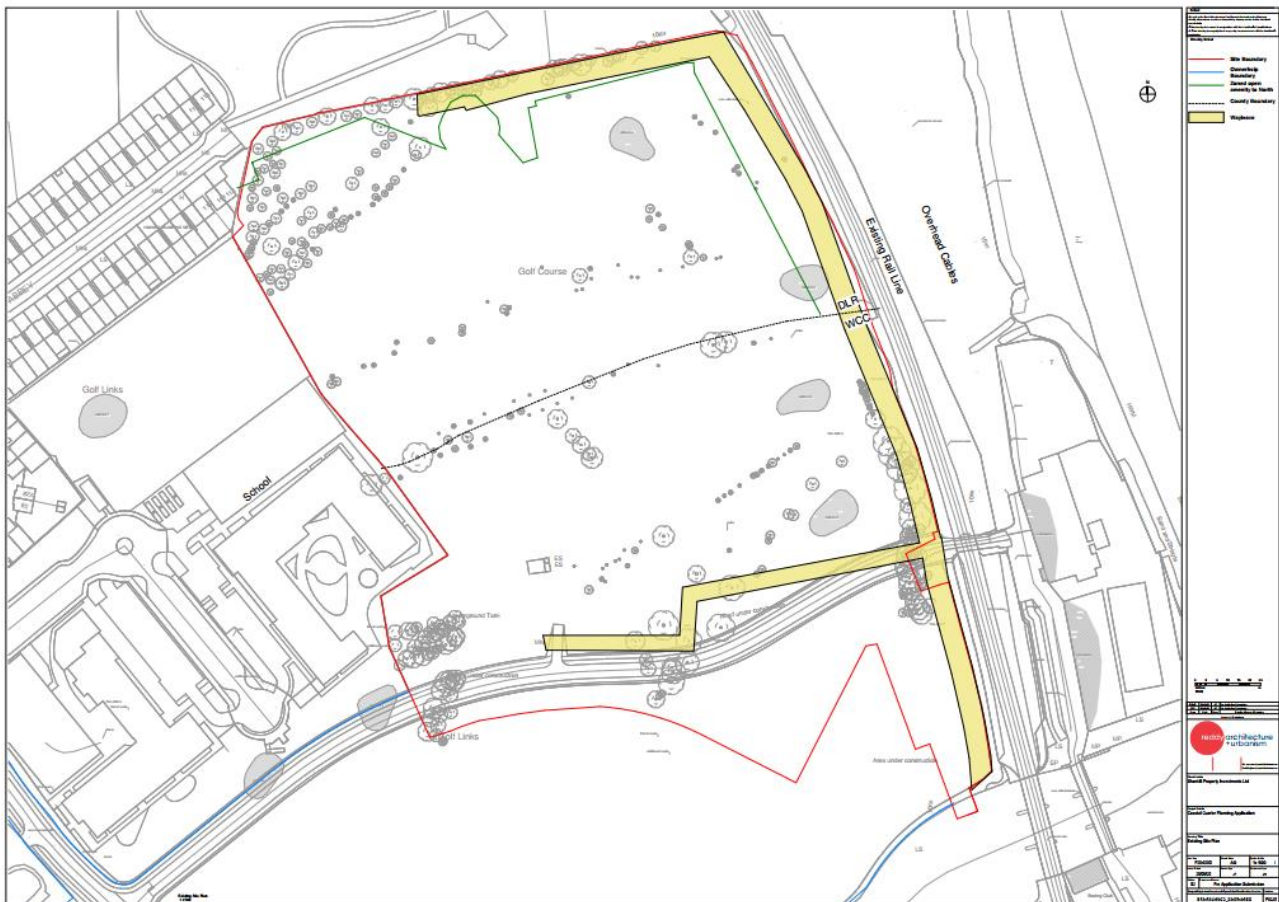


Figure 1b: Location of Phase 1, Coastal Quarter (red line is an approximate outline of the proposed development site of Phase 1, Coastal Quarter (Source: Atkins Ireland).

1.3.2 Proposed Project

The proposed development will provide a residential development consisting of 564 no. units (comprising a mix of apartments and houses) together with car and bicycle parking at basement and surface levels; a childcare facility; public open spaces; play areas; substations; utility and service connections; and; all associated site works on lands forming part of the former Bray Golf Club lands, off Ravenswell Road and Dublin Road, Bray, Counties Wicklow and Dublin (Source: Atkins Ireland).

It is proposed that 281 no. units will be located in Dún Laoghaire-Rathdown and 283 no. units will be located in Wicklow. The overall density of the quarter will be 73 no. units per hectare (uph). A more detailed description of the residential development is set out below:

- Block 1A (within DLRCC administrative area) will be a 7-storey block comprising 150 no. units (47 no. one bedroom units, 92 no. two bedroom units and 11 no. three bedroom units).
- Block 1B (within WCC administrative area) will be a 7-storey block over basement comprising 170 no. units (69 no. one bedroom units, 90 no. two bedroom units and 11 no. three bedroom units).
- Block 1C (within WCC administrative area) will be a 4-storey block comprising 63 no. units (35 no. one bedroom units and 28 no. two bedroom units).

- Block 1D (within DLRCC administrative area) will be a 5-storey block comprising 29 no. units (21 no. one bedroom units and 8 no. two bedroom units).
- 82 no. housing units (59 no. housing units within DLRCC administrative area and 23 no. housing units WCC administrative area).
- 56 no. duplexes (16 no. corner duplex units and 18 no. terrace duplex units within DLRCC administrative area and 8 no. corner duplex units and 14 no. terrace duplex units within WCC administrative area).
- 14 no. triplex townhouses (9 no. triplex townhouses within DLRCC administrative area and 5 no. triplex townhouse units within WCC administrative area).

1.3.3 General Bat Survey Aims

The general aims of a bat survey are as follows:

- Collect robust data following good practice guidelines to allow an assessment of the potential impacts of the proposed project on local bat populations, both on and off-site (where possible);
- Facilitate the design of mitigation, enhancement and monitoring strategies for local bat populations recorded;
- Provide baseline information with which the results of post-construction monitoring surveys can be compared to, where appropriate;
- Provide information to enable NPWS and planning authorities to reach robust decisions with definitive required outcomes;
- Assist clients in meeting their statutory obligations;
- Facilitate the conservation of local bat populations.

Surveys are comprised of many different types and may differ from site to site depending on the goals of the survey. The following is a brief description of main types of surveys that can be completed. The surveys deemed suitable for a particular project is determined on a case-by-case basis.

- Emergence (dusk) surveys: surveying of buildings or structures to determine whether such building/structure is a bat roost. Undertaken from 10 minutes prior to sunset to 90 minutes after sunset.
- Walking transect: bat surveys completed on-foot where the surveyor(s) walk the survey site from 30 minutes after sunset. Often this survey is completed post an emergence survey and therefore may be undertaken for a different period of time after sunset.
- Driving transect: bat survey completed in a car and undertaken according to a strict survey protocol. Surveying is completed from 40 minutes after sunset till the end of the planned survey route. This is only undertaken for large survey area with a well-defined public road structure. Routes are planned and mapped prior to surveying.
- Dawn surveys: surveying of buildings or structures to determine whether such building/structure is a bat roost. Undertaken from 90 minutes prior to sunrise to 10 minutes after sunrise.
- Static surveys: placement of automated recording devices within the survey area. The units are set up during the daylight hours and left in place to record during the hours of darkness.
- Additional surveys required may include trapping / netting of bats. But this type of surveying is only undertaken where specific information is required (e.g. to determine if a roost is a maternity colony).

2. Bat Survey Methodology

The following information provides some general non-specific information on the different components of a bat survey as well as specific information on what was completed as part of the bat survey methodology for this proposed development. This is background information to provide context to survey results presented in Section 3.

2.1 Daytime Inspections

One purpose of daytime inspections is to determine the potential of bat roosts within the survey area. Due to the transient nature of bats and their seasonal life cycle, there are a number of different types of bat roosts. Where possible, one of the objectives of the surveys is to be able to identify the types of roosts present, if any. However, the determination of the type of roost present depends on the timing of the survey and the number of bat surveys completed. Consequently, the definition of roost types, in this report, will be based on the following:

Table 3: Bat Roost Types (Collins 2016).

Roost Type	Definition	Time of Survey
Day Roost	A place where individual bats or small groups of males, rest or shelter in the daytime but are rarely found by night in the summer.	Anytime of the year
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 bat on occasion or it could be used regularly by the whole colony.	Anytime of the year
Feeding Roost	A place where individual bats or a few bats rest or feed during the night but are rarely present by day.	Anytime of the year
Transitional Roost	A place 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.	Outside the main maternity and hibernation periods.
Swarming Site	Where large numbers of males and females gather. Appear to be important mating sites.	Late summer and autumn
Mating Site	Where mating takes place.	Late summer and autumn
Maternity Site	Where female bats give birth and raise their young to independence.	Summer months
Hibernation Site	Where bats are found, either individually or in groups in the winter months. They have a constant cool temperature and humidity.	Winter months in cold weather conditions
Satellite Roost	An alternative roost found in close proximity to the main nursery colony and is used by a few individuals throughout the breeding season.	Summer months

2.1.1 Building & Structure Inspection

There are three buildings located within the proposed development site: golf club house and two sheds. All of these were inspected during the daytime for evidence of bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past. Inspections were undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope).

2.1.2 Tree Potential Bat Roost (PBRs) Inspection

Trees that may provide a roosting space for bats were examined using the Bat Tree Habitat Key (BTHK, 2018) and the classification system reported in Collins (2016). The Potential Roost Features (PRFs) listed in the BTHK are used to determine the PBR value of trees. Trees identified as Potential Bat Roosts (PBRs) were inspected during the daytime, where possible, for evidence of bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework), bat pupae and claw marks.

A Phase 1 inspection was undertaken on the 10/7/2020 and 6/8/2020 in order to make a list of trees within the proposed development site that may be suitable as roosting sites for bats. Inspections were undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) during the daytime searching for PRFs.

Table 4: Tree Bat Roost Category Classification System (Collins, 2016).

Tree Category	Description
1	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts
2	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats;
3	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	Trees have no potential.

2.1.3 Bat Habitat & Commuting Routes Mapping

The survey site was assessed during daytime on 10/7/2020 where a walkabout survey was completed to document potential bat foraging habitat and potential bat commuting routes. Aerial photographs were also examined to assist this step. Bat habitats and commuting routes were also identified in the wider landscape to determine landscape connectivity for local bat populations through the examination of aerial photographs.

2.2 Night-time Bat Detector Surveys

The following bat surveys were completed and methodology for these are described below.

Dusk Survey – 12/7/2020 (Weather conditions: full cloud cover, 16oC, calm and dry);

- Surveyor 1: School-side of derelict golf club house.
- Surveyor 3: River-side of derelict golf club house

Dusk Survey – 15/7/2020 (Weather conditions: patchy cloud cover, 16oC, calm and dry);

- Surveyor 1: School-side of derelict golf club house adjacent to trees.
- Surveyor 2: St. John of God buildings / old primary school

Walking Transect – 15/7/2020 (Weather conditions: patchy cloud cover, 16oC, calm and dry);

- Surveyor 1: walked sections of the proposed development site and continued along the River Dargle into Bray town centre (People's Park).
- Surveyor 2: walked the proposed development site and general environs wooded area to the north of the proposed development site.

Dusk Survey – 6/8/2020 (Weather conditions: full cloud cover, 17oC, light breeze, dry);

- Surveyor 1: Field south of St. John of God.
- Surveyor 3: Derelict golf club house.

Walking Transect – 7/8/2020 (Weather conditions: patchy cloud cover, 16oC, calm and dry);

- Surveyors 1 & 3: walked the proposed development site.

Dawn Survey – 7/8/2020 (Weather conditions: patchy cloud cover, 14oC, calm, dry);

- Surveyor 1: Field south of St. John of God.
- Surveyor 3: Road network between River Dargle and new Ravenshill School.

2.2.1 Dusk & Dawn Bat Surveys, Walking Transects

Dusk emergence surveys were completed from 10 minutes before sunset to 90 minutes post sunset. The surveyors position themselves adjacent to the buildings/trees to be surveyed to determine if bats are roosting within the buildings and visible trees in order to record the location of roosts, number of bats, bat species present.

Walking transects were completed on two dates and these were undertaken post-dusk survey on the 15/7/2020 and pre-dawn survey on 7/8/2020, both 100 minutes long. These involved the survey team walking a predetermined route, noting the time, location and bat species encountered. The geo-referenced calls were mapped using Google Earth with a KLM file produced for mapping purposes. Validation of bat records was completed by the principal bat surveyor prior to mapping.

Surveys were completed during mild and dry weather conditions with air temperature of 8°C or greater. All bat encounters were noted during surveys.

The following equipment was used:

Surveyor 1: (Principal surveyor): Anabat Walkabout Full Spectrum Detector and Petersson D200 Heterodyne Bat Detector.

Surveyor 2: Wildlife Acoustics Echo Meter Touch2 Pro (Android) connected to Samsung Galaxy Tab S3 and Petersson D200 Heterodyne Bat Detector.

Surveyor 3: Wildlife Acoustics Echo Meter Touch (Generation 1, Apple IOS) connected to iPad 2 (32 GB storage) and Petersson D200 Heterodyne Bat Detector.

2.2.2 *Passive Static Bat Detector Survey*

A Passive Static Bat Surveys involves leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified period of time (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector is effectively used as a bat activity data logger. This results in a far greater sampling effort over a shorter period of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

The microphone of the unit was position horizontally to reduce potential damage from rain. Wildlife Acoustics Song Meter SM4 Bat Full Spectrum Units use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card and downloaded for analysis. These results are depicted on a graph showing the number of bat passes per species per night. Each bat pass does not correlate to an individual bat but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats not unless the individual is foraging above a tree canopy.

The recordings were analysed using Wildlife Acoustics Kaleidoscope Pro. Each sound file was noted as a bat pass to indicate level of bat activity for each species recorded. This is either expressed as the number of bat passes per hour or per survey night.

The following static units were deployed during this static bat detector survey. The static surveillance was completed for 5 nights from 9/6/2020 to 15/6/2020.

Table 5: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
SM4 Units 2, 3, 6, 7 & 8	Wildlife Acoustics SongMeter Mini Bat	Passive Full Spectrum	SMM-U2

The statics were located on mature trees at the following locations:

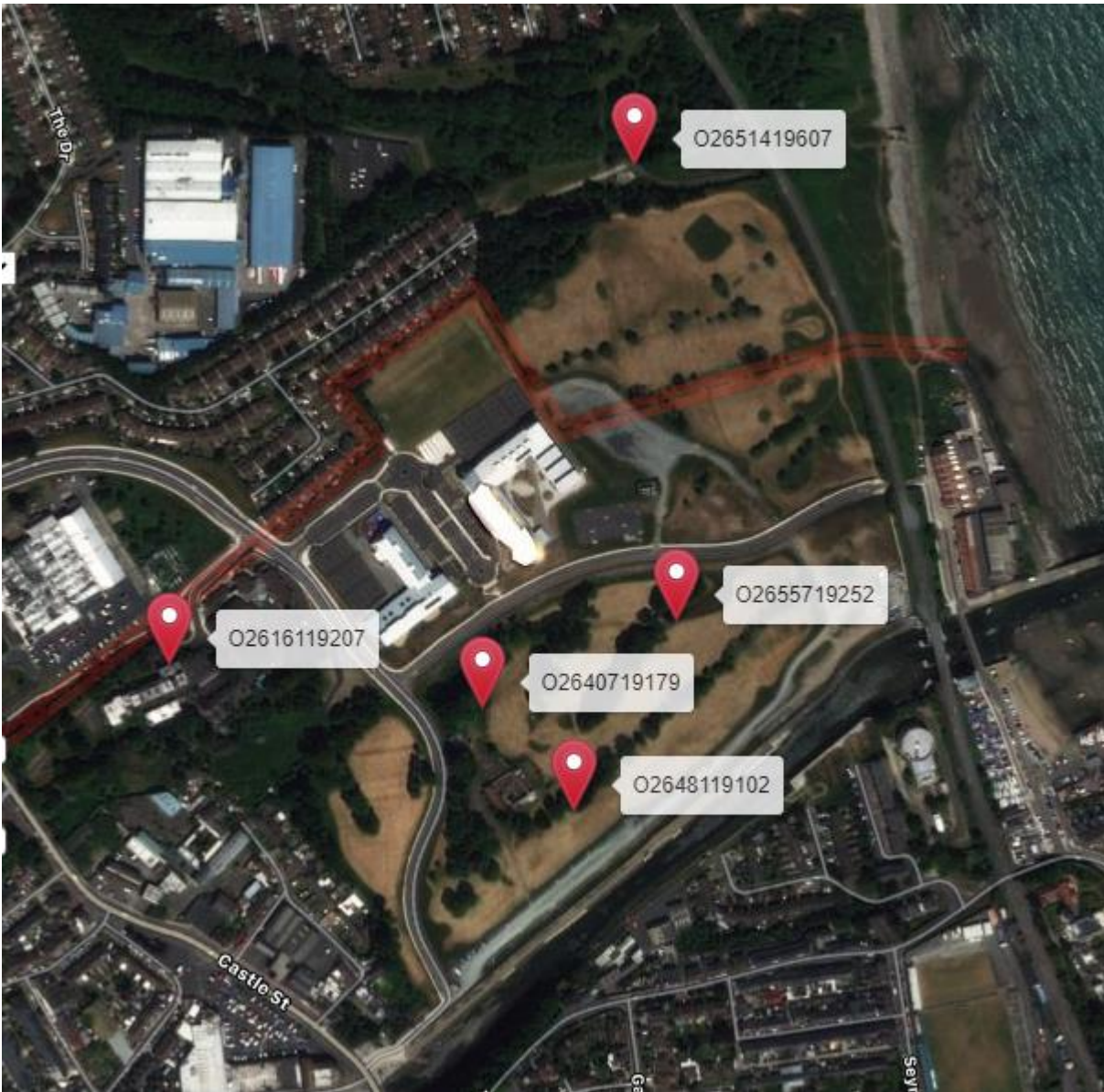


Figure 2: Location of static unit deployment within proposed development site (Source: www.gridreferencefinder.ie).

2.3 Desktop Review

2.3.1 Bat Conservation Ireland Database

A 1km radius of the Irish grid Reference O264191 was requested.

2.4 Photographic Record

A photographic record was completed for the survey and is presented throughout the report.

2.5 Survey Constraints & Survey Summary

The following is a summary of the surveying completed for this project:

Table 6: Survey Summary.

Category	Discussion
Timing of surveys	All surveys were completed during the maternity season. Therefore there is no constraints in relation to timing.
Weather conditions	Good weather conditions were noted during all surveys completed. Therefore there are no constraints in relation to weather conditions.
Survey effort	2020 Bat Survey
Total hours of surveys: TOTAL = 18 hours, 20 mins	Static Surveillance – 5 static units, 5 nights (10/7/2020 to 15/7/2020) Dusk survey 12/7/2020 – 2 surveyors Dusk survey 15/7/2020 – 2 surveyors Walking Transect 15/7/2020 – 2 surveyors
Total hours of static surveillance TOTAL = 200 hours	Dusk survey 6/8/2020 – 2 surveyors Walking Transect 7/8/2020 – 2 surveyors Dawn survey 7/8/2020 – 2 surveyors
Equipment	All in good working order
Access	There was antisocial behaviour during the July surveys which limited location of dusk surveys and location of a static on mature trees in the area east of the modern Ravenshill school. As a consequence, the static units were located south and north of this location. But the walking transects aimed to reduce this limitation as these were undertaken late into the night when people were generally not present.

It is therefore deemed that the survey work completed is adequate in order to complete the aims of the bat survey.

3. Bat Survey Results

3.1 Daytime Inspections

3.1.1 Building & Structure Inspection

The following buildings / structures were inspected on 15/7/2020 and 6/8/2020 both externally and internally (where possible) as described in the table below. Bat droppings or other signs of bat usage were not recorded in any of the building inspected.

Table 7: Buildings / Structures daytime inspection assessment and results.

Building Code	Description	Grid Reference	Roost Type / Suitability	Bat Species
Golf club house	Multiple mixed material building in derelict condition due to fire damage.	02638619138	Low	No evidence recorded
Shed 1	Single storey concrete block shed with corrugated roof	02634519175	Low-Medium	No evidence recorded
Shed 2	Single storey concrete block shed with corrugate (asbestos) roof	02616319162	Medium	No evidence recorded

There are large number of buildings adjacent to the survey area (St. John of God facility, old Ravenshill School, house estates etc.). A number of these buildings were identified as bat roosts during night-time bat surveys but no inspection of such buildings were undertaken as they are private buildings outside the remit of this bat survey.



Plate 1: Shed 2 located south of old Ravenshill School.



Plate 2a, b: Derelict golf club house.

3.1.2 Tree Potential Bat Roost (PBRs) Inspection

There are a large number of trees within the proposed development area deemed to be suitable as bat roosts. There is also a high degree of connectivity between the wooded areas, treelines and hedgerows within and along the boundary of this proposed development site connecting to the two rivers within the adjacent areas.

Common pipistrelle roosts were recorded emerging from two trees (adjacent to Shed 1) during the dusk surveys completed (Tree Tag No.s 0682 and 0683). Early emerging Leisler's bats may also be roosting in trees within in this survey area, but exact trees were not identified.

A total of 22 trees were noted as Category 2 PBRs and two trees were identified as tree roosts and therefore Category 1 PBRs.

Table 8: Tree Potential Bat Roost (PBR) inspection results (PBR value Classification according to Collins, 2016).

Tree No.	Tree Species	Potential Roost Features (PRFs)	Bat Usage	PBR Value
0317	White Poplar	Large crack in limb	Foraging and commuting. Low to Medium potential of bat roosts present.	Cat. 2
0324	White Poplar	Hazard beam, spilt limb	Foraging and commuting. Low to Medium potential of bat roosts present.	Cat. 2
0350	Sycamore	Tree holes, ivy growth	Foraging and commuting. Low to Medium potential of bat roosts present.	Cat. 2
0351	Sycamore	Tree holes, ivy growth	Foraging and commuting. Low to Medium potential of bat roosts present.	Cat. 2
0354	Sycamore	Tree holes, ivy growth	Foraging and commuting. Low to Medium potential of bat roosts present.	Cat. 2
0360	Sycamore	Tree holes, ivy growth	Foraging and commuting. Low to Medium potential of bat roosts present.	Cat. 2
0512	White Poplar	Dead wood	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0513	White Poplar	Dead wood	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0563	Birch	Tree holes	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0561	White Poplar	Fissure	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0541	Birch	Fissure	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0653	White Poplar	Dead wood	Foraging and commuting.	Cat. 2

			Medium potential of bat roosts present.	
0666	Ash	Dead wood	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0683	Oak	Tree holes, split limbs and dead wood	Foraging and commuting. Medium to High potential of bat roosts present. TREE ROOST – CP*	Cat. 1
0682	Oak	Tree holes, split limbs and dead wood	Foraging and commuting. Medium to High potential of bat roosts present. TREE ROOST – CP*	Cat. 1
0691 x2	White poplar	Tear-out wound, dead wood	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0723	White poplar	Tear-out wound, dead wood	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0003	Horse Chestnut	Ivy growth, dead wood	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0005	Oak	Tree holes, dead wood	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
0013	Beech	Tree holes, spilt limbs	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2
Group 5	Scots Pine x3	Dead wood, spilt limbs	Foraging and commuting. Medium potential of bat roosts present.	Cat. 2

Note: CP = common pipistrelle

The tree survey report (Independent Tree Surveys, July 2020) was consulted as part of this assessment to ensure that correct tree species are quoted in table. Examination of the plans for the proposed development site indicate that the majority of trees within the internal spaces of the survey area will be removed.

3.2 Night-time Bat Detector Surveys

Two walking transects, three dusk surveys and one dusk survey were completed on various dates in 2020. The results of these are presented below.

3.2.1 Dusk Bat Survey 12/7/2020

Two surveyors completed the dusk survey on the 12/7/2020 (21:25 hrs start time) and were located adjacent to the golf club house to determine if this building is a bat roost. No bats were recorded emerging from the building by either surveyor.

- Two trees (Tree Tag No.s 0682 & 0683) were identified as tree roosts for common pipistrelles (>8 individuals). These bats foraged around the group of trees adjacent to Shed 1 and the club house before commuting away. The first bat emerged at 21:43 hrs.
- Leisler's bats were recorded commuting into the survey areas (from 21:56 hrs) from an unknown roost located north of the surveyor location heading in a southerly direction. Foraging was recorded within the survey area. At least six individuals were recorded.
- Soprano pipistrelles were recorded commuting into the survey area from 22:07 hrs with foraging recorded along the internal treelines of the golf course adjacent to the club house.
- Survey ceased at 22.40 hrs due to rain shower.

3.2.2 Dusk Bat Survey 15/7/2020

Two surveyors completed the dusk survey on the 15/7/2020 (21:20 hrs start time). Surveyor 1 was located along the road between the golf club house and adjacent fields while Surveyor 2 was located within the grounds of St. John God facility/old Ravenhills school.

Surveyor 1 recorded:

- Four Leisler's bat commuted (21:48 hrs) from a north-west direction towards the golf club house and foraged along the treelines.
- Common pipistrelles (x2 individuals) commuted from the direction of Shed 2 towards the area of the golf club house and foraged along the treelines.
- These two species were recorded continuously throughout the survey period.

Surveyor 2 recorded:

- Leisler's bat activity was recorded first at 21:50 hrs with continuous activity from commuting and foraging bats for approximately 24 minutes.
- The first common pipistrelle bat encounter was at 22:23 hrs and this individual commuted from a southerly direction with a low level of bat activity recorded.

3.2.3 Dusk Bat Survey 6/8/2020

Two surveyors completed the dusk survey on the 6/8/2020 (21:10 hrs start time). Surveyor 1 was located in the field adjacent to Shed 2 (south of the old Ravenshill School) and Surveyor 3 was located adjacent to the golf club house to determine if this building is a bat roost.

Surveyor 1 recorded:

- A Leisler's bat were first recorded at 21:08 hrs, prior to the official state time of the survey indicating that a roost is located within the survey area or immediately adjacent to the proposed development area.

- Common pipistrelles were recorded from 21:24 hrs commuting from houses along the proposed development site boundary. It was decided to undertake a dawn survey in this location to determine where the roost sites were located.
- Foraging for both Leisler's bats and common pipistrelles were recorded during the remainder of the survey.

Surveyor 3 recorded:

- Two trees (Tree Tag No.s 0682 & 0683) were reconfirmed as tree roosts for common pipistrelles.
- No bats were recorded emerging from the golf club house.
- Only common pipistrelle and Leisler's bat activity was recorded during this survey.
- Continuous common pipistrelle bat activity throughout the survey, principally associated with the treelines.
- A single Leisler's bat flew from a north-westerly direction at 21:20 hrs.

3.2.4 Dawn Bat Survey 7/8/2020

Two surveyors completed the dawn survey on the 7/8/2020 (04:15 hrs start time). Surveyor 1 was located in the field adjacent to Shed 2 (south of the old Ravenshill School) and Surveyor 3 was located along the road network from the River Dargel to the new Ravenshill School.

Surveyor 1 recorded:

- Two common pipistrelle roosts were recorded in two private houses along the western boundary of the proposed development site. Eight individuals were recorded returning to these two buildings.

Surveyor 3 recorded:

- Common pipistrelles and Leisler's bats were recorded commuting from the river along treelines heading in a northerly direction. Overall a low level of bat activity was recorded.

3.2.5 Walking Transects

Two walking transects were completed for this bat survey assessment (15/7/2020 and 7/8/2020). The walking transect completed by Surveyor 1 was undertaken on two survey dates, with the first concentrating on the River Dargle (15/7/2020) and the second date within the survey area (6/8/2020). Surveyor 2 walked the survey area on the 15/7/2020. The results of these walking transects are combined and presented on the figures below.

Three species of bat were recorded within the proposed development area: common pipistrelle, soprano pipistrelle and Leisler's bat. Common pipistrelle was the most frequently recorded bat species and this is reflective of the number of bat roosts location within and adjacent to the survey area. Activity was concentrated along treelines such as those adjacent to the golf club house and to the north of the site leading into the woodland area of Rathmichael Stream (Figure 3a). Leisler's bats was the second most frequently encountered bat species and again this was concentrated along treelines (Figure 3b). Soprano pipistrelles was infrequently recorded during the walking transect (Figure 3c).

Commuting routes recorded during the dusk surveys are presented on the figures below to provide additional context to the bat encounter data. The principal commuting routes for common pipistrelles were associated with the roosts (R symbol on Figure 3a) recorded during the dusk and dawn surveys. For all other bat species, roosts were not confirmed.

Areas surveyed outside the proposed development area were also surveyed and four bat species were recorded: common pipistrelle, soprano pipistrelle, Leisler's bat and Daubenton's bat. As with bat encounters within the proposed development area, common pipistrelle was the most frequently recorded bat species outside the proposed development area. But soprano pipistrelles was also frequently recorded along the River Dargle (People's Park). It should be noted that sections of the River Dargle is lined with street lights and bat activity tended to be higher in the darker areas (e.g. river bank adjacent to the People's Park (See Figure 3d, Red section – heavily lit; Blue section – no lights and Green Section – semi-lit). One section, in particular, is heavily lit with a lot of light spillage across the surface of the river (Red section) and no bats were recorded foraging or commuting in this area. The Green section had occasional bat encounters but observation of bats in this area indicated that the bats were commuting and rarely foraging (this was particularly the case for Daubenton's bats). This is also the section of the river that is widest and may allow some bat activity as a consequence. It has been noted that Daubenton's bats (a light sensitive bat species) will commute through lit up areas but will do so at speed in order to get to darker and more preferred areas. Barre *et al.* (2020) undertook research on the impact of illuminated bridges on foraging bats in France. Lit bridges had less bat activity but all bats, if flying in vicinity of the bridge, would fly faster through the light zone. These results suggest that bridge lighting strongly reduces habitat availability and likely connectivity for bats. Only three encounters of Daubenton's bats was recorded along the River Dargle.



Figure 3a: Common pipistrelle bat encounters recorded during Walking Transects (Map source: ArcGIS).



Figure 3b: Soprano pipistrelle bat encounters recorded during Walking Transects (Map source: ArcGIS).



Figure 3c: Leisler's bat encounters recorded during Walking Transects (Map source: ArcGIS).

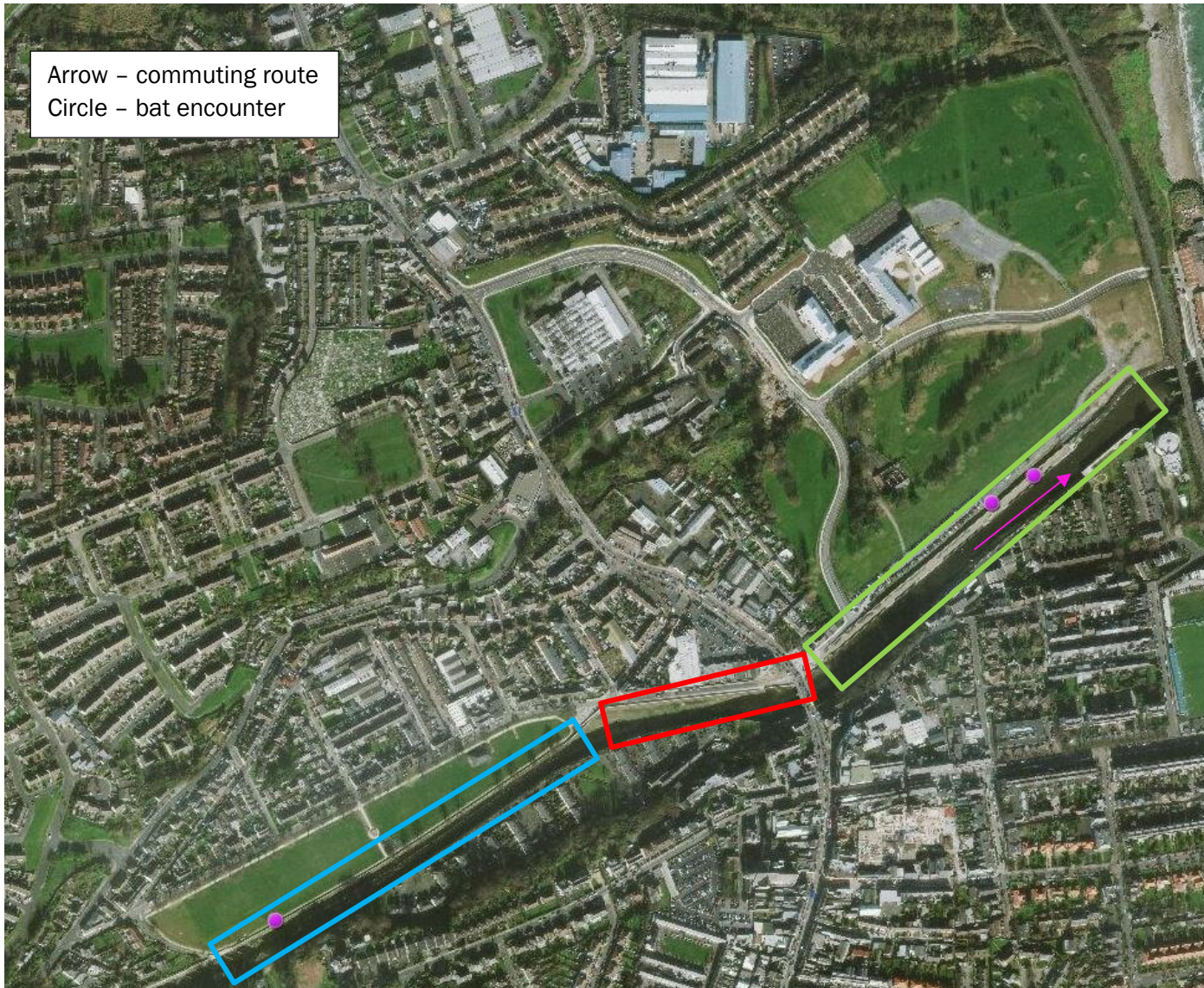


Figure 3d: Daubenton's bat encounters recorded during Walking Transects (Map source: ArcGIs).

As part of the analysis, heat maps were produced in relation to common pipistrelle and Leisler's bat encounters (2 most frequently encountered bat species). The two white boxes on the heat map for common pipistrelle coincides with area where roosts were confirmed for this species. While a Leisler's bat roost was not confirmed, the time of early encounters for this species indicate that the roost is in vicinity of the survey area. The buildings of old Ravenhill School are likely candidates.

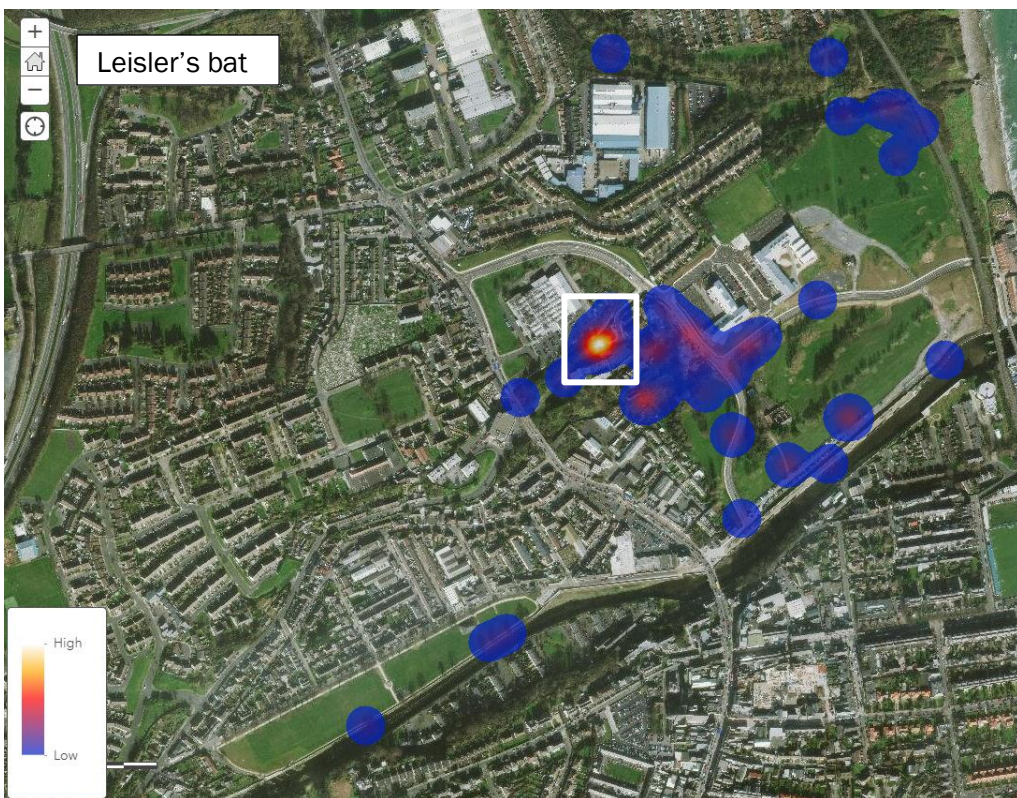


Figure 4a & b: Heat maps in relation to activity level locations for common pipistrelle and Leisler's bats.

3.2.6 Passive Static Bat Detector Survey

Static recording units (n=5 units) were deployed from the 10/7/2020 to 15/7/2020. These units were principally deployed to determine the level of bat activity along principal commuting routes and foraging habitats within the proposed development site. A total of three bat species were recorded on the static units.

Table 10a: Results of Static Bat Detectors deployed during Static Bat Detector Surveys 2020.

Static Code	Location Description	Survey Period	Bat Species – no. of bat passes	Bat Activity Level
Mini 2	On tree along walkway of woodland park to north Phase 1. O2651419607	10/7/2020 to 15/7/2020 (5 nights)	CP – 1,440 passes (288 passes/night) SP – 52 passes (10 passes/night) Leis – 859 passes (172 passes/night)	CP – Medium SP – Low Leis - Medium
Mini 3	On Pine tree within carpark of old Ravenshill School. O2616119207	10/7/2020 to 15/7/2020 (5 nights)	CP – 2,075 passes (415 passes/night) SP – 32 passes (6 passes/night) Leis – 310 passes (62 passes/night)	CP – High SP – Low Leis - Low
Mini 6	On tree (Tree Tag 0619) O2655719252	10/7/2020 to 15/7/2020 (5 nights)	CP – 990 passes (198 passes/night) SP – 91 passes (18 passes/night) Leis – 743 passes (149 passes/night)	CP – Medium SP – Low Leis - Medium
Mini 7	On tree (Tree Tag 0029) O2640719179	10/7/2020 to 15/7/2020 (5 nights)	CP – 2,865 passes (573 passes/night) SP – 101 passes (20 passes/night) Leis – 420 passes (84 passes/night)	CP – High SP – Low Leis - Medium
Mini 8	On tree (Tree Tag 0915) O2648119102	10/7/2020 to 15/7/2020 (5 nights)	CP – 281 passes (56 passes/night) SP – 109 passes (22 passes/night) Leis – 274 passes (55 passes/night)	CP – Low SP – Low Leis - Low

Note: SP = Soprano pipistrelle, CP = Common pipistrelle, Leis = Leisler's bat.

As a general guide, activity level is determined as follows: Low = <10 bat passes/hr; Medium = >10 - <50 bat passes/hr; High = >50 bat passes/hr). The static units recorded for approximately 8 hours per night. Therefore the activity levels for each bat species is presented in Table 10a.

NOTE: The behaviour of bats during commuting and foraging greatly influences the level of bat passes recorded on static units. The number of bat passes do not equate to the number of bats flying past the static unit. Pipistrellus species tended to foraging as they commute and therefore are regularly observed flying up and down a treeline or hedgerow before moving on in the landscape. 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. As a consequence, Pipistrellus species bat activity tends to result in a higher number of bat passes recorded on static units compared to Leisler's bats. In relation to other bat species recorded, as they tend to be less common in the landscape compared to common pipistrelles, soprano pipistrelles and Leisler's bats, their recorded presence is notable. Exceptions to this would include Daubenton's bats on a waterway or a static located adjacent to a known bat roost.

Static unit Mini 7 recorded the highest level of common pipistrelle bat activity. This static unit was located within the group of trees where two common pipistrelle tree roosts were recorded.

Static unit Mini 2 recorded the highest level of Leisler's bat activity. This static unit was located on a tree within the woodland area of the Rathmichael Stream.

While activity levels for soprano pipistrelle was low for all static units, the highest level was on Static unit Mini 8, located south of the golf club house. Survey results from other bat surveys indicate that bats of this species commuted to the proposed development site and the timing of such indicate that potential roosts sites are not immediately adjacent to the proposed development site.

3.3 Summary of Results

The following is the principal results recorded:

- Two tree roosts for common pipistrelle was recorded.
- Additional common pipistrelle roosts in buildings were recorded but these are located adjacent to the propose development site.
- Results indicate that there is a Leisler's bat roost located close to the proposed development site while soprano pipistrelle roosts are likely to be within the town environ of Bray.
- A high level of foraging was recorded along the treelines within the proposed development site.
- Commuting routes are principally along the treelines within the proposed development site.
- As this site is one of the last remaining green field sites in this area of Bray, it is essential that there is commuting and foraging habitat retained for local bat populations to ensure connectivity between the River Dargle and Rathmichael Stream.

3.4 Desktop Review

3.4.1 Bat Conservation Ireland Database

Data for a 1km radius of the Irish grid Reference O264191 was received from Bat Conservation Ireland.

The results are as follows:

All Ireland Daubenton's Bat Waterways Survey

- Bray Bridge Transect along the River Dargle (surveyed since 2007) has recorded Daubenton's bat.

There are four Ad Hoc bat detector records

- Four consultancy surveys recorded soprano pipistrelles, common pipistrelles, Natterer's bat, Daubenton's and Leisler's bats.

4. Bat Ecological Evaluation

4.1 Bat Species Recorded

Four bat species were recorded in total by the array of bat surveys completed for this survey site.

Three of the bat species recorded were common pipistrelle, Leisler's bat and soprano pipistrelle and these are the three most common bat species in Ireland.

Common pipistrelle was the most frequently encountered bat species. Two tree roosts were recorded for this species within the proposed development site while two additional roosts were recorded in two private buildings located adjacent to the proposed development site. A medium-high level of bat activity was recorded for this species of bat.

Leisler's bats were recorded commuting into the survey area from a north-easterly direction. But the early time of detection during the dusk surveys may indicate that some individuals are roosting in close to the proposed development site, with buildings located at the old Ravenshill School as likely candidates. A medium level of bat activity was recorded for this species of bat.

While soprano pipistrelles were recorded foraging and commuting within the survey area, the timing of their encounters indicated that they travelled some distance before arriving to forage and therefore the roosting sites are not within the proposed development site or immediately adjacent to it. A low level of bat activity was recorded for this species of bat.

Daubenton's bats were only recorded on the River Dargle during bats surveys and this was at a low level of bat activity.

Overall, the level of bat activity could be considered as Medium-High level for the proposed development site.

4.2 Bat Foraging Habitat & Commuting Routes

The site for the proposed development is located largely on lands formerly used as a golf course. The site is largely greenfield in nature with mature and semi mature trees throughout. The habitat classification for the site can be largely categorised as scattered trees, parkland with large areas of amenity grassland, gravel tracks and areas of recolonising bare ground.

The River Dargle which flows in an easterly direction outfalling to the Irish Sea in Bray Harbour. To the north of the site the Rathmichael Stream flows in an easterly direction through wooded and grassland areas which have formalised public pathways throughout. To the east the Dublin to Rosslare railway line forms a continuous border for the entirety of the development site. The west boundary of the development site is dominated by school buildings and associated sports pitches.

Bray urban area surrounds the proposed development site along the west, north and south. As a consequence, the rivers (and associated habitats) and coastal zone are essential to allow bats to commute around the Bray urban area.

Extensive foraging was recorded within the proposed development area with common pipistrelle and Leisler's bats the most frequently recorded bat species. The parkland trees and boundary of treelines, particularly along the western boundary of the site are important foraging areas.

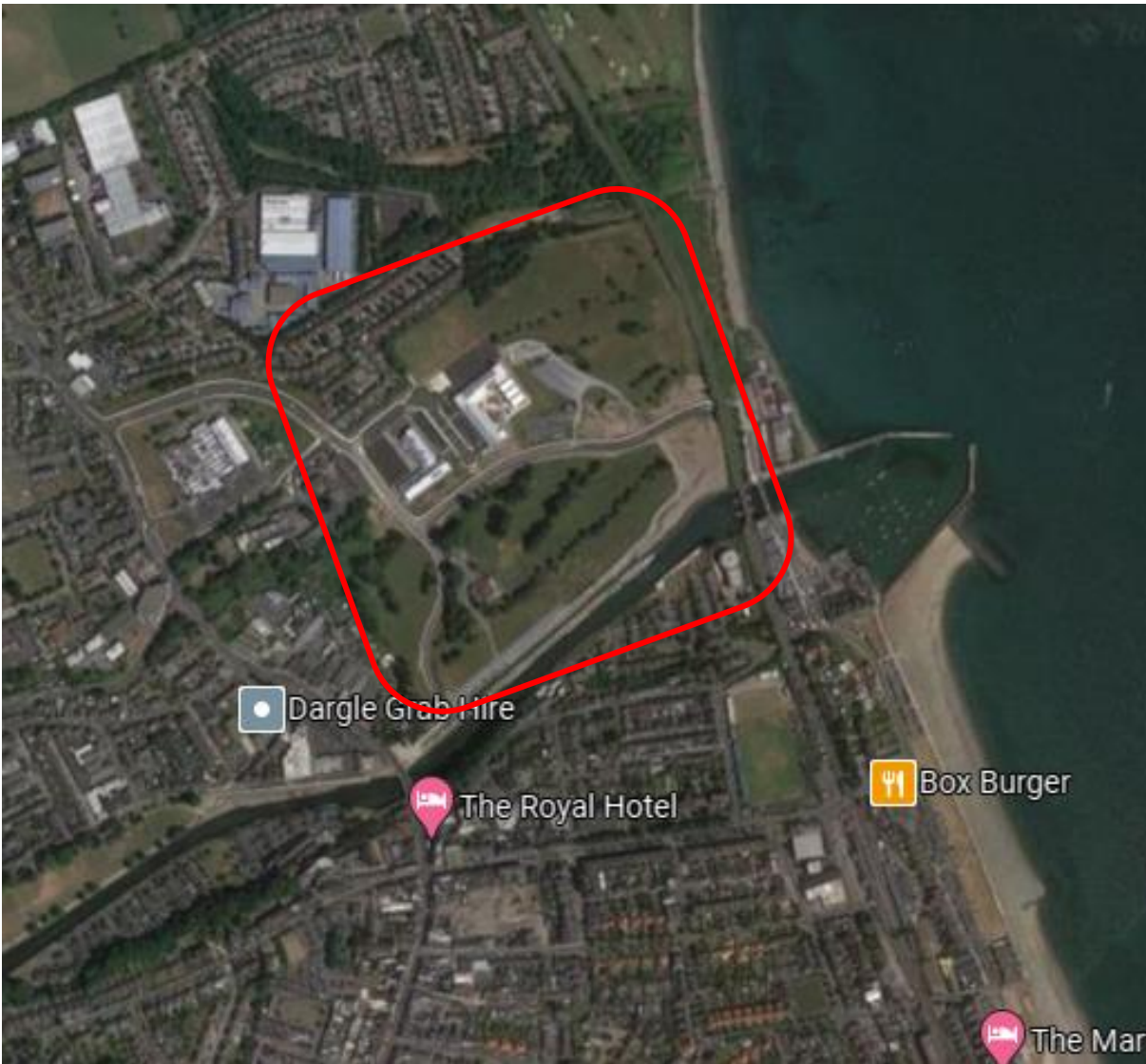


Figure 5a: Aerial map of the proposed development site (approximate area within red line) (source: Google Maps).

4.3 Zone of Influence – Bat Landscape Connectivity

The site for the proposed development is located largely on lands formerly used as a golf course and is largely greenfield in nature with mature and semi mature trees throughout. The River Dargle which flows in an easterly direction outfalling to the Irish Sea in Bray Harbour ca. 50m from the southeast extent of the project site. This stretch of the river has been subject to flood alleviation works and the banks of the river have been recently developed into a formalised promenade and public amenity space. To the north of the site the Rathmichael Stream flows in an easterly direction through wooded and grassland areas which have formalised public pathways throughout. To the east the Dublin to Rosslare railway line forms a continuous border for the entirety of the development site. The west boundary of the development site is dominated by school buildings and associated sports pitches.

Bray urban area surrounds the proposed development site along the west, north and south. As a consequence, the rivers (and associated habitats) and coastal zone are essential to allow bats to commute to the wider landscape to the north and west of Bray urban area.



Figure 5b: Aerial map of the proposed development site within the wider landscape (approximate area within red line) (source: Google Maps).

5. Impact Assessment & Mitigation

The following bat species were recorded during this bat survey: common pipistrelle, soprano pipistrelle, Leisler's bat and Daubenton's bat. This represents four of the nine resident bat species known to Ireland. However, only three of these species were recorded within the proposed development area.

5.1 Impact Assessment - Loss of bat roosts

The three buildings located in the proposed development site are as follows: golf club houses and two sheds. No bats were recorded roosting in these buildings. Therefore the removal of them will not have an impact on local bat populations.

Two trees were confirmed as tree roosts while an additional 22 trees were identified as Potential Bat Roosts (PBR). The loss of these trees will impact on local bat populations, particularly if the two trees confirmed as bat roosts were removed.

5.2 Impact Assessment – Foraging & Commuting Habitats

While there is no current list available determining which trees are to be removed, due to the parkland layout of the proposed development site, much of the internal treelines are likely to be removed to facilitate the proposed development. As a consequence this loss will impact on commuting and foraging habitat for local bat populations.

5.3 Impact Assessment – Construction & Operation of Residential Development

The construction of the proposed residential development will potentially increase the degree of light (both street and residential lighting) spilling onto the treelines and woodland habitats within the survey area and boundaries of the proposed development site.

However commitment has been made by the developers to use bat friendly lighting (2700 Kelvin LED lighting on 5.5m lamp posts). This is a positive commitment and will contribute to reducing light pollution (Source; communication from Atkins Ireland).

5.4 Landscape Plan

Due to the fact that Phase 1, Coastal Quarter is currently in planning, a draft plan is available for this area. However there are no plans currently available for Phase 2, River Quarter. The draft landscape plan for Phase 1, Coastal Quarter, indicates that biodiversity will be taken into consideration a part of the proposed development with a commitment to:

- Install bat roosting sites within buildings
- Erect bat boxes on trees
- Planting and retaining of trees, where possible.

Extracts of the draft landscape plan for Phase 1, Coastal Quarter (provided by Atkins Ireland) provide the following details:

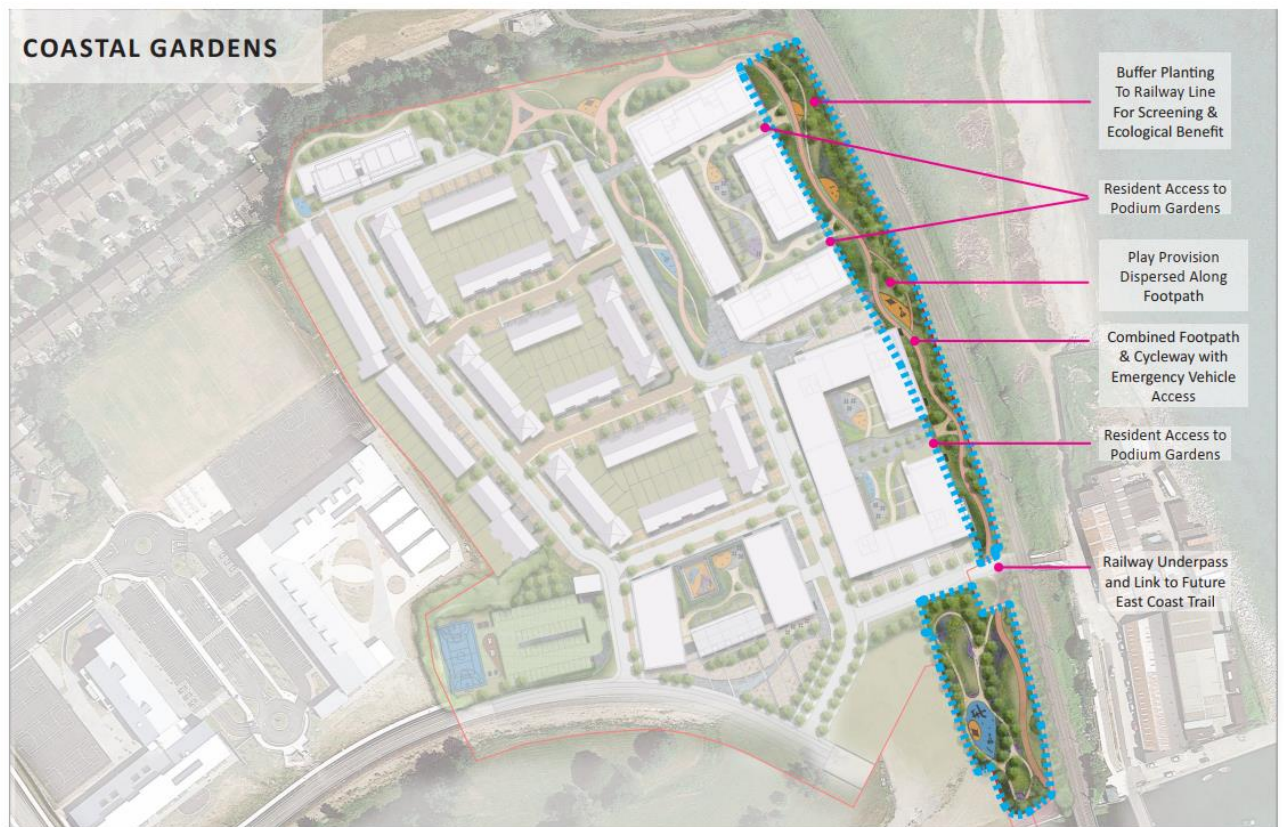
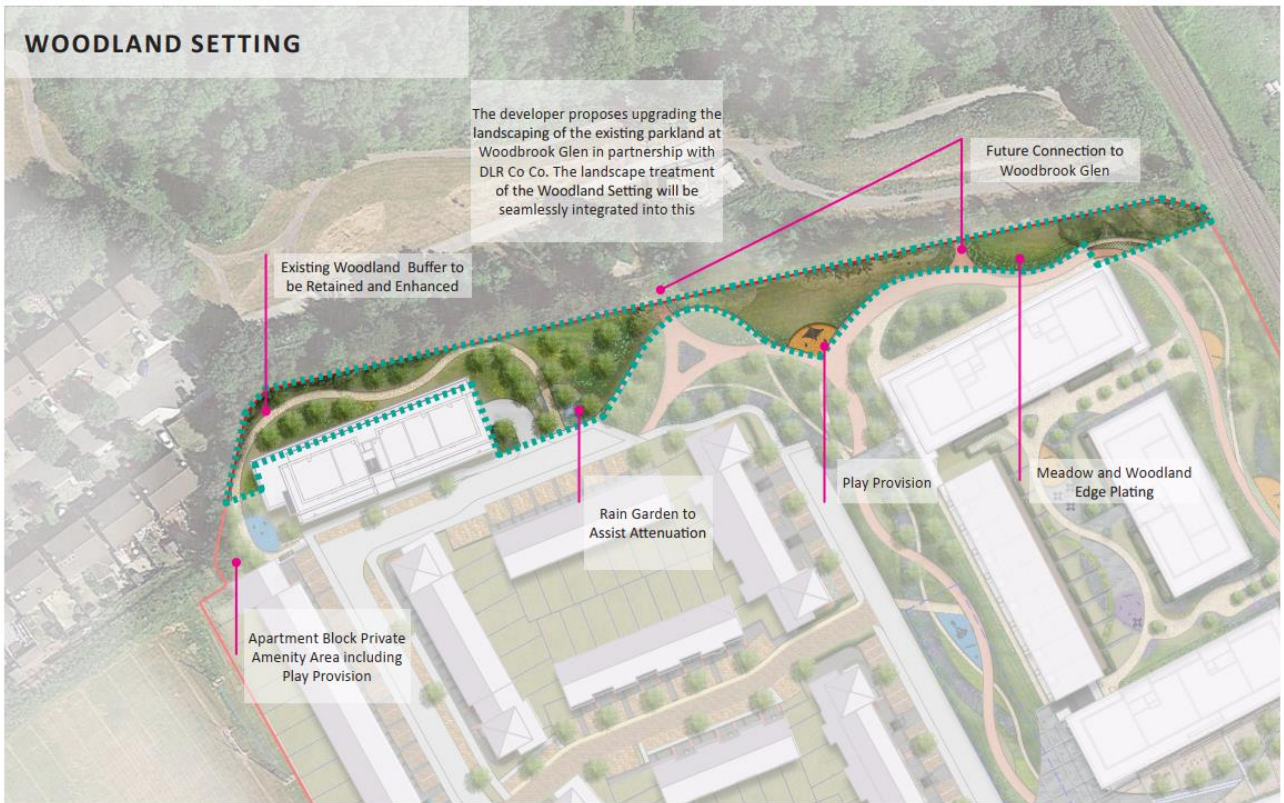


Figure 6a, b: Extracts from the draft landscape plan for Phase 1, Coastal Quarter.

5.5 Impact Assessment – Overall

There is a medium to high level of bat activity within the proposed development area. The potential impact of the proposed development is overall Moderate but there are potential Moderate to Major impacts in relation to common pipistrelle and Leisler's bats. This is particularly due to the fact that this area of Bray proposed to be developed is a large greenfield site / parkland compared to the large urban area of Bray located to the west, north and south of the proposed development site.

Table 13a: Potential impact of the proposed development on the different bat species recorded during survey work.

Works	SP	CP	Leis	Daub
Lighting of development area	Minor-Moderate	Minor-Moderate	Minor	Moderate
Removal of buildings	None	None	None	None
Removal tree roosts	None	Major	None	None
Removal of internal treelines	Minor-Moderate	Moderate	Moderate	None
Removal of individual trees (potential tree roosts)	Minor-Moderate	Moderate	Moderate	None
Removal of boundary treelines	Minor-Moderate	Moderate to Major	Moderate	None
Operation of the development site	Minor-Moderate	Minor-Moderate	Minor	None
Infrastructure	Minor-Moderate	Minor-Moderate	Minor	None
Landscape Plan – Planting	Positive	Positive	Positive	Positive

SP = soprano pipistrelle, CP = common pipistrelle, Leis = Leisler's bat, BLE = brown long-eared bat, Daub = Daubenton's bat, Nath P = Nathusius' pipistrelle, Natt = Natterer's bat.

However, the proposed Landscape Plan will have a positive impact on local bat populations. Additional measures will be recommended for this landscape plan to further increase positive impact.

5.6 Mitigation Measures

The following mitigation measures are recommended to reduce the potential impact of the proposed development on local bat populations, to protect local bat populations during proposed works and to conserve local bat populations post residential development.

5.6.1 Tree Roosts & PBRs

It is recommended that the two trees identified as tree roosts and the group of mature trees in vicinity of these trees are retained and incorporated into the landscape plan for Phase 2, River Quarter.

It is recommended that treeline boundaries are retained throughout the proposed development site to ensure that there is landscape connectivity for local bat populations.

It is recommended that as many of the trees identified as Potential Bat Roosts (PBRs) are retained, where possible, and incorporated into the landscape plans for both phases.

5.6.2 Tree Felling

A Phase Two PBR survey is required for all trees proposed to be felled. This should be undertaken at least one month prior to tree felling in order to propose a tree felling plan in conjunction with tree contractors.

- i) Erection of an alternative roosting sites will be required prior to removal of trees. These should be erected 6 months prior to tree felling to allow local bat populations to become aware of it prior to removal of the structure.
 - a. Rocket Bat Box (x4) – free-standing chamber on free standing pole (See appendices – Habibat Box). Location of rocket box will be in dark zones within woodland and treeline habitats. Such areas will need to be confirmed with Atkins Ireland and marked up on the final landscape plans for both Phase 1 (x2 boxes) and Phase 2 (x2 boxes).
 - b. Summer Bat Boxes (1FF Schwegler woodcrete or similar design) – at least 10 bat boxes should also be erected on mature trees within the proposed development site (5 boxes in each phase of development).

Bat boxes will be erected prior to tree felling. Some general points that will be follow include:

- Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 3 metres above and below position of bat box.
- Diameter of tree should be wide and strong enough to hold the required number of boxes.
- Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations should be sheltered from prevailing winds.
- Bat boxes should be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of resident bats.
- It is recommended to erect a number of bat boxes on one tree at an array of aspects. South facing boxes will receive the warmth of the sun, which is necessary for maternity colonies. In large bat box scheme it is generally recommended to have three bat boxes arranged at the same height facing North, South-East and South-West. This ensures a range of temperatures are available all day. If the South facing boxes become warm, bats can safely remove to the cooler North facing box.
- Locations for bat boxes should be selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes.

Trees proposed to be removed, should be felled on mild days during the autumn months of September, October or November or Spring months of February and March (felling during the spring or autumn months avoids the periods when the bats are most active).

An assessment of trees according to their PBR value determines the methodology of felling. Trees with PBR Category 1 are highly suitable for roosting bats and require more intensive procedures prior to felling. The trees identified within the survey area are PBR Category 1 and 2. The procedure to fell these is as follows:

- Category 1 & 2: Trees with roosting features (dead wood, tree holes etc.) should be checked prior to felling. It is recommended that they are physically checked (using an endoscope and high power torch) or a dusk/dawn surveys are completed to determine if bats are roosting within. A tree felling plan will be required in consultation with the tree surgeons. A bat box scheme will need to be erected prior to felling and in consultation with the bat specialist. Any trees showing crevices, hollows, *etc.*, should be removed while a bat specialist is present to deal with any bats found. Such animals should be retained in a box until dusk and released on-site. Large mature trees will be felled carefully, essentially by gradual dismantling by tree surgeons, under supervision of a bat specialist. Care will be taken when removing branches as removal of loads may cause cracks or crevices to close, crushing any animals within.
- Category 2: Any ivy covered trees which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape. A felling strategy for all other trees identified as Category 2 trees shall be discussed with the tree felling contractors. Depending on the felling strategy, it may be required to undertake dusk and dawn surveys to determine if bats are present prior to felling.

5.6.3 Lighting Plan

It is important that any proposed lighting for the proposed residential development is wildlife friendly and that there is a provision for continued dark zones to facilitate movement of light sensitive bat species such as Daubenton's bats.

Nocturnal mammals are impacted by lighting. Therefore it is important that lighting installed within the proposed development site is completed with sensitivity for local wildlife while still providing the necessary lighting for human usage. It is also important that developments reduce their impact on the night sky and reduce sky glow. The "Dark Sky" principal should be followed – i.e. no upward lighting to reduce light pollution. The following principles should be followed:

- Luminaire design for any street lighting or lighting on buildings is extremely important to achieve an appropriate lighting regime. Luminaires come in a myriad of different styles, applications and specifications which a lighting professional can help to select. The following should be considered when choosing luminaires. This is taken from the most recent BCT Lighting Guidelines (BCT, 2018).
 - All luminaires used will lack UV/IR elements to reduce impact.
 - LED luminaires will be used due to the fact that they are highly directional, lower intensity, good colour rendition and dimming capability.
 - A warm white spectrum (<2700 Kelvins will be used to reduce the blue light component of the LED spectrum).

- Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible. Ballard lighting should be considered for pedestrian and greenway areas, if deemed necessary.
- Only luminaires with an upward light ratio of 0% and with good optical control will be used.
- Luminaires will be mounted on the horizontal, i.e. no upward tilt.
- Any external security lighting will be set on motion-sensors and short (1min) timers. The intensity of external lighting should be limited to ensure that skyglow does not occur in order to reduce light pollution.
- As a last resort, accessories such as baffles, hoods or louvres will be used to reduce light spill and direct it only to where it is needed.

In addition to above the following should also be followed:

No lighting, where possible, should be erected in the following areas:

- Along treeline boundaries.
- Along the southern boundary adjacent to the River Dargle.
- Within and adjacent to retained woodland habitat.
- In vicinity of alternative roosting sites (includes bat boxes, Rocket bat boxes, Bat walls etc.)

The lighting plan for cycle routes and pedestrian walkways should strictly adhere to the guidelines listed above. Where possible, no lighting should be installed or bollard lighting/dim lighting (lighting that dims or turns off during the night when humans are less active) should be considered. There is no lighting in the People's Park and as a consequence, there was a high level of bat activity along the river bank within this area. This type of scenario is important to replicate to ensure that there is dark corridors through our urban area to allow nocturnal wildlife to operate effectively.

5.6.4 *Landscape Plan*

The following is recommended to be included in the landscape plan to ensure that there is commuting and foraging habitat for local bat populations:

- Retention all existing boundary treelines.
- Plant a new treelines and hedgerow along the eastern boundary (coastal area), southern boundary and western boundary (adjacent to new Ravenshill School). Ensure that no lighting, where possible do not spill onto these new habitats.
- Aim to ensure that newly planted areas are connected to retained boundary habitats.
- Extensive planting of native tree and shrub plant species.

5.6.5 *Alternative Roosting Sites*

The draft landscape report made a commitment to providing alternative roosts within buildings and the erection of a bat box scheme. In addition to bat boxes listed in Section 5.6.2, it is recommended to undertake the following:

- Pumping Station – there is a screen of natural stone wall to be erected here. This is an ideal opportunity to insert bat tubes within the wall (x5 interconnecting units – e.g. Interconnecting Woodstone Bat Box). In order for this to work effectively, the wall will require to be at least 3m high, boxes are inserted at the highest points on the wall and no lighting should shine on this wall and the wall needs to be connected to treeline/hedgerow habitat to allow commuting. Where other walls potentially meet these criteria, bat tubes are recommended to be inserted. Please see appendices for more information on this bat tube.
- Non-Residential Buildings – it is recommended to inserted integrated bat boxes (x10 units) into the walls of non residential buildings. These are specifically designed boxes that provided alternative roosting for bats, are contained and designed to be a part of the wall structure (e.g. Bat Block – Please see appendices for more information). The following criteria are required to increase the success of these alternative roosts:
 - o Should be erected at least 4m off the ground;
 - o Should only be erected on rear walls of buildings where there is no street lighting;
 - o Should be erected only where there is connectivity to treelines and hedgerows to ensure commuting and foraging habitat.

5.6.6 Monitoring

Monitoring is recommended post-construction works. This monitoring should involve the following aspects:

- Inspection of bat boxes within one year of erection of bat box scheme/rocket box and alternative roosts. Register bat box scheme, rocker bat boxes and supplementary roosts with Bat Conservation Ireland. This should be undertaken for a minimum of 2 years in relation to bat boxes/rocket bat boxes and supplementary roosts (i.e. Bat Walls).
- Monitoring of any bat mitigation measures. All mitigation measures should be checked to determine that they were successful. A full summer bat survey is recommended post-works.

If the mitigation measures recommended in this report are strictly followed the potential impact of the proposed development on local bat populations will be reduced to Minor-Moderate.

6. Bat Assessment Conclusions

This report provides information on the bat usage of the proposed development site. A total of four bat species were recorded: common pipistrelle, Leisler's bat, soprano pipistrelle and Daubenton's bat.

- Common pipistrelle was the most frequently encountered bat species. A medium to high level of bat activity was recorded for this species within the proposed development site. The tree roosts were recorded for this species and additional roosts were recorded in buildings located adjacent to the proposed development site.
- Leisler's bats were principally recorded commuting into the survey area from a northerly direction. There is likely to be roosts in buildings adjacent to the proposed development site (e.g. old Ravenshill School) A medium level of bat activity was recorded for this species of bat within the proposed development site.
- Soprano pipistrelles were recorded foraging and commuting within the survey area. A low level of bat activity was recorded for this species of bat within the proposed development site.
- The remaining bat species recorded was the Daubenton's bat and this was recorded on the River Dargle only.

The proposed development site is a large green field area / parkland habitat surrounded on three sides by the urban area of Bray. Overall, the level of bat activity recorded within the proposed development site could be considered as Medium-High level. Therefore this site is an important foraging area for bats and due to treeline boundaries, it provides commuting habitat to and from the River Dargle and Rathmichael Stream (and associated habitats).

The two tree roosts recorded as common pipistrelle roosts are important part of the roosting network for this bat species.

The three buildings located within the proposed development plan were not recorded as bat roosts and therefore the removal of these will not impact on local bat populations.

The lighting plan will ensure that the guidelines recommended by BCT, 2018 will implement and therefore reducing the impact of the lighting plan on local bat populations.

The landscape plan aims to retain as much of the trees, treelines and woodland area within and adjacent to the proposed development site. It will also undertake additional planting to provide foraging and commuting habitat for local bat populations. This landscape plan will reduce the potential impact of the proposed development on local bat populations.

A wide array of alternative roosting sites have been recommended in order to mitigate for the potential loss of Category 2 Potential Bat Roosts in trees likely to be felled.

Therefore the proposed development, if all mitigation measures including the Lighting Plan, Landscape Plan and alternative roosting sites are strictly adhered to, will likely have a Minor-Moderate impact on local bat populations, in the long-term.

7. Bibliography

- Abbott, I. M., Butler, F. And Harrison, S. (2012) When flyways meet highways – the relative permeability of different motorway crossing sites to functionality diverse bat species. *Landscape and Urban Planning* 106 (4): 293-302.
- Abbott, I. M., Berthinessen, A., Stone, E., Booman, M., Melber, M. and Altringham, J. (2015) Bats and Roads, Chapter 5, pp/ 290-299. In: *Handbook of Road Ecology*. Editors: R. Van der Ree., D. J. Smidt and C. Grilo. Wiley Blackwell.
- Altringham, J. D. (2013) *British Bats*. Collins New Naturalist Library, Volume 93. Haper Collins, London.
- Altringham, J. And Kerth, G. (2016) Bats and Roads, Chapter 3. In: *Bats in the Anthropocene: Conservation of Bats in a Changing World*. Editors: C. C. Voigt and T. Kingston. Springer Open.
- Aughney, T., Roche, N., & Langton, S (2018) The Irish Bat Monitoring Programme 2015-2017. *Irish Wildlife Manuals*, No. 103. National Parks and Wildlife Service, Department of Cultural heritage and the Gaeltacht, Ireland.
- Barratt, E. M., Deauville, R., Burland, T. M., Bruford, M. W., Jones, G., Racey, P. A., & Wayne, R. K. (1997). DNA answers the call of pipistrelle bat species. *Nature* 387: 138 - 139.
- Barre, K. , K. Spoelstra, Y. Bas, S. Challeat, R. Kiri , C. Azam, G. Zissis, D. Lapostolle, C. Kerbirou & I. Le Viol (2020) Artificial light may change flight patterns of bats near bridges along urban waterways. *Animal Conservation*, doi:10.1111/acv.12635.
- Bat Conservation Ireland (2015) BATLAS 2020 Pilot Project 2015: Volunteer Survey Manual. Version 01. www.batconservationireland.org.
- Bat Conservation Trust (2018) Bats and artificial lighting in the UK: bats and the built environment series. Guidance Note 08/2019. BCT, London.
- Bharddwaj, M., Soaner, K., Straka, T., Lahoz-Monfort, J., Lumsden, L. F. and van der Ree, R. (2017) Differential use of highway underpasses by bats. *Biological Conservation* 212: 22-28.
- Billington, G. E. & Norman, G. M. (1997). A report on the survey and conservation of bat roosts in bridges in Cumbria, Kendal. *English Nature*.
- BTHK (2018) *Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-Care and Ecology Professionals*. Exeter: Pelagic Publishing.
- CIEEM (2016) *Guidelines for Ecological impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (2nd Edition)*. CIEEM, Winchester.
- Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition)*. The Bat Conservation Trust, London.
- 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.
- Dietz, C., Helversen, O. and Dietmar, N. (2011) *Bats of Britain, Europe & Northweat Africa*. A&C Black, London.
- EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive) 1992.
- Gunnell, K., Grant, G. and Williams, C (2012) *Landscape and urban design for bats and biodiversity*. The Bat Conservation Trust, London.

- Hundt, L. (2012) *Bat Surveys: Good Practice Guidelines* (2nd Edition). The Bat Conservation Trust, London.
- Kelleher, C. & Marnell, F. (2006) *Bat Mitigation Guidelines for Ireland*. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Lundy, M.G., Montgomery, I.W., Roche, N. & Aughney, T. (2011). *Landscape Conservation for Irish Bats & Species Specific Roosting Characteristics* (Unpublished). Bat Conservation Ireland, Cavan, Ireland.
- Lysaght, L. and Marnell, F. (eds) (2016) *Atlas of Mammals in Ireland 2010-2015*, National Biodiversity Data Centre, Waterford.
- 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.
- Mathews, F., Roche, N., Aughney, T., Jones, N, M Day, J., Baker, J. and Langton, S. (2015) Barriers and benefits: implications of artificial night-lighting for the distribution of common bats in Britain and Ireland. *Philosophical Transactions of the Royal Society of London B* 370 (1667), doi: 10.1098/rstb.2014.0124.
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland. McAney, K. (2014). An overview of *Rhinolophus hipposideros* in Ireland (1994-2014). *Vespertilio* **17**, 115–125.
- McAney, K., O'Mahony, C., Kelleher, C., Taylor, A. & Biggane, S. (2013). *The Lesser Horseshoe Bat in Ireland: Surveys by The Vincent Wildlife Trust*. Belfast, Northern Ireland: Irish Naturalists' Journal.
- Mullen, E. (2007). Brandt's Bat *Myotis brandtii* in Co. Wicklow. Irish Naturalists' Journal 28: 343.
- O'Sullivan, P. (1994). *Bats in Ireland*. Special supplement to the Irish Naturalists' Journal.
- Richardson, P. (2000). *Distribution atlas of bats in Britain and Ireland 1980 - 1999*. The Bat Conservation Trust, London, UK.
- Roche, N., Aughney, T. & Langton, S. (2015). *Lesser Horseshoe Bat: population trends and status of its roosting resource* (No. 85). , Irish Wildlife Manuals. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Roche, N., Langton, S. & Aughney, T. (2012). *Lesser Horseshoe Bat: Population, Trends and Threats 1986 to 2012* (Unpublished). Bat Conservation Ireland, Cavan, Ireland.
- Roche, N., Aughney, T., Marnell, F. & Lundy, M. (2014). *Irish Bats in the 21st Century*. Bat Conservation Ireland, Cavan, Ireland.
- Russ, J. (2012) *British Bat Calls: A guide to species identification*. Pelagic Publishing, Exeter.
- Schofield, H. (2008). *The Lesser Horseshoe Bat Conservation Handbook*. Herefordshire, England: The Vincent Wildlife Trust.
- Stebbing, R. E. & Walsh, S. T. (1991) *Bat Boxes: A guide to the history, function, construction and use in the conservation of bats*. The Bat Conservation Trust, 1991.
- Whilde, A. (1993). *Threatened mammals, birds, amphibians and fish in Ireland. Irish Red Data Book 2: Vertebrates*. Belfast: HMSO.
- Wildlife Act 1976 and Wildlife [Amendment] Act 2000. Government of Ireland.

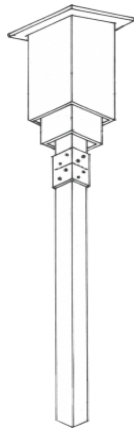
8. Appendices

Appendix 1

A) Alternative Bat Roosting (Tree Mitigation)

Habitat Double Chambered Rocket Box

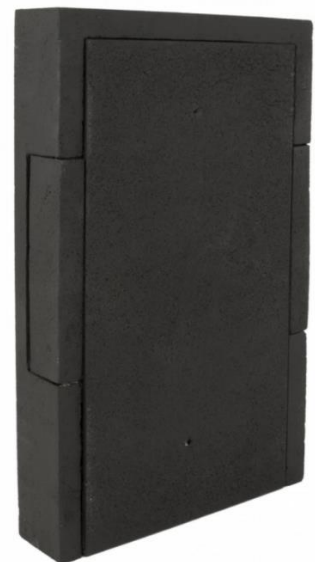
Pole-mountable bat box to provide extensive roosting space



(please view on www.nhbs.com)

B) Supplementary Bat Roosts - Stone Walls with integrated bat boxes

It is recommended to insert integrated bat boxes into the stone wall to be erected on the pump house and any other place that stone walls are to be built (that meet the criteria listed). The Woodstone Integrated Bat Box is as follows (Source: www.nhbs.com):





About this product

The Vivara Pro Interconnecting Bat Box has a slim, mountable design with removable panels that allow multiple boxes to be connected together. The internal compartment is designed for crevice roosting bats such as the common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Brandt's bat, whiskered bat and Barbastelle's. The box has a depth of 20mm and a rough interior to provide lots of grip for bats to cling to. The box is made from WoodStone - a robust material composed of concrete and wood fibres, which has excellent insulating properties and provides protection from predators. This box is ideal for installation directly under a roof edge, gutter or under a bridge or dam. The box can easily be connected to another by removing the connecting pieces on either side and then placing the cabinets tightly against each other. This can be repeated with multiple boxes as required, creating an ever larger area for the bats. The bats can then crawl from one box to the other

The box should be installed at a height of 3m or above, fixings supplied.

Specification

Dimensions: Height 50cm x Width 30cm x Depth 7.5cm

Weight: 5.6kg

Material: WoodStone

C) Alternative Bat Roosts – non-residential buildings with integrate bat boxes

It is recommended to insert bat blocks into rear walls of buildings (that meet the criteria listed). The Bat Block is as follows (Source: www.nhbs.com):



About this product

If you are purchasing more than one of these boxes, please note that due to the size and weight of these boxes, additional shipping costs will apply. Our customer services will be in contact once you have placed your order to confirm these costs with you. If you wish to discuss this before your order, please contact our customer services at customer.services@nhbs.com.

The Green & Blue Bat Block is designed to create roosting space for bats within the framework of new builds, or to be retrofitted within existing properties. Once installed, the front of the Bat Block is designed to sit flush with the outside bricks of a build, with the entrance slightly protruding. Depending on the position installed, the Bat Block can become either a summer maternity roost (South or West facing) or a winter hibernation roost (North facing).

The Bat Block features an internal FSC certified wooden panel, a small entrance space to deter larger birds and predators and a "Bat Ladder" at the base of the box to facilitate bats landing and climbing. The Bat Block can be turned into a colony by knocking out the section on the side and installing Bat Blocks next to each other.

Made from cast concrete using up to 75% waste materials from the Cornish China Clay industry and is standard UK block size.

The Bat Block should be positioned at least 4m from ground level, away from artificial light sources and in proximity to vegetation and linear features like hedgerow which bats rely on for navigation and food. If it is on an existing feeding or flight route you are more likely to get occupation. The Bat Block does not require maintenance as the design allows droppings to fall from the entrance.

Specification

Dimensions: 215mm x 440mm x 160mm

Weight: Approx. 15 kg

Materials: Cast Concrete and FSC Certified Wood

The following are some case studies to provide information on alternative roosting sites:

Case Study 1: Soprano pipistrelle Roost (Private Location – Active Survey Site by author)

The natural stone facade of this building is used by individual soprano pipistrelles. The natural stone wall is not pointed and therefore provides roosting crevices for bats.

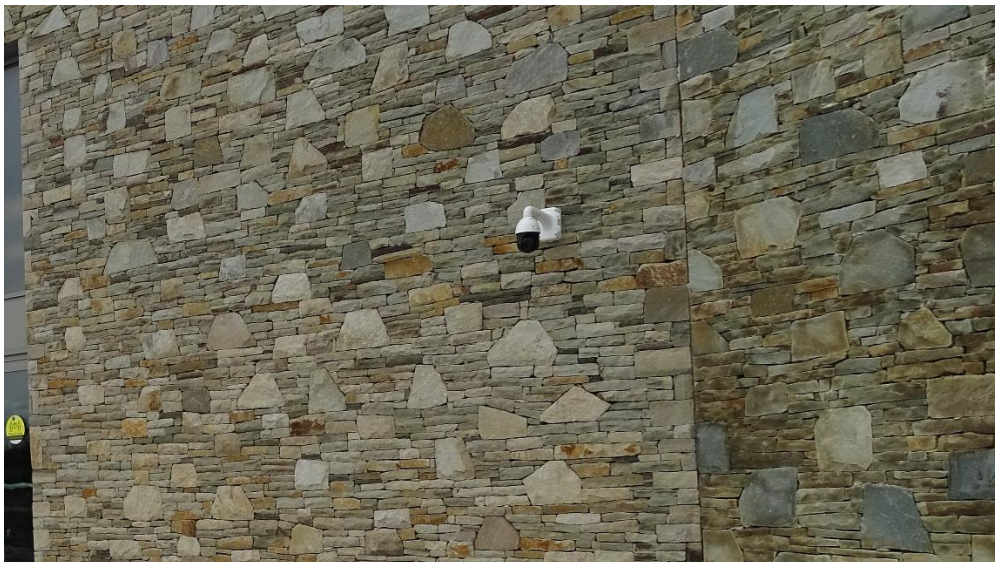


Plate A: Example of a natural stone facade with multiple crevices suitable as roosting sites for bats (Source: T. Aughney)

Case Study 2: [Garland L., Wells M. & Markham S. \(2017\) Performance of artificial maternity bat roost structures near Bath, UK. *Conservation Evidence*, 14, 44-51.](#)

Structure demolished: Farm house and associated outbuildings in the Cotswolds Hills, Bath, UK.

Roost Type: A brown long-eared bat maternity roost was identified in the loft of the inhabited former farm house, and a common pipistrelle maternity roost was found in an east-facing stone constructed gable wall (triangular portion of a wall between the edges of intersecting roof pitches) of an adjacent uninhabited cottage. A lesser horseshoe bat *Rhinolophus hipposideros* and greater horseshoe bat *Rhinolophus ferrumequinum* night roost was also found within a nearby carport structure.

Proposed Mitigation Measures:

- A Bat Wall with the primary purpose of attracting crevice-dwelling common pipistrelle bats (Figure 3, Source: Conservation Evidence).



Figure 3. New purpose-designed Bat Wall constructed on the east-facing gable wall of an existing hay barn; includes multiple crevices between the stonework leading to internal cavities and five wall integrated IFR Schwegler Bat boxes.

Plate B: Figure 3 of scientific paper depicting Bat Wall.

Case Study 3: Daubenton's Bat Roost (Ross Bridge, Co. Clare – surveyed by author)

Two Schwegler Bat Tubes were inserted into the bridge parapet walls (external face) to provide alternative roosting sites for roosting Daubenton's bats. The bridge required extensive stabilising works which resulted in the loss of crevices in the stonework of the archway. Monitoring of the bat tubes 1 year after works were completed recorded Daubenton's bat usage of the bat tubes.



Figure C: Bat tube inserted into external parapet walls of Ross Bridge, Co. Clare.

The following illustrations are examples of bat mitigation measures designed by English Nature. These give examples of potential designs of the "Bat Walls".

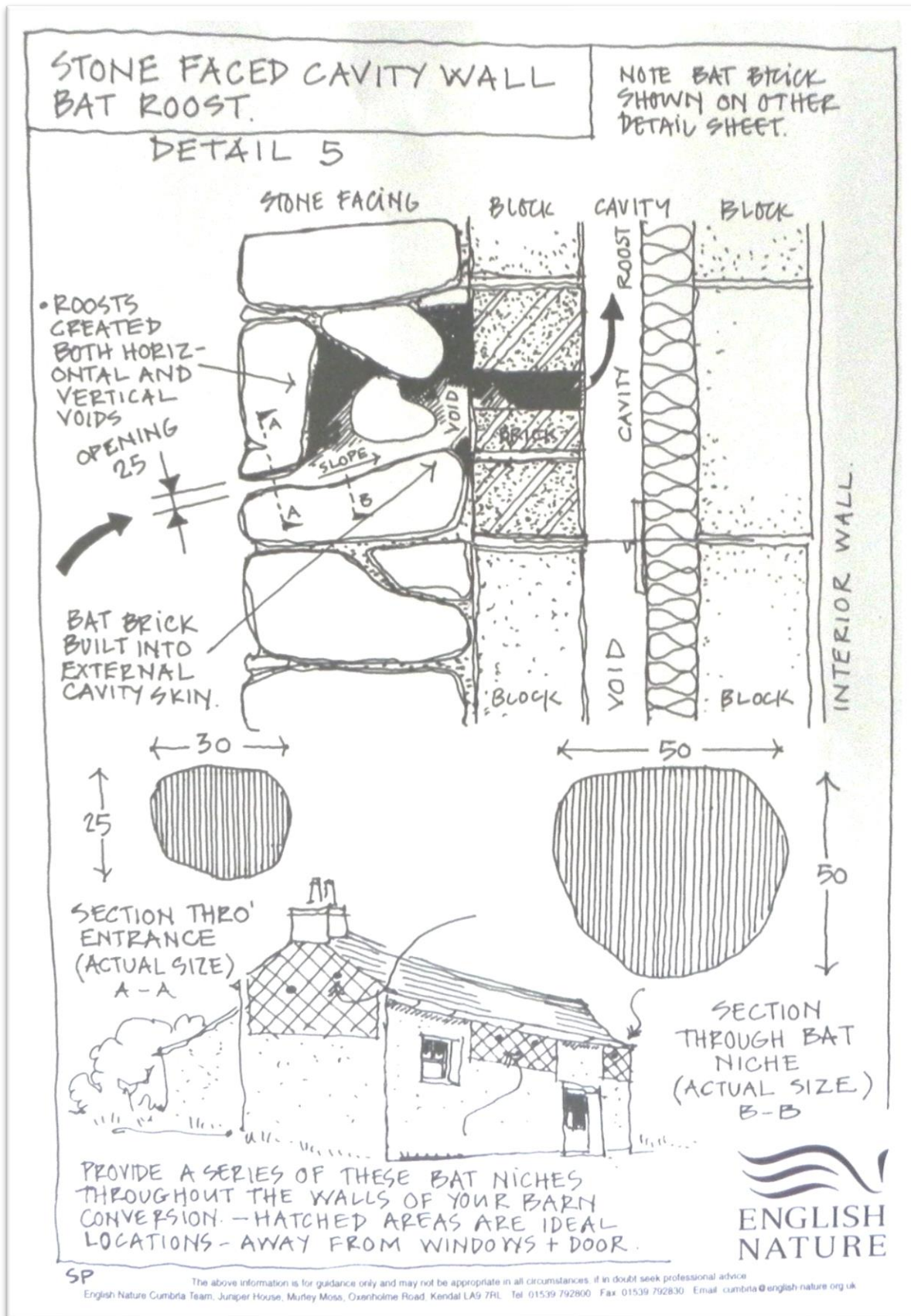


Figure D: Stone Faced Cavity Wall Bat Roost (Source: English Nature).

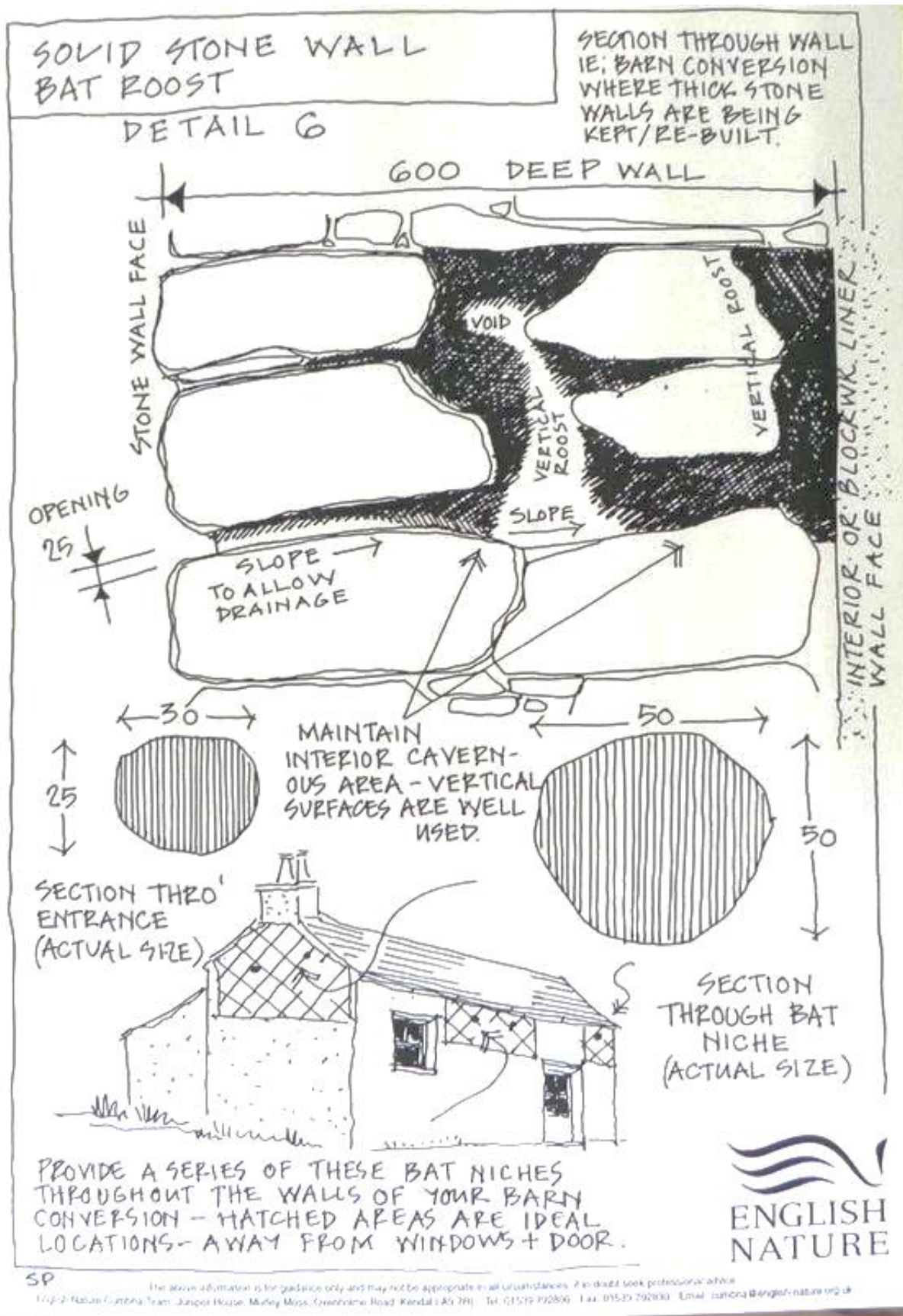


Figure E: Solid Stone Wall Bat Roost (Source: English Nature).

Appendix 2 Static Surveillance Results

Date	SP	CP	Leis	Location
10/07/2020	2	202	168	Tree
11/07/2020	22	426	512	O2651419607
12/07/2020	9	535	126	Along walkway
13/07/2020	19	277	53	within park
14/07/2020	0	0	0	
Total	52	1440	859	
Mini 2				
Date	SP	CP	Leis	Location
10/07/2020	12	670	16	Pine tree
11/07/2020	5	88	194	O2616119207
12/07/2020	5	190	79	Car park of
13/07/2020	9	693	17	old Ravenshill
14/07/2020	1	434	4	School
Total	32	2075	310	
Mini 3				
Date	SP	CP	Leis	Location
10/07/2020	0	123	224	Tree Tag 0619
11/07/2020	1	10	207	O2655719252
12/07/2020	59	207	49	Treeline
13/07/2020	5	269	152	
14/07/2020	26	381	111	
Total	91	990	743	
Mini 6				
Date	SP	CP	Leis	Location
10/07/2020	54	825	77	Tree Tag 0029
11/07/2020	5	272	108	O2640719179
12/07/2020	5	321	65	Adj. to shed
13/07/2020	18	812	126	School side of
14/07/2020	19	635	44	survey site
Total	101	2865	420	
Mini 7				
Date	SP	CP	Leis	Location
10/07/2020	0	13	52	Tree Tag 0915
11/07/2020	5	25	66	O2648119102
12/07/2020	98	124	46	Between golf
13/07/2020	2	60	68	club house and
14/07/2020	4	59	42	car park
Total	109	281	274	
Mini 8				

9. Species Profiles

Leisler's bat

This bat species was recorded commuting through the proposed development site. Ireland's population is deemed of international importance and the paucity of knowledge of roosting sites, makes this species vulnerable. However, it is considered to be widespread across the island. The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km²). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.*, 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km. In addition, of all Irish bat species, Leisler's bats have the most specific roosting requirements. It tends to select roosting habitat with areas of woodland and freshwater.

Irish Status	Near Threatened
European Status	Least Concern
Global Status	Least Concern
Biographical Range	km ²
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	73,000 to 130,000 (2007-2013) Ireland is considered the world stronghold for this species
Estimate Core Area (Lundy <i>et al.</i> 2011)	52,820 km ²

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

The principal concerns for Leisler's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Selection of maternity sites is limited to specific habitats;
- Relative to the population estimates, the number of roost sites is poorly recorded;
- Tree felling, especially during autumn and winter months; and
- Increasing urbanisation.

Common pipistrelle

This species was the most recorded species along the proposed development site and it generally considered to be the most common bat species in Ireland. The species is widespread and is found in all provinces. The modelled Core Area for common pipistrelles is a large area that covers much of the island of Ireland (56,485km²) which covers primarily the east and south east of the area (Roche *et al.*, 2014). The Bat Conservation Ireland Irish Landscape Model indicated that the Common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Biographical Range	km ²
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	1.2 to 2.8 million (2007-2012)
Estimate Core Area (km²) (Lundy <i>et al.</i> 2011)	56,485

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

Principal concerns for Common pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore, careful site specific planning for this species is required in order to ensure all elements are maintained.
- Renovation or demolition of derelict buildings.
- Tree felling
- Increasing urbanisation (e.g. increase in lighting)

Soprano pipistrelle

This species was the second most recorded species along the proposed development site and it generally considered to be the second most common bat species in Ireland. The species is widespread and is found in all provinces, with particular concentration along the western seaboard. The modelled Core Area for soprano pipistrelle is a large area that covers much of the island of Ireland (62,020km²). The Bat Conservation Ireland Irish Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Biographical Range	km ²
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	0.54 to 1.2 million (2007-2012)
Estimate Core Area (km ²) (Lundy <i>et al.</i> 2011)	62,020

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

Principal concerns for Soprano pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosts;
- Renovation or demolition of structures;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

Daubenton's bat

The modelled Core Area for Daubenton's bats is a relatively large area that covers much of the island of Ireland (41,285km²) reflecting the distribution of sizeable river catchments. The Irish Landscape Model indicated that the Daubenton's bat habitat preference is for areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Biographical Range	km ²
Irish Population Trend	2008-2013 Stable
Estimated Irish Population Size	81,000 to 103,000 (2007-2012)
Estimate Core Area (km ²) (Lundy <i>et al.</i> 2011)	41,285

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

Principal concerns for Daubenton's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Potential roost loss due to bridge maintenance;
- Loss of woodland and forest clearance;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.