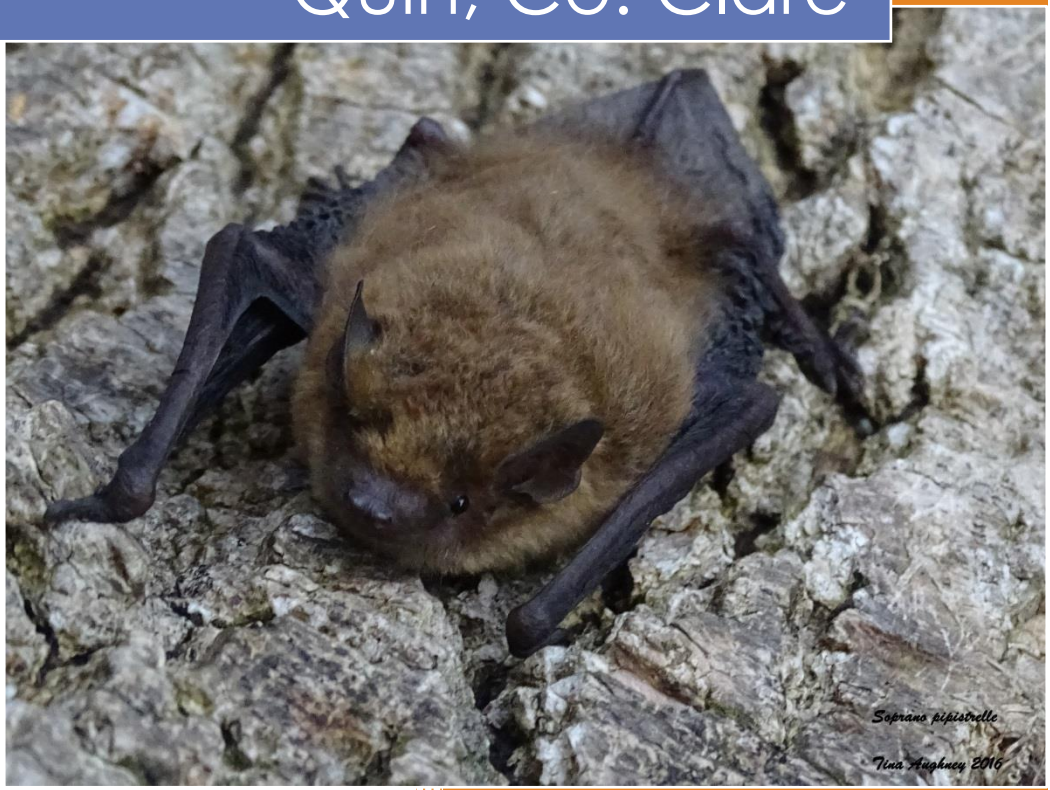
2025

Bat Assessment of Ballykilty Manor, Quin, Co. Clare



Bat Eco Services Limited

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NPWS licence C17/2023 (Licence to handle bats, expires 23rd January 2026);
NPWS licence 017/2025 (Licence to photograph/film bats, expires 31st December 2025);
NPWS licence DER/BAT 2025-171 (Survey licence, expires 31st December 2025).

Statement of Authority: Dr Aughney has worked as a Bat Specialist since 2000 and has undertaken extensive survey work for all Irish bat species including large scale development projects, road schemes, residential developments, wind farm developments and smaller projects in relation to building renovation or habitat enhancement. She was a monitoring co-ordinator and trainer for Bat Conservation Ireland for 20 years. She is a co-author of the 2014 publication *Irish Bats in the 21st Century.* This book received the 2015 CIEEM award for Information Sharing. Dr Aughney is a contributing author for the Atlas of Mammals in Ireland 2010-2015. She is a trained bat handler, bat ringer and radio-telemetry project manager. She is a member of the Nathusius' Pipistrelle Working Group and the Cavan Bat Group.

All analysis and reporting is completed by Dr Tina Aughney. Data collected and surveying is completed with the assistance of trained field assistants. Mr. Shaun Boyle (Field Assistant) NPWS licence DER/BAT 2025-172 (Survey licence, expires 31st December 2025). Ms. Eva Boyle (Field Assistant) NPWS licence DER/BAT 2025-173 (Survey licence, expires 31st December 2025). Both field assistants have received in-house training to undertake all elements of bat surveying according to Collins (2023).

Client: Peter Lavelle Building Surveyors & Fire Engineers (PLBS) on behalf of owner.

Project Name & Location: Ballykilty Manor, Quin, Co. Clare.

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
18th June 2022	Draft 1	By email to PLBS
16th September 2022	Draft 2	By email to PLBS
31st March 2025	Draft 3	By email to PLBS
6th May 2025	Draft 4	By email to PLBS
9th June 2025	Final	By email to PLBS

Purpose

This document has been prepared as a Report for PLBS. 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 Ltd. 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: Ballykilty Manor, Quin, Co. Clare

Proposed work: Development of estate buildings and grounds into hotel and associate infrastructure.

Bat Survey Results - Summary

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

Bat Survey Duties Completed (Indicated by red shading)

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	◯	Thermal Imagery filming	◯

Citation: Bat Eco Services (2025) Bat assessment of proposed development at Ballykilty Manor, Quin, Co. Clare. Unpublished report prepared for PLBS.

Contents

1. Introduction

Bat Eco Services was commissioned by PLBS to undertake a bat survey of Ballykilty Manor with particular emphasis on lesser horseshoe bats, known to roost in Ballykilty House, one of the buildings located within the survey area.

1.1 Relevant Legislation & Bat Species Status in Ireland

All Irish bat species are protected under the Irish 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.

1.1.1 EU Legislation

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is an offence. The most recent guidance document is "Guidance document on the strict protection of animal species of Community interest in the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final".

Regulation 51(2) of the 2011 Regulations (S.I. No. 477/2011 – European Communities (Birds and Natural Habitats) provides the following text –

("(2) Notwithstanding any consent, statutory or otherwise, given to a person by a public authority or held by a person, except in accordance with a licence granted by the Minister under *Regulation 54,* a person who in respect of the species referred to in *Part 1* of the *First Schedule*—
(*a*) deliberately captures or kills any specimen of these species in the wild, (*b*) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,
(*c*) deliberately takes or destroys eggs of those species from the wild,
(*d*) damages or destroys a breeding site or resting place of such an animal, or
(*e*) keeps, transports, sells, exchanges, offers for sale or offers for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive, shall be guilty of an offence."

The grant of planning permission does not permit the commission of any of the above acts or render the requirement for a derogation licence unnecessary in respect of any of those acts. Any works interfering with bats and especially their roosts, may only be carried out under a derogation licence granted by National Parks and Wildlife Service (NPWS) pursuant to Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law).

1.1.2 Irish Bat Species

There are eleven recorded bat species in Ireland, nine of which are considered resident on the island. Eight resident bat species and one of the vagrant bat species are 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 have not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidae 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. 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). 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. Sonogram records were more recently recorded in 2020 in Laragh, Co. Wicklow (pers. comm. Nick Marchant).

The following species list (Table 1a) identifies the range of bat species (resident and vagrant) whose presence has been confirmed in Ireland along with their current status. According to the Bat Conservation Ireland databases, all nine resident bat species have been recorded in Co. Galway.

The International Union for Conservation of Nature (IUCN) uses red list categories and criteria intended to be an easily and widely understood system for classifying species at high risk of global extinction. It divides species into nine categories: 'Not Evaluated', 'Data Deficient', 'Least Concern', 'Near Threatened', 'Vulnerable', 'Endangered', 'Critically Endangered', Extinct in the Wild' and 'Extinct'. One of the categories is 'Least Concern'. Although 'Least Concern' species have a lower risk of extinction, they are still important in terms of global biodiversity. Some species listed in the 'Least Concern' category are undergoing slow declines. A second category 'Near Threatened (NT)' is when a taxon has been evaluated against the criteria but does not qualify for categories that are associated with more serious declines in populations on the red list such as categories including 'Critically Endangered', 'Endangered' or 'Vulnerable'. 'Near Threatened (NT)' category is close to qualifying for or is likely to qualify for a threatened category in the near future.

Table 1a: Status of the Irish bat fauna (Marnell *et al.,* 2019 & NPWS, 2022).

Species: Common Name	Irish Status	European Status	Global Status
Resident Bat Species ^			
Daubenton's bat *Myotis daubentonii*	Least Concern	Least Concern	Least Concern
Whiskered bat *Myotis mystacinus*	Least Concern	Least Concern	Least Concern
Natterer's bat *Myotis nattereri*	Least Concern	Least Concern	Least Concern
Leisler's bat *Nyctalus leisleri*	Least Concern	Least Concern	Least Concern
Nathusius' pipistrelle *Pipistrellus nathusii*	Least Concern	Least Concern	Least Concern
Common pipistrelle *Pipistrellus pipistrellus*	Least Concern	Least Concern	Least Concern
Soprano pipistrelle *Pipistrellus pygmaeus*	Least Concern	Least Concern	Least Concern
Brown long-eared bat *Plecotus auritus*	Least Concern	Least Concern	Least Concern
Lesser horseshoe bat *Rhinolophus hipposideros*	Inadequate	Least Concern	Least Concern
Possible Vagrants ^			
Brandt's bat Myotis brandtii	Data deficient	Least Concern	Least Concern
Greater horseshoe bat *Rhinolophus ferrumequinum*	Data deficient	Near threatened	Near threatened

^ Roche *et al.,* 2014

1.1.3 NPWS Article 17 Reporting

NPWS (2019) provides details on the conservation status for each of Ireland's bat species along with distribution maps. The following table summarises the conclusions of Article 17 assessment of conservation status at the end of the most recent reporting period. Additional information for each of the bat species provides some clarifying notes in relation to the conservation status conclusions. Such information, where appropriate to the current project, will be drawn on in the project assessment section.

Article 11 of the Habitats Directive requires EU Member States to monitor the habitats and species listed in the annexes (habitats in the Annex I and species in the Annexes II, IV and V), and Article 17 requires a report to be sent to the European Commission every 6 years following an agreed format. The core of the 'Article 17' report is assessment of conservation status of the habitats and species targeted by the directive. The assessment is made based on information on status and trends of species populations or habitats and on information on main pressures and threats. Conservation status is assessed using a standard methodology as being either 'favourable', 'unfavourable-inadequate' and 'unfavourable-bad', based on four parameters as defined in Article 1 of the Directive. 'Unfavourable' and' inadequate' indicate population declines. The parameters for species are range, population, habitat of species and future prospects. The conservation status of each habitat and species is assessed separately for each biogeographical or marine region in which it occurs. The conservation status trend incorporates the categories 'deteriorating', 'improving' and 'stable'.

Table 1b: NPWS Article 17 Conservation Status of Irish Bat Species (Adapted from NPWS, 2022).

	Range	Population	Habitat	Future Prospects	Cons. Status Assessment	Conservation Status Trend
Lesser horseshoe bat	Inadequate	Favourable	Inadequate	Inadequate	Inadequate	Deteriorating
Common pipistrelle	Favourable	Favourable	Favourable	Favourable	Favourable	Improving
Soprano pipistrelle	Favourable	Favourable	Favourable	Favourable	Favourable	Improving
Nathusius' pipistrelle	Unknown	Unknown	Favourable	Unknown	Unknown	Not applicable
Natterer's bat	Favourable	Favourable	Favourable	Favourable	Favourable	Stable
Daubenton's bat	Favourable	Favourable	Favourable	Favourable	Favourable	Improving
Whiskered bat	Favourable	Favourable	Favourable	Favourable	Favourable	Improving
Brown long-eared bat	Favourable	Favourable	Favourable	Favourable	Favourable	Improving
Leisler's bat	Favourable	Favourable	Favourable	Favourable	Favourable	Improving

1.1.4 Irish Bat Monitoring Programme – Population Trends

The Irish Bat Monitoring Programme provides information on monitoring schemes managed by Bat Conservation Ireland:

● Car-Based Bat Monitoring (All Ireland) – monitors common pipistrelle, soprano pipistrelle, Leisler's bats with limited information for Nathusius' pipistrelle and *Myotis* species.
● All Ireland Daubenton's Bat Waterway Monitoring
● Brown Long-eared Bat Roost Monitoring
● Lesser Horseshoe Bat Monitoring

This provides population trend data for seven bat species: common pipistrelle, soprano pipistrelle, Leisler's bat, Nathusius' pipistrelle, Daubenton's bat, brown long-eared bat and lesser horseshoe bat (some limited data for *Myotis* species). Pilot monitoring surveys for Natterer's bat and whiskered bat are currently in progress.

Annual reporting is undertaken and the most recent report (Aughney *et al.,* 2023) is referenced for this report. In summary, the population trends for each bat species are as follows:

- Trends of the three common bat species (common pipistrelle, soprano pipistrelle and Leisler's bat) continued to increase in 2022, although the yearly estimates of common pipistrelle levelled out a little. Confidence intervals of these three bat species were all above their baseline indices indicating they each show a significantly increasing trend.
- Nathusius' pipistrelle trends are still unclear due to low encounter rates but decreased a little in 2022 compared to previous years.
- The yearly estimate for the *Myotis* spp. group steadied out a little but overall the smoothed trend for this group is still well below the baseline.
- Daubenton's bat numbers trend line appears to be fairly steady from year to year with error bars consistently encompassing the baseline.
- Brown long-eared bat shows a fluctuating trend around the baseline and is considered to be currently stable.
- Lesser horseshoe bat continues to increase in 2022 for the summer counts while low winter counts caused a slight downward trend in 2022. But overall, this species has increased over the last 20 years of monitoring.

1.2 Evaluation & Assessment Criteria

1.2.1 Assessment Parameters

Different parameters are considered for the overall assessment of the potential impact(s) of a proposed development on local bat populations. The overall impacts of the proposed project on local bat populations is assessed using the following criteria:

- Impact Quality using the parameters Positive, Neutral or Negative Impact (based on EPA, 2017)

Table 1c: Criteria for assessing impact quality based on EPA, 2017,

Quality of Effect	Criteria
Positive	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Negative	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

- Impact Significance of potential impact parameters on specific bat species in relation to particular elements (e.g. roosting sites, foraging area and commuting routes) are assessed with reference to the following:
    - Table 4 of Marnell *et al.* (2022) (Figure 1a);
    - the known ecology and distribution of the bat species in Ireland;
    - bat survey results including type of roosts (if any recorded), pattern of bat usage of the survey area, level of bat activity recorded etc.
    - and bat specialist experience.

- Impact Significance of the proposed development on local bat populations maybe determine, where applicable, using the parameters listed in Table 2c (based on EPA, 2017).

Table 1d: Criteria for assessing significance of effects based on EPA, 2017,

Significance of Effects	Definition
Imperceptible	An effect capable of measurement but without significant consequences.
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics

The following terms will be used, where possible and applicable, when quantifying the duration of the potential effects (selected from EPA, 2017):

- Temporary – effects lasting less than a year
- Short-term – effects lasting 1 to 7 years
- Medium term – effects lasting 7 to 15 years
- Long term – effects lasting 15 to 60 years
- Permanent – effects lasting over 60 years
- Reversible – effects that can be undone, for example through remediation or restoration.

1.2.2 Bat Mitigation Measures

1.2.2.1 Bat Houses & Bat Lofts

The NPWS Survey and Mitigation Guidelines (Marnell *et al.* 2022) provides some general guidelines in relation to the provision of alternative roosts but states that critical issues "are the size and suitability of the final roost and the disposition of the entrances and flight paths, including the location of any exterior lighting or vegetation".

1.2.2.1.1 Bat Houses & Bat Lofts – Effective Mitigation Measures

The principal bat species that the bat house was designed for was lesser horseshoe bat as maternity roost for this bat species was initially in the loft of the stable buildings and then in the attic of the main house. The bat house was designed by Biggane (2004) but works were not completed as recommended. Kelleher (2008) undertook a review of the purposed built bat house and provided further recommendations.

Therefore, recommendations were made by Bat Eco Services (complete report – Bat Eco Services, 2022) and the alterations of the bat house take into consideration Schofield (2008) and Aughney *et. al.,* 2021. Aughney *et al.* (2021) reports on the successful renovation of an existing building for lesser horseshoe bats in Co. Galway. Monitoring of this structure by the author has demonstrated that the works completed were very successful and that this was primarily due to the fact that this building is located in prime foraging grounds of deciduous forest and that the extent of the renovation works completed were undertaken according to best practice reported in Schofield (2008).

A separate report was prepared in relation to alterations for the existing bat house.

1.2.2.2 Bats & Lighting

All European bat species, including Irish bat species, are nocturnal. Light levels as low as typical full moon levels, i.e. around 0.1 LUX, can alter the flight activity of bats (Voigt *et al.* 2018). Any level of artificial light above that of moonlight can mask the natural rhythms of lunar sky brightness and, thus, can disrupt patterns of foraging and mating and might, for instance, interfere with entrainment of the circadian system.

Artificial light pollution is an increasing global problem (Rich and Longcore, 2006) and Artificial light at night (ALAN) is considered a major threat to biodiversity, especially to nocturnal species. As urbanisation expands into the landscape, the degree of street lighting also expands. Its ecological impacts can have a profound affect the behaviour of nocturnal animals including impacts on reproductive behaviours, orientation, predator-prey interaction and competition among others, depending on the taxon and ecosystem in question (Longcore and Rich 2004). It is considered by Hölker *et al.* (2010) to be a key biodiversity threat to biodiversity conservation. In relation to bats, the potential impacts of artificial night lighting can result in habitat fragmentation (Hanski, 1998), delay in roost emergence (Downs *et al.,* 2003) and a reduction in prey items.

In the context of behavioural ecology, lights can work to attract or repel certain animals. Many groups of insects, including moths, lacewings, beetles, bugs, caddisflies, crane flies, midges, hoverflies and wasps, can be attracted to artificial light (Eisenbeis and Hassel 2000; Frank 1988; Kolligs 2000). Attraction depends on the spectrum of light. In the context of street lights, white (mercury vapour) lamps emit a white light that includes ultraviolet. High pressure sodium lights (yellow) emit some ultraviolet, while low pressure sodium lamps (orange) emit no ultraviolet light (e.g. Rydell 2006). As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and

around street lights and, particular bat species such as aerial insect predators, can exploit the swarming insects to their advantage. Such attraction can also take prey items away from dark zones where light sensitive species are foraging, thus reducing their likelihood of feeding effectively.

Rydell (2006) divides bats into four categories in terms of their characteristic behaviours at street lamps. The four categories are based on bat size, wing morphology and echolocation call characteristics which were highlighted by Norberg and Rayner (1987) to determine flight speed, manoeuvrability, and prey detection capabilities of bats. Rydell (2006) stated that the large, fast flying bats, which are confined to open airspace, fly high over lit areas and are rarely observed near ground level. None of these, typically large free-tailed bats (e.g. large species of the family Molossidae), are found in Ireland. The second category are the medium-sized fast flying species, including the *Nyctalus* species, which patrol the street well above the lights and can be seen occasionally as they dive for prey into the light cone. This group includes the Leisler's bat, which is found in Ireland. Rydell's third category describes the small but fast flying bats that are manoeuvrable enough to forage around light posts or under the lights, and includes the small *Pipistrellus* species of the old world, three of which are found in Ireland. The fourth category includes broad-winged slow flyers, most of which are seldom or never observed at lights. Slow flying bat species may be more vulnerable to predation by diurnal birds of prey and this may restrict their exploitation of insects around artificially illuminated areas (e.g. Speakman 1991). There are also the concerns that some bat species are more light sensitive and therefore actively avoid lit up areas. This is particularly relevant for lesser horseshoe bats. Therefore from this, we can categorise the suite of Irish bats species as follows (please note that the sensitivity category is the author's description):

Table 2: Potential light sensitivity of the Irish bat fauna using categories described by Rydell, 2006.

Species: Common Name	Rydell Category	Sensitivity
Daubenton's bat *Myotis daubentonii*	Category 4	Light sensitive
Whiskered bat *Myotis mystacinus*	Category 4	Light sensitive
Natterer's bat *Myotis nattereri*	Category 4	Light sensitive
Leisler's bat *Nyctalus leisleri*	Category 2	Light tolerant
Nathusius' pipistrelle *Pipistrellus nathusii*	Category 3	Semi-tolerant
Common pipistrelle *Pipistrellus pipistrellus*	Category 3	Semi-tolerant
Soprano pipistrelle *Pipistrellus pygmaeus*	Category 3	Semi-tolerant
Brown long-eared bat *Plecotus auritus*	Category 4	Light sensitive
Lesser horseshoe bat *Rhinolophus hipposideros*	Category 4	Light sensitive

The ability of different bat species to exploit insects gathered around street lights varies greatly. Gleaning species such as *Myotis* bats rarely forage around street lights (Rydell and Racey, 1995). The ecological effects of illuminating aquatic habitats are also poorly known. Moore *et al.* (2006) found that light levels in an urban lake, subject simply to sky glow and not direct illumination from lights, reached the same order of magnitude as full moonlight.

All European bat species, including Irish bat species, are nocturnal. As a consequence, the scientific literature provides evidence that artificial lighting does impacts on bats. The degree of impact

depends on the light sensitivity of the bat species and the type of luminaire. Lesser horseshoe bats are light sensitive and therefore adversely effected by the presence of lighting in all aspects of their life strategies (e.g. foraging, commuting, drinking and roosting).

The potential impacts of street lighting can be summarised as follows:

- Attracting Prey Items

Lights can work to attract or repel certain animals. Many groups of insects can be attracted to artificial light and this attraction depends on the spectrum of light. As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and around street lights. Such attraction can also take prey items away from dark zones where light sensitive species, such as lesser horseshoe bats, are foraging, thus reducing their likelihood of feeding effectively.

- Reducing Foraging Habitat

The research documents that there is less bat species diversity foraging in habitats lit up by artificial lighting. Only bat species considered to be light tolerant are generally able to exploit habitats with lighting present, but overall, all bat species activity tends to be less in lit up habitats compared to non-lit up habitats.

- Fragmenting The Landscape

Scientific evidence shows that lighting is a barrier to the movement of light sensitive bat species, such as lesser horseshoe bats. Light sensitive bat species will actively seek dark corridors to commute along and therefore the presence of lighting in commuting habitats will restrict their movement of such species in the landscape.

- Reducing Drinking Sites

There is increasing evidence that drinking sites for bats is an essential component for local bat population survival and that the presence of artificial lighting at waterbodies prevents bats from availing of this resource.

Lighting, including street lights come in an array of different types but for street lights they typically include High Pressure Sodium, Low Pressure Sodium, Mercury Vapour and the more modern Light Emitting Diodes (LED). An array of field-based research has been undertaken to document the potential impact of lighting on bat flight activity. LED lighting is predicted to constitute 70% of the outdoor and residential lighting markets by 2020. While the use of LEDs promotes energy and cost savings relative to traditional lighting technologies, little is known about the effects these broad-spectrum “white” lights will have on wildlife, human health, animal welfare, and disease transmission. As a consequence, a large array of research has been undertaken recently on the potential impact of LED on bats.

Stone *et al.* (2012) undertook research in relation to “Cool” LED street lights on an array of local bat species in England. Overall the presence of LED street lights had a significant negative impact on lesser horseshoe bats and *Myotis* spp. for all light treatments investigated while there was no sign impact of light treatment type on *Pipistrellus pygmaeus* (soprano pipistrelle – a common Irish bat species) or *Nyctalus* (Leisler’s bats is part of this bat family and is a common Irish bat species)/*Eptesicus* species. This research paper also documented behavioural changes for the different bat species. Lesser horseshoe bats and *Myotis* spp. did not avoid lights by flying along the other side of the hedge but altered their commuting behaviour altogether. It was concluded that LEDs can fragment commuting routes causing bats to alter their behaviour with potentially negative

conservation consequences. Lesser horseshoe bat activity was significantly lower during high intensity treatment than medium, but at all treatment levels (even as low as 3.6 LUX), activity was significantly lower than unlit control (LUX level measurements were taken at 1.7m at the hedge below the light).

Russo *et al.* (2017) investigated the impact of LED lighting on drinking areas for bats in Italy. Drinking sites are considered to be important components for the survival of local bat populations. Drinking sites were illuminated with a portable LED outdoor light emitting (48 high-power LEDs generated a light intensity of 6480 lm (4000–4500 K) at 25°C, two peaks of relative luminous flux at 450 and 590 nm). *Plecotus auritus* (brown long-eared bat – resident in Ireland), *Pipistrellus pygmaeus* (soprano pipistrelle – resident in Ireland) and *Rhinolophus hipposideros* (lesser horseshoe bat – resident in Ireland) did not drink when troughs were illuminated.

Rowse *et al.* (2018) researched the impacts of LED lights (portable lights, 97W 4250K LED on 10m high poles) in England on local bat populations. Treatments were either 100% light intensity; dimmed (using pulse width modulation) at 50% or 25% light intensity; and unlit. Sites were in suburban areas along busy roads but with vegetation and tree lines adjacent. High light levels (50% & 100% light treatments) increased activity of opportunistic *Pipistrellus pipistrellus* (common pipistrelle – resident in Ireland) but reduced activity of *Myotis* species group. Conversely 25% and unlit sites had no difference from each other. The research paper conclude that dimming could be an effective strategy to mitigate ecological impacts of street lights.

Wakefield *et al.* (2017) stated that an important factor to be aware of in relation to LED is the direction of the light projected. Therefore it is recommended that highly focused/shielded LEDS designed to filter out short wavelengths of light may should be used as they attract relatively fewer insects. Less insects attracted to street lights means less insects leaving dark zones where light sensitive bat species primarily feed.

Martin *et al.* (2021) showed that LED street lights lead to a reduction in the total number of insects captured with light traps in a wide range of families. Coleoptera and Lepidoptera orders were the most sensitive groups to ecological light pollution in the study area. The paper suggested that LED was the least attractive light system for most of the affected groups both because of its very little emitted short-wavelength light and because of its lower light intensity. They also concluded that reduction in insect attraction to LED could be even larger with current LED technologies emitting warmer lights, since other research showed that LED emitting “warmer white” colour light (3000 K) involves significantly lower attraction for insects than “colder white” LED (6000 K).

Wilson *et al.* (2021) investigate the impact of LED on biting insects and concluded because LED is highly malleable with regard to spectral composition, they can be tailored to decrease or increase insect catches, depending on situation. Therefore this design control of LED could greatly assist in reducing impact of street lighting on local bat populations.

Stone *et al*. (2015) reviewed the impacts of ALAN on bat roosts and flight paths in order to provide recommendations in relation to street lighting. The principal recommendations were to avoid lighting places where bats are present and to ensure that there are interconnected light exclusion zones and variable light regimes with reduced intensity of light in specific areas (e.g. important foraging and commuting habitats) as responses to street lighting may vary between species. It recommends that there should be a 'light threshold'.

1.2.2.2.1 Lighting Guidelines – Effective Mitigation Measures

As a consequence of this extensive amount of research there are two principal guideline documents available for best practice for effective mitigation relating to outdoor lighting.

EUROBATS (Voigt *et al.,* 2018) guidelines recommends the following:

- ALAN should be strictly avoided, and artificial lighting should be installed only where and when necessary coupled with the following:
    - Dynamic lighting schemes, where possible.
    - Use a minimal number of lighting points and luminaires on low positions in relation to the ground for minimising light trespass to adjacent bat habitats or into the sky.
    - Use focused light, e.g. by using LED or shielded luminaires which limit the light flux only to the required areas and prevent light trespass into adjacent bat habitats.
    - Create screens, either by erecting walls or by planting hedgerows or trees, to prevent light trespass, e.g. from illuminated roads, to surrounding bat habitats.
    - Exits of bat roosts and a buffer zone around them should be protected from direct or indirect lighting to preserve the natural circadian rhythm of bats.

This BCT (2018) guidelines provides a list of recommendations in relation to luminaire design, which is based on the extensive research completed to-date on the potential impact of lighting on bats, and therefore provides best practice mitigation measures. These recommendations are the basis of mitigation measures pertaining to bats listed in this report and are summarised as follows:

- All luminaires used should lack UV/IR elements to reduce impact.
- A warm white spectrum (<2700 Kelvins should be used to reduce the blue light component of the LED spectrum).
- Luminaires should have a peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Only luminaires with an upward light ratio of 0% and with good optical control should be used.
- Luminaires should be mounted on the horizontal, i.e. no upward tilt.
- Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible.
- Bollard lighting should be considered for pedestrian, parks and greenway areas, if deemed necessary.

1.2.2.3 Bat Box Schemes

Bat Boxes are frequently used as part of bat mitigation to retain local bat populations within an area proposed to be development. The NPWS Bat Mitigation Guidelines (Marnell *et al.* 2022) considers that where roosts of low conservation significance (Figure 20, Marnell *et al.* (2022)) are to be lost due to a development, bat boxes may provide an appropriate form of mitigation and the effectiveness depends on the type of bat box provided, which should be appropriate to the bat species (Figure 1a).

Table 7 The types of bat box used by different species.

Species	Summer/ maternity	Summer/non breeding	Hibernation*	Notes
Rhinolophus hipposideros	N/A	N/A	N/A	Horseshoe bats cannot use bat boxes
Myotis daubentonii	H	H		
Myotis mystacinus	H	H		
Myotis nattereri	H	?		
Pipistrellus nathusii	H	H		
Pipistrellus pipistrellus	C	C/H	C	H are rarely used as maternity roosts.
Pipistrellus pygmaeus	C	C/H	C	
Nyctalus leisleri	H	H	H?	
Plecotus auritus	H	H		Maternity roosts

Key

* Large well-insulated hibernation boxes may be more successful

N/A -not applicable; bat boxes should not be considered as replacement roosts

H – tree hollow-type box, providing a void in which bats can cluster

C – tree crevice-type box, with 25-35mm crevices

? – few data on which to base an assessment

Figure 1a: Table 7 (p 58) Reproduced from Marnell *et al.* (2022).

1.2.2.3.1 Effectiveness of Bat Boxes as a Mitigation Measure

Two publications that provide good scientific advise in relation to the effectiveness of bat boxes are presented below. McAney & Hanniffy (2015) reviewed the use of bat boxes in Ireland in relation to the bat usage of the following bat box schemes: 62 Schwegler boxes of three models erected in Portumna Forest Park (Bat box scheme consisted of 30x 1FF design, 30x 2FN design and 2x 1FW design); 50 2FN boxes erected in Coole-Garryland Nature Reserve and 50 2FN boxes erected in Knockma Nature Reserve of which 40 were later transferred to Glengarriff Nature Reserve County Cork. The bat box schemes were set up in March 1999 and data was collected up to 2015. Eight of the nine resident bat species were recorded roosting in bat boxes (lesser horseshoe bats cannot use bat boxes due to their need to fly, rather than crawl, into roosts). The main summary points are as follows:

- Leisler's, brown long-eared and *Pipistrellus* spp. were recorded in boxes at all three Galway woods, Daubenton's bat was only recorded in Garryland, Natterer's bat was only recorded in Glengarriff and whiskered/Brandt's was recorded just twice.
- There was a 31% chance of encountering a bat at Portumna Forest Park compared to 11.5% and 10% at Coole-Garryland Nature Reserve and Knockma Nature Reserve respectively.
- Pipistrellus spp. preferred 1FF boxes as this bat box design offer crevice-like roosting conditions. This species group also showed a seasonal preference with more bats present later in the season (visual observations confirmed the bats were using the boxes as mating roosts) and their numbers increased from the time that the bat box scheme was originally established.
- Brown long-eared bats preferred 2FN boxes that mimic holes in trees, the natural roosting sites for this species. This species also showed no seasonal pattern to their occurrence in the boxes. However one aspect of 2FN boxes that this report mentions is the high occupancy

by birds which can be an issue in relation to nesting material reducing the availability of bat boxes for roosting bats.
- Leisler's bat showed no preference for box model but showed a seasonal preference with more bats present later in the season.
- Aspect was not a significant factor for occupancy but most boxes received dappled sunshine for part of the day.
- The other factor that proved significant was the length of time the boxes were in place, with occupancy rates increasing for all three species, although in the case of pipistrelles this increase appears to have stabilised. So, although the boxes were occupied very quickly, it took several years before they were regularly occupied and before clusters of bats were formed and breeding was confirmed.

Collins *et al.* (2020) investigated the implementation and effectiveness of bat roost mitigation, which included bat boxes, in building developments completed between 2006 and 2014 in England and Wales. The bat species studied were: common and soprano pipistrelle, brown long-eared bat and *Myotis* species, all of which are present in Ireland. A summary of the main points relating to bat boxes are as follows:

- Bat boxes were the most frequently deployed roosting provision (i.e. alternative roosts), being installed at 64% (n = 71) of sites surveyed as a compensation or enhancement measure.
- Box frequencies ranged from 1 to 41 at sites where they were installed, with an average of 6.6 boxes per site.
- Bats, or evidence of bats, were recorded in 20% of these bat boxes.
- Bat boxes mounted externally on buildings showed the highest occupation rate regardless of species while Common pipistrelle showed a preference for these over tree mounted boxes; the opposite was true for soprano pipistrelle.
- The four most popular bat box models used by consultants in the study were all Schwegler woodcrete bat boxes. Bat presence was highest in the 1FF bat box design (32%, n = 53) and lowest for birds (8%). The tree-mounted 2F and wall-integrated 1FR/2FR models both demonstrated similar bat presence rates of 23% (n = 43) and 25% (n = 32) respectively. The 2FN tree-mounted model showed the lowest presence rate for bats (11%, n = 19) and the highest for birds (58%). There were also 26 timber bat boxes, none of which were used by bats.

The author has also erected a number of bat box schemes and, where possible, has completed occasional monitoring visits. One such example is a bat box scheme erected in Kileshandra, Co. Cavan which consists of 8 Schwegler woodcrete bat boxes of various designs. The bat boxes were erected on mature trees located in a linear woodland adjacent to a river. This bat box scheme was erected in 2012 as part of mitigation for the demolishment of a large derelict building where small satellite roosts were recorded for *Pipistrellus* spp. and Daubenton's bat. Two site visits have been completed since 2012 and during these visits the bat boxes were checked for evidence of bat usage. The first site visit was on 25/8/2015 and one bat box was occupied by a single Leisler's bat while the additional seven bat doxes had evidence of bat droppings (*Pipistrellus* spp. and *Myotis* spp.). During the second site visit (27/7/2019) four bat boxes were occupied by bats (Soprano pipistrelle x1 individual (adult male), Leisler's bat x1 individual (adult male) and two bat boxes with x16 Daubenton's bats and x10 Daubenton's bats respectively). Biometrics was recorded for the 12 of the bats (which included 10 of the Daubenton's bats recorded in the bat box with 16 individuals) and five of these Daubenton's bats were lactating females with the remaining five Daubenton's bats recorded as juveniles, thereby indicating that this bat box was used as a maternity roost. The remaining four bat boxes all had droppings within for *Pipistrellus* spp and Leisler's bats. This bat box scheme, while

just one example, demonstrates that when bat boxes are erected in an area with good bat habitat (bat survey documented a high level of bat activity for the named bat species), a high level of occupancy of bat boxes will occur.

In relation to bat boxes, Marnell *et al.* (2022), a document that provides guidelines that are considered to be practical and effective based on past experience, recommends that the design life of potential bat boxes, including essential maintenance, should be about 10 years, as this would be comparable with the lifespan of the tree roosts that bat boxes are designed to mimic. The guidelines continues by stating that the "This lifespan can be achieved with good quality wooden boxes and exceeded by woodcrete bat boxes or other types of construction that ensure any softwoods are protected from the weather and attack by squirrels" (note – this includes woodstone bat boxes).

In relation to the number of bat boxes recommended to be erected, Lintott & Mathews (2018) found that the greater the number of bat boxes deployed, the greater the probability of at least one of the boxes becoming occupied and that the odds of bats occupying at least one box increased by approximately 7% with each additional bat box that was deployed. Bat boxes are erected, as part of this proposed development, to mitigate for the loss of potential roosts in trees. Therefore the number of bat boxes are calculated according to the number of trees with additional boxes added for greater bat conservation value.

Therefore Schwegeler woodcrete bat boxes are recommended as a bat mitigation measure and the authors preference to use 1FF designs as this box is open at the bottom which reduces build-up of droppings (i.e. it is a self-cleaning bat box). Both McAney & Hannify (2015) and Collins *et al.* (2020) demonstrated that usage of this bat box design by bat species recorded in this survey report. This bat box is also less likely to be used by birds and therefore retaining it for bat usage between monitoring visits. To increase occupancy of bat boxes by bats it is important to erect bat boxes 4m or higher (to ensure that bat boxes are out of reach from disturbance by humans and predation by other mammals) and that they should be located where bats have been documented foraging and commuting. The aspect of the bat box is not an influencing factor in relation to occupancy. These recommendations have all been included in this report.

1.2.2.4 Landscaping For Bats

Bats depend on the landscape for foraging, roosting and commuting. Different bat species will travel different distances, to and from their principal roosting sites, depending on their morphology, life stage and preferred foraging areas. Bats in Ireland are insect eating mammals and feed on an array of insects, whose populations are ultimately supported by vegetation. Areas of rich vegetation habitat tend to support higher abundances of insect populations and therefore a higher abundance of bats. In addition, many bat species rely on continuous linear habitats (e.g. treelines and hedgerows) to commute along. As a consequence landscaping as part of a proposed development project is an important element to the goal of retaining local bat populations.

The Bat Conservation Trust publication "Landscape and Urban Design for bats and biodiversity" (Gunnell *et al.,* 2012) is a resource for planning landscape design in our urban areas. This resource encourages measures to enhance existing bat foraging habitat, create water features such as ponds (drinking sites for bats and as a source of emerging insects), manage species rich grassland and planting of tall vegetation to ensure that exiting treelines and hedgerows are linked. It also recommends that use of landscaping as a means to creating dark zones or dark corridors for this mammal group to fly along in our lit urban areas. This is also support by the BCT Lighting Guidelines (BCT, 2018) where landscape design can be utilised to buffer potential light spillage from developments.

1.2.2.5 Seasonality of Bat Mitigation Measures

The NPWS Bat Mitigation Guidelines (Marnell *et al.* 2022) provides best practice guidance in relation to the timing of bat mitigation measures. It states that the most common and effective method of avoiding potential harm to a bat is to carry out the work at an appropriate time of the year. The following table provides a summary of timings.

Table 5 Optimum season for works in different types of roosts.

Bat usage of site	Optimum period for carrying out works (some variation between species)
Maternity	1st October – 1st May
Summer (not a proven maternity site)	1st September – 1st May
Hibernation	1st May – 1st October
Mating/swarming	1st November – 1st August

Figure 1b: Table 5 (p 50) Reproduced from Marnell *et al.* (2022).

Timing of bat mitigation measures is relevant to the proposed tree felling of Potential Bat Roosts (PBRs). Felling is recommended outside the principal maternity season and during mild weather conditions (to avoid cold weather that would encourage bats to hibernate). This coupled with dusk/dawn surveys and additional daytime inspections is best practice to ensure that tree felling is completed without causing harm to potentially roosting bats. The preferred tree felling months also avoids the bird nesting season.

1.3 Lesser Horseshoe Bat

1.3.1 Lesser Horseshoe Bats – Morphology & Ecology

The lesser horseshoe bat is a relatively small sized species of *Rhinolophus.* Typically it weighs between 4-8g and has a wingspan of 225-250mm (McAney, 2016). It is easily distinguishable from other Irish bat species by the fleshy, circular nose-leaf structure surrounding the nostrils. This species echolocation call is a distinctive melodic warble when heard on a bat detector tuned to 110 kHz.

This bat species will typically feed on a range of insects including midges, craneflies, caddisflies, lacewings and moths (McAney, 2016). The BCIreland Landscape Model indicates that the species' habitat preference is for areas with broadleaf and mixed woodland and that a mosaic of habitats is important (Roche *et al.,* 2014). It tends to commute along distinct linear habitat features such as stonewalls and hedgerows and avoids flying out in the open. It travels short distances from summer roosts to foraging areas, typically 2km.

Females form maternity colonies in buildings from April to September with a single pup born in June or July. The knowledge of roosting sites for this species is extensive as a result of an intensive survey completed in six Counties by the Vincent Wildlife Trust between 1994 and 2004 (McAney *et al*., 2013). In general, this species has a preference for buildings constructed prior to the 1900s, built of stone with slate rooves (Schofield, 2008). Such sites are also relatively undisturbed and uninhabited by people. Kelleher (2006) documented a demise in the quality of buildings used by lesser horseshoe bats in Ireland. Many summer roosting sites are now in one-storey buildings often roofed with corrugated iron and this may be an indication that optimal sites are less available to the species (McAney *et al.,* 2013).

Hibernation typically occurs from October to March and hibernation sites in Ireland are typically found underground, although at a number of buildings have been recorded as hibernation sites. The bats have been recorded hibernating in ground storey rooms during the winter months and there is a general trend in such hibernacula towards greater numbers of bats in buildings with two storeys or more (Roche *et al*., 2012).

1.3.2 Lesser Horseshoe Bats – Global Status & Status in Ireland

The lesser horseshoe bat is distributed across Europe from Portugal and Ireland to the Ukraine and Poland. It is present in northern Africa and parts of the middle east (Csorba *et al.,* 2003).

The lesser horseshoe bat is mainly found in counties on Ireland's western seaboard (Mayo, Galway, Clare, Limerick, Kerry and Cork) and its strongholds are found in County Kerry, west Cork and County Clare. A single animal has also been recorded in Co. Roscommon in 2004 (B. Keeley, pers. comm.) and bat droppings were recorded in Tubercurry, Co. Sligo (C. Kelleher, pers. comm.). A single bat (male) was also recorded in Ballina, Co. Tipperary in 2015 (pers. comm, Dr Áine Lynch, NPWS). The lesser horseshoe bat is Ireland's only Annex II-listed bat species (EU Habitats Directive [92/43/EU]). As a consequence, a roost monitoring scheme is operated by NPWS and managed by Bat Conservation Ireland (BCIreland). BCIreland carried out analysis of the lesser horseshoe bat database in 2012, and concerns were expressed about the state of deterioration of many of its roosting sites (McAney, 2014; Roche *et al.*, 2015) as well as the finding that there are genetically distinct clusters within the Irish population (Dool *et al.*, 2013) that are likely to have arisen due to landscape connectivity constraints.

As discussed previously, the modelled Core Area for lesser horseshoe bat is a relatively small area restricted to the Counties on the western seaboard (5,993km^2). Given this small range, significant impacts on this species may occur even with small levels of habitat modification or changes to roost availability (Roche *et al,* 2014).

According to Roche *et al,* 2014 the primary concerns for this species is as follows:

- Increased urbanisation;
- Mono cultural landscape (e.g. large swathes of coniferous forestry and high intensity farmed landscapes);
- Roost due to deterioration, demolition or renovations;
- Street lighting;
- Recreational cave visits etc to hibernation sites;
- Natural flooding of underground site.

1.3.2.1 Lesser Horseshoe Bat Population Trends & Distribution Gaps

Research present by Dr Andrew Harrington on the population genetics of lesser horseshoe bat in Ireland (Dr Harrington's Ph.D. thesis Title: The Development of Non-Invasive Genetic Methods for Bats of the British Isles, July 2018) examined the lesser horseshoe bat's range across Ireland with DNA samples from 21 colonies examined. This was to determine the level of interbreeding and possible risk of inbreeding within this population. One aspect of the study was to determine the sex ratio of colonies examined (Harrington *et al.,* 2017). Previously, it was assumed that 25% of the maternity roost colonies was comprised of 25% males. However, Dr Harrington's work showed that in reality the percentage of males can be much higher with a range of 14.2% to 74.3% recorded. As a result the estimated population of lesser horseshoes in Ireland is considered to be lower than previously reported (14,010 individuals as reported by Roche *et al.,* 2012).

Lesser horseshoe bat roosts are counted by NPWS and VWT staff as part of the Lesser Horseshoe Bat Roost Monitoring (managed by Bat Conservation Ireland under the Irish Bat Monitoring Programme). This involves annual winter and summer counts and using the summer roost and hibernacula count data BCIreland have analysed population trends for the species to winter and summer 2021.

Counts of lesser horseshoe bats in hibernaculum was undertaken at 156 sites and contribute to the winter trend analysis was completed as part of the Lesser Horseshoe Bat Roost Monitoring. The trend has been increasing since the start of the survey with the exception of a five year period between 2007 and 2011 when numbers were stable. Over the past 20 years (2002-2021), the trend index increased by 81.5%, which is equivalent to a 3% annual increase (Aughney *et al.,* 2022). Similar to the increasing trend in hibernation counts, there has been a significant increase in lesser horseshoe bats in summer. Between 1992 and 2021 the index increased by 98%. Over the past 20 years the index has increased by 2.98% per annum. Over the past six years the annual increase in summer has been 2.1%, which is slightly lower than that seen in winter sites (Aughney *et al.,* 2022).

However, while the current population trend is favourable, the NPWS & VWT (2022) emphasises that there is growing evidence that lesser horseshoe populations are becoming isolated. For example studies undertaken by the VWT have indicated that a gap of over 45km had opened between the still occupied roosts in Rathkeale (Limerick) and those at Castleisland and Tralee (north Kerry) and this increased to 70km between roosts with more than 25 bats (Lyons, 2014). Another VWT GIS study completed by Finch & McAney (2020) to investigate the interaction between all roosts in all regions at landscape scale with specific emphasis on the following regions: between the northern and central regions, between the central and southern regions and between roosts in south Limerick and east Kerry. The results of this study indicate there are high levels of local connectivity between roosts within each of the three regions but limited connectivity between the regions (NPWS & VWT, 2022). The high level of artificial illumination (e.g. outdoor street lighting) associated with the cities of Galway and Limerick may be a barrier to movement by this species (Finch & McAney, 2020) and therefore this is a concern in relation to urban developments.

Genetic studies over the last decade has also highlighted the concern relating population isolation. One such study undertaken by Harrington (2018) examined the population genetics of the species, focusing on the northern part of its range, using DNA extracted from droppings collected at roosts. This study confirmed that there is consistent genetic structuring within the Irish lesser horseshoe bat population that has created three subpopulations described as southern (Cork/Kerry), central (Limerick, Clare and south Galway) and northern (north Galway and Mayo) (see figure below). As a consequence, distribution gaps are leading to genetic sub-populations within the range of the lesser horseshoe bat in Ireland, from Harrington (2018). Harrington *et al. (*2019) at All Ireland Mammal Symposium (AIMS) stated that maintaining the gene flow within the Irish population is essential to "prevent the future risk of inbreeding depression or local extinctions". As a consequence, this means that this species is in serious risk of negative effects of operations that increase barriers to dispersal to these current sub-populations. The study further identified that the point separating the North Galway-Mayo population from the Clare-South Galway population is an area to the south-east of Galway City (the Galway Gap).

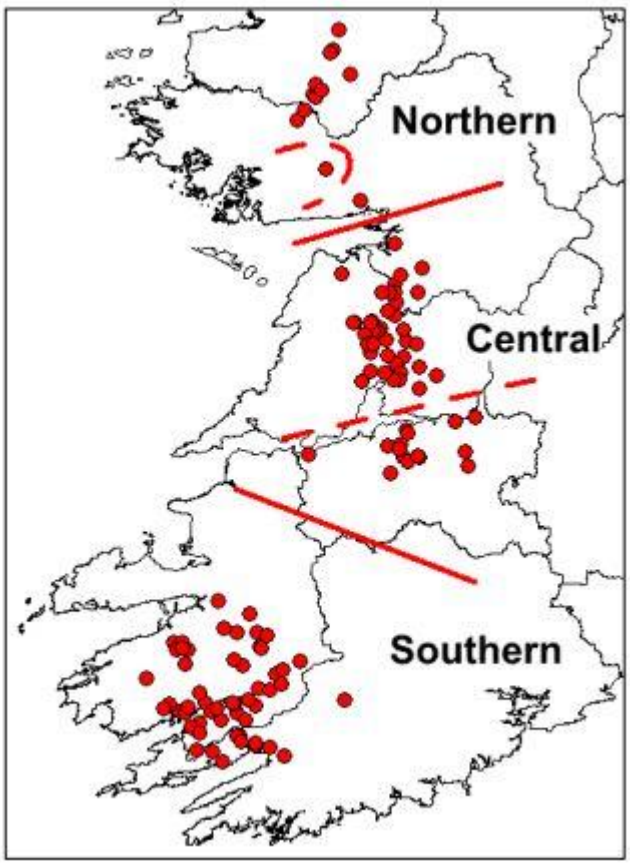

Figure 1c: Taken from NPWS & VWT (2022).

One of the principal issues for lesser horseshoe bats commuting in the landscape is the need for continuous linear habitats to fly along (i.e. flight corridors). The Vincent Wildlife Trust (VWT) prepared a map of potentially important flight paths for lesser horseshoe bats in the Limerick landscape, linking the Curraghchase SAC to the south of the county. The VWT (McAney *et al*., 2013) reported that a gap of over 45km has opened up between the roosts at Rathkeale in Co. Limerick and those at Castleisland and Tralee in north Co. Kerry. A distance of over 70km was measured between roosts that are used by more than 25 bats. While the lesser horseshoe bat population for the county is only several hundred and is confined to a small number of sites, Co. Limerick is key to ensuring connectivity between populations in the north and south. As a consequence, the VWT has concerns about this phenomenon, which they describe as the 'Limerick Gap', is likely to have arisen as a result of habitat fragmentation and roost loss. Information on where to focus future conservation actions to enable the species to recolonise this area is essential if future range decline is to be prevented. The VWT have recommend that two areas be targeted for conservation of the lesser horseshoe bat (Figure 1h).

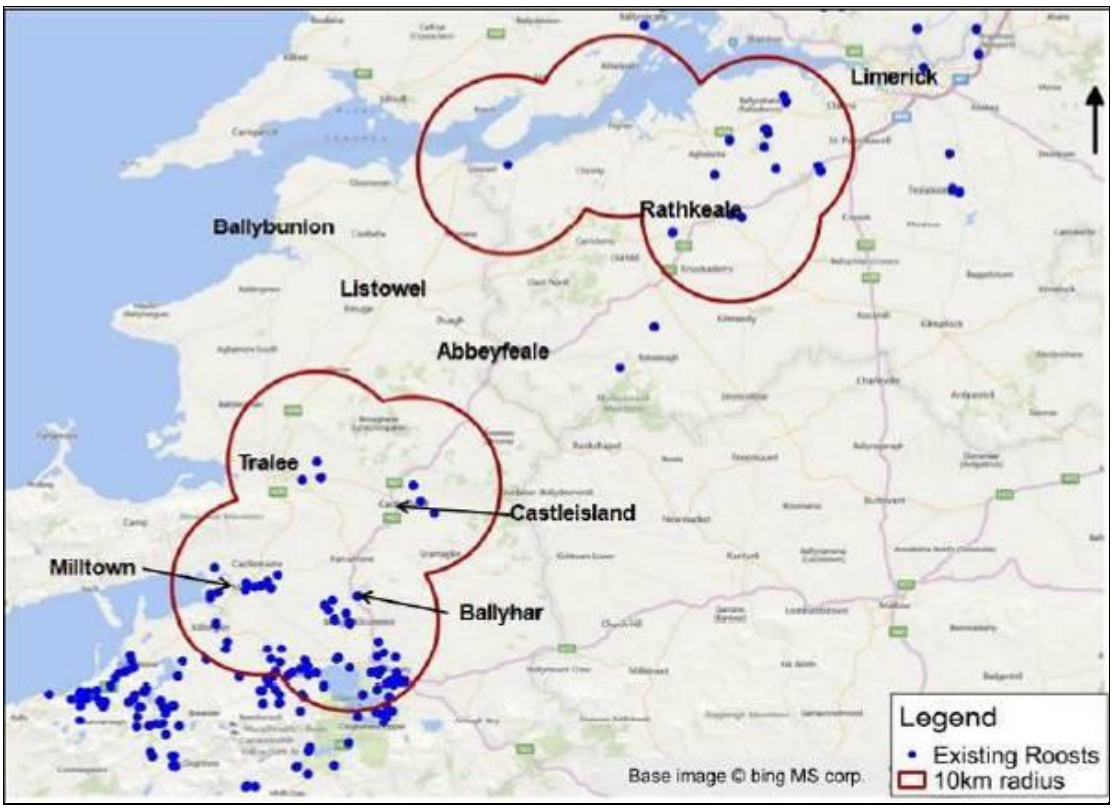

Figure 1d: Conservation target areas for Lesser horseshoe bat (McAney *et al*., 2013)

2. Proposed Development Description

2.1 Site Location

The proposed development is located at Ballykilty Manor, Quin, Co. Clare.

2.2 Proposed Project

The proposed development is a boutique hotel and associated infrastructure.

BALLYKILTY HOUSE.

OUTLINE DESCRIPTION OF PROPOSED WORKS.

This project relates to a proposal to submit a planning permission application to renovate and extend the existing Ballykilty Manor House and out-buildings to provide a new Boutique Hotel of 19 No. Bedrooms, Reception area, Offices, Function Room, Lounge Bar, Kitchen, Restaurant/Dining Room, Car Park, Waste-Water Treatment Plant, external Photo-Voltaic Solar Panel Bank, Store Rooms and Plant Rooms together with all ancillary services.

The works will also include, the upgrade of the existing main entrance gate and bridge to the property, the driveway from the entrance to the main house, the provision of a new service road to serve the plant areas at the rear of the main building, the demolition of some derelict structures, as well as the landscaping of the property to include the removal of some trees, the planting of new trees, shrubs and hedgerows.

The proposed works will further include the provision of the new Café building within the existing Walled Garden, as well as the upgrade and repair of its existing stone walls and the landscaping and planting of the grounds within the walled garden.

All other ancillary works required to complete the project are also deemed to be included as shown on the relevant drawings.

P. Lavelle
12.03.2025

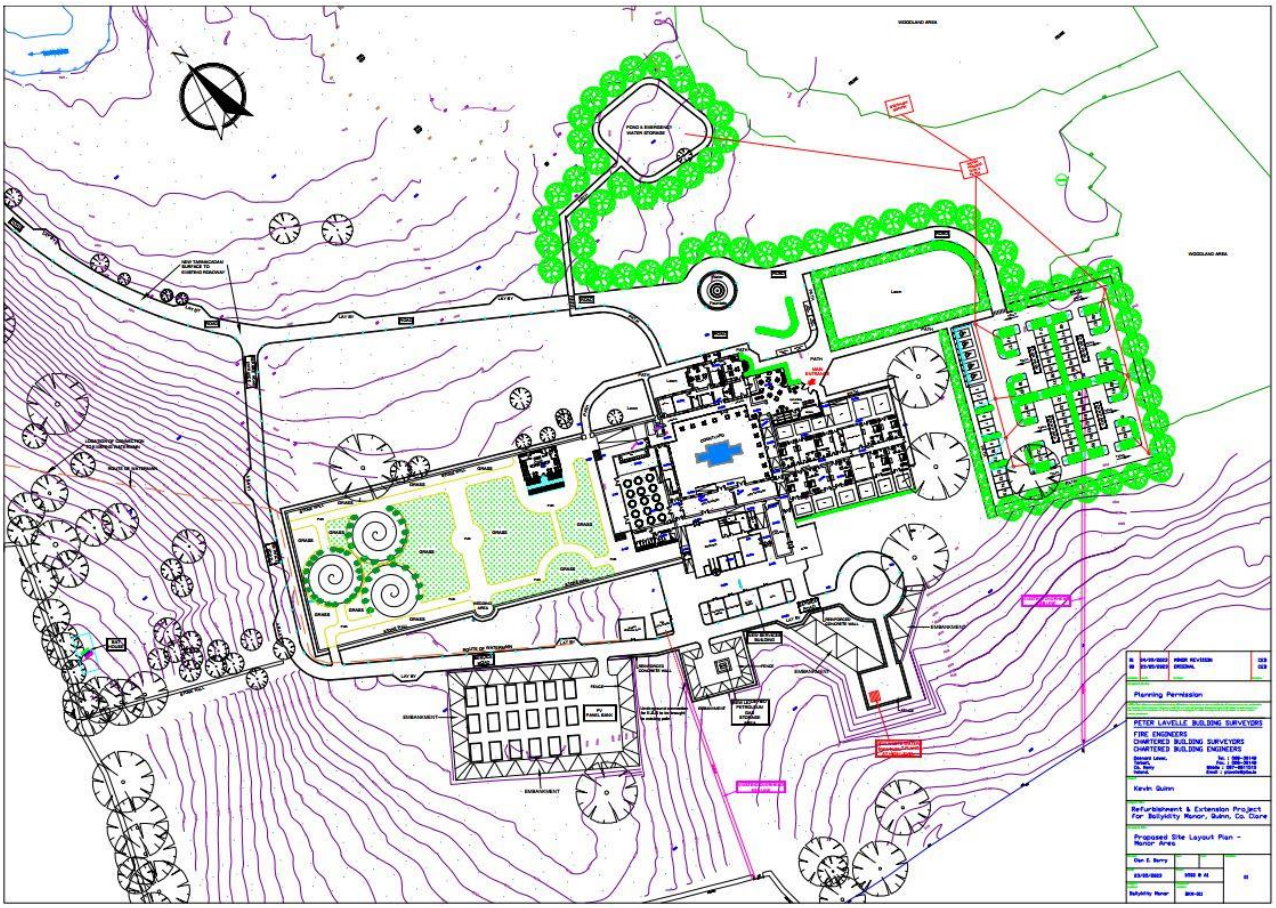

Figure 2: Propose layout of development of Ballykilty Manor, Quin, Co. Clare.

2.2.1.1 Historical Reports

Biggane, S. (2004) Assessment of the Bat Populations of Ballykilty Estate, Quin, County Clare as part of Environmental Impact Statement on the impact of proposed Hotel, leisure facilities and housing development on the bat populations of Ballykilty House. Unpublished Report, Inis Environmental Services.

This report provides information on the bat usage of Ballykilty Estate as a result of bat surveys completed on various dates in July, August and September 2004. These surveys identified that a maternity lesser horseshoe roosts was located in the stable complex (loft space) to the rear of Ballykilty House. In addition, smaller roosts for brown long-eared bats and common pipistrelles were also recorded.

The proposed development works would have resulted in the loss of this roost and therefore it was recommended to construct an alternative roost. In brief, the report recommended the following important elements:

- Replicate the current stable complex structure (e.g. natural stone walls).
- Alternative roost to be located in the top of Field C.
- Building to have a loft space (similar to original stable complex structure) divided into three rooms, with access via a trap door from the ground floor to the loft space.
- Roof to be constructed from natural slate.

Unfortunately, while the bat house was constructed it did not follow the recommendations listed above. The bat house was built in a different area (constructed in Field A), constructed from concrete blocks with plaster finish, roofed with tiles and the exit point is unsuitable for exiting maternity lesser horseshoe bats (i.e. too small to allow a large number of roosting lesser horseshoe bats to emerge efficiently – this will be elaborated on below).

Kelleher, C. (2008) Proposed development of holiday lodges within the grounds of Ballykilty Manor, Quin, Co. Clare. Unpublished Report prepared by Ardwolf Wildlife Surveys.

This report reviewed the bat house structure in view of its potential to cater for a maternity roosting site for lesser horseshoe bats. It was noted in this report that the structure was located in the wrong field, only one exit point was provided and due to extensive shading from mature trees adjacent to the building, will result in lower temperatures within the loft space rendering the structure unsuitable for its purpose.

This report makes the following recommendations to rectify the situation:

- 2nd exit point: recommended to be above the doorframe.
- Bat house heating (3 radiators to be installed and operated from March 1st to September 1st annually.

The fact that the purpose built bat house has not achieved its purpose has been noted by NPWS (pers. comm. Mr. David Lyons) as a maternity colony of lesser horseshoe bats have since 2010 taken up residence in the attic space of the main house (i.e. Ballykilty House) and not within the Bat House.

3. Methodology

3.1 Guidance Document

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 ***(Used to guide surveys undertaken in this report prior to 2024 and therefore is used as a reference in this report).***
- Collins, J. (Editor) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). Bat Conservation Trust, London. *(Updated in September 2023)*. ***(This document was used for surveys completed in 2024).***
- 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.
- NPWS & VWT (2022) Lesser Horseshoe Bat Species Action Plan 2022- 2026. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland (Version 1: Kelleher & Marnell, 2006).
- Bat Conservation Trust (2023) Bats and artificial lighting at night. Guidance Note GN08/23. BCT, London & Institution of Lighting Professionals (ILP), Warwickshire.
- National Roads Authority (2006) Guidelines for Assessment of Ecological Impacts of national Road Schemes.
- CIEEM (2022) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.2.

Collins (2016) was the principal document used to provide guidance in relation to bat survey effort required. Additional reference is made to this document in relation to determining the value of buildings, trees etc. as bat roosts. The tables referred to from this document are described in the Appendices. Many of the surveys before 2023 were completed prior to the publication of Edition 4 of the guidelines (Collins, 2023). Surveys completed in 2024 and 2025 were completed according to Collins (2023). Marnell *et al.* (2022) is referred to for guidance in relation to survey guidance (timing and survey design), derogation licences and mitigation measures.

3.2 Desktop Review

3.2.1 Bat Conservation Ireland Database

Bat Conservation Ireland acts as the central depository for bat records for the Republic of Ireland. Its' bat database is comprised of >100,000 bat records. The database primarily contains bat records from the following datasets:

- Irish Bat Monitoring Programme

The Irish Bat Monitoring Programme is comprised of four surveys (Car-based Bat Monitoring Scheme (2003-), All Ireland Daubenton's Bat Waterways Survey (2006-), Brow Long-eared Bat Roost Monitoring Scheme (2007-) and Lesser Horseshoe Bat Monitoring Scheme (1980s-). Apart from the latter survey, all monitoring data is stored on the BCIreland database.

- BATLAS 2020 & 2010

BCIreland has undertaken two all-Ireland species distribution surveys (2008-2009 for BATLAS 2010 and 2016-2019 for BATLAS 2020) of four target bat species (Common and soprano pipistrelle, Leisler's bats and Daubenton's bat).

- Ad Hoc Bat Records

Ad hoc bat records from national bat groups, ecological consultants and BCIreland members are also stored on the BCIreland database.

- Roost Records

These records are only report at a 1km level to protect the location of private dwellings and to protect such important bat records.

A 1km radius search was requested for the Irish Grid Reference R417738.

3.2.2 NPWS Lesser Horseshoe Bat Database

The 2024 NPWS Lesser Horseshoe Database contains a large volume of roost records collated by NPWS over the last four to five decades (>6,000 records for 970 roost locations). Many of the summer and winter roosts annually or regularly counted are designated as SACs (41 SAC designations with multiple roars within many of the SACs). There are also a large number of additional roost sites annually or regularly counted and such sites are considered to be important to the future survival of the Irish population. This database was consulted in relation to bat counts completed at Ballykilty House by NPWS.

3.3 Non-Bat Activity Surveys

This sections included daytime assessments for potential presence or absences of bat usage evidence and roost characterisation surveys

3.3.1 Building & Structure Inspection

Structures, buildings and other likely places that may provide a roosting space for bats are inspected during the daytime for evidence of bat usage, where access was provided. 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 are undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope).

Buildings were assessed to determine their suitability as a bat roost and described using the parameters Negligible, Low, Moderate or High suitability in view of Table 2 from Marnell *et al.* (2022). The level of suitability informs the level of surveying and timing of surveys required based on Table 7.3 of Collins (2023) (Note: These two tables are presented in Appendix 1 but a summary is provided in the table below). Surveying was carried out in the preferred months of May to September (Collins, 2023) with additional buildings undertaken during the winter to determine if hibernating bats roosting in the buildings. All buildings within the estate grounds were inspected.

Table 3a: Building Bat Roost Classification System & Survey Effort (Adapted from Collins, 2023 and Marnell *et al.*, 2022).

Suitability Category	Description (examples of criteria)	Survey Effort (Timings)
Negligible	Building have no potential as a roost site Urban setting, heavily disturbed, building material unsuitable, building in poor condition etc.	No surveys required
Low	Building has a low potential as a roost site. No evidence of bat usage (e.g. droppings)	One dusk emergence survey
Moderate	Building with some suitable voids / crevices for roosting bats Some evidence of bat usage Suitable foraging and commuting habitat present	At least one survey in May to August, minimum of two dusk emergence surveys
High	Building with many features deemed suitable for roosting bats Evidence of bat usage Largely undisturbed setting, rural, suitable foraging and commuting habitat, suitable roof void and building material	At least two surveys in May to August, with a minimum of three surveys

3.3.2 Tree Inspections

Daytime ground inspections of linear habitat features along areas where proposed works are planned were undertaken on an array of dates. During daytime general field work trees, within the road scheme, with Potential Roost Features (PRFs) were noted (i.e. location, ITM grid reference) and a ground assessment of such trees was completed. Trees that may provide a roosting space for bats were classified using the Bat Tree Habitat Key (BTHK, 2018) and categorised according to the table below. The Potential Roost Features (PRFs) listed in Bat Tree Habitat Key (BTHK, 2018) were used to determine the Potential Bat Roost (PBR) value of trees.

Trees identified as 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) 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 of features accessible from the ground were undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope).

Table 3b: Tree Potential Bat Roost PBR) Category Classification System (Collins, 2016 & 2023).

Tree Category	Description
1 High	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts (Collins (2023) = PRF-I)
2 Moderate	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats (Collins (2023) = PRF-M)
3 Low	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features (PRFs) which may have limited potential to support bats;
4 Negligible	Trees have no potential.

3.4 Night-time Bat Detector Surveys

3.4.1 Dusk & Dawn Bat Surveys

Dusk Emergence Surveys were completed from 15 minutes before sunset to at least 110 minutes post sunset and the surveyors position themselves adjacent to the building / structure to be surveyed to determine if bats are roosting within, location of roost(s), number of bats, bat species etc.

Survey Dates:
30th May 2021 (Weather conditions: clear sky, calm, sky, 17oC)
2nd June 2021 (Weather conditions: full cloud cover, dry, calm and 16oC)
25th July 2021 (Weather conditions: clear sky, calm, dry and 18oC)
7th September 2021 (Weather conditions: full cloud cover, dry, light wind and 13oC)
23rd June 2022 (Weather conditions: patchy cloud cover, calm, dry and 15oC)
30th May 2024 (Weather conditions: clear sky, calm, dry and 12oC)
3rd June 2025 (weather conditions: clear sky, dry, calm, 12oC)

Dawn surveys were completed from 110 minutes before sunrise to 15 minutes after sunrise. Surveys are completed during mild and dry weather conditions with air temperature 8°C or greater. All bat encounters are noted during surveys.

Survey Dates:
3rd June 2021 (Weather conditions: full cloud cover, dry, light wind and 13oC)
26th July 2021 (Weather conditions: full cloud cover, calm, dry and 14oC)
24th June 2022 (Weather conditions: full cloud cover, light wind, occasional showers and 9.5oC)

The following equipment was used:

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

Surveyor 2: Bat Logger M2 Spectrum Bat Detector and Petersson D200 Heterodyne Bat Detector.

Surveyor 3: Anabat Scout Full Spectrum Bat Detector and Petersson D200 Heterodyne Bat Detector.

3.4.2 Walking Transects

Walking transects were completed post Dusk Emergence Surveys and involved the surveyor(s) walking the survey area, noting the time, location and bat species encountered. Mapping of bat encounters was undertaken using QGIS and an excel file produced for mapping purposes (ITM Irish grid reference co-ordinates). Validation of bat records was completed by the principal bat surveyor prior to mapping.

Survey Dates:

30th May 2021 (Weather conditions: clear sky, calm, sky, 17oC)
2nd June 2021 (Weather conditions: full cloud cover, dry, calm and 16oC).
25th July 2021 (Weather conditions: clear sky, calm, dry and 18oC)
7th September 2021 (Weather conditions: full cloud cover, dry, light wind and 13oC).
24th June 2022 (Weather conditions: full cloud cover, light wind, occasional showers and 9.5oC)

3.4.3 Filming

A Sony Camcorder (with night shot capability) filming assisted with Infra-red lamps (connected to 12 volt batteries) was used to capture potential emerging bats from potential roosting sites. This was completed from 15 minutes before sunset till at least 110 minutes after sunset. Captured film was watched post-survey and any emerging bats were noted.

Survey Dates: 2/6/2021, 25/7/2021, 7/9/2021, 23/6/2022, 24/6/2022, 30/5/2024 & 3/6/2025.

A Guide TrackIR Pro25, Pro19 and FLIR Scion OTM255 thermal imagery scope filming was also deployed to capture potential emerging bats from potential roosting sites. This was completed from 15 minutes before sunset till at least 120 minutes after sunset and 110 minutes before sunrise to 15 minutes after sunrise. Captured film was watched post-survey and any emerging bats were noted.

Survey Dates: 2/6/2021, 25/7/2021, 7/9/2021, 23/6/2022, 24/6/2022 & 3/6/2025.

Bat detectors were attached to the filming units to aid species identified: Anabat Scout Full Spectrum Bat Detector and Pettersson D200 Heterodyne Bat Detector.

3.4.4 Passive Static Bat Detector Survey

Passive Static Bat Surveys were completed on various dates in May, June and July 2021 with extended periods of surveillance inside the attic of the main house during the autumn and winter months (2021, 2022 & 2024). This was for a comparison to the static surveillance in the bat house (Please see separate report on bat house for more details).

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 and the habitat type of where the bat detector is location is noted to allow interpretation of the results (e.g. Open verses Edge verses Closed habitat types – see table below). Static surveillance 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 positioned horizontally to reduce potential damage from rain. Wildlife Acoustics Song Meter SM4 Bat FS and Mini Bat FS Platform 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 (or micro SD cards depending on the model) and downloaded for analysis.

The recordings are analysed using Wildlife Acoustics Kaleidoscope Pro. The Auto-Id function is used for all sound files but manual verification is used to ensure the auto-id function is accurate. This is particularly important for less common bat species and cryptic bat species such as *Myotis* species. In addition, “Noise” and “Unidentified” sound files are also checked. Each sequence of bat pulses are 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.

Audio files are a maximum of 15 seconds long and each audio file is taken as a bat pass for each bat species recorded within the audio file. Each bat pass does not equate to the number of individuals of bats flying in vicinity of the recording device 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 (i.e. separate audio files within a small 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 of echolocation calls or bat pass is more likely to be indicative of individual bats.

The following static units were deployed during this static bat detector survey:

Table 3c: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
SM4 Units 1 - 8	Wildlife Acoustics SongMeter 4 Bat FS	Passive Full Spectrum	SMM-U2, 4m cable
SM Mini Bat Units 1-12	Wildlife Acoustics SongMeter Mini Bat	Passive Full Spectrum	SMM-U2

Bats produce different types of echolocation calls and each bat species family have a characteristic bat echolocation call depending largely on their morphology and preferred habitat type. The different types of echolocation calls (i.e. CF or Constant Frequency call verses a FM or Frequency Modulated call) provides different types of information and therefore are used to detect prey items or for orientation in different habitat types. These can be broadly defined as in the table below.

Table 3d: Bat Habitat Types definitions for Passive Static Bat Detector Surveys.

Bat Habitat	Definition	Example
Open	Large open space require bat to produce calls that are loud and therefore will travel far in order to detect prey items in the open sky. This is typically where Leisler's bats will forage.	Grassland field
Edge	Linear habitat features where bats produce echolocation calls that allow them to detect the linear habitat and the adjacent open space of a field for example. This is typically where *Pipistrellus* species will forage.	Hedgerows and treelines
Closed	To fly within a closed habitat of a woodland (i.e. the clutter of branches and leaves), bats produce a quite calls that provides very detailed information. This is typically where brown long-eared bats will forage.	Woodland interior
Water	This is a specific Bat Habitat Type for Daubenton's bats which produced bat echolocation calls in the same manner as a bats would produce bat echolocation calls when flying within a Closed Bat Habitat Type. Daubenton's bats typically fly 30cm above water surface and as a consequence produce echolocation calls to detect the "Clutter" of the closeness of their flight to the water surface.	Rivers

4. Bat Survey Results

A bat survey is comprised of a number of different elements. The results of these different types of surveys are presented below in a step-wise fashion and summarised at the end of the section. It is important that the whole section is read in order to gain a full impression of the potential bat value of the survey area. Due to the large array of buildings, these were the principal focus of the dusk and dawn surveys. There are also a large array of trees with numerous features that provide potential roosting sites. Trees were regularly the focus of walkabout surveys to determine if there was swarming bats to indicate trees roosts.

4.1 Desktop Review

4.1.1 Bat Conservation Ireland Database

The bat records within a 1km radius of the proposed development on the BCIreland database. This dataset consists of 2 roost bat records (which includes Ballykilty House and the second is a local cave – both are lesser horseshoe bat roosts). In addition there is six BATLAS 2010 Ad-Hoc bat detector records for the following bat species: lesser horseshoe bat, common pipistrelle, soprano pipistrelle, Leisler's bat, Daubenton's bat, Natterer's bat and brown long-eared bat.

4.1.2 NPWS Lesser Horseshoe Bat Database

Ballykilty House roost records listed on the NPWS Database is presented in the table below.

Table 4: Lesser horseshoe bat counts completed by NPWS at Ballykilty House (Source: NPWS Database).

No.	Date	No. of bats
1	12/06/2013	22
2	20/06/2014	18
3	24/06/2015	34
4	21/06/2016	55
5	21/06/2017	70
6	21/06/2018	65
7	18/06/2019	54
8	24/06/2020	50
9	30/05/2021	54

Ballykilty House is not designated an SAC but due to the presence of a lesser horseshoe bat maternity roost, it is monitored under the Lesser Horseshoe Bat Roost Survey as part of the Irish Bat Monitoring Programme (Bat Site Code 730). This survey is primarily completed by NPWS and VWT regional staff and managed by Bat Conservation Ireland. The primary conservation objectives for SAC designated for Lesser horseshoe bats is as follows:

Extent of potential foraging habitat	Hectares	No significant decline within 2.5km of qualifying roost	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 2 which shows a 2.5km zone around the above roost and identifies potential foraging grounds
Linear features	Kilometres	No significant loss within 2.5km of qualifying roost. See map 2	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost (Schofield, 2008)
Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roost or along commuting routes within 2.5km of the roost. See map 2	Lesser horseshoe bats are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing energetic costs for bats (Schofield, 2008)

Figure 3: Conservation Objectives relating to lesser horseshoe bats.

NPWS & VWT (2002) states that it is essential, that existing foraging habitat supporting colonies is retained, and that steps are taken to provide new habitat. The optimal foraging habitats for this species are deciduous woodlands, riparian vegetation and mature hedgerows within a few kilometres of a roost. In the absence of woodland, areas of scrub close to roosts are also deemed important and should be retained. NPWS & VWT (2022) also recommends that there is no significant increase in artificial lighting adjacent to roosts of importance, or along commuting routes within 2.5km of these roosts, and that a list of recommendations should be provided to each local authority on how to reduce or mitigate existing high levels of light intensity in the vicinity of roosts or foraging areas.

4.2 Daytime Inspections

4.2.1 Building & Structure Inspection

The following buildings were inspected on prior to dusk surveys (dates listed in previous sections). Bat droppings were recorded in a number of buildings but the principal area of bat roosting evidence was within the main house. Please see photographs of the buildings present.

The buildings are in various conditions due to neglect and numerous attempts to develop the buildings in the last decade. As a consequence, many of the buildings have been dramatically changed since the original survey undertaken in 2004. The principal changes include the removal of the loft space of the stable building (Plate 3a, b, c) which resulted in the loss of the lesser horseshoe bat and brown long-eared bat roosts. These two species have since taken up roosting in the main house. The “Single Storey Ruined Shed” described below had a slate roof during the 2004 surveys and was recorded as a light sampling area for lesser horseshoe bats (Plate 3b). The windows of Ballykilty House have been boarded up apart from one window to allow an exit point suitable for lesser horseshoe bats (Plate 1c).

Table 4: Buildings / Structures inspection results.

Building Code	Description	ITM Grid Reference	Roost Type / Suitability	Bat Species
Main House Plates 1a, b, c	Large 2-storey house with modern extension to rear of structure. Slate roof, two attic spaces.	541056,673253	High Droppings for at least 4 species of bat recorded internally.	Lesser horseshoe bat Brown long-eared bat *Myotis* spp. *Pipistrellus* spp.
Single storey shed Plate 2a	Building with two sections, one section is open arched and the remaining is a closed section.	541063,673222	Moderate No dropping recorded.	No bat species recorded.
Stable building Plate 2a, b, c	Large natural stone stable building with slate roof.	541037,673218	Moderate Droppings Suitable crevices, but bright within structure. No loft.	*Myotis* spp.
Single storey ruined shed Plate 2b	Natural stone structure with no roof.	541030,673239	Low to Moderate	No bat species recorded.
Bar building Plate 3a, b	Large modern extension with slate roof and loft section with large opening into the loft.	541064,673203	Moderate Droppings	*Pipistrellus* spp.
Bat House	Bungalow style with loft, tile roof, bituminous felt.	540918,673286	High Droppings and visible bats	Lesser horseshoe bat Brown long-eared bat

Plate 1a: Main house of Ballykilty Manor, Quin, Co. Clare – Front View.

Plate 1b: Main house of Ballykilty Manor, Quin, Co. Clare - Rear. Red arrows indicate exit points recorded.

Please note: there is a 6th exit point, this is located on the ground floor to the front of the house (gable). It is a 40cm x 40cm hole in the wall that Lesser horseshoe bats use as an additional exit point to Exits 1 & 2. With the presence of a barn Owl (owl pellets noted during 20/3/2024 internal inspection), it is likely that this exit point is an important alternative if the owl is present during dusk emergence.

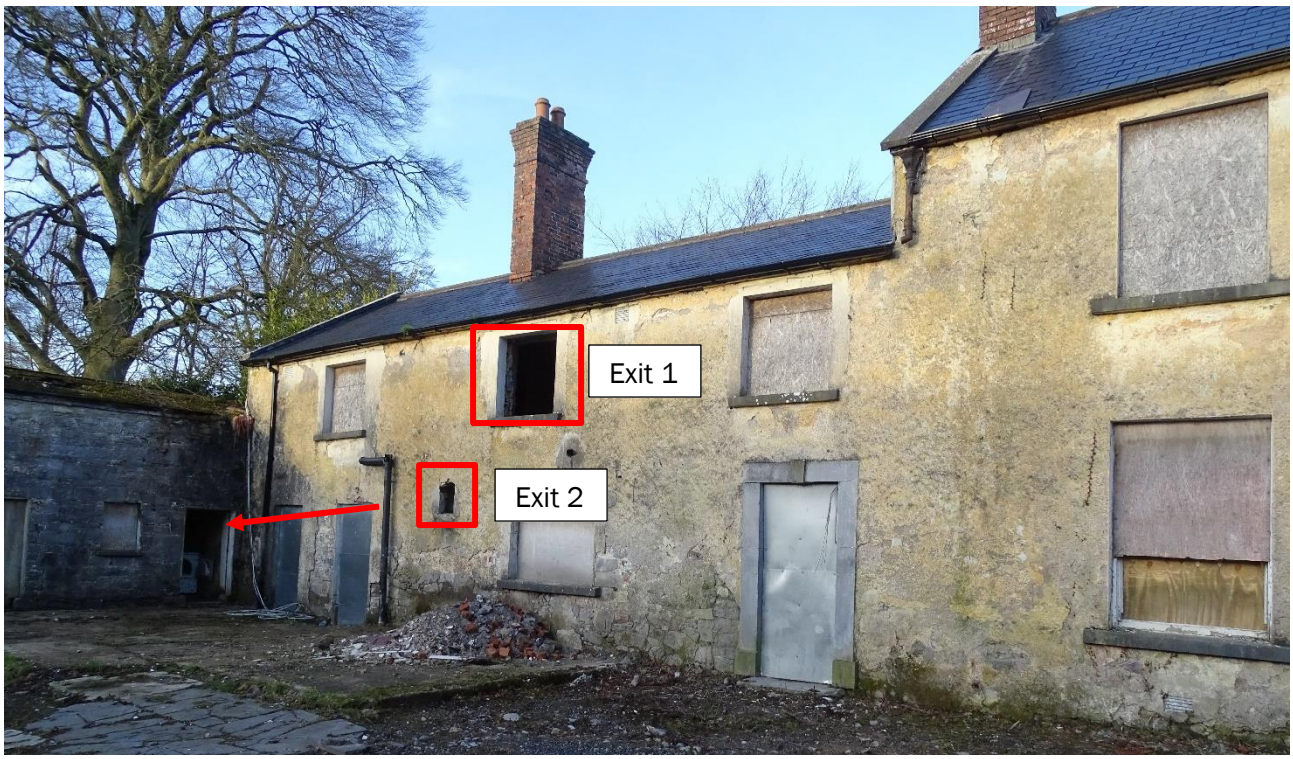

Plate 1c: Modern extension of main house of Ballykilty Manor, Quin, Co. Clare - Rear. Red squares are 2 of the 3 exits points recorded for lesser horseshoe bats (Exit 1 and 2). The red arrow indicates the direction of the commuting bats – into the adjoining derelict building and along the walled garden.

Plate 1d: Modern extension of main house of Ballykilty Manor, Quin, Co. Clare – front gable exit (Exit 6).

Plate 2a: Single storey shed and a section of the Stable building of Ballykilty Manor, Quin, Co. Clare.

Plate 2b: Section of the Stable building and single storey ruined shed of Ballykilty Manor, Quin, Co. Clare.

Plate 2c: Internal space of stable building Ballykilty Manor, Quin, Co. Clare.

Plate 3a: Bar Building of Ballykilty Manor, Quin, Co. Clare.

Plate 3b: Internal space of Bar Building of Ballykilty Manor, Quin, Co. Clare. This building has a loft space for ¾ of the roof area.

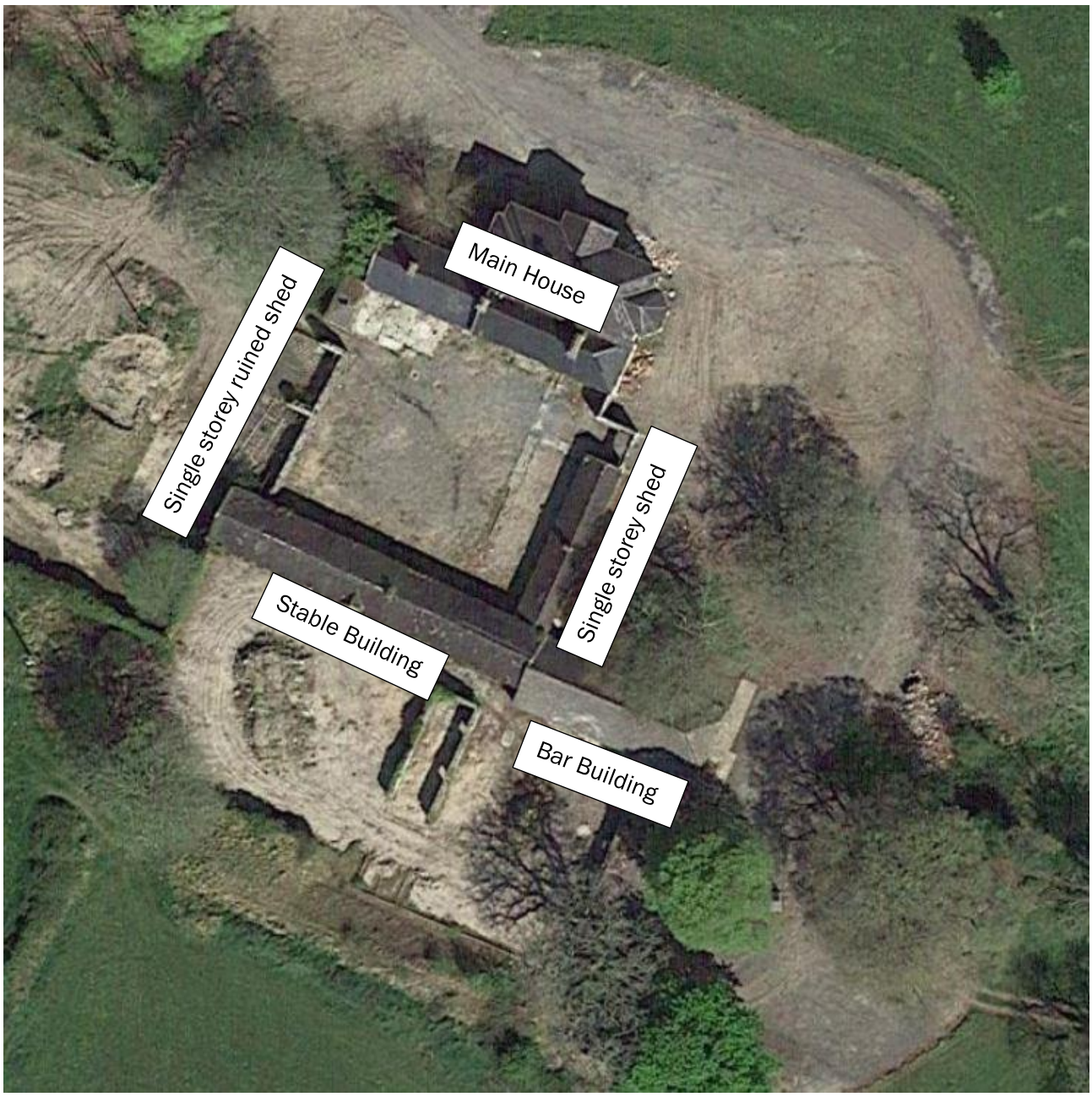

Figure 3: Aerial photograph of buildings located at Ballykilty Manor, Quin, Co. Clare (Source: GoogleMaps).

4.2.2 Tree Potential Bat Roost (PBRs) Inspection

The following trees were inspected on 4th February 2022. Trees mark for felling by the tree survey report (Poplar Tree Services, dated 7th December 2021) were inspected and categorised in relation to their PBR value (Highlighted in orange in the table below). It should be noted that trees identified by tree surgeons for removal are trees that tend to be used by bats as roosting sites primarily because such trees have dead wood, wounds etc that bats will use to roost in. Therefore, even tree surgery works (i.e. removal of dead wood features etc.) will reduce the bat roosting resource in existing trees within the survey area. A small number of additional trees within the survey area (please note not all trees listed in the tree report were inspected) were also inspected in order to highlight the importance of many of the trees within the grounds of Ballykilty Manor, Quin, Co. Clare. Two tree roosts were confirmed and these are listed under section 4.2.1.

A total of 44 trees are proposed to be felled, 17 of which are not considered to have a PBR value. All other trees proposed to be felled are considered to be of PBR value, 17 are Category 1 PRB value, seven are Category 2 PBR value and three are Category 3 PBR value.

Table 5: Tree PBR inspection results.

Tree No.	Tree Species	PRFs	PBR Value
101	Beech	Dead wood	Category 1
102	Oak	Dead wood	Category 1
103	Beech	Dead wood	Category 1
104	Ash	Dead wood	Category 1
105	Beech	Dead wood	Category 1
106	Beech	Dead wood, wounds	Category 1
107	Oak	Dead wood, wounds	Category 1
108	Horse chestnut	Dead wood, wounds	Category 1
109	Beech	Dead wood, wounds	Category 1
111	Willow	No PRF features	Not suitable
112	Willow	No PRF features	Not suitable
117	Beech	No PRF features	Not suitable
118	Cherry laurel	No PRF features	Not suitable
119	Cherry laurel	No PRF features	Not suitable
120	Ash	No PRF features	Not suitable
121	Beech	Dead wood, wounds	Category 1
122	Ash	No PRF features	Not suitable
123	Ash	No PRF features	Not suitable
124	Beech	No PRF features	Not suitable
125	Beech	No PRF features	Not suitable
126	Ash	No PRF features	Not suitable
127	Ash	Dead wood, wounds	Category 2
128	Beech	Dead wood, wounds	Category 2
129	Beech	No PRF features	Not suitable
130	Ash	Dead wood, wounds	Category 2
131	Ash	Dead wood, wounds	Category 2
133	Ash	No PRF features	Not suitable
135	Ash	No PRF features	Not suitable
136	Beech	Dead wood, wounds	Category 1
139	Ash	Dead wood, wounds	Category 2
141	Conifer	Ivy growth	Category 3
142	Conifer	Ivy growth	Category 3

149	Oak	No PRF features	Not suitable
153	Ash	No PRF features	Not suitable
157	Ash	Dead wood, wounds	Category 2
168	Oak	Dead wood, wounds	Category 1
175	Elm	Dead tree	Category 2
205	Scot's Pine	Dead tree	Category 1
220	Beech	Dead wood, wounds	Category 1
231	Beech	Dead wood, wounds	Category 1
251	Ash	Ivy growth	Category 3
263	Ash	No PRF features	Not suitable
270	Beech	Dead wood	Category 1
272	Oak	Dead tree	Category 1
288	Oak	Dead wood, wounds	Category 1
299	Oak	Dead wood, wounds	Category 1
326	Oak	Dead wood, ivy growth	Category 1
346	Beech	Spilt limbs, tree holes, ivy	Category 1
361	Beech	Heavy ivy growth, dead wood, spilt limbs	Category 1
405	Beech	Spilt limbs, tree holes, dead wood	Category 1
414	Ash	Spilt limbs, tree holes, dead wood	Category 1

Plate 4: Example of trees within Ballykilty Manor, Quin, Co. Clare.

4.2.3 Bat Habitat & Commuting Routes Mapping

The habitat types, with reference to Fossit (2000) were recorded both within the survey area and adjacent to the survey area on 30th May 2022

Table 6a: Habitat types present within survey area.

Habitat	Yes	Habitat	Yes	Habitat	Yes	Habitat	Yes
Cultivated land		Salt marshes		Exposed rock		Fens/flushes	
Built land	√	Brackish waters		Caves		Grasslands	√
Coastal structures		Springs		Freshwater marsh	√	Scrub	√
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	√
Sea cliffs/islets		Disturbed ground	√	Heath		Conifer plantation	
Sand dunes		Watercourse	√	Bog		Woodland	√

Table 6b: Habitat types present adjacent to survey area.

Habitat	Yes	Habitat	Yes	Habitat	Yes	Habitat	Yes
Cultivated land		Salt marshes		Exposed rock		Fens/flushes	
Built land	√	Brackish waters		Caves		Grasslands	√
Coastal structures		Springs		Freshwater marsh	√	Scrub	√
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	√
Sea cliffs/islets		Disturbed ground	√	Heath		Conifer plantation	
Sand dunes		Watercourse	√	Bog		Woodland	√

Plate 5: View of parkland and woodland habitats within the survey area.

4.3 Night-time Bat Detector Surveys

The following tables summarises the results of the bat detector surveys completed. Due to the large array of surveys completed, the surveys for Ballykilty House are presented separate to other buildings to give a clearer indication of the importance of the main house for bats. During the Autumn and Winter months, a dusk or dawn survey was not undertaken but the internal rooms and attics were inspected for roosting bats. Static surveillance was also undertaken (Please note: a separate monitoring report for the bat house was prepared).

4.3.1 Ballykilty House

4.3.1.1 Dusk & Dawn Bat Surveys

The results confirm that the main house provides roosting for four species of bat: lesser horseshoe bat (maternity roost – maximum count 101 individuals recorded during surveys), brown long-eared bat (maternity roost – maximum count 10 individuals recorded during surveys), soprano pipistrelle (satellite roost – maximum count 9 individuals recorded during surveys) and Natterer's bat (satellite roost – maximum count 2 individuals recorded during surveys). There are six recorded exit points used by the bats (See Plate 1b and 1c for more details).

The purpose built bat house was monitored during routine surveys and a separate report is available in relation to the results of this bat work.

Citation: Bat Eco Services (2025) Renovation works and bat monitoring of a purpose built bat house at Ballykilty Manor, Quin, Co. Clare. Unpublished report prepared for PLBS.

Table 7a: Ballykilty House survey results.

Survey Date	Roost Type & Location	Bat Species (No. of bats)	Access Points	Vegetation / Lighting
30/5/2021 Dusk Survey assisted with IR and Thermal Imagery filming Static surveillance	Main attic space: lesser horseshoe bats (LHB), soprano pipistrelles (SP)	LHB – Exit 1 & 2: 39 individuals Exit 6: 15 individuals SP – Exit 1: 2 individuals Exit 3: 5 individuals	Exit 1 & 2– window to rear of house + lower window Exit 6 – Wall window at gable, front of house Exit 3 – Facia & soffit along modern extension (rear)	No lighting Mature trees adjacent to Exit 6. Stone wall courtyard adjacent to Exit 2.
2/6/2021 Dusk Survey assisted with IR and Thermal Imagery filming	Main attic space: lesser horseshoe bats (LHB), brown long-eared bats (BLE), soprano pipistrelles (SP)	LHB – Exit 1 & 2: 45 individuals Exit 6: 12 individuals SP – Exit 1: 2 individuals Exit 3: 7 individuals BLE – Exit 4: 2 individuals Natts –	Exit 1 & 2– window to rear of house + lower window Exit 6 – Wall window at gable, front of house Exit 3 – Facia & soffit along modern extension (rear)	No lighting Mature trees adjacent to Exit 6. Stone wall courtyard adjacent to Exit 2.

		Exit 1 – 1 individual		
3/6/2021 Dawn Survey – inside main house	Main attic space: lesser horseshoe bats (LHB), brown long-eared bats (BLE), soprano pipistrelles (SP), Natterer's bat (Natt)	BLE – 8-10 individuals swarming in loft room (where Exit 1 leads into) SP – 1 individual flying in attic room Natts – 1 individual flying in attic room	From loft room, there is direct access to the ceiling leading to main attic space. Also direct access throughout house via corridors etc. BLE – recorded entering the main attic space by the lead flashing around the chimneys.	Not applicable
25/7/2021 Dusk Survey assisted with IR and Thermal Imagery filming Static surveillance NOTE – exit points are depicted on photographs of buildings.	Main attic space: lesser horseshoe bats (LHB), brown long-eared bats (BLE), soprano pipistrelles (SP), Natterer's bat (Natt) Static results: lesser horseshoe bat and soprano pipistrelle	LHB – Exit 1 & 2: 87 individuals Exit 6: 14 individuals SP – Exit 3: 7 individuals BLE – Exit 4 & 5: 3 individuals Natts – Exit 1 – 2 individuals	Exit 1 & 2– window to rear of house + lower window Exit 6 – Wall window at gable, front of house Exit 3 – Facia & soffit along modern extension (rear) Exit 4 – lead flashing around chimneys Exit 5 – facia board of main attic space	No lighting Mature trees adjacent to Exit 6. Stone wall courtyard adjacent to Exit 2.
7/9/2021 Dusk Survey assisted with IR and Thermal Imagery filming	Main attic space: lesser horseshoe bats (LHB), brown long-eared bats (BLE), soprano pipistrelles (SP), Natterer's bat (Natt)	LHB – Exit 1 & 2: 48 individuals Exit 6: 22 individuals SP – Exit 3: 7 individuals BLE – Exit 4: 3 individuals Natts – Exit 1 – 2 individuals	Exit 1 & 2– window to rear of house + lower window Exit 6 – Wall window at gable, front of house Exit 3 – Facia & soffit along modern extension (rear) Exit 4 – lead flashing around chimneys	No lighting Mature trees adjacent to Exit 6. Stone wall courtyard adjacent to Exit 2.
5/11/2021 Internal inspection of attics and rooms	Main attic space: lesser horseshoe bats (LHB)	LHB – 2 individuals in main attic, 1 individual hanging in curtain Droppings recorded in both attics, rooms and corridors	No applicable	No applicable

19/11/2021 Internal inspection of attics and rooms	Main attic space: lesser horseshoe bats (LHB)	LHB – 3 individuals in main attic, 1 individual hanging in curtain, 1 individual hanging from coving Droppings recorded in both attics, rooms and corridors	No applicable	No applicable
4/2/2022 Internal inspection of attics and rooms	Main attic space: lesser horseshoe bats (LHB)	LHB – 1 individual in main attic, 1 individual hanging from coving Droppings recorded in both attics, rooms and corridors	No applicable	No applicable
23/6/2022 Dusk Survey assisted with IR Imagery filming	Main attic space: lesser horseshoe bats (LHB), brown long-eared bats (BLE), soprano pipistrelles (SP), Natterer's bat	LHB – Exit 1 & 2: 49 individuals Exit 6: 10 individuals BLE – Exit 5 – 8 individuals SP – Exit 3: 2 individuals Natt – Exit 1 – 2 individuals	Exit 1 & 2– window to rear of house + lower window Exit 6 – Wall window at gable, front of house Exit 3 – Facia & soffit along modern extension (rear) Exit 5 – Facia & soffit of main attic	No lighting Mature trees adjacent to Exit 6. Stone wall courtyard adjacent to Exit 2.
20/3/2024 Internal inspection of attics and rooms	Internal space of house and attic spaces were inspected	No bats present	No applicable	No applicable
30/5/2024 Dusk Survey assisted with IR Imagery filming	Main attic space: lesser horseshoe bats (LHB), brown long-eared bats (BLE), soprano pipistrelles (SP), Natterer's bat	LHB – Exit 1 & 2: 29 individuals Exit 6: 18 individuals BLE – Exit 5 – 6 individuals SP – Exit 3: 4 individuals Natt – Exit 1 – 2 individuals	Exit 1 & 2– window to rear of house + lower window Exit 6 – Wall window at gable, front of house Exit 3 – Facia & soffit along modern extension (rear) Exit 5 – Facia & soffit of main attic	No lighting Mature trees adjacent to Exit 6. Stone wall courtyard adjacent to Exit 2.

3/6/2025 Dusk Survey assisted with IR Imagery filming	No internal inspection of building. Dusk survey only.	LHB – Exit 1 & 2: 22 individuals Exit 6: 25 individuals BLE – Exit 5 – 2 individuals SP – Exit 1: 1 individual Natt – Exit 1 – 2 individuals	Exit 1 & 2– window to rear of house + lower window Exit 6 – Wall window at gable, front of house Exit 5 – Facia & soffit of main attic	No lighting Mature trees adjacent to Exit 6. Stone wall courtyard adjacent to Exit 2.

Please note that during the internal inspection of the building on 20th March 2024 a Barn Owl exited the building (disturbed by our surveyors presence) and a large number of owl pellets were recorded on the floor of the loft room where Exit 1 is located (Plate 1c).

In relation to the total number of lesser horseshoe bats recorded during the surveys completed as a result of dusks surveys or internal inspections of Ballykilty House, the following table presents this.

Table 7b: Total number of Lesser horseshoe bats recorded roosting in Ballykilty House.

No.	Date	Total No. of Bats	Type of Roost	Type of Survey
1	30/05/2021	54	Maternity	Dusk Survey
2	02/06/2021	57	Maternity	Dusk Survey
3	25/07/2021	101	Maternity	Dusk Survey
4	07/09/2021	70	Maternity	Dusk Survey
5	05/11/2021	3	Hibernation	Internal Inspection
6	19/11/2021	5	Hibernation	Internal Inspection
7	04/02/2022	2	Hibernation	Internal Inspection
8	23/6/2022	59	Maternity	Dusk Survey
9	20/03/2024	0	Hibernation	Internal Inspection
10	30/05/2024	47	Maternity	Dusk Survey
11	3/6/2025	47	Maternity	Dusk Survey

During the 2025 survey, an opportunity was undertaken to survey the Bat House. A dusk survey was completed and one lesser horseshoe bat emerged (1st floor, gable exit – Plate 6a & b)) while two soprano pipistrelles emerged from the eaves. Therefore a total of 48 lesser horseshoe bats were recorded between the Bat House and Ballykilty House.

Plate 6a, b: Screenshot of thermal imagery filming of Bat House 1st Floor Gable Exit. Lesser horseshoe bat exit (6a) and soprano pipistrelle exit (Red heat signature in 6b)

4.3.2 Static Surveillance – Ballykilty House

A static unit was frequently placed inside the loft room of Ballykilty House during the survey years. The results of these are presented below.

4.3.2.1 Static Surveillance 2021

A unit was placed for one night on the 25th July 2021 to recorded bats roosting inside the structure. A total of three bat species were recorded in the Loft Room: Lesser horseshoe bats, common pipistrelle and soprano pipistrelle. This was the first recording of a common pipistrelle inside the building and may indicate that occasional individual of this species enters the building to roost.

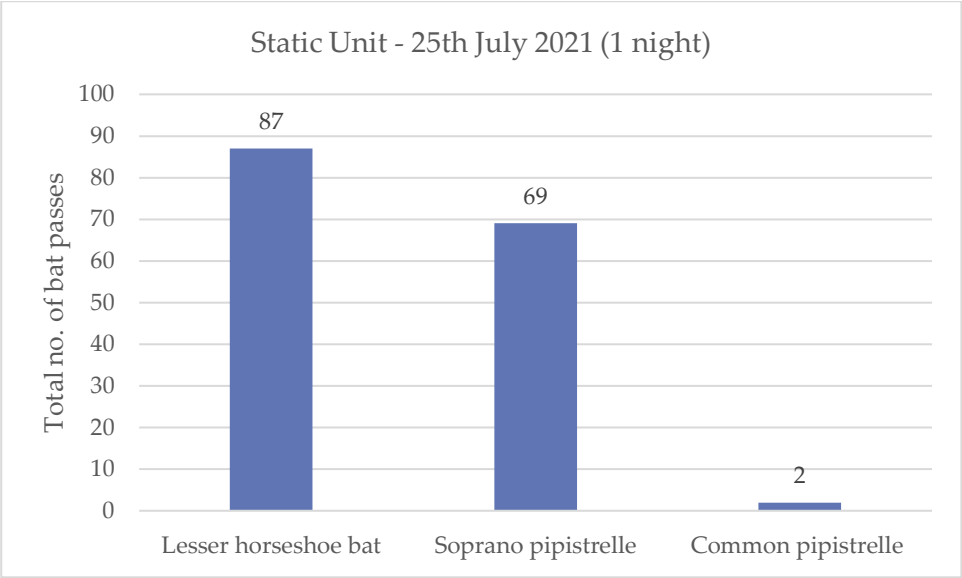

Figure 4a: Total number of bat passes recorded for each species of bat on static unit deployed. Please note: number of bat passes does not equal to number of individual bats. It is a measure of bat activity.

A second static unit was placed in one of upper corridor of the houses (below attic space) for one night also and the following bat species were recorded: lesser horseshoe bats (7 passes); Natterer's bat (4 passes), brown long-eared bat (2 passes), soprano pipistrelle (8 passes) and *Myotis* species (1 pass). No common pipistrelles were recorded on this static unit.

4.3.2.2 Static Surveillance 2024

A static unit was placed in Ballykilty House (Loft Room) on 26th March 2024 for nine nights of recording. Four species of bat was recorded: lesser horseshoe bat, Natterer's bat, soprano pipistrelle and brown long-eared bat. The following graph provides the total number of bat passes recorded for each species per night of surveillance.

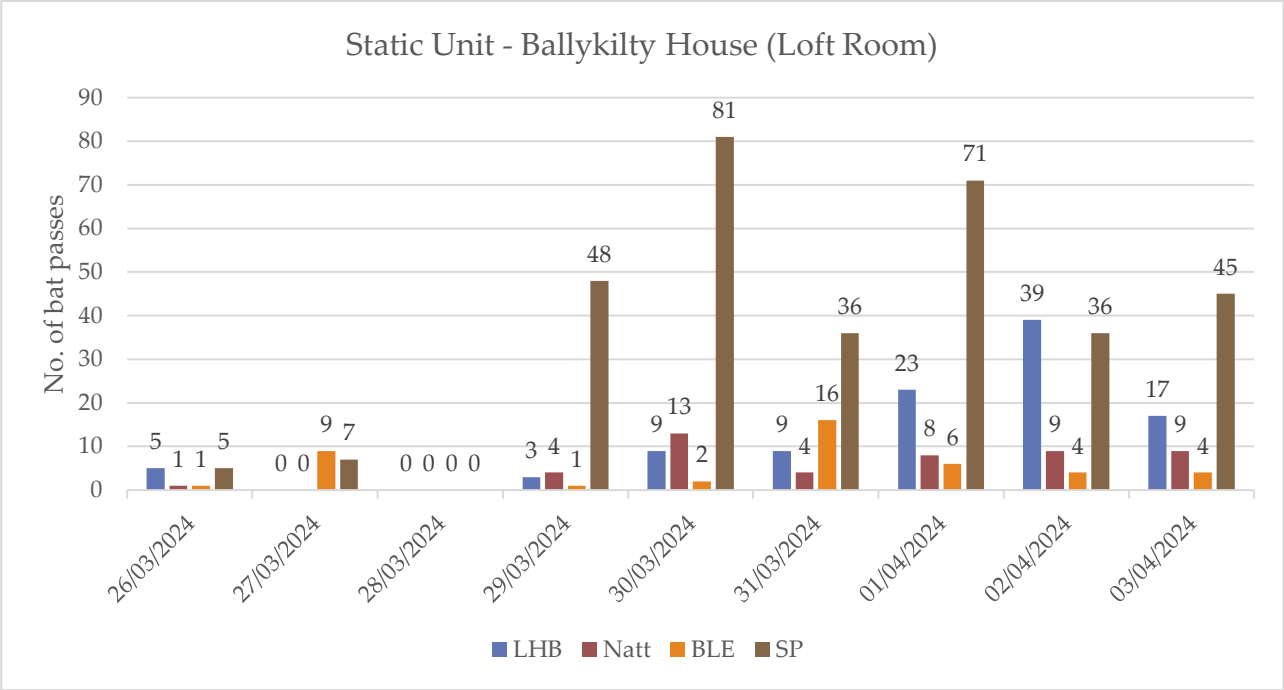

Figure 4b: Number of bat passes recorded per night for each species of bat roosting in Ballykilty House during 2024 Static Surveillance. LHB = lesser horseshoe bat, Natt = Natterer's bat, BLE = brown long-eared bat & SP = soprano pipistrelle.

4.3.3 Dusk & Dawn Surveys – Additional Buildings & Trees

Additional roosts were recorded in other buildings as well as two trees roosts. The additional building roosts were satellite roosts and/or day roosts for bat species recorded in the main house. One of the tree roosts (Oak tree) is a maternity roost for Leisler's bats as well as a satellite roost for soprano pipistrelles. The second tree roost is a day roost for Leisler's bats and soprano pipistrelle. Overall, seven species of bat was recorded: Lesser horseshoe bat, Leisler's bat, brown long-eared bat, Natterer's bat, Daubenton's bat, common pipistrelle and soprano pipistrelle.

Table 7b: All other buildings - survey results.

Building Code	Roost Type & Location	Bat Species (No. of bats)	Access Points	Vegetation / Lighting
Bar Building 2/6/2021 Dusk Survey assisted with IR filming Static surveillance	Loft space: lesser horseshoe bats (LHB) Due to the open structure of this building, bat calls recorded also represent bats flying by.	LHB - Exit 1: 2 individuals **Static unit (1 night – 25/7/2021)** LHB: 1 pass Daub bat – 1 pass Natt – 1 pass Myotis – 14 passes Leis – 11 passes CP – 3 passes SP – 193 passes BLE – 2 passes	Exit 1 – opening into a loft space Soprano pipistrelles recorded flying inside the building during the night.	No lighting Adjacent to mature trees
Stable Building 2/6/2021 Dusk Survey	Natural stone building – open space, no loft space. Bats in rafters.	BLE – 1 individual Natterer's bat – 1 individual	Open windows and doorways.	No lighting Walled garden connected to building
Stable Building 25/7/2021 Dusk Survey Static surveillance	Natural stone building – open space, no loft space. Bats in rafters.	Natterer's bat – 2 individuals **Static (1 night – 25/7/2021)** SP – 1 pass	Open windows and doorways.	No lighting Walled garden connected to building
Single storey shed 25/7/2021 Static surveillance only	Open rafters (Pump House) – modern concrete blocks. Due to the open structure of this building, bat calls recorded also represent bats flying by.	**Static (1 night – 25/7/2021)** LHB: 57 passes Daub bat – 1 pass Natt – 1 pass Myotis spp. – 13 passes Leis – 10 passes CP – 1 pass SP – 150 passes BLE – 2 passes	Open windows and doorways. A number of bat species were recorded on the static unit in building – due to narrow calls of LHB, the recording of this species indicates a Night Roost (57 passes)	No lighting Adjacent to mature trees

Bar Building 26/7/2021 Dawn Survey	Loft space: soprano pipistrelle	SP - Exit 1: 2 individuals	Exit 1 – opening into a loft space	No lighting Adjacent to mature trees
Tree Roost – Oak tree Tree Tag 362 6/7/2021 Dawn Survey (Thermal imagery filming)	Large dead limb	Leisler's bats – 28 individuals	Open cracks in limb	No lighting Mature trees in parkland setting
Tree Roost – Oak tree Tree Tag 362 23/6/2022 Dusk Survey (Thermal imagery filming)	Large dead limb is the main roost. Additional features used by other bat species.	Leisler's bats – 25 individuals Soprano pipistrelles – 14 individuals	Open cracks in limb	No lighting Mature trees in parkland setting
Tree Roost – Oak tree Tree Tag 362 3/6/2025 Dusk Survey (Thermal imagery filming)	Large dead limb is the main roost. Note: this tree has suffered extensive storm damage with the upper half of the tree now missing. As a consequence, the limb used as a roost is open to the weather.	Leisler's bats – 3 individuals Soprano pipistrelles – 14 individuals	Open cracks in limb	No lighting Mature trees in parkland setting
Tree Roost – Beech tree 24/6/2022 Dawn survey (Thermal imagery filming)	Tree holes and dead wood	Leisler's bats – 1 individual Soprano pipistrelles – 2-3 individuals	Tree holes and dead wood	No lighting Mature trees in parkland setting

Note: LHB = lesser horseshoe bat; Daub = Daubenton's bat, Natt = Natterer's bat, Myotis = Myotis spp.; Leis = Leisler's bat, CP = Common pipistrelle, SP = Soprano pipistrelle & BLE = Brown long-eared bat.

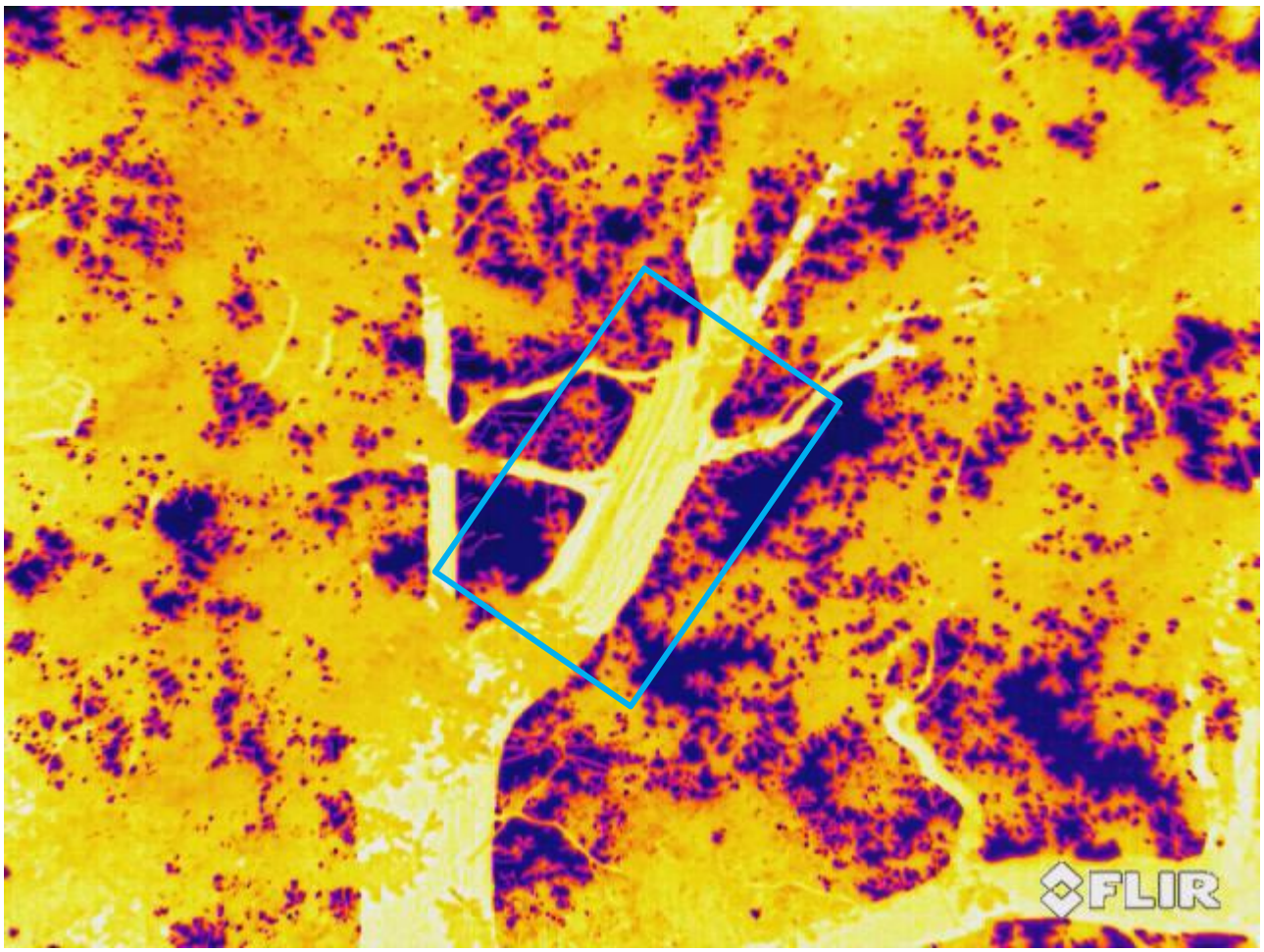

Plate 7: Thermal imagery view of filming of Oat Tree (Tree Tag 362) on 3/6/2025. Limb where bats roost is mark by Blue rectangle.

4.3.4 Dusk & Dawn Survey of Walled Garden

A walled garden is located west of the main house. Sections of the walls are in poor condition and it was requested by PLBS to complete survey work on five sections in order to determine if bats were roosting within the crevices. This survey work was undertaken on the 23rd (Dusk) and 24th (Dawn) June 2022. This was to facilitate repair works on the walls.

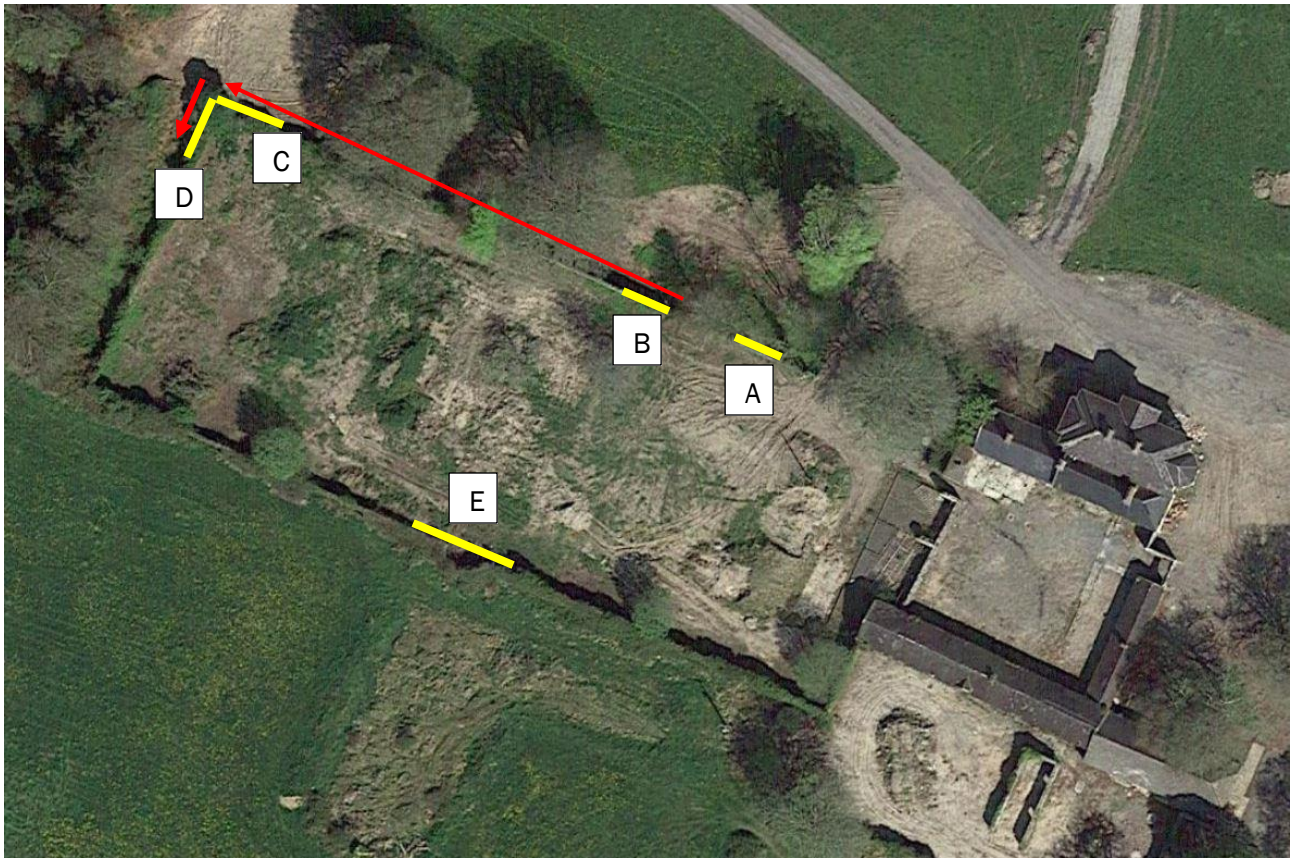

Figure 4: Aerial photograph of the walled garden, Ballykilty Manor, Quin, Co. Clare (Source: GoogleMaps).

The walls were inspected prior to the dusk survey and post the dawn survey using a torch and endoscope. No bats were recorded within the crevices. Each section of the walls were also surveyed by filming during either dusk or dawn using IR or Thermal Imagery. No bats were recorded emerging from crevices and/or returning to crevices during these surveys.

However, bats (lesser horseshoe bats, soprano pipistrelles and brown long-eared bats) were confirmed commuting along the wall of Section A, B and C towards mature trees further west. This commuting route was principally along the external face of the wall under the canopy of mature trees (red arrows). A total of 59 bats were recorded on thermal imagery filming commuting along the red arrows shown on Figure 4. A total of 71 bats (all species recorded) were noted emerging during the dusk survey on the 23/6/2022. Therefore at least 83% of these bats commuted west of Ballykilty House, possibly towards the River Rinn and adjoining woodlands. Biggane (2004) also noted commuting principally in this direction and recorded bats commuting along the river towards Dromoland Castle, an area that would provide extensive foraging for local bat populations and located approximately 3km SW of the proposed development site.

4.3.5 Passive Static Bat Detector Survey

The following table summarises the results recorded on the static units deployed in 2021 to collate information on bat species foraging and commuting within the grounds of Ballykilty Manor, Quin, Co. Clare. A total of seven bat species were recorded: soprano pipistrelle, common pipistrelle, Leisler's bat, brown long-eared bat, Natterer's bat, Daubenton's bat and lesser horseshoe bat.

Table 8: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Code	Location Description / Bat Habitat Type	Grid Reference	Survey Period	Bat Species
SM4 Unit 1 **Static 1**	On mature trees along treeline avenue adjacent to River Rine (entrance to manor)	540821, 673537	30/5/2021 to 3/6/2021 (4 nights)	Soprano pipistrelle Common pipistrelle Leisler's bat Brown long-eared bat Daubenton's bat Natterer's bat
SM4 Unit 4 **Static 2**	Mature tree to LHS of main house	540979, 673291	30/5/2021 to 3/6/2021 (4 nights)	Soprano pipistrelle Common pipistrelle Leisler's bat Brown long-eared bat Daubenton's bat Natterer's bat Lesser horseshoe bat
SM4 Unit 5 **Static 3**	Mature tree to RHS of main house	541092, 673199	30/5/2021 to 3/6/2021 (4 nights)	Soprano pipistrelle Common pipistrelle Leisler's bat Brown long-eared bat Daubenton's bat Natterer's bat Lesser horseshoe bat
SM4 Unit 3 **Static 4**	Mature tree in woodland adjacent to river	541180, 673286	30/5/2021 to 3/6/2021 (4 nights)	Soprano pipistrelle Common pipistrelle Leisler's bat Brown long-eared bat Daubenton's bat Lesser horseshoe bat

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 tend to forage as they commute and therefore are regularly observed flying up and down a treeline or hedgerow before moving on in the landscape. This can result in multiple passes being recorded for an individual bat. 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.

Figure 5: Location of static units deployed during static surveillance, Ballykilty Manor, Quin, Co. Clare.

4.3.6 Summary of Night-time Survey Results

The following figures depict the location of bat encounters during the night-time bat surveys, dusk and dawn surveys and static surveillance. These maps provide information with regards to the distribution of the different bat species recorded within the survey area: lesser horseshoe bat, brown long-eared bat, Leisler's bat, soprano pipistrelle, common pipistrelle, Daubenton's bat and Natterer's bat. Five of these species were also recorded roosting within the survey area: lesser horseshoe bat, brown long-eared bat, Leisler's bat, soprano pipistrelle and Natterer's bat and the location of the roosts are indicated by the letter R on the appropriate figures. In addition, the recorded commuting routes (R arrows) are also depicted on the figures, where recorded.

4.3.6.1 Lesser horseshoe bat

This species of bat was principally recorded during the dusk and dawn surveys of the known roost in the main house. Due to the narrow echolocation call produced by this bat species, it is often difficult to record this species once individuals are foraging and commuting within the landscape. However, due to the level of surveys, it was documented that bats commuted west through the walled garden towards the mature trees adjacent to the Bat House and north-east towards the woodland as shown by the arrows on Figure 6a: Individuals were also recorded foraging within the woodland area located north-east of the main house and along the linear woodland adjacent to the river. This species was recorded roosting in the main house, bar room and the bat house (See Figure below).

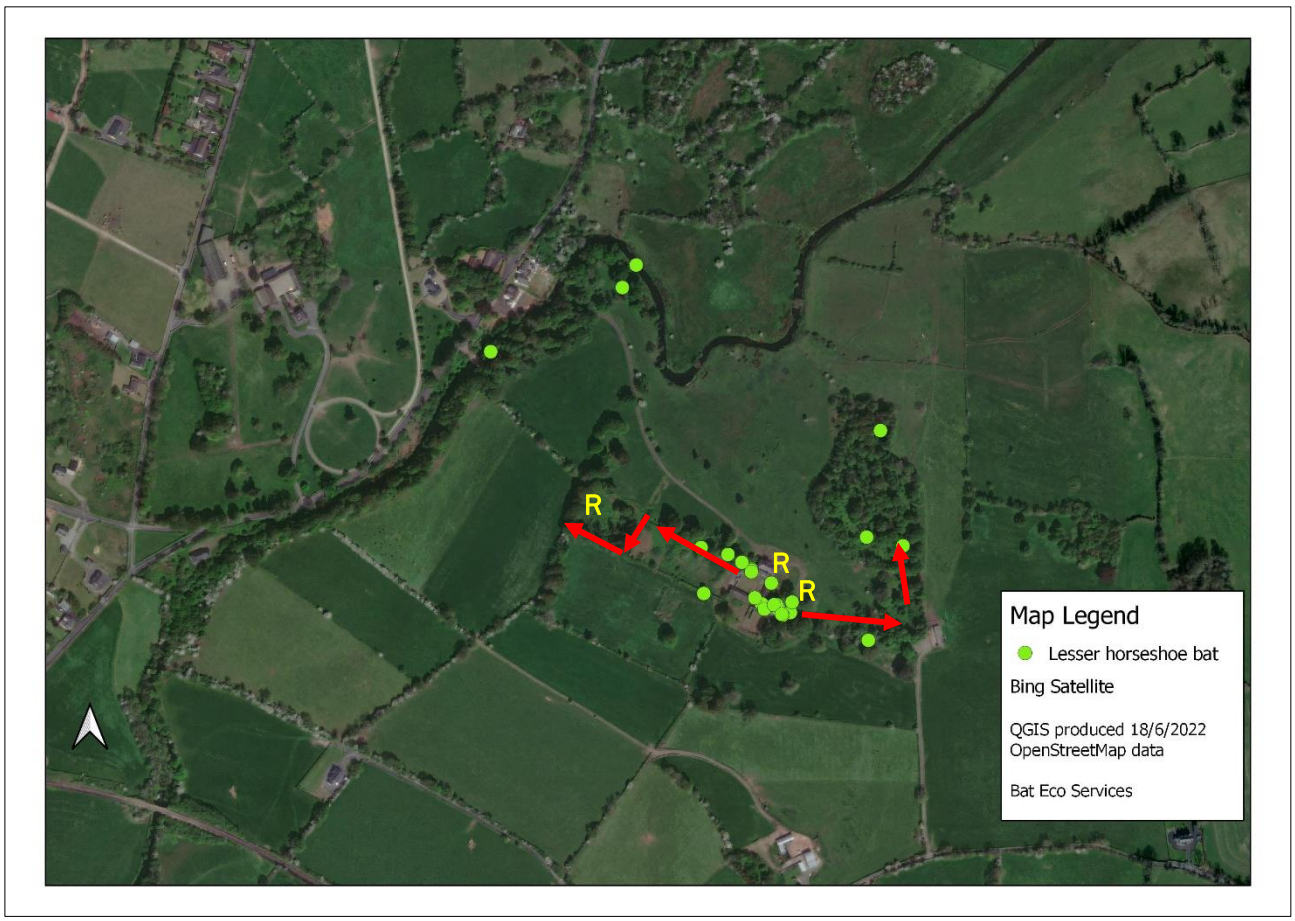

Figure 6a: Lesser horseshoe bat encounters recorded during night-time surveys, recorded commuting routes (Red arrows) and location of roosts (R).

It is important to note that surveys completed in relation to the walled garden noted that least 83% of these bats commuted west of Ballykilty House, possible towards the River Rinn and adjoining woodlands. Biggane (2004) also noted commuting principally in this direction and recorded bats

commuting along the river towards Dromoland Castle, an area that would provide extensive foraging for local bat populations and located approximately 3km SW of the proposed development site.

It was noted during the dusk survey of the bat house, completed on the 3/6/2025, that lesser horseshoe bats (11 bat passes) commuted past the bat house, from the direction of the main house, following the mature treelines towards the River Rinn.

NPWS & VWT (2002) states that it is essential, that existing foraging habitat supporting colonies is retained, and that steps are taken to provide new habitat. It is also recommended that there is no significant increase in artificial lighting adjacent to roosts of importance, or along commuting routes within 2.5km of these roosts. As part of the analysis, a 2.5km radius of Ballykilty House was mapped along with known lesser horseshoe bat records. Two lesser horseshoe bat roosts are also located within the 2.5km buffer, one a hibernation roost (north-east of Ballykilty House) and the second a summer roost (south of Ballykilty House), while Dromoland Castle is located just outside the 2.5km buffer (Orange Circle on figure below). An examination of the landscape within the 2.5km buffer and taking in consideration the results recorded, the River Rinn and associated woodland habitats are likely to be the principally means of movement for individuals of this bat species.

Figure 6b: Lesser horseshoe bat roosts within vicinity of Ballykilty House.

4.3.6.2 Brown long-eared bat

This species of bat has a similar distribution to that of the lesser horseshoe bat. It is also a species that produces quiet echolocation calls and therefore is often underestimated during bats surveys. However, due to the level of surveys, it was documented that bats commuted west through the walled garden towards the mature trees adjacent to the Bat House and north-east towards the woodland as shown by the arrows on Figure 6b.

Individuals were also recorded foraging within the woodland area located north-east of the main house and along the linear woodland adjacent to the river. This species was recorded roosting in the main house and the bat house.

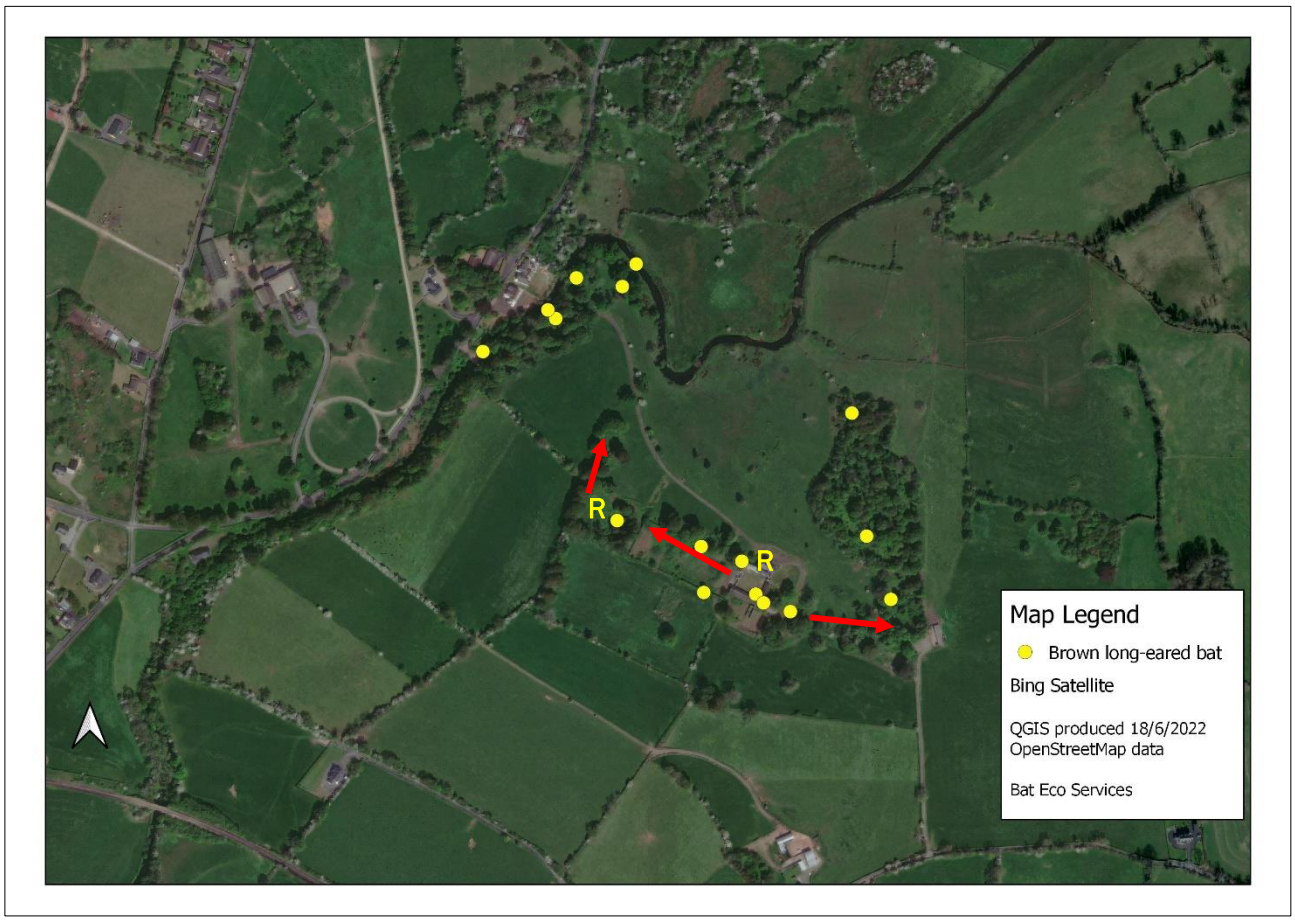

Figure 6b: Brown long-eared bat encounters recorded during night-time surveys, recorded commuting routes (Red arrows) and location of roosts (R).

4.3.6.3 Leisler's bat

This species of bat was principally recorded commuting through the survey area. This is a high flying bat species and produces loud calls. However, it travels long distances during the night to preferred feeding areas. The parkland landscape of the survey area is highly suitable for this species of bat and this is reflected in the level of activity and the presence of a tree roost (Oak tree located east of the main house, near the track) within the grounds. An additional tree roost was recorded in a Beech tree located east of the main house.

Recorded commuting routes were principally to wooded area but as this species is a fast and high flying bat species. Therefore when individuals emerged from tree roosts, they flew directly into the open areas of parkland habitat of the survey site and commuted in numerous directions. It is not a species confined to follow linear habitats compared to all other Irish bat species.

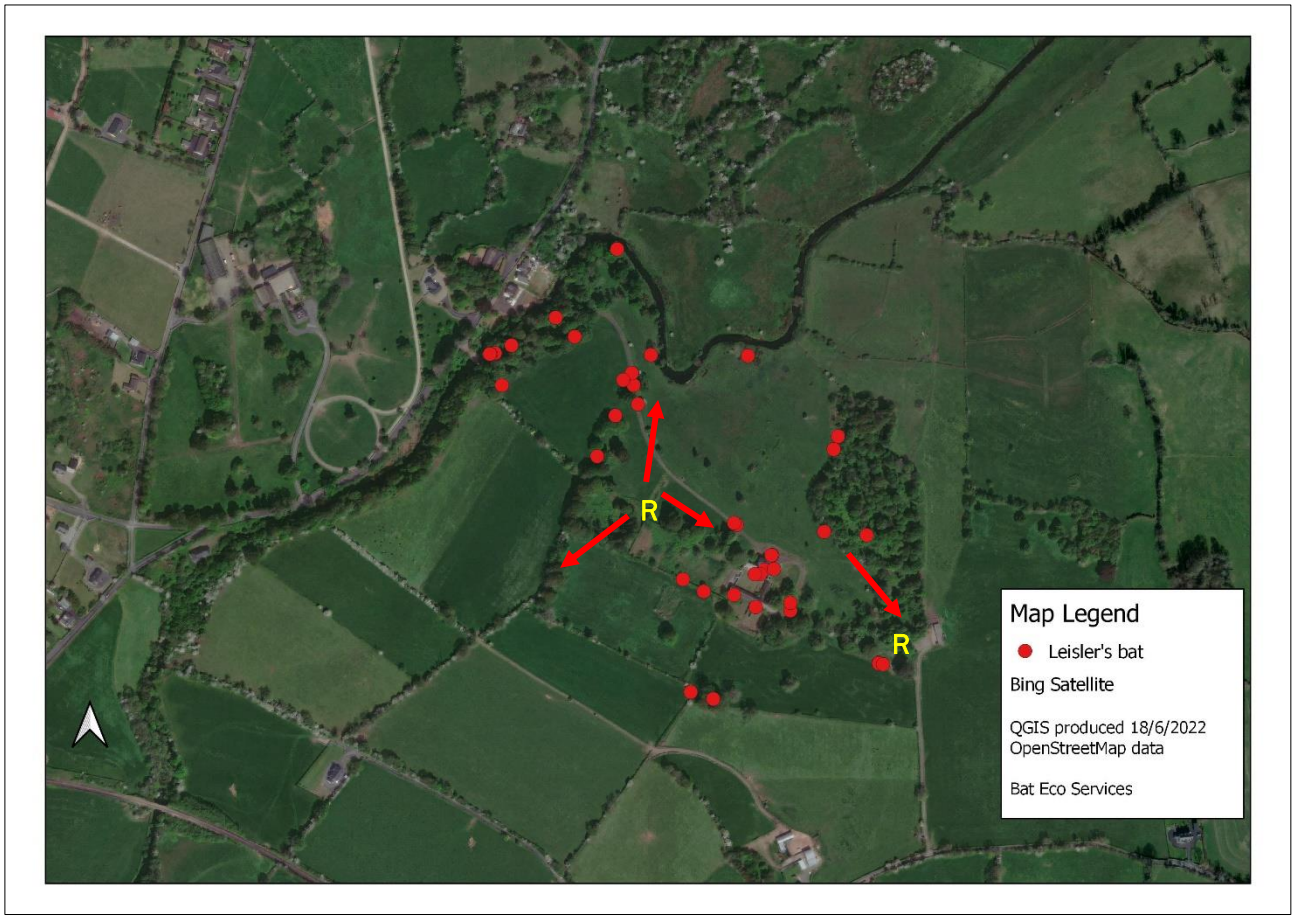

Figure 6c: Leisler's bat encounters recorded during night-time surveys, recorded commuting routes (Red arrows) and location of roosts (R).

4.3.6.4 Soprano pipistrelle

Soprano pipistrelles was the most frequently recorded bat species within the survey area. This bat species is considered to be Ireland's second most common bat species. Four roosts were confirmed within the survey area, two building roosts and two tree roosts. This species were frequently encountered during walking transects and this is reflected in the high level of bat activity recorded.

Recorded commuting routes were principally along the walls of the walled garden, mature tree lines and woodland edges. Foraging was principally along the mature trees of the walled garden, mature trees around the bat house and along the River Rinn.

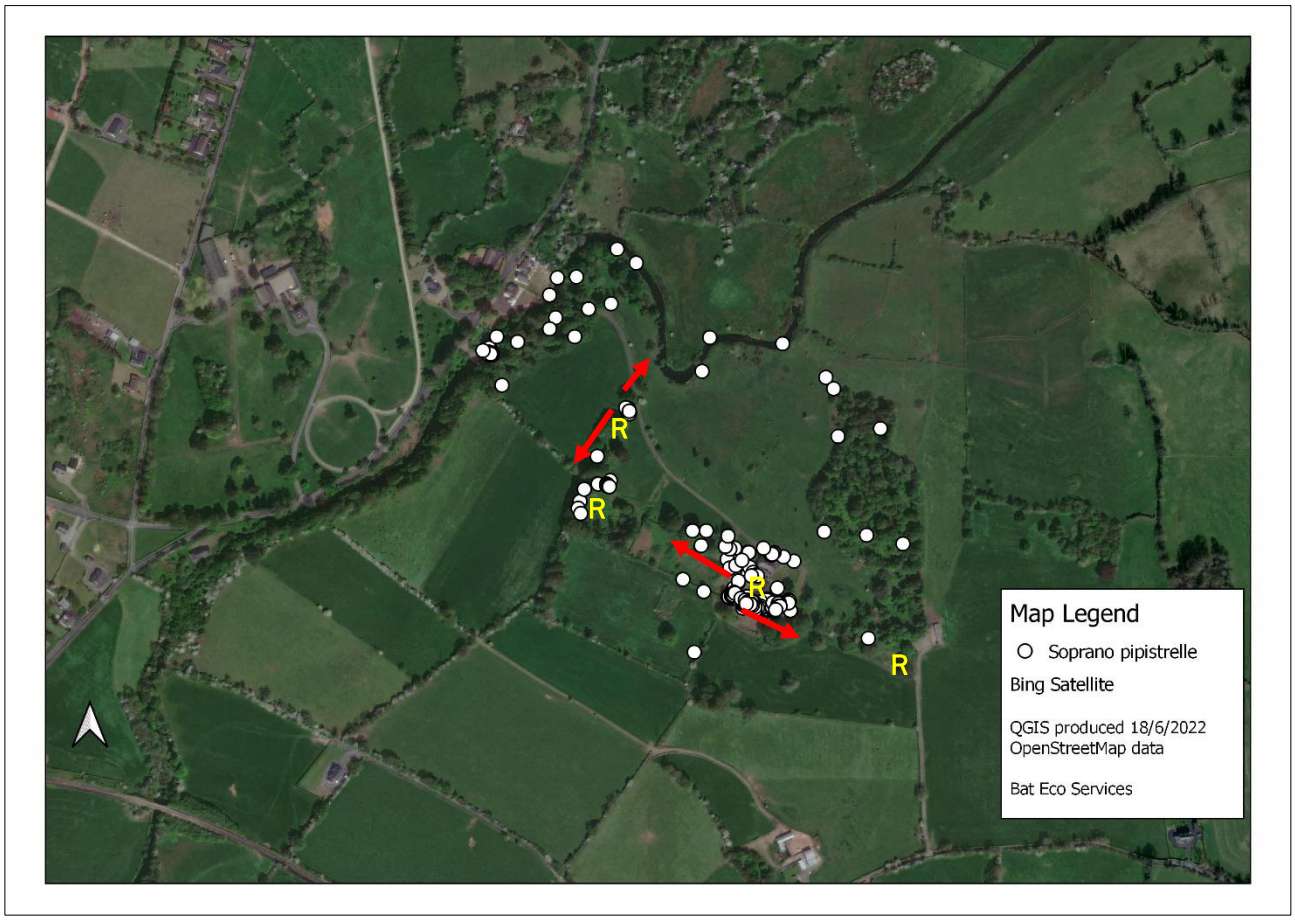

Figure 6d: Soprano pipistrelle bat encounters recorded during night-time surveys, recorded commuting routes (Red arrows) and location of roosts (R).

4.3.6.5 Common pipistrelle

Common pipistrelles was recorded throughout the survey area. This bat species is considered to be Ireland's most common bat species but it was less frequently recorded compared to soprano pipistrelles. No bat roosts were confirmed for this species within the survey area even though a roost was recorded by Biggane (2004) in the single storey shed (Plate 2a).

Recorded commuting routes were principally of individuals flying onto the survey area for foraging along the treelines, River Rinn and woodland area.

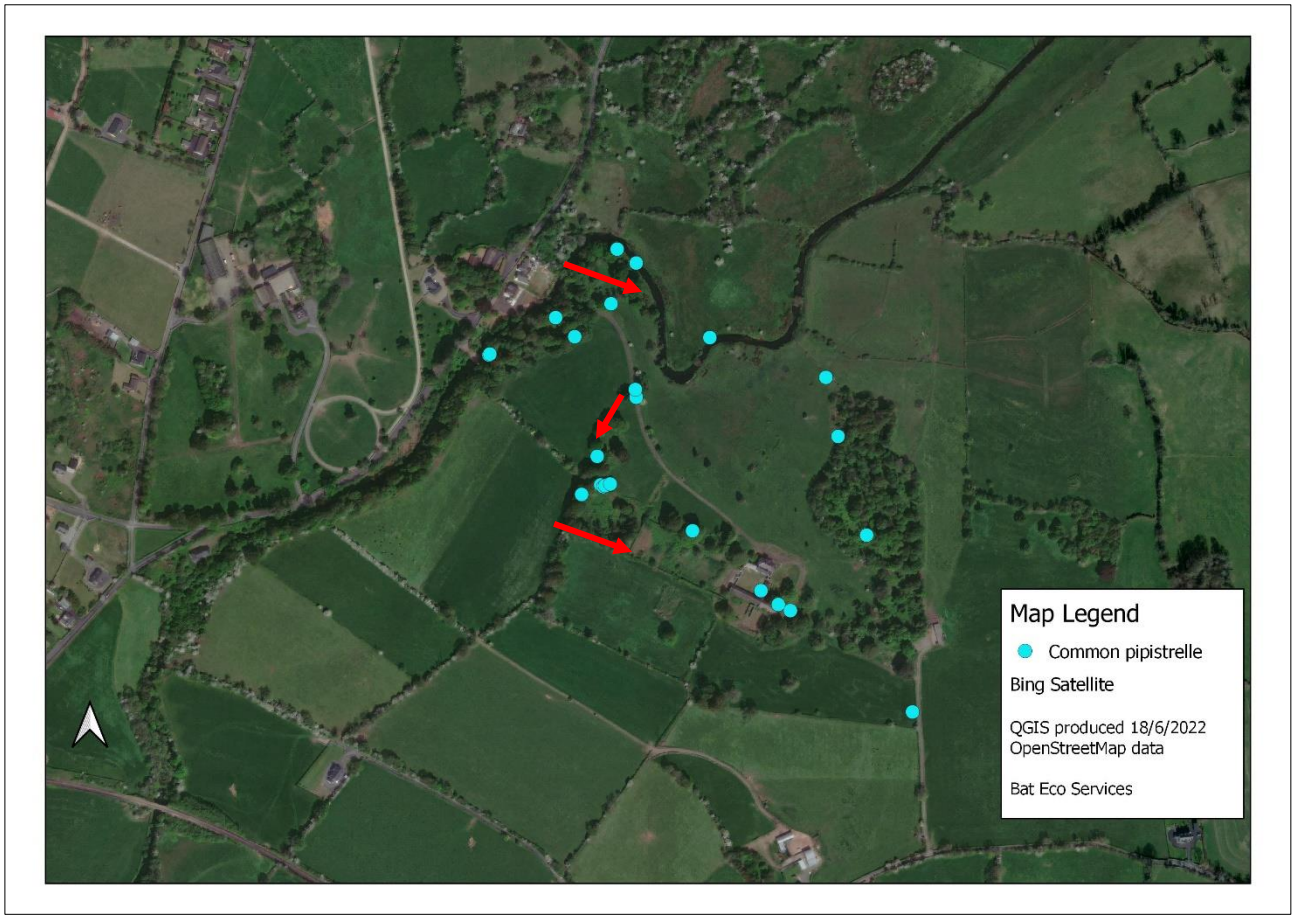

Figure 6e: Common pipistrelle bat encounters recorded during night-time surveys.

4.3.6.6 Natterer's bat

Natterer's bat was the most frequently recorded *Myotis* bat species within the buildings located within the survey area. It was confirmed roosting, in small numbers, in the main house and the stables. Foraging was principally along the mature trees of the walled garden woodland areas to the west and along the River Rinn. Due to the lower level of bat activity recorded for this bat species, compared to other bat species recorded, commuting routes were not noted during night-time surveys.

Figure 6f: Natterer's bat encounters recorded during night-time surveys and location of roosts (R).

4.3.6.7 Daubenton's bat

Daubenton's bat was primarily associated with the River Rinn, where it was recorded foraging extensively. While it is likely that individuals are occasionally roosting within the buildings of the proposed development site and mature trees, no bat roosts were not confirmed during the night-time surveys. Individuals of this species commuted along the River Rinn.

Figure 6g: Daubenton's bat encounters recorded during night-time surveys.

4.4 Bat Survey Results Summary

The following table summarises all of the bat survey results collated by Bat Eco Services in 2021, 2022 and 2024.

Table 9: Summary of 2021, 2022 & 2024 Bat Survey Results, Ballykilty Manor, Quin, Co. Clare.

Bat Species	Roosts		Foraging Habitat		Commuting Routes	
Lesser horseshoe bat	Yes	Ballykilty House (Maternity Roost) Bar Building (Day Roost) Bat House (Day Roost) Pump house (Night Roost)	Yes	Along linear habitats, walled garden and within woodland areas	Yes	Along linear habitats, walled garden and within woodland areas
Brown long-eared bat	Yes	Ballykilty House (Maternity Roost) Bar Building (Day Roost) Bat House (Satellite Roost)	Yes	Along linear habitats, River Rinn, walled garden and within woodland areas	Yes	Along linear habitats, walled garden and within woodland areas
Leisler's bat	Yes	Tree roosts x2 (Maternity Roost & Day Roost)	Yes	Throughout the parkland habitat and woodland areas of survey area.	Yes	Through open parkland habitat from recorded tree roosts
Soprano pipistrelle	Yes	Ballykilty House (Satellite Roost) Tree roosts x2 (Satellite Roost) Bat House (Day & Night Roost)	Yes	Along linear habitats, walled garden River Rinn and within woodland areas.	Yes	Along linear habitats, River Rinn, walled garden and within woodland areas.
Common pipistrelle	Yes	No roosts recorded during Dusk & Dawn surveys, but was recorded once on static unit in the attic of Ballykilty House once. Therefore a potential Night Roost	Yes	Along linear habitats, walled garden River Rinn and within woodland areas.	Yes	Along linear habitats, River Rinn, walled garden and within woodland areas.
Natterer's bat	Yes	Ballykilty House (Satellite Roost) Stables (Day Roost)	Yes	Along linear habitats, walled garden River Rinn and within woodland areas	Yes	Along linear habitats, River Rinn, walled garden and within woodland areas
Daubenton's bat	No	No roosts recorded	Yes	Along linear habitats, walled garden River Rinn and within woodland areas	Yes	Along linear habitats, River Rinn and within woodland areas.
Whiskered bat	No	Not applicable	No	Not applicable	No	Not applicable
Nathusius' pipistrelle	No	Not applicable	No	Not applicable	No	Not applicable

4.5 Survey Effort, Constraints & Survey Assessment

The following table details any Survey Constraints encountered and a summary of Scientific Assessment completed.

Table 10: Survey Effort, Constraints & Survey Assessment Results.

Category	Discussion
Timing of surveys	Ful Season Bat Survey completed.
Survey Type	Bat Survey Duties Completed (Indicated by red shading) 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 ■ Thermal imagery filming ■
Weather conditions	Weather conditions during night-time surveys were suitable in order to detect bat activity.
Survey Constraints	No survey constraints – surveys were undertaken during all four seasons, providing a details of bat usage of the survey area all year round.
Survey effort **TOTAL = 467 hrs hrs**	Daytime Inspections: 7 surveys = 25 hrs Dusk & Dawn Surveys: 9 surveys (2-3 people) = 43 hours Filming (IR & Thermal Imagery) = 46 hours Walking Transects: 4 surveys (2 people) = 10 hrs Static Surveillance: May (7 statics, 4 nights) = 196 hrs; July (5 statics, 1 night) = 40 hrs; 2024 (1 static, 9 nights = 108 hrs (Additional surveillance of bat house reported separately)
Extent of survey area	Ballykilty Manor, Quin, Co. Clare
Equipment	All in good working order

The extent of the surveys undertaken has achieved to determine:

- Presence / absence of bat within the survey area;
- A bat species list for the survey area;
- Extent and pattern of usage by bats within the survey area.

Surveying was completed according Collins (2016 & 2023) and the timing and survey level meets this guidance document. It is therefore deemed that the Scientific Assessment completed is Appropriate in order to complete the aims of the bat survey.

5. Bat Ecological Evaluation

5.1 Bat Species Recorded & Sensitivity

Seven bat species were recorded within red line boundary of Ballykilty Manor, Quin, Co. Clare during surveys undertaken in 2021, 2022, 2024 and 2025. Five of these species were confirmed recorded roosting in buildings and trees within the survey area and this consisted of three maternity roosts (Lesser horseshoe bat, brown long-eared bat and Leisler's bat), four satellite roosts (Natterer's bat, soprano pipistrelle, brown long-eared bat) five day roosts (Lesser horseshoe bat, soprano pipistrelle, Natterer's bat and brown long-eared bat) and three night roosts (Lesser horseshoe bat) were recorded (Please consult Table 12 for more details). A potential night roost was recorded for common pipistrelles in Ballykilty House.

All seven bat species recorded were detected foraging and commuting within the survey area. A number of commuting routes were recorded and these principally were of individuals commuting from roosts along treelines/ stonewalls towards the River Rinn and/or to the woodland areas adjacent to the River Rinn. It is important to note that due to the current darkness (i.e. no artificial outdoor lighting within the survey area) of the survey site, there is extensive connectivity from the buildings recorded as roosts along parkland trees and stonewalls to the woodland areas and the River Rinn.

Table 11: Bat Ecological Evaluation Results for Ballykilty Manor according to referenced criteria.

Bat Species	Survey Results	Evaluation Value	Roost Evaluation
Lesser horseshoe bat	Maternity roost Day and night roosts Foraging habitat Commuting routes	County Importance – County Clare	Conservation Significance - HIGH (Marnell *et al.,* 2022) – Maternity sites of rarer species.
Brown long-eared bat	Maternity Roost Satellite, night and day roosts Foraging habitat Commuting routes	Local importance	Conservation Significance - HIGH (Marnell *et al.,* 2022) – Maternity sites of rarer species.
Natterer's bat	Satellite and day roosts Foraging habitat Commuting routes	Local importance	Conservation Significance – MEDIUM (Marnell *et al.,* 2022) – "Small numbers of rarer species. Not a maternity roost".
Leisler's bat	Tree Roosts – maternity and satellite roosts Foraging habitat Commuting routes	Local importance - however, there are few tree roosts registered on the BCIreland database. Therefore, the Leisler's bat tree roost is an important recording.	Conservation Significance - MEDIUM (Marnell *et al.,* 2022) – "Maternity Sites of common bat species".

Soprano pipistrelle	Satellite, night and day roosts Tree roosts – satellite roosts Foraging habitat Commuting routes	Local importance - however, there are few tree roosts registered on the BCIreland database. Therefore, the two tree roosts are an important recording.	Conservation Significance – LOW (Marnell *et al.,* 2022) – "Small numbers of common species. Not a maternity roost".
Common pipistrelle	Satellite & night roosts Tree roosts Foraging habitat Commuting routes	Local importance	Conservation Significance (Marnell *et al.,* 2022) – Not applicable.
Daubenton's bat	Satellite roosts Foraging habitat Commuting routes	Local importance	Conservation Significance (Marnell *et al.,* 2022) – Not applicable.

Lesser horseshoe bat

- Lesser horseshoe bat is an Annex II bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national lesser horseshoe bat population is considered to be significantly increasing trend (Aughney *et al.,* 2022).
- The modelled Core Area for Leisler's bats is a small area confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork (5,993km^2). It is considered that this small core area represents the only suitable range for this species in the country. The Bat Conservation Ireland Irish Landscape Model indicated that the lesser horseshoe bat habitat preference for deciduous woodland and riparian vegetation within a few kilometres of roosts and relies on linear landscape features to commute from roosts to feeding areas (Roche *et al.,* 2014)..

Leisler's bat

- Leisler's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Leisler's bat population is considered to be significantly increasing trend (Aughney *et al.,* 2022).
- The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km^2). 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.

Common pipistrelle

- Common pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national common pipistrelle population is considered to be significantly increasing trend (Aughney *et al.,* 2022).

- The modelled Core Area for common pipistrelle is a relatively large area that covers much of the island of Ireland (56,485km^2). 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).

Soprano pipistrelle

- Soprano pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national soprano pipistrelle population is considered to be significantly increasing trend (Aughney *et al.,* 2022).
- The modelled Core Area for soprano pipistrelle is a relatively large area that covers much of the island of Ireland (62,020km^2). 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).

Brown long-eared bat

- Brown long-eared bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national brown long-eared bat population is considered to be stable (Aughney *et al.,* 2021).
- The modelled Core Area for brown long-eared bat is a relatively large area that covers much of the island of Ireland (49,929 km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5km emphasising the importance of local landscape features for this species (Roche *et al.,* 2014).

Natterer's bat

- Natterer's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Natterer's bat population is currently unknown.
- The modelled Core Area for Natterer's bat is a relatively large area that covers much of the island of Ireland (52,864km^2).The Bat Conservation Ireland Irish Landscape Model indicated that the Natterer's bat selects areas with broadleaf woodland, riparian habitats and areas with larger scale provision of mixed forest (Roche *et al.,* 2014). Therefore, it is likely that this species is more widespread within the survey area.

Daubenton's Bat

- Daubenton's bat is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national Daubenton's bat population is considered to be stable (Aughney *et al.,* 2021).
- The modelled Core Area for Daubenton's bat is (41,285 km^2) 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).

Annex II bat species (i.e. lesser horseshoe bat) was recorded within the survey. This species of bat was recorded during dusk surveys, walking transects and static surveillance.

5.2 Bat Foraging Habitat & Commuting Routes

The maps prepared as part of the results section of the report provides evidence of the commuting routes used by local bat populations.

In the immediate area of Ballykilty Manor, it was documented that lesser horseshoe bats commuted west through the walled garden towards the mature trees adjacent to the Bat House and north-east towards the woodland. Individuals were also recorded foraging within the woodland area located north-east of the main house and along the linear woodland adjacent to the river. In relation to lesser horseshoe bats, an examination of the landscape within the 2.5km buffer and taking in consideration the results recorded, the River Rinn and associated woodland habitats are likely to be the principally means of movement for individuals of this bat species.

For all other bat species, a similar set of commuting routes were recorded with the River Rinn, associated linear woodland and the larger area of woodland located in the east within the survey area.

5.3 Zone of Influence – Bat Landscape Connectivity

In the immediate area of Ballykilty Manor, it was documented that the River Rinn and associated woodland habitats are likely to be the principally means of movement for local bat populations. An examination of the immediate landscape along the River Rinn illustrates that there is a greater amount of linear woodland along the river as the river flows west. There is also a great amount of woodland and suitable bat foraging habitat to the west of the survey area, particularly in association with Dromoland Castle.

6. Assessment of Potential Impact

The proposed development works will result in the following:

A) Construction Impacts

- Renovation of Ballykilty House which result in the loss of a lesser horseshoe bat maternity roost and potential loss of the maternity roost of brown long-eared bat and satellite roosts for Natterer's bat and soprano pipistrelles. Due to the morphological requirements of lesser horseshoe bats, it is not possible to retain the roosting requirements for this species to be compatible with the proposed renovation works. However, it is possible to retain roosting requirements for other bat species as part of proposed renovation works. Measures will be recommended to incorporate such roosting requirements in order to reduce the overall potential negative impact of the proposed development on local bat populations. A bat house was purposely built to cater for lesser horseshoe bats and a separate report has been prepared in relation to this structure.
- Renovation of stables will result in the loss of satellite and day roosts. The roosting sites are located within the internal walls of the stone structure (i.e. crevices) and renovation of this building will not facilitate roosting sites. However, alternative roosting will be provided in the form of suitable bat boxes and bat tubes within the external walls of the proposed lesser horseshoe bat Day Roost (see below).
- Renovation of bar building will result in the loss of satellite and day roosts. However, it is possible to retain roosting requirements for other bat species as part of proposed renovation works. Measures will be recommended to incorporate such roosting requirements in order to reduce the overall potential negative impact of the proposed development on local bat populations.
- Removal of pump house will result in the loss of a night roost for lesser horseshoe bat. However, a replacement roost building will be recommended to mitigate for this and this will be located in the woodland area adjacent to the River Rinn. This will be in the form of a Day Roost structure which will also include bat tubes to provide alternative roosting for other bat species.
- Removal of trees classified as Potential Bat Roosts (PBRs). There is a large number of mature trees located within the survey area. A total of 44 trees are proposed to be felled, 17 of which are not considered to have a PBR value. All other trees proposed to be felled are considered to be of PBR value, 17 are Category 1 PRB value, seven are Category 2 PBR value and three are Category 3 PBR value.

B) Operational Impact

There will be an increase in human activity (noise and light levels) (Operational Operations) as a result of the proposed development and due to the high level of bat biodiversity and bat activity, it is considered that this will impact on local bat populations.

Due to the fact that bats are nocturnal mammals outdoor lighting will impact on local bat populations. Therefore, the lighting plan is an important element of the proposed development that needs to consider its potential impact on commuting and foraging bats. Consultation was undertaken and measures have been agreed in order to reduce this potential impact of outdoor lighting on commuting and foraging bats, especially lighting located adjacent to boundary habitats with particular reference to the lesser horseshoe bat requirements.

An another element to mitigate for the impact of the lighting is the loss of foraging and connectivity in the immediate landscape. Therefore, an extensive landscape plan is required to ensure that there

is a continuous “dark” commuting routes from the Bat House, other alternative roosting sites to preferred foraging areas of the adjacent woodland and the River Rinn. It is also important that the proposed landscaping provide a “dark” buffer of tall vegetation along the external boundary of proposed lighting to reduce the impact of lighting.

Therefore the potential impact of the proposed development is, overall, considered to be Permanent Negative and to have a scale of impact of Moderate to Significant impact on lesser horseshoe bats (according to criteria set out in Tables 2c and d, Section 1.2.2) and Moderate impact on all other bat species.

Bat mitigation measures are presented in order to reduce the potential impact of renovation works, the lighting scheme for the proposed development with additional measures relating to tree felling and the erection of a bat box scheme. Additional bat conservation measures are also presented for the conservation of local lesser horseshoe bat populations (e.g. erection of a day roost). If the mitigation measures presented below are strictly implemented, the scale of impact is likely to be reduced to Slight Negative impact on local bat populations.

6.1 Bat Mitigation Measures

General bat mitigation measures are described below and these take into consideration Marnell *et al.* (2022) as well as best practice guidelines from Collins (2023) and BCT (2023). The measures described are those considered to be practical and effective based on past experience of the principal bat specialist, for the proposed development site. Measures are also reflective to published scientific research, where available and applicable to Irish bat populations. As stated by Marnell *et. al.* (2022) “Any mitigation intended to ensure that there is no impact or minimal impact on the bats must be clearly described in detail, giving examples of how it worked in other places”. Please see Section 1.2.3 for more information.

A NPWS Derogation Licence is required for renovation works relating to Ballykilty House, stables and bar building and the demolishment of the Pump House as these were recorded as roosting site for following species of bat: lesser horseshoe bat, brown long-eared bat, soprano pipistrelle and Natterer’s bat. As a derogation licence will be required for the permanent and temporary loss of the bat roosts (dependent on the bat species whether a permanent or temporary loss of roost is likely to occur). Bat mitigation measures in relation to alternative roosts is required to be in place according to the time frame recommended below and shown to be suitable as mitigation for potential loss of bat roosts. It is also recommended that consultation is undertaken with NPWS prior to application of planning, particularly in relation to the purposed built lesser horseshoe bat roosts and in relation to the extensive bat mitigation measures present below.

6.1.1 Renovation Works

PLBS have prepared a document on the Preliminary Outline of Works (dated 16th March 2025) that provides details of the proposed works for each building within the survey area (Please consult this document for more information). In summary the works will involve the following that may impact on bats roosting in the structures:

- Main House: new roof (including slates and roof timbers), repointing of internal walls, new plaster work and new windows and window frames.
- Out-buildings/Stables: new roof (including slates and roof timbers), repointing of internal walls, new plaster work and new windows and window frames.
- Pump House: to be demolished.

The planned works will result is extensive disturbance to local bat populations and will result in the exclusion of bats roosting, particularly lesser horseshoe bats. Therefore provision of alternative roosting sites is an important element of bat mitigation measures, some of which has already been implemented.

A Bat House was constructed to provide alternative roosting for lesser horseshoe bats. Bat Eco Services Limited provided additional measures to improve this structure and has recorded this species of bat roosting within (please see separate report on this). However, due to the fact that this species of bat is "roost faithful", the colony will continue to roost in the attic space of Ballykilty House until there is no alternative but to roost elsewhere. If the proposed development receives planning permission and NPWS permits a derogation licence for the exclusion of bats within the structure, careful steps will be required, under the supervision of the bat specialist, to encourage the colony to move to the Bat House. This is considered to be the best alternative for the colony, as the extent of human noise and associated lighting proposed for the development Ballykilty House will render the immediate area of the buildings unsuitable for this species of bat (Please see Figure 7b and explanation of this in Section 6.1.2). Therefore, it is proposed to have a "Lesser Horseshoe Bat Zone" within the red line boundary of the proposed development that encompasses the Bat House and is linked to commuting and foraging habitats to provide a "Dark Zone". This "Dark Zone" will also benefit other bat species and will be linked to additional alternative roosting proposed. However, there is an opportunity to provide some alternative roosting within the buildings for other bat species that are less sensitive to human presence and this is presented below.

6.1.1.1 Ballykilty House

The following steps are required to be followed to exclude lesser horseshoe bats prior to renovation works:

- No exclusion works will permitted until the end of the maternity season.
- From 1st September it is recommended that the current exit points used by lesser horseshoe bat are sealed once all individuals have emerged. Therefore a daytime inspection of the building is required on Day 1 to determine if lesser horseshoe bats present. A dusk survey is then undertaken to count all bats exiting (using night vision aids) and to ensure that no bats are present. Once all bats are noted to have exited, the exit points are sealed. The surveyors are then required to undertake an inspection of the internal space of the building to determine if any bats are still within in the structure. As an extra precaution, statics units are required to be left inside the building to record if any lesser horseshoe bats are still present within the structure overnight. These units are checked on Day 2 along with a second daytime inspection. If any lesser horseshoe bats are recorded on the static units or a visibly seen during inspection, then one exit point is opened at dusk to allow any remaining bats to emerge. This is coupled with a dusk survey (using night vision aids) to monitor bat activity. These steps are repeated until the internal space of Ballykilty House is deemed to be lesser horseshoe bat free. During this procedure, a static unit will be placed in the Bat House to monitor bat activity coupled with daily internal inspections to determine if the displaced bats find this alternative roost.
- As all other bat species use other exit points (e.g. lead flashing around chimneys), exclusion of such species can only be undertaken directly prior and during proposed roof works. A dusk survey will be undertaken prior to the roof removal to determine what bats are present to assist the extent of supervision required. When roof works are planned, a bat specialist is required to be on-site to supervise the hand-removal of slates, ridge tiles etc. to ensure that no bats are harmed in the process. Any bats encountered are safely removed to alternative roosts (e.g. bat boxes). Such works can only be undertaken outside the maternity season.

- I relation to replace of existing windows, the bat specialist is required to check all windows frames to ensure that no bats represented on the day of proposed works by using an endoscope and torch. Any bats present will be safely removed to alternative roosts (e.g. bat boxes).
- In consultation with the developer, access to the new roof space will be provided via bat slates. Depending on the final designs, a section of the roof space, at a minimum, will be chosen as an alternative roosting space and designed for brown long-eared bats, Natterer's bats and soprano pipistrelles.

6.1.1.2 Out-Buildings / Stables

The following steps are required to be followed to exclude bats prior to renovation works or demolition works:

- No exclusion works are permitted until the end of the maternity season.
- From 1st September it is recommended that the current exit points used by lesser horseshoe in the Bat Building is sealed following similar steps provided above in Section 6.1.1.1.
- For all other bats species, removal of existing roofs will following steps provided above in Section 6.1.1.1.
- In relation to internal and external crevices in the stone walls, these will be checked using an endoscope for any roosting bats. All crevices deemed bat free will be filled with bubble wrap or covered in hessian material to prevent re-access of such species by roosting bats. This procedure will be undertaken in conjunction with the stone masons.
- The above procedure will also be followed in relation to free standing walls within the courtyard and the walled garden. Where possible and in consultation with the stone masons, additional bat tubes will be inserted into the external surfaces of the walled garden (i.e. sections that face the Bat Conservation Zone).
- Any walls proposed to be demolished will also be checked with an endoscope and torch to ensure that not bats are present prior to demolition.

6.1.1.3 Pump House

The following steps are required to be followed to exclude lesser horseshoe bats prior to renovation works:

- No exclusion works are permitted until the end of the maternity season.
- From 1st September it is recommended that the Pump House is checked during the daytime for roosting bats.
- A dusk survey is then undertaken and once it is deemed bat free, the structure is sealed to prevent any re-entry of roosting bats.
- It is recommended that the structure is knock the following day once it is deemed bat free.

6.1.1.4 Alternative Bat Roosts

The following alternative bat roosts are in place or proposed:

- Bat House (in place);
- Bat Box Scheme (to be erected 3 months prior to planned works including any tree surgery works);
- Lesser horseshoe Bat Pump House (to be constructed prior to demolition of exiting Pump House);
- Bat Tubes in external walls (to be inserted, where possible, during repair works);
- Ballykilty House roof space (to be constructed during renovation works)
- Additional roosts to be designed in at least one more roof space of buildings proposed to be renovated or constructed (to be finalised in consultation with the client and to be constructed

during renovation/construction works). Possible locations include function rooms located on the outer edge of the proposed development and/or adjacent to the external boundary adjacent to the Bat Conservation Zone (e.g. Function Room Extension).

6.1.2 NPWS Derogation Licence

An NPWS Derogation Licence has been applied for. This provides detailed measures in relation to the steps required for the renovation of each building, based on the document provided by PLBS (Preliminary Outline of Works, dated 16th March 2025).

6.1.3 Lesser Horseshoe Bat Conservation Zone

Due to the presence of lesser horseshoe bats within the survey area and the fact that the proposed development is within 2.5km radius of two SACs for this species of bat, it is important that measures are undertaken to conservation local lesser horseshoe bat populations. These measures will entail the following:

- Compensatory planting for the removal of trees and landscape planting to ensure connectivity within the Conservation Zone and to buffer against proposed lighting (please see Section 6.1.5).
- To provide alternative roosting for other bat species (please see Section 6.1.4).
- Specific measures to reduce lighting impacts (Please see Section 6.1.2)
- Lesser horseshoe Bat Conservation Zone

Zone of land along woodland, River Rinn and associated linear woodland (Figure 7a). This area has been selected because it is outside the Lighting Plan Zone (Figure 7c) and it is adjacent to the River Rinn which is deemed as a commuting route for lesser horseshoe bats within the proposed development area. It will also encompass the Bat House and the linear habitat features around this structure and connecting linear habitat to the woodland and River Rinn.

- Erection of Day Roost (VWT design)

This is a small structure building of concrete block (externally plastered) with a natural slate roof and bituminous felt. It is designed according to VWT Day Roost recommendations and full details of the plans are provided in the appendices. The provision of such features within the 2.5km radius of Lesser Horseshoe Bat SACs is considered by VWT as an important component to the support network for maternity and hibernation roosts. Additional bat tubes will be inserted into the external walls of the bat house to provide additional roosting spaces for bat species recorded within the survey area.

This Day & Night Roost will also mitigate for the proposed demolishment of the Pump House (recorded as a Night Roost) and the loss of lesser horseshoe bat Day Roost in the Bar Building (proposed to be renovated). The proposed location for this is presented on Figure 7a.

Figure 7a: Lesser Horseshoe Bat Conservation Zone.

Dark Blue Rectangle: Existing Bat House
Brown Square: Propose location of Day Roost
Blue Stars: Bat Box Scheme Locations

6.1.4 Lighting Plan

This element of the proposed planning application is important aspect in relation to local bat populations. All European bat species, including Irish bat species, are nocturnal. They usually hide in roosts during the daytime, while fly to feeding areas or drinking sites using commuting routes during the night. Annually bats will hibernate in the winter, swarm in the autumn and give birth in the summer months. In all aspects of the bat lifestyle, Artificial Light at Night (ALAN) may significantly change their natural behaviour in relation to roosting, commuting and feeding. While bats are naturally exposed only to very low lighting levels produced by moonlight, starlight and low intensity twilight, light levels greater than natural light levels can impact on the lifestyle of bats.

Bats are light sensitive species, hence their nocturnal activities. The three bat species recorded commuting and foraging within the survey area are Light Tolerant or Semi-tolerant bat species. However, it is still important that strict lighting guidelines are required to reduce the potential impact of the proposed development on local bat populations as standard best practice.

Luminaire design 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, 2023). Consultation was undertaken with the lighting specialists to reduce the potential impact on local bat populations.

- 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 (i.e. 2200 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.
- 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.
- 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.

Any external lighting for the proposed development should strictly follow the above guidelines and these should be strictly implemented during construction and operation phase of the proposed development. The following table provides details of which of the BCT, 2023 measures will be implemented as part of the proposed lighting plan.

The following figure depicts the proposed lighting plan for Ballykilty Manor, Quin, Co. Clare.

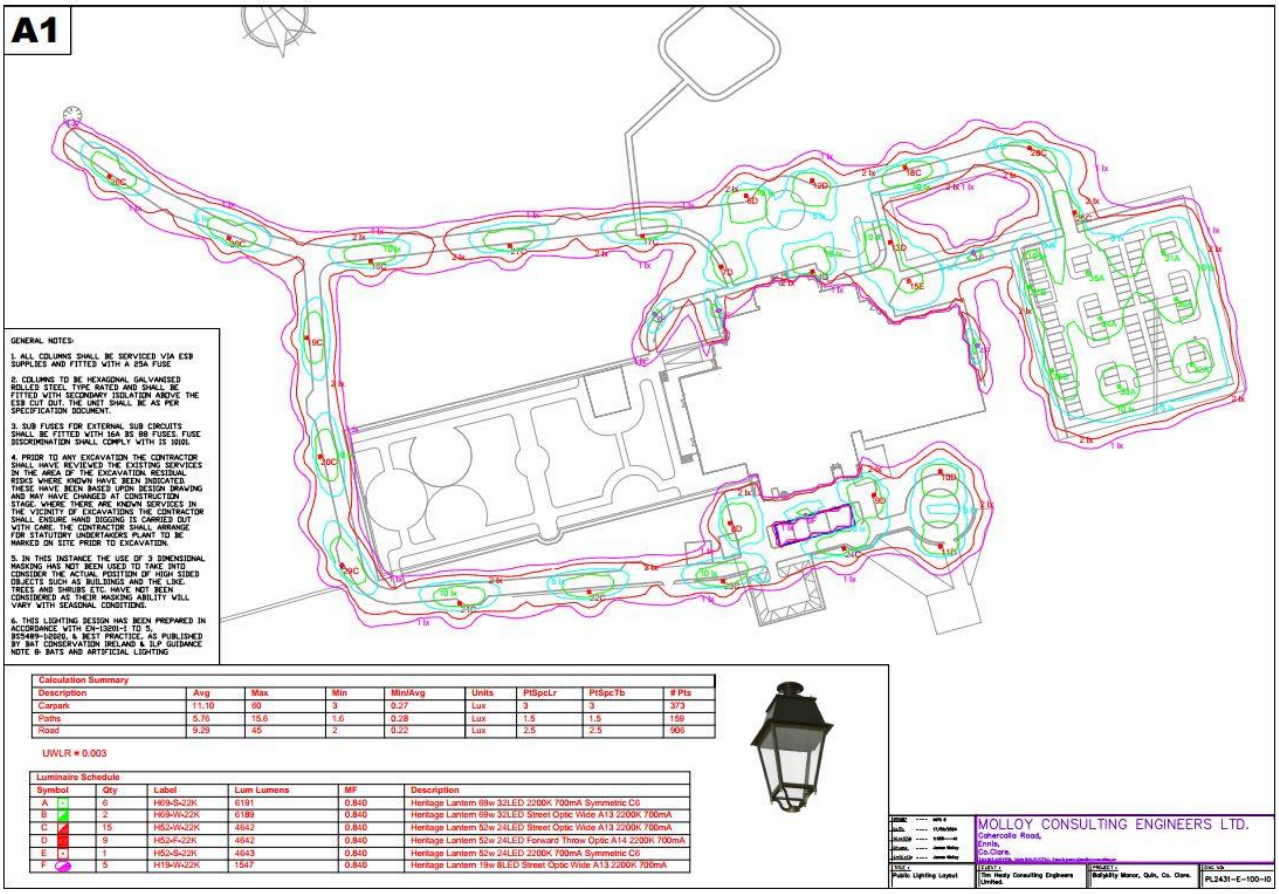

Figure 7b: Proposed lighting plan for Ballykilty Manor, Quin, Co. Clare

A lighting design plan was provided to review (Figure 7 above, and a letter was received from Molloy Consulting Engineers Ltd.) and within this the following specifications were listed:

- The design uses 38 x Heritage Lantern LED 2200K mounted on 5m columns with the following wattages and optics:
    - 8 x 69w (6 x Symmetric C6 Optic and 2 x Street Optic Wide A13) to light the carpark
    - 25 x 52w (15 x Street Optic Wide A13,
    - 9 x Forward Throw Optic A14 and 1 x Symmetric) to light the roads
    - 5 x 19w Street Optic Wide A13 to light the paths
- Light levels are as follows: Carpark – 11 lux average, 0.27 uniformity.

The letter continues to state the following:

- This complies with IS EN 12464-2 for parking areas – medium traffic (10 lux average, 0.25 uniformity);
- Road – 9 lux average, 2 lux minimum (0.22 uniformity). This complies with IS EN 13201-2 / BS 5489-1 for roads – class P3 (7.5 lux average, 1.5 lux minimum);
- Paths – 5.7 lux average, 1.6 lux minimum (0.28 uniformity). This complies with IS EN 13201-2 / BS 5489-1 for paths / pedestrian areas – class P4 (5.0 lux average, 1.0 lux minimum).

Table 12: Lighting Recommendations to be implemented to reduce impact on local bat populations.

BCT, 2023 Guidelines	Included in Lighting Plan	Action
All luminaires used will lack UV/IR elements to reduce impact	LED	Completed as per guidelines
LED luminaires will be used due to the fact that they are highly directional, lower intensity, good colour rendition and dimming capability	LED	Completed as per guidelines
A warm white spectrum (<2700 Kelvins or lower will be used to reduce the blue light component of the LED spectrum).	2200 Kelvins	Completed as per guidelines for lesser horseshoe bats
Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats	Peak is 600nm	Completed as per guidelines
Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible	Shortest column height should be as low as possible	5m All lighting to be mounted on 5m columns. Dropping to 4m would make it hard to achieve uniformity requirements in the parking area.
Only luminaires with an upward light ratio of 0% and with good optical control will be used.	Lanterns are of the fully cut off type with no upward light.	Completed as per guidelines
Luminaires will be mounted on the horizontal, i.e. no upward tilt.	All lanterns are mounted fully in the horizontal. No tilt proposed.	Completed as per guidelines
Any external security lighting will be set on motion-sensors and short (1min) timers	Noted. Final control lighting strategy to be discussed and agreed with the client representative.	Review should take into consideration bat conservation requirements.
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. **Monitoring is recommended to determine that this action is reducing lighting spillage.**	Baffles/louvers can be used to keep light off a specific wall or area but aren't easily modelled in software. Care has been taken in this design to only light the areas necessary for public safety.	Completed as per guidelines

It is confirmed that the proposed lighting design meets the BCT (2023) guidelines with specific needs for lesser horseshoe bat requirements taken into consideration. Additional mitigation measures in relation to landscaping is listed below.

An additional component to ensuring that the potential impacts of the proposed lighting scheme is further reduced on local lesser horseshoe bat populations, a landscape plan is required. The following aerial depicts the approximate outer illuminance contour of potential light spill.

Figure 7c: Approximate area of the survey site deemed to be enclosed within the extent of the outdoor lighting plan influence.

Therefore, the entire area enclosed by this Blue Line will no longer be available to local lesser horseshoe bat populations for roosting, foraging and commuting. As a consequence the following is required:

- New linear habitats to be planted to reconnect the landscape (marked in red on the figure);
- New planting to compensate for the loss of foraging habitat;
- Alternative roosting.

6.1.5 PBR Tree Felling

In relation to trees proposed to be felled and identified as PBRs, these should be resurveyed in consultation with the tree contractors. The following is recommended:

i) A Phase Two PBR survey is recommended for the trees proposed to be felled and identified as a PBR and 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.
ii) Alternative roosting sites (i.e. summer bat boxes) will be erected prior to the removal of trees. These are recommended to be erected 6 months prior to tree felling to allow local bat populations to become aware of them prior to removal of the trees.

iii) Trees proposed to be removed, should be felled on mild days during the autumn months of September, October or November or Spring month of February (felling during the spring or autumn months avoids the periods when the bats are most active).
iv) 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 2. The procedure to fell these is as follows:

a. Category 3: 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.
b. Category 2 and Category 1 trees will be re-surveyed and dismantled during felling to ensure that no bats are presented or harmed during the felling process. Surveying at dusk and dawn the day before scheduled felling will determine if bats are present and the level of dismantling required during felling. Dismantling involves the felling of large limbs which are lowered to the ground before the felling of the main trunk.

A large number of trees a proposed to be felled and these are generally located directly adjacent to the buildings and walled garden. However, there are a number of trees that are within the Lesser Horseshoe Bat Conservation Zone. It is recommended that trees located within the Lesser Horseshoe Bat Conservation Zone are retained (Tree Tag 414, 405, 397, 141, 142, 149, 153, 157, 205, 251, 263, 270, 279, 288, 175, 289, 326, 361 and 346) as these trees are of benefit to the tree cover required and also, provide roosting sites for other bat species.

6.1.6 Bat Box Scheme

The total number of bat boxes required to mitigate for general conservation of local bat populations (Please see appendices for details):

- 15 summer bat boxes (Schwegler Woodcrete 1FF and 1F bat boxes – www.veldshop.nl) to be erected on mature trees within the proposed development site. This is to mitigate for soprano pipistrelles, brown long-eared bats and Leisler's bats and to provide roosting for common pipistrelle.
- 5 Miramere bat boxes– source www.nhbs.com) to be erected on mature trees within the proposed development site. This is to mitigate for Natterer's bat and to provide roosting for Daubenton's bat.
- Bat Tubes (Schwegler Woodcrete 1FR & 2FR – www.veldshop.nl) to be inserted in to external walls of free standing retained walls and walled garden. A minimum of 6 bats tubes are required. Additional bat tubes are proposed for the Lesser Horseshoe Bat Pump House.

Bat boxes scheme be sited carefully and this will be undertaken by a bat specialist. Bat boxes will be erected prior to construction works. The bat specialist will erect the bat boxes with assistance from the contractor. Some general points that will be follow include:

- Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 1 metre 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 roosting bats.

- Locations for bat boxes should be selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes. Therefore the bat boxes are to be erected mature trees to the rear of the proposed development site and away from public street lighting (Figure 7a).

6.1.7 Landscaping Plan

Extensive planting will be required to replace trees proposed to be felled and to ensure that there is tall vegetation to buffer any proposed lighting plan for the proposed development area. The two main areas of planting is present below. For the immediate planting, a native treeline/hedgerow comprised of fast growing tree species such as alder and birch (intermixed with double hedgerow planting of hawthorn, blackthorn and holly) are recommended along the boundary of the two planting zones. This planting is requires to be undertaken as part of immediate works as part of the development of the buildings to ensure that there is tall vegetation prior to the operation of the proposed development site.

The planting of the internal areas should consist of tree species similar to the existing tree species along the River Rinn and the woodland. This can be planted during and post-operation of the proposed development and maybe part of a Native Woodland Planting regime.

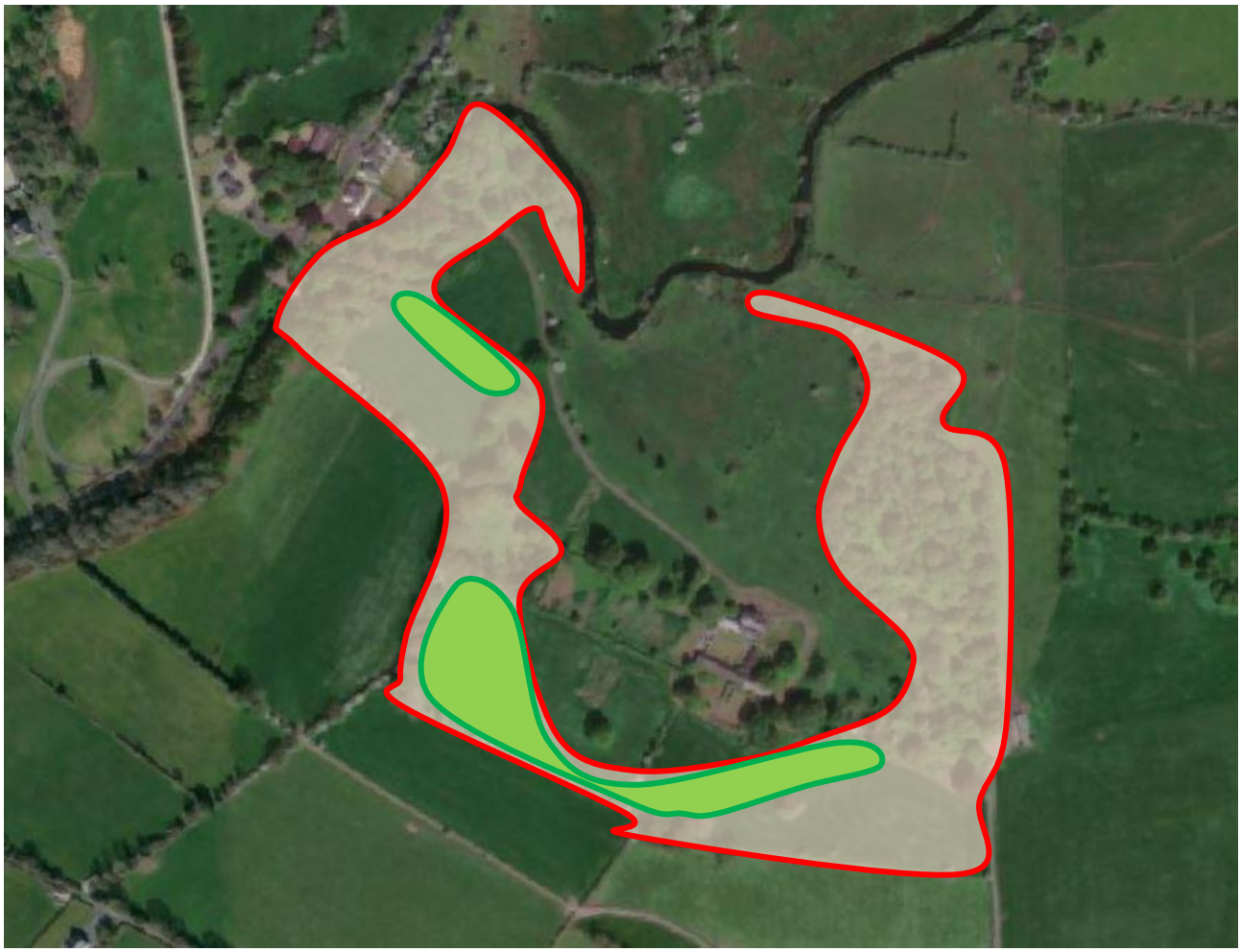

Figure 7d: Lesser Horseshoe Bat Conservation Zone Landscape Areas.

6.1.8 Monitoring

Extensive supervision by a bat specialist of the proposed renovation works will be required throughout the development of the buildings to ensure that no bats are harmed during the works.

This should be coupled with static surveillance of the bat house to document bat activity within this structure and all other alternative roosting provisions.

7. Survey Conclusions

Seven bat species were recorded within red line boundary of Ballykilty Manor, Quin, Co. Clare during surveys undertaken in 2021, 2022 and 2024. Five of these species were confirmed recorded roosting in buildings and trees within the survey area.

The following bat roosts were recorded:

Ballykilty House
- Lesser horseshoe bat maternity roost
- Brown long-eared bat maternity roost
- Natterer's bat satellite roost
- Soprano pipistrelle satellite roost

Bat House
- Lesser horseshoe bat day roost
- Brown long-eared bat satellite roost
- Soprano pipistrelle day and night roosts

Bar Building
- Lesser horseshoe bat day roost
- Brown long-eared bat day roost

Pump House
- Lesser horseshoe bat night roost

Stables
- Natterer's bat day roost

Tree Roost
- Leisler's bat maternity & day roosts
- Soprano pipistrelle satellite roosts (x2)

All seven bat species recorded were detected foraging and commuting within the survey area. A number of commuting routes were recorded and these principally were of individuals commuting from roosts along treelines/ stonewalls towards the River Rinn and/or to the woodland areas adjacent to the River Rinn. It is important to note that due to the current darkness (i.e. no artificial outdoor lighting within the survey area) of the survey site, there is extensive connectivity from the buildings recorded as roosts along parkland trees and stonewalls to the woodland areas and the River Rinn.

The proposed works will result in the loss of roosts for some species while temporary disturbance as likely for other bat species. In addition, increased lighting and human presence will also negatively impact on local bat populations. Therefore the potential impact of the proposed development is, overall, considered to be Permanent Negative and to have a scale of impact of Moderate to Significant impact on lesser horseshoe bats and Moderate impact on all other bat species.

As a consequence, bat mitigation measures are presented in order to reduce the potential impact of renovation works and this includes a bat friendly lighting scheme for the proposed development with additional measures relating to tree felling and the erection of a bat box scheme. Bat conservation measures are also presented for the conservation of local lesser horseshoe bat populations (e.g. erection of a day roost and a conservation zone). In addition, measures are also presented to reduce

the impact on local bat populations during the construction works to ensure that bats are not harmed in the process and that alternative roosting is available during the construction and operation of the proposed development.

If the mitigation measures presented below are strictly implemented, the scale of impact is likely to be reduced to Slight Negative impact on local bat populations.

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9. Appendices

9.1 Appendix 1 – Alternative Bat Roosts

Bat Boxes

Examples of bat box designs recommended

a) Woodcrete 1FF

b) Woodcrete 2F

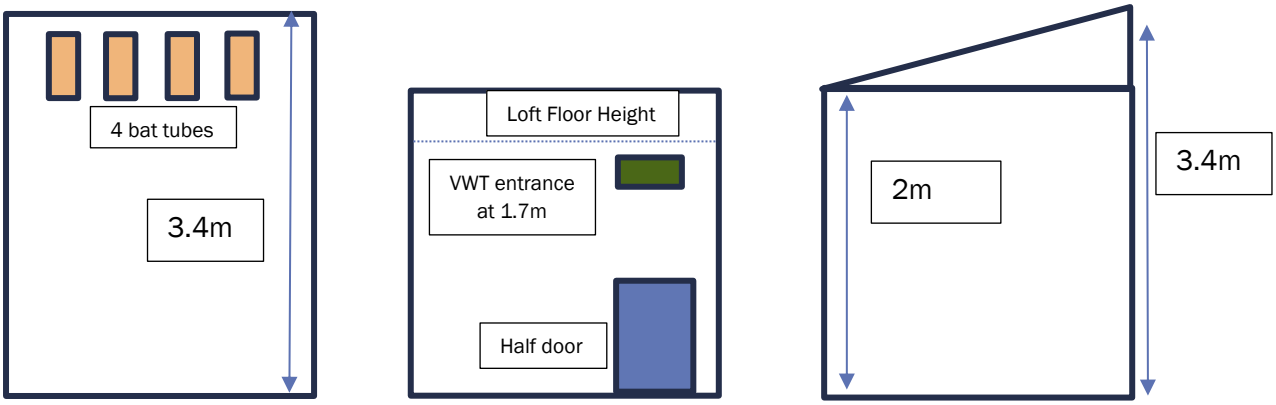
c) Miramere bat box

Marnell *et. al. (*2022) and Schofield (2008) is used to design alternative bat roosting structures for lesser horseshoe bats with roosting provisions for soprano pipistrelles and Daubenton's bats. Additional communications made with NPWS and VWT in relation to newly designed Day Roost for lesser horseshoe bats (*pers comm* Declan O' Donnell, NPWS and Dr Kate McAney, Vincent Wildlife Trust (VWT)) was also taken into consideration in relation to alternative structures. In addition, VWT constructed six Lesser horseshoe bat Daytime Roosts as The Mulkear EIP Project. Bat Eco Services undertook the design and supervision of a similar design for Clare Co. Co. as part of bat mitigation work. Please note that the VWT will be releasing updated guidelines regarding the construction of artificial roosts for this species in 2025 and therefore, updates to the design below maybe required once this publication is available.

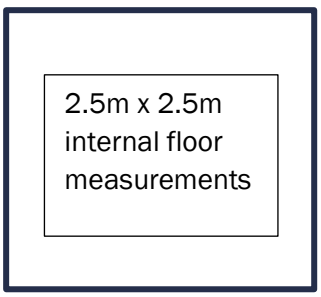
The following principals will be followed:

- Located as close to the existing roosts as possible.
- The location of the alternative roost should be close to existing flight lines and foraging habitat to increase its success.
- The design should take into consideration the requirements of the species concerned.
- The alternative roost should be designed to provide suitable thermal regimes.
- Opportunities should be taken to provide a variety of roosting opportunities and thermal regimes so as to maximise the value of the structure for bats.

Therefore the alternative roost plans are as follows:



External Rear View External Front View External Side View



Internal View

Figure A: Drawing of proposed alternative bat house.

Components of structure:

- Internal height from 1.8m (top of joists of loft floor – 20 cm joists) (Line represents the loft floor on External Front View drawing above). Insulation board between the loft floor joists (i.e. underside of loft floor) and line with a ply wood sheeting above and below joists. Then chicken wire is fixed to the ply wood on the underside of the insulation board and joists of loft floor to provide a grip for lesser horseshoe bats to hang from in the ground floor room.
- It is recommended that there is a 30º angle slope roof, but in order to have some space at the shorter side of the structure, the roof is fixed (on 10cm joists) starting 30cm above the loft floor at the shorter end to 1.7m at the tall end (Tall wall height is 3.4m).
- Natural slate roof only.
- 1F bitumous felt (NO MODERN BREATHABLE FELT)
- Internal loft floor with loft floor opening of 40cm x 40cm (to allow bats to fly from post box entrances into the loft space internally. This loft floor opening is positioned in the centre of the floor. This opening does not have a trap door.
- Internal wall – solid concrete block wall not plastered (insulation between internal and external block walls).
- External wall – solid concrete block with external walls sand and cement rendered.
- Facia and soffit with downpipe.
- 4 bat tubes to be built into the external wall (tallest section). Bat tubes are the approx. size of a solid concrete block.
- Half (size) steel entrance door with lock.
- Bat entrance can either be fitted above door or on the gable wall at 1.7m height (Shown on gable wall above). Recommend using the VWT predator proof entrance (constructed on demand from a company in Limerick – See Plate 1) for this entrance point as it is slightly lower to ground level.
- Foundation to engineers specifications.

Plate 1a: VWT Lesser Horseshoe Bat Daytime Roost (Photo: VWT, Ireland).

The following is some examples of Pine Marten proofing undertaken at other lesser horseshoe roosts.

Plate 1b: Garryland Lodge LHB Roost, Garryland Nature Reserve, Gort, Co. Galway – please note the lead sheet around the windowsill to reduce Pine Marten entering the structure.

Plate 1c: Ballykilty Bat House, Co. Clare – please note the lead sheet below the entrance point to reduce Pine Marten entering the structure.

9.2 Appendix 2 Bat Assessment Tables

Table 4.1 Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape, to be applied using professional judgement.

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

[a] For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.
[b] Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten *et al.*, 2015). This phenomenon requires some research in the UK but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in large buildings in highly urbanised environments.
[c] This system of categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Figure A: Table 4.1 (p 35) Reproduced from Collins (2016).

(1) Conversion, modification, demolition or removal of buildings (including hotels, schools, hospitals, churches, commercial premises and derelict buildings) which are:

- agricultural buildings (e.g. farmhouses, barns and outbuildings) of traditional brick or stone construction and/or with exposed wooden beams;
- buildings with weather boarding and/or hanging tiles that are within 200m of woodland and/or water;
- pre-1960 detached buildings and structures within 200m of woodland and/or water;
- pre-1914 buildings within 400m of woodland and/or water;
- pre-1914 buildings with gable ends or slate roofs, regardless of location;
- located within, or immediately adjacent to woodland and/or immediately adjacent to water;
- Dutch barns or livestock buildings with a single skin roof and board-and-gap or Yorkshire boarding if, following a preliminary roost assessment, the site appears to be particularly suited to bats.

(2) Development affecting built structures:

- tunnels, mines, kilns, ice-houses, adits, military fortifications, air-raid shelters, cellars and similar underground ducts and structures; unused industrial chimneys that are unlined and brick/stone construction;
- bridge structures, aqueducts and viaducts (especially over water and wet ground).

(3) Floodlighting of:

- churches and listed buildings, green space (e.g. sports pitches) within 50m of woodland, water, field hedgerows or lines of trees with connectivity to woodland or water;
- any building meeting the criteria listed in (1) above.

(4) Felling, removal or lopping of:

- woodland;
- field hedgerows and/or lines of trees with connectivity to woodland or water bodies;
- old and veteran trees that are more than 100 years old;
- mature trees with obvious holes, cracks or cavities, or that are covered with mature ivy (including large dead trees).

(5) Proposals affecting water bodies:

- in or within 200m of rivers, streams, canals, lakes, reed beds or other aquatic habitats.

(6) Proposals located in or immediately adjacent to:

- quarries or gravel pits;
- natural cliff faces and rock outcrops with crevices or caves and swallets.

(7) Proposals for wind farm developments of multiple wind turbines and single wind turbines (depending on the size and location) (NE TIN 051 – undergoing updates at the time of writing).

(8) All proposals in sites where bats are known to be present[1]

This may include proposed development affecting any type of buildings, structures, feature or location.

Notes:

1. Where sites are of international importance to bats, they may be designated as SACs. Developers of large sites 5–10km away from such SACs may be required to undertake a HRA.

Figure B: Reproduced from Collins (2016) – page 13.

Table 2 Factors affecting the probability of bats being present.

Factors affecting the probability of a building being used by bats in summer	
Increased probability	Disused or little used; largely undisturbed
	Large roof void with unobstructed flying spaces
	Large dimension roof timbers with cracks, joints and holes
	Uneven roof covering with gaps, though not too draughty
	Entrances that bats can fly in through
	Hanging tiles or wood cladding, especially on south-facing walls
	Rural setting
	Close to woodland and/or water
	Pre-20th century or early 20th century construction
	Roof warmed by the sun
	Within the distribution area of horseshoe bats
Decreased probability	Highly urbanised area with few feeding places
	Small or cluttered roof void (esp. for brown long-eared bat)
	Heavily disturbed
	Modern construction with few gaps around soffits or eaves (but be aware these may be used by pipistrelles in particular)
	Prefabricated with steel and sheet materials
	Active industrial premises
	Roof shaded from the sun
Factors affecting the probability of trees being used by roosting bats	
Increased probability	In ancient woodland or parkland
	Large trees with complex growth form
	Species that typically form cavities, such as beech, willow, oak or ash
	Visible damage caused by rot, wind, lightning strike *etc.*
	Loose bark providing cavities
Decreased probability	Coniferous plantation with no specimen trees
	Young trees with simple growth form and little damage
Factors affecting the probability of underground sites being used by roosting bats	
Increased probability	Large enough to develop stable temperature in winter
	High humidity
	Undisturbed
	Close to woodland or water (but note that bats will also use upland sites)
	Many cracks and crevices suitable for bats
Decreased probability	Small and draughty
	Heavily disturbed
	In urbanised areas
	Smooth surfaces with few roosting opportunities

Figure C: Table 2 Reproduced from Marnell *et al.* (2022).

10. Bat Species Profile

10.1 Leisler's bat

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 (52,820km^2). 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
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 *et al. 2011*)	52,820 km^2

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

10.2 Common pipistrelle

This species is 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 (56,485km^2) 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
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	1.2 to 2.8 million (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011*)	56,485

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

10.3 Soprano pipistrelle

This species is 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 (62,020km^2). 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
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	0.54 to 1.2 million (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011)*	62,020

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

10.4 Brown long-eared Bat

This species is generally considered to be widespread across the island. The modelled Core Area for Brown long-eared bats is a relatively large area that covers much of the island of Ireland (52,820km^2) with preference suitable areas in the southern half of the island. The Bat Conservation Ireland Irish Landscape Model indicated that the Brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5km emphasising the importance of local landscape features for this species (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2008-2013 Stable
Biographical Range	km^2
Estimate Core Area (Lundy *et al. 2011)*	49,929 km^2

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

Principal concerns for brown long-eared 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;
- Lack of knowledge of winter roosts;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

10.5 Natterer's bat

There are three species included in the *Myotis* species family and their echolocation calls are very similar across these three species. The modelled Core Area for Natterer's bats is a relatively large area that covers much of the island of Ireland (52,864km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Natterer's bat selects areas with broadleaf woodland, riparian habitats and areas with larger scale provision of mixed forest (Roche *et al.,* 2014). Therefore, it is likely that this species is more widespread within the survey area.

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	Unknown
Estimated Irish Population Size	Unknown
Estimate Core Area (Lundy *et al. 2011)*	52,864

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

Principal concerns for Natterer's bats 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;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

10.6 Daubenton's bat

The modelled Core Area for Daubenton's bats is a relatively large area that covers much of the island of Ireland (41,285km^2) 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
Irish Population Trend	2008-2013 Stable
Estimated Irish Population Size	81,000 to 103,000 (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011)*	41,285

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

10.7 Whiskered bat

The modelled Core Area for whiskered bats is a relatively small area (29,222 km2) compared to the other two resident *Myotis* bat species. The range is restricted to southern and eastern areas of Ireland. The Irish Landscape Model indicated that the whiskered bat habitat preference is for areas of woodland cover, small areas of pasture, urban and scrub habitat (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	Unknown
Estimated Irish Population Size	Unknown
Estimate Core Area (km^2) (Lundy *et al. 2011)*	29,222

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

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

- Lack of knowledge of roosting requirements, swarming sites
- Riparian habitat loss
- Loss of woodland and forest clearance
- Loss of woodland, scrub and hedgerows
- Tree surgery and felling
- Increasing urbanisation
- Light pollution

10.8 Nathusius' pipistrelle

The modelled Core Area for Nathusius' pipistrelle is a relatively restricted area (13,543km^2) and these areas are primarily associated with large water bodies such as Lough Neagh and the Lough Erne complex. The Bat Conservation Ireland Irish Landscape Model indicated that the Nathusius' pipistrelle habitat preference is large waterbodies (Roche *et al.,* 2014). But due to the paucity of information on this species, the knowledge of this species preference in Ireland is limited, any records recorded for this species is important.

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 (limited data, probably stable
Estimated Irish Population Size	10,000 to 18,000 (2007-2013)
Estimate Core Area (km^2) (Lundy *et al. 2011)*	13,543

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

The principal concerns for Nathusius' pipistrelle is the fact that roosting sites are poorly known in the Republic of Ireland:

- Lack of knowledge of winter sites and whether migration occurs;
- Renovation or demolition of derelict buildings and structures may cause undocumented roost losses; and
- Water pollution may be a threat to this species because it is particularly associated with lakes.