Planning and Environmental Consultants

Baseline Bat Report

Proposed Strategic Housing Development, Bóthar an Chóiste, Castlegar, Co. Galway

DOCUMENT DETAILS

Client:	**Lock House Developments Limited**
Project Title:	**Proposed Strategic Housing Development, Bóthar an Chóiste, Castlegar, Co. Galway**
Project Number:	**240420**
Document Title:	**Baseline Bat Report**
Document File Name:	**BBR – D2 – 2025.02.21**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	15/11/2024	NF	
02	Draft	13/02/2025	NF	SF

Table of Contents

TABLE OF TABLES

TABLE OF PLATES

TABLE OF FIGURES

1. INTRODUCTION

1.1 Purpose of this Report

MKO was commissioned to complete a comprehensive assessment of the potential effects on bats, as part of an Ecological Impact Assessment (EcIA) for an application for planning permission of a Strategic Housing Development, at Bóthar an Chóiste, Castlegar, Co. Galway. This report provides details of the bat surveys undertaken, including survey design, methods and results, and recommendation to safeguard bats. An impact assessment based on the information contained in this report is carried out within the accompanying EcIA.

The report presents the ecological baseline recorded within the proposed development site in relation to bats. Surveys were carried out in July – October 2024. Surveys included a suitability appraisal and inspection of the habitats and potential roosting features present on site. Manual activity surveys and roost surveys were carried out, as well as ground-level static detector surveys. Two detectors were deployed around the site for 35 nights.

The main objective of the surveys was to assess the site for its suitability for foraging and commuting bats, as well as assess and inspect any structures for potential roosts, including maternity roosts. The bat surveys were designed to establish the nature, scale and locations of potential bat activity within the site.

The bat survey and assessment were informed by a desk study and with reference to the following guidelines:

- *Bat Survey Guidelines: Traditional Farm Buildings Scheme. The Heritage Council, Áras na hOidhreachta, Church Lane, Kilkenny (Aughney, T., Kelleher, C. & Mullen, D., 2008)).*
- *'Bat Workers' Manual' (3rd edn). JNCC, Peterborough (Mitchell-Jones, A.J. & McLeish, A.P. (eds) 2004).*
- *The Lesser Horseshoe Bat Conservation Handbook, Vincent Wildlife Trust (Schofield, HW., 2008).*
- *Bat Surveys for Professional Ecologists – Good Practice Guidelines (4th edn.) (Collins, 2023)*
- *Bat Roosts in Trees (Andrews, 2018)*
- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (NRA, 2006a)*
- CIEEM (2013) *Competencies for Species Surveys: Bats.* Chartered Institute of Ecology and Environmental Management, Winchester.
- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes (NRA, 2006b)*
- *British Bat Calls: A Guide to Species Identification (Russ, 2012)*
- *Bat Mitigation Guidelines for Ireland – V2. Irish Wildlife Manuals, No. 134. (Marnell, Kelleher & Mullen 2022)*
- *UK Bat Mitigation Guidelines, (Reason, P. F. and Wray, S. 2023)*
- *Guidance Note 08/23: Bats and Artificial Lighting at Night (ILP, 2023)*
- *Lesser Horseshoe Bat Species Action Plan 2022-2026 (NPWS & VWT, 2022)*

1.2 Site Description

The Proposed Development site is located on lands to the north of Bóthar an Chóiste, in the townlands of Castlegar and Ballinfoile, Co. Galway, approximately 2.8 km north-east of Galway City (Grid Ref: M 31488 28212). The site is accessed via the local road, Bóthar an Chóiste.

The primary land use in the area is agricultural. The primary land uses in the wider landscape are residential and commercial. A location map of the Proposed Development site is provided in Figure 1-1.


Map Legend
Site Boundary
Site Location Map
Proposed Strategic Housing Development- Bothar na Choiste
MK
CM
240420
Figure 1-1
1:40,000
15.11.2024
MKO
Planning and Environmental Consultants
Tuam Road, Galway, Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie
Microsoft product screen shots reprinted with permission from Microsoft Corporation
© Ordnance Survey Ireland. All rights reserved. Licence number CYAL50267517
DRAFT

1.3 Policy and Legislation

All Irish bats are protected under European legislation, namely the Habitats Directive (92/43/EEC). All Irish species are listed under Annex IV of the Directive, requiring strict protection for individuals, their breeding sites and resting places. The Lesser horseshoe bat (*Rhinolophus hipposideros*) is further listed under Annex II of the Directive, requiring the designation of conservation areas for the species. Under this Directive, Ireland is obliged to maintain the favourable conservation status of Annex-listed species. This Directive has been transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011).

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976, as amended). Under this legislation, it is an offence to intentionally disturb, injure or kill a bat or disturb its roost. Any work at a roost site must be carried out with the agreement of the National Parks and Wildlife Service (NPWS) and a derogation licence must be granted before works commence.

The NPWS monitors the conservation status of European protected habitats and species and reports their findings to the European Commission every 6 years in the form of an Article 17 Report. The most recent report for the Republic of Ireland was submitted in 2019. Table 1-1 summarises the current conservation status of Irish bat species and identified threats to Irish bat populations.

Table 1-1 Irish Bat Species Conservation Status and Threats (NPWS, 2019).

Bat Species	Conservation Status	Principal Threats
Common pipistrelle *Pipistrellus pipistrellus*	Favourable	**A05** Removal of small landscape features for agricultural land parcel consolidation (M) **A14** Livestock farming (without grazing) [impact of anti-helminthic dosing on dung fauna] (M) **B09** Clear--cutting, removal of all trees (M) **F01** Conversion from other land uses to housing, settlement or recreational areas (M) **F02** Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (M) **F24** Residential or recreational activities and structures generating noise, light, heat or other forms of pollution (M) **H08** Other human intrusions and disturbance not mentioned above (Dumping, accidental and deliberate disturbance of bat roosts (e.g. caving) (M) **L06** Interspecific relations (competition, predation, parasitism, pathogens) (M) **M08** Flooding (natural processes) **D01** Wind, wave and tidal power, including infrastructure (M)
Soprano pipistrelle *Pipistrellus pygmaeus*	Favourable	
Nathusius' pipistrelle *Pipistrellus nathusii*	Unknown	
Leisler's bat *Nyctalus leisleri*	Favourable	
Daubenton's bat *Myotis daubentoni*	Favourable	
Natterer's bat *Myotis nattereri*	Favourable	
Whiskered bat *Myotis mystacinus*	Favourable	
Brown long-eared bat *Plecotus auritus*	Favourable	

Bat Species	Conservation Status	Principal Threats
Lesser horseshoe bat *Rhinolophus hipposideros*	Inadequate	

1.4 Bat Roosting Behaviour

Bats use a variety of natural and manmade structures as roosting or resting places. The type of roost and its level of use is determined by its function in the bat life cycle. Table 1-2 provides a summary of different types of bat roosts (Collins, 2023).

Table 1-2 Bat Roost Types and Definitions

Roost Type	Definition
Day	Where individuals or small groups, rest/shelter in the day but are rarely found by night in summer.
Night	Where bats rest/shelter at night but are rarely found in the day.
Feeding	Where individuals, or a few individials, rest/feed for short periods during the night but are not present by day.
Transitional	Used by a few individuals for short periods of time prior to or following hibernation.
Maternity	Where females give birth and raise their young.
Hibernation	Where bats are found during winter (constant cool temperature and high humidity).
Satellite	An alternative roost found in close proximity to the main nursery colony used throughout the breeding season.
Swarming Site	Where large numbers gather in late summer to autumn. Important mating sites. Roosting may occur alongside swarming.
Mating Site	Where mating takes place in late summer to winter.

The likelihood of detecting active roosts is determined by the timing of the roost survey. In general:

- April surveys may detect transitional roosts used by bats following hibernation and prior to summer roosting.
- May-August surveys may detect maternity colonies and male/non-breeding female summer roosts.
- August surveys are best to determine maximum counts of adult and juvenile bats.
- August – October surveys may detect swarming and mating bats.
- September and October surveys may detect transitional roosts used by bats following the dispersal of maternity colonies and prior to hibernation.
- Day, night, feeding and satellite roosts may be found anytime between April and October.
- November – March surveys may detect hibernacula.

1.4.1 Bat Roost Significance

Whilst there are no clear Irish guidelines on assessing the significance of a roost, significance should be assessed at an appropriate spatial scale, based on species distribution, conservation status, current population trends, functionality of the site and the Zone of Influence (ZoI) of the project in question as it relates to bats (Reason and Wray, 2023). The significance of a bat roost is dependent on the rarity of the species using the roost and its function to the bat's life cycle, as outlined in Table 1-2 above. Table 3.2 of the CIEEM guidelines (adapted in Table 1-3) provides a starting point on the geographical assessment, which will rely on professional judgement and will be based on the baseline data collected and available information gathered during desktop studies.

Table 1-3 Roost importance at various geographic levels, adapted to Ireland from Table 3.2 of CIEEM guidelines (Reason and Wray, 2023)

Conservation status/ distribution	Individual or very small occasional/ transitional/ opportunistic roosts	Non-breeding day roosts (small numbers of species)	Mating sites, small numbers of hibernating bats	Larger transitional roosts	Hibernation sites	Autumn swarming sites	Maternity sites
Widespread all geographies	Site	Site	Site	Site/Local	Local/County [Larger hibernation sites rare in the UK]	Local/County [Very large pipistrelle swarming sites appear uncommon in the Ireland]	Unlikely to exceed Local/County importance unless colonies are atypically large; importance increased for assemblages.
Widespread in many geographies, but not as abundant in all	Site	Site	Site, dependent on local distribution [For *Myotis*, see swarming site column]	Local/County	Local/County importance dependent on size and number of species	County/National importance dependent on size; importance increased for larger sites that serve larger numbers/species	Unlikely to exceed County importance unless colonies are atypically large; importance increased for assemblages.
Rarer or restricted distribution	Site (very well-used night roosts may be of County importance for some species)	Site/Local/County, dependent on local distribution	Site/Local/County dependent on local distribution	Local/County	Local/County importance dependent on size and local distribution; increased value for assemblages.	County/National importance on size and local distribution; increased value for assemblages.	County/National importance on size and local distribution; increased value for assemblages.
Rarest Annex II species and very rare	Site (very well-used night roosts may be of Local/County importance for some species)	Site/Local/County, dependent on local distribution	Site/ Local/County, dependent on local distribution	Local/County	County/Regional importance on size and local distribution; increased value for assemblages	County/National importance on size and local distribution; increased value for assemblages.	County/National importance on size and local distribution; increased value for assemblages

All the largest roosts of Lesser Horseshoe Bat (LHB) in Ireland are of international importance and it is anticipated that all large Leisler's bat roosts (>100) would also have international significance (NRA, 2006) due to the limited distribution of this species in other European countries. Table 1-4 provides some criteria for determining the significance of different building roosts, as determined by the Bat Expert Panel of the Heritage Council in 2003 (NRA, 2006). Geographic criteria will be applied to these values.

Table 1-4 Level of Importance of Various Roosts in Ireland

Species	Indicator	Significance
Lesser horseshoe bat	Special Area of Conservation	Very significant
	If present	Significant
Whiskered bat	>10	Very significant
	If present	Significant
Natterer's bat	>10	Very significant
	If present	Significant

Daubenton's bat	Maternity roost	Significant
Leisler's bat	Maternity roost	Significant
Common pipistrelle	Maternity roost	Significant
Soprano pipistrelle	Maternity roost	Significant
Brown long-eared bat	Maternity roost	Significant

1.5 Statement of Authority

MKO employs a dedicated bat unit within its Ecology team, dedicated to scoping, carrying out, and reporting on bat surveys, as well as producing impact assessments in relation to bats. MKO ecologists have relevant academic qualifications and are qualified in undertaking surveys to the levels required. MKO's Ecology team holds an open bat derogation licence from NPWS. The licence is intended for professionals carrying out surveys with the potential to disturb roosting bats (i.e. roost inspections). Graduate and seasonal ecologist staff are covered under the licence under condition of being accompanied by more experienced colleagues.

Survey scoping was prepared by Aoife Joyce. The daytime walkover survey and inspections were carried out by Nathan Finn, Ryan Connors, and Ciara Lynn Sheehan. Manual activity surveys were carried out by Nathan Finn, Ciara Lynn Sheehan, Cormac Roberts, and Nora Szijarto. Data manual ID were carried out by Frederick Mosley, Nathan Finn, Charlie Meehan, and Cormac Roberts. This report was prepared by Nathan Finn, and was reviewed and approved by Sara Fissolo. Staff's roles and relevant training are presented in Table 1-4 below.

Table 1-5 Project team qualifications and training.

Staff	Role	Qualifications and Training
Aoife Joyce (B.Sc., M.Sc.)	Project Director	B.Sc. (Hons) Environmental Science, University of Galway, Ireland. M.Sc. (Hons) Agribioscience, University of Galway, Ireland. Advanced Bat Survey Techniques – Trapping, biometrics, handling (BCI), Bat Impacts and Mitigation (CIEEM), Bat Tree Roost Identification and Endoscope Training (BCI), Bats in Heritage Structures (BCI), Bats and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Sara Fissolo (B.Sc.)	Project Ecologist	B.Sc. (Hons) Ecology and Environmental Biology, University College Cork, Ireland. Advanced Bat Survey Techniques (BCI), Bat Impacts and Mitigation (CIEEM), Bats in Heritage Structures (BCI), Bat Care (BCT), Bats and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Nathan Finn (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. (Hons) Science, National University of Ireland, Galway. M.Sc. (Hons) Environmental Science, University College Dublin. Bat Detector and Survey Training (BCI), Kaleidoscope Pro Analysis (Internal), Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal),

		Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).
Ciara Lynn Sheehan (B.Sc.)	Graduate Ecologist	B.Sc. (Hons) in Ecology and Environmental Biology from University College Cork Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).
Nora Szijarto (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. Biology, University of Lausanne, Switzerland M.Sc. Behaviour, Evolution and Conservation, University of Lausanne, Switzerland Bat Detector and Survey Training (BCI), Kaleidoscope Pro Analysis (Wildlife acoustics), Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).
Ryan Connors (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. (Hons) Zoology, University College Galway, Ireland. M.Sc. (Hons) Conservation Behaviour, Atlantic Technological University, Galway, Ireland. Surveying Trees for Bats (BRTS), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal), Kaleidoscope Pro Analysis (Internal), Winter Tree Identification (Internal), Wintering Bird Surveying (Internal).
Cormac Roberts	Student	Summer intern in the bat team. Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).

2. METHODOLOGY

2.1 Desktop Study

A desktop review of published material was undertaken to inform all subsequent field studies and assessments. The aim of the desktop review was to identify the presence of species of interest within the site and surrounding region.

The following list describes the sources of data consulted:

- *Review of online web-mappers: National Parks and Wildlife Service (NPWS) mapping.*
- *Review of NPWS Article 17 Report.*
- *Review of the publicly available National Biodiversity Data Centre web-mapper.*
- *Review of specially requested records from the NPWS Rare and Protected Species Database for the hectads which overlap with the study area.*
- *Galway County Development Plan 2022-2028*
- *BCI Database*
- *Review of NPWS Lesser Horseshoe Bat national dataset*

2.1.1 Bat Species' Range

EU member states are obliged to monitor the conservation status of natural habitats and species listed in the Annexes of the Habitats Directive. Under Article 17, they are required to report to the European Commission every six years. In April 2019, Ireland submitted the third assessment of conservation status for Annex-listed habitats and species, including all species of bats (NPWS, 2019).

The 2019 Article 17 Reports were reviewed for information on bat species' range and distribution in relation to the location of the proposed development.

2.1.2 National Bat Database of Ireland

The National Bat Database of Ireland holds records of bat observations received and maintained by Bat Conservation Ireland. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. The database was searched for bat presence and roost records within a 10km radius of the proposed site, as well as general landscape suitability for bats.

2.1.3 Designated Sites

The potential for the proposed works to impact on sites that are designated for nature conservation is considered in separate Ecological Impact Assessment (EcIA) and Appropriate Assessment Screening (AASR) reports. Special Areas of Conservation (SACs) are designated under EU Habitats Directive. The European Sites that are within the Zone of Likely Impact, with bats identified as Qualifying Interests, are listed in Section 3.1.3 below.

Natural Heritage Areas (NHAs) are designated under the Wildlife (Amendment) Act 2000 and their management and protection is provided for by this legislation and planning policy. Proposed Natural Heritage Areas (pNHAs) were designated on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. Any identified NHAs and pNHAs designated for the protection of bats are presented in Section 3.1.3 and potential for impacts was fully considered.

2.1.4 Habitat and Landscape

2.1.4.1 Ordnance Survey Mapping

Ordnance survey maps (OSI 1:5,000 and 1: 50,000) and aerial imagery (ortho-based maps) were reviewed to identify any habitats and features likely to be used by bats. Maps and images of the site and general landscape were examined for suitable foraging, commuting or roosting habitats including woodlands and forestry, hedgerows, tree lines and watercourses.

2.1.4.2 Geological Survey Ireland

The Geological Survey Ireland (GSI) online mapping tool and University of Bristol Spelaeological Society (UBSS) Cave Database for the Republic of Ireland were consulted for any indication of natural subterranean bat sites, such as caves, within 10 km of the proposed site (BCI, 2012) (last searched on the 12th November 2024). Furthermore, the archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (last searched on the 12th November 2024).

2.1.4.3 National Monuments

The archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (last searched on the 12th November 2024).

2.1.5 Previous Reports

The previous bat report produced by MKO in 2022, based on bat surveys carried out in 2020 and 2021 was reviewed for further information regarding bats at the Proposed Development site.

A review of available documentation of relevant surveys undertaken within or in the vicinity of the proposed development site was carried out. The following projects were considered:

- Menlo Castle Restoration Project (2022 – 2025)
- N6 Galway City Transport Project (2018)

2.2 Field Study

2.2.1 Bat Habitat Appraisal

A walkover survey of the Study Area was carried out during daylight hours on the 16th July 2024. The landscape features on the site were visually assessed for potential use as bat roosting habitats and commuting/foraging habitats using a protocol set out in BCT *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (4th edn.) (Collins, 2023). The aim of the survey was to identify suitable bat habitats within the site to guide further survey efforts.

Table 4.1 of the 2023 BCT Guidelines identifies a grading protocol for assessing structures, as well as commuting/foraging habitat for bats, which is summarised in Table 2-1. The protocol is divided into five Suitability Categories: *High, Moderate, Low, Negligible and None*. Table 4.2 of the 2023 BCT Guidelines identifies a grading protocol to assess trees, which is divided into three Suitability Categories: NONE (No suitability), FAR (Further Assessment Required), and PRF (Potential Roosting Feature present). This initial tree grading protocol can inform a preliminary roost assessment (PRA) to determine the available tree-roosting resource within the proposed development site, depending on

whether a PRF could accommodate a small number of bats (PRF-I) or a larger roost, including maternity roosts (PRF-M). More information on PRAs is provided below.

Table 2-1 BCT protocol for bat habitat appraisals (Collins, 2023).

Assessment	Rationale
High	Structure 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, and surrounding habitat. Continuous, high-quality, well-connected habitats, connected to known roosts.
Moderate	A structure used by bats due to their size, shelter, protection, conditions and surrounding habitat, but are unlikely to support a roost of high conservation status, and suitable, connected habitats.
Low	Structures with one or more potential roost sites that could be used by an individual bat opportunistically, and suitable but isolated habitats that could be used by a small number of bats.
Negligible	No obvious features present, but a level of uncertainty remains.
None	No habitat features likely to be used by roosting, foraging or commuting bats.

2.2.1.1 Preliminary Roost Assessment

A search for roosts was undertaken within the boundary of the proposed site by two licenced ecologists to identify any potential roost features (PRFs). The licence, issued by NPWS, is intended for professionals carrying out surveys with the potential to disturb roosting bats. The aim of the survey was to determine the presence of roosting bats, potential access points, roosting locations and the need for further survey work or mitigation.

All structures identified within the site were assessed for their potential to support roosting bats. A systematic search of accessible interiors, including all attic spaces, was undertaken. The exterior of each building was inspected first from ground level and included all accessible windowsills, walls, eaves, roof ridge and roof slates. Inspections were carried out with the aid of torches, an endoscope, and thermal cameras. Surveyors searched for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises, as well as potential access points into the structure.

The proposed development site contains a large number of trees spread within woodland and treeline habitats. Roosting suitability was assessed in clusters and at feature level, and areas were marked in accordance to BCT Guidance (Collins, 2023) during the initial walkover surveys to inform need for further surveys and assessment.

Trees present within the site were examined from ground level for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other PRFs identified by Andrews (2018).

Three structures, along with the trees present on site were assessed and are described in Section 3.2.1 below.

2.3 Bat Activity Surveys

2.3.1 Manual Surveys

Manual activity surveys included roost surveys of any feature identified as a potential roost, as well as dusk emergence surveys and night-time bat walkovers (NBWs). For each of the surveys, surveyors were equipped with active full spectrum bat detectors, Batlogger M (Elekon AG, Lucerne, Switzerland). Where possible, species identification was made in the field and any other relevant information was also noted, e.g., numbers, behaviour, features used, etc. All bat echolocation was recorded for subsequent analysis to confirm species identifications, as detailed in Section 2.4. The survey effort is summarised in Table 2-2 and presented in Figure 2-1.

Table 2-2 Bat Activity Survey Effort.

Date	Surveyors	Type	Sunset	Weather	PRF
16th July 2024	Nathan Finn, Ciara Lynn Sheehan	Roost Emergence & NBW	21:54	14 – 17 °C, Dry, Calm - Light breeze, 55 - 75% Cloud Cover	Derelict farmhouse and derelict farm shed
7th August 2024	Nathan Finn, Cormac Roberts	Roost Emergence	21:19	16 – 17 °C, Dry – Moderate Rain, Calm, 100% Cloud Cover	Derelict farmhouse
18th September 2024	Nathan Finn, Nora Szijarto	Roost Emergence & NBW	19:45	15 - 19°C, Dry, Calm, 0% Cloud Cover	Occupied dwelling

2.3.1.1 Roost Surveys

Any structure identified during the bat habitat appraisal as having potential to host roosting bats was subject to presence/absence surveys in the form of preliminary roost assessments and emergence surveys. Rationale for survey effort was based on guidelines proposed by Collins in Tables 7.1 and 7.2 (Collins, 2023). Three structures were identified within the site and were subject to roost surveys following the initial roost assessment.

The derelict farmhouse (IG Reference: M 31596 28166) was subject to a preliminary roost assessment on 16th July prior to the dusk emergence survey. The structure was subject to a repeat inspection on 7th August 2024. The derelict farm shed (IG Ref.: M 31588 28181) was subject to a preliminary roost assessment on 16th July 2024. The occupied dwelling (IG Ref.: M 31471 28069) was subject to a preliminary roost assessment on 2nd October. The inspection of the occupied dwelling was delayed as we were waiting for access permission. Preliminary roost assessments were aided by flashlights, endoscopes and thermal cameras.

Surveyors were located at strategic vantage points near structures with a focus on potential access point and roosting features identified during the daylight walkover surveys. The purpose was to identify any bat species, numbers, access points and roosting locations within each the PRF structure. Night vision aids (NVAs), including a thermal camera and an infrared camera, aided the survey effort, as detailed in Section 2.3.1.2.

Roost emergence surveys commenced at least 15 minutes before sunset. The roost emergence survey on 16th July 2024 was ended 1 hour and 45 minutes after sunset. The survey on the night of 7th August 2024 was terminated 1 hour and 5 minutes after sunset due to unsuitable weather conditions for bats, along with bat activity ceasing. All other surveys were carried out in favourable weather conditions (Table 2-1). The emergence survey on the night of 18th September 2024 was terminated after 1 hour

and 6 minutes because activity had stopped at the PRF, and the surveyors wanted to get more details regarding the Lesser horseshoe bat flight paths.

2.3.1.2 Night Vision Aids

The use of NVAs is now considered standard best practice for bat activity surveys. MKO employs thermal camera equipment and Infrared camera equipment. A thermal camera (Infiray EYE II E6+ V3), mounted on a tripod, was used as a third surveyor during the roost survey performed on 16th July 2024 to identify potential roosting hotspots and monitor emergence activity. One infrared camera (SiOnyx Aurora PRO) and infrared light (Night Master NM1 SL), were also utilised during this survey for added visibility.

Footage from NVAs was saved and reviewed in office in full, with any instances of emergence marked for future use. The location of the NVAs is presented in Figure 2-1.

2.3.1.3 Night-time Bat Walkover

Manual activity surveys also comprised night-time bat walkovers after the roost emergence surveys. Night-time bat walkovers were performed on 16th July 2024 and 18th September 2024. The aim of these surveys was to observe bat species using the site and visually assess bat behaviour and important features used by bats within the site.

The walkover was performed by two surveyors, recording bats in real time. It followed the manual roost survey and was completed within 3 hours after sunset. Surveyors were equipped with one active full spectrum bat detector, the Batlogger M bat detector (Elekon AG, Lucerne, Switzerland). The transect route was prepared with reference to the proposed layout, desktop and walkover survey results, as well as any health and safety considerations and access limitations. The walkover routes are presented in Figure 2-1.

2.3.2 Static Detectors Surveys

Two full spectrum SM4 bat detectors (Wildlife Acoustics, Maynard, MA, USA), were deployed during static surveys to record bat activity on a monthly basis for periods of at least one week. The detectors were deployed from the 16th July 2024 to the 30th July; from the 7th August to the 14th August; and from the 18th September to the 2nd October 2024. The two locations of static detectors were selected to represent the range of habitats present within the site, and particularly favourable bat habitats.

Settings used were those recommended by the manufacturer for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates. Static detector locations are shown in Figure 2-1 and presented in Table 2-3.

Table 2-3 Static Detector Locations.

Detector ID	IG Reference	Habitat	Linear Feature within 50 m
D01	M 31586 28196	GA1 near WL1 and BL3	Fence and hedgerow within 10 m.
D02	M 31349 28242	Between GA1 and WL2	Beside treeline.

2.4 Bat Call Analysis

All recordings were later analysed using bat call analysis software Kaleidoscope Pro v.5.6.8 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the proposed development site. Bat species were identified using established call parameters, to create site-specific custom classifiers. All identified calls were also manually verified.

Echolocation signal characteristics (including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra) were compared to published signal characteristics for local bat species (Russ, 1999). *Myotis* species (potentially Daubenton's bat *(M. daubentonii),* Whiskered bat *(M. mystacinus),* Natterer's bat *(M. nattereri)*) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of Soprano pipistrelle *(P. pygmaeus)* and Common pipistrelle *(P. pipistrellus)* are distinguished by having distinct (peak frequency of maximum energy in search flight) peak frequencies of ~55 kHz and ~46 kHz respectively (Jones & van Parijs, 1993). Some overlapping is possible between these species: where no certainty could be achieved, calls were identified to genus level.

Individual bats of the same species cannot be distinguished by their echolocation alone. Thus, 'bat passes' was used as a measure of activity (Collins, 2023). A bat pass was defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration. All bat passes recorded in the course of this study follow these criteria, allowing comparison. Due to the volume of bat activity data recorded, where multiple bat passes were recorded within the same registration, rarer or harder to record species were identified. Underreporting of common species is possible using this method, and is accounted for within the assessment.

Echolocation calls by Brown long-eared bats (*Plecotus auritus*) are intrinsically quiet and hard to record by static equipment. All data collected, including Noise files and Auto ID files are checked to ensure all calls for this species have been captured. However, a level of underrepresentation is expected for this species and is accounted for in the assessment of activity levels.

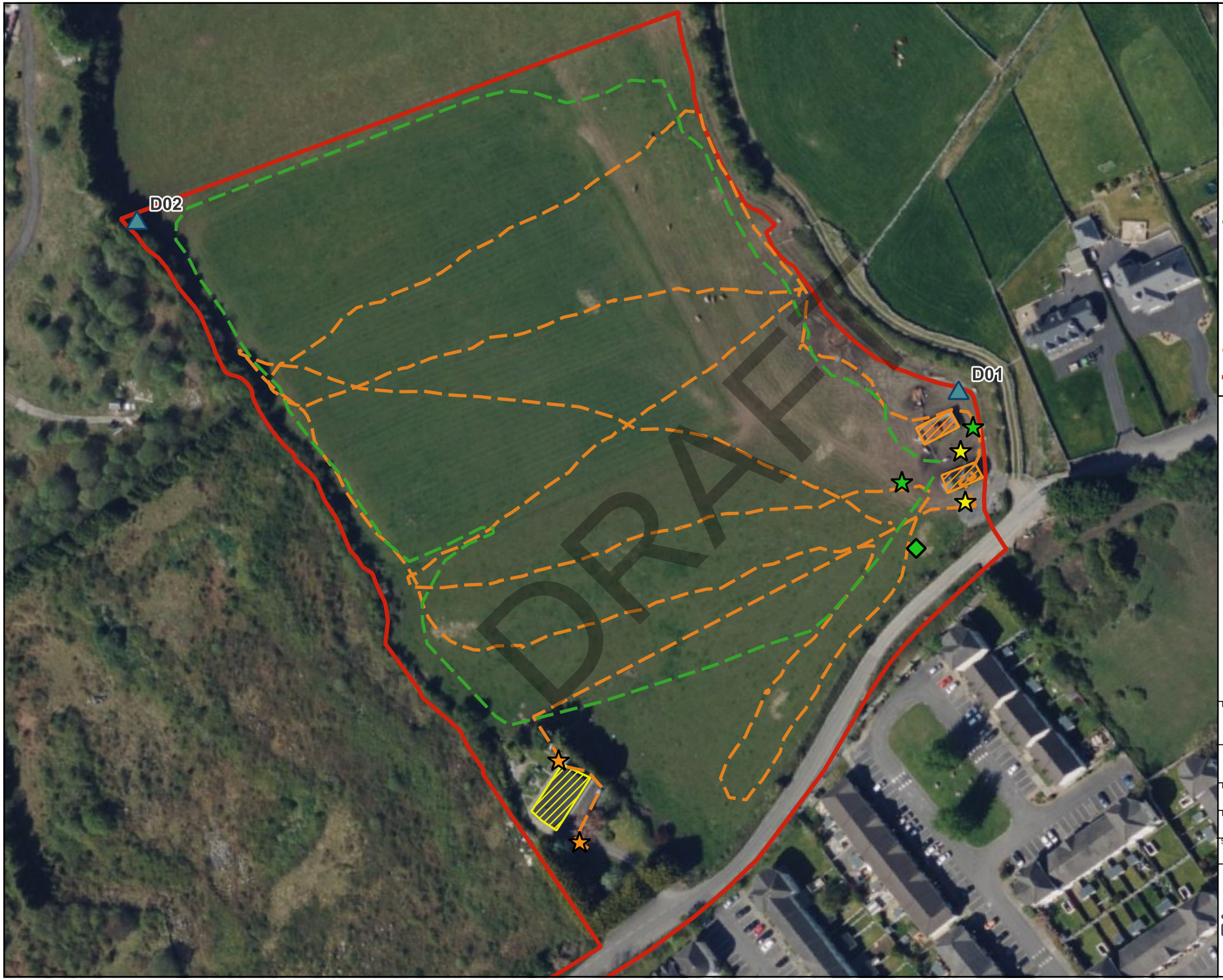
Echolocation by Lesser horseshoe bats (*Rhinolophus hipposideros*) is directional and can be missed by detectors, particularly manual detectors. MKO employs omni-directional microphones to limit under-recording for the species.

2.5 Assessment of Bat Activity Levels

The online database tool Ecobat (mammal.org.uk) is recommended by Collins to assess bat activity levels within a site. This web-based interface, launched in August 2016, allows users to upload activity data and to contrast results with a comparable reference range, allowing objective interpretation. Uploaded data then contributes to the overall dataset to provide increasingly robust outputs. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments.).

Ecobat was unavailable for a cross-site analysis of static data as the platform has been undergoing maintenance since late 2022 with no proposed timeline of a relaunch. Therefore, activity levels were assessed based on professional experience gained from performing bat surveys in a wide variety of Irish habitats. Ecobat has since relaunched after all site-specific analysis had been completed.

All statistical analyses and graphical representations in this report were conducted using R (version 4.3.2), and RStudio (Version 2023.09.0+375.). R is a powerful statistical programming language and provided the framework for data manipulation and statistical testing. To allow this, data were standardised into bat passes per hour. RStudio, as an integrated development environment for R, facilitated efficient coding, visualization, and reproducibility. The 'ggplot2' package in R was particularly instrumental in creating the detailed graphs presented in the results section.



Map Legend

- Detector Locations

Buildings Inspected

- Low
- Moderate

Manual 1 (16th Jul)

- Surveyor
- Thermal
- Transect Route

Manual 2 (7th Aug)

- Surveyor

Manual 3 (18th Sep)

- Surveyor
- Transect Route
- Site Boundary

N

Drawing Title
2024 Survey Effort

Project Title
Bóthar an Chóiste

Drawn By	Checked By
NF	SF
Project No.	Drawing No.
240420	Figure 2-1
Scale	Date
1:1,500	21.02.2025

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

3. RESULTS

3.1 Desktop Study

3.1.1 Galway County Development Plan – 2022-2028

The Galway County Development Plan 2022-2028 was searched for references specific to the protection of bats. The National Heritage and Biodiversity Policy Objectives 9 of Chapter 10 states that:

Protection of Bats and Bats Habitats

Seek to protect bats and their roosts, their feeding areas, flight paths and commuting routes. Ensure that development proposals in areas which are potentially important for bats, including areas of woodland, linear features such as hedgerows, stonewalls, watercourses and associated riparian vegetation which may provide migratory/foraging uses shall be subject to suitable assessment for potential impacts on bats. This will include an assessment of the cumulative loss of habitat or the impact on bat populations and activity in the area and may include a specific bat survey. Assessments shall be carried out by a suitably qualified professional and where development is likely to result in significant adverse effects on bat populations or activity in the area, development will be prohibited or require mitigation and/or compensatory measures, as appropriate. The impact of lighting on bats and their roosts and the lighting up of objects of cultural heritage must be adequately assessed in relation to new developments and the upgrading of existing lighting systems.

3.1.2 National Biodiversity Data Centre

A review of the National Bat Database of Ireland on the 5th November 2024 yielded results of bats within the 10 km hectads close to the proposed works (four hectads were searched). The search yielded 10 bat species within 10 km. Table 3-1 lists the bat species recorded within the hectads near the Site (M32).

A review of the NBDC bat landscape map provided a habitat suitability index of 45.33 (red). This indicates that the proposed development area has high habitat suitability for bat species.

Table 3-1 NBDC Bat Records.

Hectad	Species	Record Count	Date of Last Record	Database	Status
M32	Brown Long-eared Bat (Plecotus auritus)	4	19/09/2022	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M32	Common Pipistrelle (Pipistrellus pipistrellus sensu stricto)	16	18/09/2020	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M32	Daubenton's Bat (Myotis daubentonii)	2	29/08/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts

M32	Lesser Horseshoe Bat (Rhinolophus hipposideros)	3	05/02/2015	National Lesser Horseshoe Bat Database	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M32	Lesser Noctule (Nyctalus leisleri)	16	19/09/2022	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M32	Nathusius's Pipistrelle (Pipistrellus nathusii)	1	20/08/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M32	Natterer's Bat (Myotis nattereri)	1	27/08/2021	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M32	Pipistrelle (Pipistrellus pipistrellus sensu lato)	18	06/08/2022	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M32	Soprano Pipistrelle (Pipistrellus pygmaeus)	10	19/09/2022	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M22	Brandt's Bat (Myotis brandtii)	1	24/09/2015	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M22	Brown Long-eared Bat (Plecotus auritus)	40	14/08/2021	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M22	Common Pipistrelle (Pipistrellus pipistrellus sensu stricto)	48	14/08/2021	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M22	Daubenton's Bat (Myotis daubentonii)	173	23/08/2021	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M22	Lesser Horseshoe Bat (Rhinolophus hipposideros)	19	02/06/2021	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts

M22	Lesser Noctule (Nyctalus leisleri)	26	20/09/2022	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M22	Nathusius's Pipistrelle (Pipistrellus nathusii)	3	30/05/2021	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M22	Natterer's Bat (Myotis nattereri)	9	11/08/2021	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M22	Pipistrelle (Pipistrellus pipistrellus sensu lato)	8	15/09/2021	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M22	Soprano Pipistrelle (Pipistrellus pygmaeus)	63	20/09/2022	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M33	Brown Long-eared Bat (Plecotus auritus)	2	27/09/2009	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M33	Common Pipistrelle (Pipistrellus pipistrellus sensu stricto)	4	29/08/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M33	Daubenton's Bat (Myotis daubentonii)	223	31/08/2021	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M33	Lesser Noctule (Nyctalus leisleri)	11	29/08/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M33	Natterer's Bat (Myotis nattereri)	1	16/06/2009	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M33	Pipistrelle (Pipistrellus pipistrellus sensu lato)	3	24/09/2019	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M33	Soprano Pipistrelle (Pipistrellus pygmaeus)	9	29/08/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts

M23	Brown Long-eared Bat (Plecotus auritus)	2	26/05/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M23	Common Pipistrelle (Pipistrellus pipistrellus sensu stricto)	7	27/08/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M23	Daubenton's Bat (Myotis daubentonii)	9	30/05/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M23	Lesser Horseshoe Bat (Rhinolophus hipposideros)	14	18/01/2019	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M23	Lesser Noctule (Nyctalus leisleri)	8	06/06/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M23	Natterer's Bat (Myotis nattereri)	4	18/01/2019	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M23	Soprano Pipistrelle (Pipistrellus pygmaeus)	14	27/08/2018	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
M23	Whiskered Bat (Myotis mystacinus)	1	06/04/2022	National Bat Database of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts

3.1.3 NPWS Rare and Protected Species Database

Records from the NPWS Rare and Protected Species Database in the vicinity of the Proposed Development site were requested in November 2024. No reply has been received as of 21st February 2025. The results of the information request received in 2021 from the NPWS scientific data unit of Rare and Protected Species is detailed in Table 3-2.

Table 3-2 NPWS Lesser horseshoe bat records within 10km of the Proposed Development

Most Recent Count	Species	Location	Designation
2015	Lesser horseshoe bat *Rhinolophus hipposideros*	Coopers Cave, Galway	HD Annex II, Annex IV, WA

3.1.4 Designated Sites

Within Ireland, the Lesser horseshoe bat is the only bat species requiring the designation of Special Areas of Conservation (SACs). Lough Corrib SAC is within 10 kilometres of the Proposed Development site and lists *Rhinolophus hipposideros* as a qualifying interest. However, the roost for which this SAC is designated, is located approximately 34 km from the Proposed Development site. There are no other SACs within 10 kilometres of the Proposed Development site.

No Natural Heritage Areas (NHAs), or proposed NHAs, designated for the protection of bats were identified within 10km of the proposed works.

Table 3-3 European and National and proposed National Sites Designated to Bats.

Designated Site	Distance to Site	Species	Roost Type
Lough Corrib SAC	0.7 km	Lesser horseshoe bat	Maternity roost

3.1.5 Habitat and Landscape

A review of mapping and photographs provided insight into the habitats and landscape features present at the proposed development site. In summary, the primary land use within the proposed site is agricultural grassland.

A search of the UBSS Cave Database for the Republic of Ireland found no caves within the Proposed Development site. Two caves were identified within 10 km of the study area, Cooley's Cave and Newry hole. A review of the GSI online mapper did not indicate the possible presence of any further subterranean sites within the EIAR Study Area. A search of the National Monuments Database did not reveal any national monuments within the site.

3.1.6 Previous Reports

3.1.6.1 Menlo Castle Restoration

Menlo Castle is a protected structure located approximately 3km from the proposed development site, in the outskirts of Galway City. Regular monitoring has been conducted on Menlo Castle to record the number of roosting bats (especially Lesser horseshoe bats) since the discovery of a maternity roost in 2000. Surveys have been conducted by consultants (including MKO) and the NPWS. A summary of results of previous surveys we conducted, along with surveys detailed in public reports are shown in Table 3-4. Numbers in Table 3-4 are expressed as the maximum amount of each species recorded roosting in Menlo Castle in each year in which details of surveys conducted were available.

Table 3-4 Summary of surveys carried out at Menlo Castle.

Year	Maximum count of roosting bats
2024	13 Lesser horseshoe bat
2023	6 Lesser horseshoe bat
2022	37 Lesser horseshoe bat 4 Soprano pipistrelles
2021	34 Lesser horseshoe bat
2018	20 Lesser horseshoe bat
2017	43 Lesser horseshoe bat
2016	35 Lesser horseshoe bat
2015	32 Lesser horseshoe bat
2014	35 Lesser horseshoe bat
2012	27 Lesser horseshoe bat

2009	38 Lesser horseshoe bat
2006	2 Lesser horseshoe bat
2005	5 – 10 Lesser horseshoe bat
2000	12+ Lesser horseshoe bat 20 Daubenton's bat 20+ Brown long-eared bat <30 Natterer's bat 1 Soprano pipistrelle

3.1.6.2 Galway City Transport Project (2015)

A review of publicly available information, on studies undertaken as part of the Galway City Transport Project (GCTP), was carried out. As part of this project, detailed bat surveys were undertaken in the area surrounding Galway City and this publicly available information was consulted.

A series of bat surveys were carried out in relation to the N6 Galway City Transport Project and are described in full within the EIAR for the project (www.n6galwaycity.ie). During field surveys between 2014 – 2018, the following bat species were recorded along the entire route of the proposed road: lesser horseshoe bat, Leisler's bat, common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, brown long-eared bat, Daubenton's bat, Natterer's bat and whiskered bat. A total of 88 roost sites were recorded during these field surveys of the entire proposed road. Bat survey work carried out as part of the GCTP included walked and car transect surveys in Castlegar and surrounding areas. Chapter 4 of the Route Selection Report identifies bats and bat roosts throughout Galway city (Table 3-5).

Lesser Horseshoe Bat

A maternity/hibernation roost for lesser horseshoe bat was identified within the ruined castle at Menlo. This roost, along with a roost at Cooper's Cave in Castlegar, were identified as key sites for the Menlo lesser horseshoe bat population, which are also supported by a network of smaller day/night roost sites across the local area. Radio-tracking studies, undertaken in 2014 and 2015, established an important link between the roosts at Menlo Castle and Cooper's Cave.

Menlo Castle has been identified as a key maternity colony for the area since it was found in August 2000 and has since been monitored annually by the NPWS.

Other Bat Species

Bat surveys in 2014 recorded less than 20 Daubenton's bats roosting within Menlo Castle. In addition, a single soprano pipistrelle bat was observed emerging from an oak tree in a field located to the south of Menlo Castle in the summer of 2015.

Table 3-5 Roosts identified within 2.5km of proposed development (2015).

Species	Approx. Distance from Site
Common pipistrelle *(Pipistrellus pipistrellus)*	1.2km north
Leisler's bat *(Nyctalus leisleri)*	<500m west
Natterer's bat *(Myotis* nattereri*)*	1km north
Natterer's bat *(Myotis* nattereri*)*	1.2km north
Unidentified pipistrelle	1.8km east
Brown long-eared bat *(Plecotus auratus)*	<500m southeast
Lesser horseshoe bat *(Rhinolophus hipposideros)*	<500m
Brown long-eared bat *(Plecotus auratus)*	1.2km north

3.1.6.3 Galway City Ring Road EIAR (2018)

The N6 Environmental Impact Assessment Report for the Galway City Ring Road (GCRR) was consulted (Table 3-6).

Table 3-6 Roosts identified within 2.5km of proposed development (2018).

Roost ID	Species	Approx. Distance from Site	Details
PBR128	Lesser horseshoe bat *Rhinolophus hipposideros*	<500m southwest	N/A
PBR54	Lesser horseshoe bat *Rhinolophus hipposideros*	<500m southeast	Building. Day/night roost for small numbers of Lesser Horseshoe bats. This roost is linked to the Menlo Castle roost and Cooper's Cave.
PBR153	Lesser horseshoe bat *Rhinolophus hipposideros*	<500m southeast	Shed/stable building. Lesser horseshoe bat day/night roost.
PBR134	Leisler's bat *Nyctalus leisleri*	<500m west	N/A
PBR196	Brown long-eared bat *Plecotus auratus* Soprano pipistrelle *Pipistrellus pygmaeus*	<500m north	Building. Roost for small numbers of Soprano pipistrelle and Brown long-eared bats (likely to be a transition/occasional roost)
PBR145	Brown long-eared bat *Plecotus auratus*	<500m east	A bungalow in Castlegar. Possible maternity roost for Brown long-eared bats, small roost.
PBR183	Brown long-eared bat *Plecotus auratus*	<500m east	Building. Roost for small numbers of Brown long-eared bats (likely to be a transition/occasional roost)
PBR182	Common pipistrelle *Pipistrellus pipistrellus*	<500m northwest	Building. Roost for small numbers of unidentified Pipistrelle bats (likely to be a transition/occasional roost).
PBR204	Lesser horseshoe bat *Rhinolophus hipposideros* Brown long-eared bat *Plecotus auratus*	~500m northwest	Building. Lesser horseshoe bat and Brown long-eared bat day/night roost for small numbers of bats.
PBR154	Lesser horseshoe bat *Rhinolophus hipposideros*	>500m northwest	Building. Lesser horseshoe bat night roost and occasional day roost.
PBR192	Brown long-eared bat *Plecotus auratus*	>500m east	Building. Roost for small numbers of Brown long-eared bats (likely to be a transition/occasional roost)
PBR112	Lesser horseshoe bat *Rhinolophus hipposideros*	680m south	Cooper's Cave. Day/night roost for small numbers of Lesser Horseshoe bats. Mating, summer and hibernacula. This roost is linked to Menlo Castle.
PBR111	Brown long-eared bat *Plecotus auratus*	1km north	Abandoned three outbuildings near Ballindooley Lough.
PBR25	Lesser horseshoe bat *Rhinolophus hipposideros* Brown long-eared bat *Plecotus auratus*	1.1km north	Disused bungalow adjacent to Ballindooley Lough.
PBR07	Common pipistrelle *Pipistrellus pipistrellus*	1.3km north	One bat in outbuilding in the Ballindooley Area.
PBR17	Brown long-eared bat *Plecotus auratus* Natterer's bat *Myotis* nattereri	1.2km north	Abandoned three outbuildings near Ballindooley Lough.
PBR228	Common pipistrelle *Pipistrellus pipistrellus*	1.3km east	A large shed adjacent to the N83 Tuam Road in Cappanabornia. Roost for small numbers of Common pipistrelle bats (likely to be a transition/occasional roost)

Roost ID	Species	Approx. Distance from Site	Details
PBR129	Lesser horseshoe bat *Rhinolophus hipposideros*	1.7km west	Building. Lesser horseshoe bat night roost.
PBR85	Lesser horseshoe bat *Rhinolophus hipposideros*	1.7km west	Building. Lesser horseshoe bat night roost.
PBR242	Unidentified pipistrelle	1.8km east	Bungalow within the grounds of Galway Racecourse in Ballybrit. Roost for small numbers of unidentified Pipistrelle bats (likely to be a transition/occasional roost)
PBR218	Lesser horseshoe bat *Rhinolophus hipposideros*	2km southwest	One bat utilised a previously unknown roost in a boulder field located in an abandoned quarry just south of Coolagh Lakes.
PBR20	Natterer's bat *Myotis* nattereri	2km north	Building.
PBR205	Common pipistrelle *Pipistrellus pipistrellus* Soprano pipistrelle *Pipistrellus pygmaeus*	2.3km east	Unoccupied farm building. Roost for small numbers of Common and Soprano pipistrelle bats (likely to be a transition/occasional roost)
PBR133	Daubenton's bat *Myotis daubentonii*	2.4km southwest	Stonewall structure on the eastern bank of the River Corrib. 25 Daubenton's bats to be roosting in the wall.
PBR158	Lesser horseshoe bat *Rhinolophus hipposideros*	2.5km west	N/A

3.1.7 Conclusion of Desktop Study

The desktop study has provided information about the existing bat activity in grid square M32, within which the proposed development is located. The GCTP and GCRR have provided information about the existing bat activity and roost locations within Galway city.

Bat records within 2.5km and 10km of the proposed development revealed that the wider area has been studied for bats and that a number of bat roost for a variety of species have been recorded. This suggests that the area offers potential for foraging and commuting bat species.

3.2 Field Study

3.2.1 Bat Habitat Appraisal

A detailed description of the habitats located onsite are presented in the accompanying Ecological Impact Assessment (EcIA). A daytime bat walkover and inspection survey were conducted on the 16th July 2024.

With regard to foraging and commuting bats, the Proposed Development site is considered of *Moderate* suitability due to the presence of suitable commuting features in the form of treelines, mixed woodland, and hedgerows, and their connectivity to the wider landscape. The mixed woodland edge at the west of the site, leads south to a treeline and hedgerow surrounding the occupied dwelling. This north-south commuting feature is considered to be of *High* commuting suitability with it being close to known roosts and connecting to high quality foraging habitat. The hedgerow that runs along the road to the south of the site is assessed as having *Moderate* commuting suitability. There is also a hedgerow running north-south just outside the Site to the east. This is a hedgerow assessed as having *Moderate*

commuting potential. The majority of the site consists of agricultural grassland (GA1) and is considered to have *Negligible* commuting and foraging potential.

Trees on the site were subject to assessments and roost inspection surveys. With regard to roosting bats, the woodland area along the western site boundary consists mainly of shrubs and immature trees which are not suitable for roosting bats. The existing treelines on site consist of a mixture of native and non-native trees. None of these were found to have PRFs and as such were assessed as having *None* roosting potential.

Details of the assessment of existing man-made structures for their suitability to host roosting bats are presented below.

3.2.1.1 Preliminary Roost Assessment

Three structures were identified and inspected as part of the roost assessment effort, a derelict farm house, a derelict farm shed and an occupied dwelling. These are all proposed for removal to allow for the proposed residential development. All structures were also the subject of roost emergence surveys. Details of the emergence surveys are presented in Section 3.3.1.

Derelict Farmhouse

One structure was a derelict farmhouse with collapsed slate roof, exterior ivy cover and open windows and doors (IG Reference: M 31596 28166). The structure is located at the south-east of the Proposed Development site. The structure was subject to two roost assessments, on the 16th July and the 7th August prior to the dusk emergence surveys. No evidence of roosting bats was found within the derelict farmhouse. However, there were many access and exit points for bats to utilise, and potential roosting locations suitable to all bat species, including lesser horseshoe bats, within the structure. This structure was assigned a *Low* roosting potential as considered unlikely to support a significant roost due to its advanced state of dereliction, exposure to weather and light penetration. On a precautionary basis, the structure was subject to two dusk emergence surveys on 16th July and 7th August, as detailed in Section 3.3.1.1.

Plate 3-1 Northern aspect of the derelict farm shed. The Lesser horseshoe bat emerged from the collapsed roof at the left side of the image (as detailed in Section 3.3.1.1.).

Plate 3-2 Southern aspect of the derelict farm shed.

Derelict farm shed

One structure was a derelict stone and mortar farm shed with collapsed galvanised roof, and open windows and doors (IG Reference: M 31588 28181). The structure is located within the Proposed Development site in proximity to the derelict farmhouse described above. The structure was subject to a preliminary roost assessment on the 16th July 2024. No evidence of roosting bats was found within the

derelict farm shed. However, there were many access and exit points for bats to utilise, and suitable potential roosting locations within the stonework. This structure was assigned a *Low* roosting potential. The structure was subject to a dusk emergence survey on 16th July 2024, as detailed in Section 3.3.1.1.

Plate 3-3 South aspect of the derelict farm shed.

Occupied Dwelling

One structure was an occupied dwelling (IG Reference: M 31471 28069). The structure is located at the south-west of the Proposed Development site. The structure was subject to a preliminary roost assessment on the 2nd October 2024. No evidence of roosting bats was found. There are some potential access points located at all 4 corners of the bungalow, on the soffits. Due to the lack of access points into the attic, and the absence of evidence of bat activity, the structure was assigned a *Low* roosting potential. No potential for lesser horseshoe roosting was found. The structure was subject to a dusk emergence survey on 18th September 2024, as detailed in Section 3.3.1.1.

Plate 3-4 South aspect of the occupied dwelling.

Plate 3-5 Attic of the occupied dwelling.

3.2.2 Bat Activity Surveys

3.2.2.1 Manual Surveys

3.2.2.1.1 *Dusk Emergence Surveys*

Three structures with roosting potential were identified within the proposed development site during the desktop study. Table 3-7 summarises the survey effort in relation to dusk emergence surveys carried out to identify and classify potential roosts. Individual surveys are described below.

Table 3-7 Manual activity surveys at PRFs.

PRF	IG Ref.	Date	Survey Type	Results
Derelict farmhouse	M 31596 28166	16th July and 7th August 2024	Dusk Emergence	Roost confirmed. 2 emergences. One Lesser horseshoe bat and one unidentified species.
Derelict farm shed	M 31588 28181	16th July 2024	Dusk Emergence	No roosting bats.
Occupied dwelling	M 31471 28069	18th September 2024	Dusk Emergence	High Lesser horseshoe bat activity, no roosting bats.

Derelict Farmhouse

Two dusk emergence surveys were conducted at the derelict farmhouse located at the south-east of the proposed development site. Both dusk emergence surveys were conducted following an interior inspection of the structure.

No bats or signs of bat activity were observed during the internal inspections. During the first survey, carried out on 16th July, one Lesser horseshoe bat was observed emerging from the roof of the most north-easterly room. Another bat (unidentified species) was recorded emerging from the vegetation cover on the roof at the south side of the structure. Based on this exit the bat is considered a crevice dweller, likely a pipistrelle species. There was high Common pipistrelle commuting activity recorded during this survey, coming from the south and east. There was also commuting activity recorded for other species (Leisler's bat, Soprano pipistrelle, and Nathusius' pipistrelle).

Another dusk emergence was conducted on this structure on 7th August. No bats were observed emerging from the structure. Activity during the survey was very low. Species recorded during this survey were Soprano pipistrelle, Common pipistrelle, Leisler's bat, and Lesser horseshoe bat. The Lesser horseshoe bat call was recorded coming from inside the structure. The Batlogger picked up the call near the entrance to the structure and there were no bats flying nearby at the time due to

unsuitable weather conditions for bat flight (heavy rain). The survey was called off 1 hour and 5 minutes after sunset due to unsuitable weather conditions for bat activity.

Derelict farm shed

One dusk emergence survey was conducted on the derelict farm shed on 16th July. The survey was conducted following an internal inspection of the structure, during which no bats or signs of bat activity were observed. No bat emergences were observed during the dusk emergence survey. There was high Common pipistrelle and Leisler's bat commuting activity recorded during the survey. Nathusius' pipistrelle and Soprano pipistrelle were also recorded commuting during this survey.

Occupied dwelling

A dusk emergence survey was conducted at the occupied dwelling on 18th September 2024. No bats were observed emerging. On the north side of the dwelling, high lesser horseshoe bat commuting activity was recorded along the treelines, along with Common and Soprano pipistrelles (flight paths were mainly south-east to north-west). On the south side, Common and Soprano pipistrelles were seen foraging and commuting, and a single Lesser horseshoe bat was recorded commuting north to south.

3.2.2.1.2 *Night-time Bat Walkover Surveys*

Two night-time bat walkover surveys (NBWs) were also conducted following the emergence surveys on 16th July and 18th September. Bat activity was recorded on all NBWs, with a total of 45 bat passes (Table 3-8).

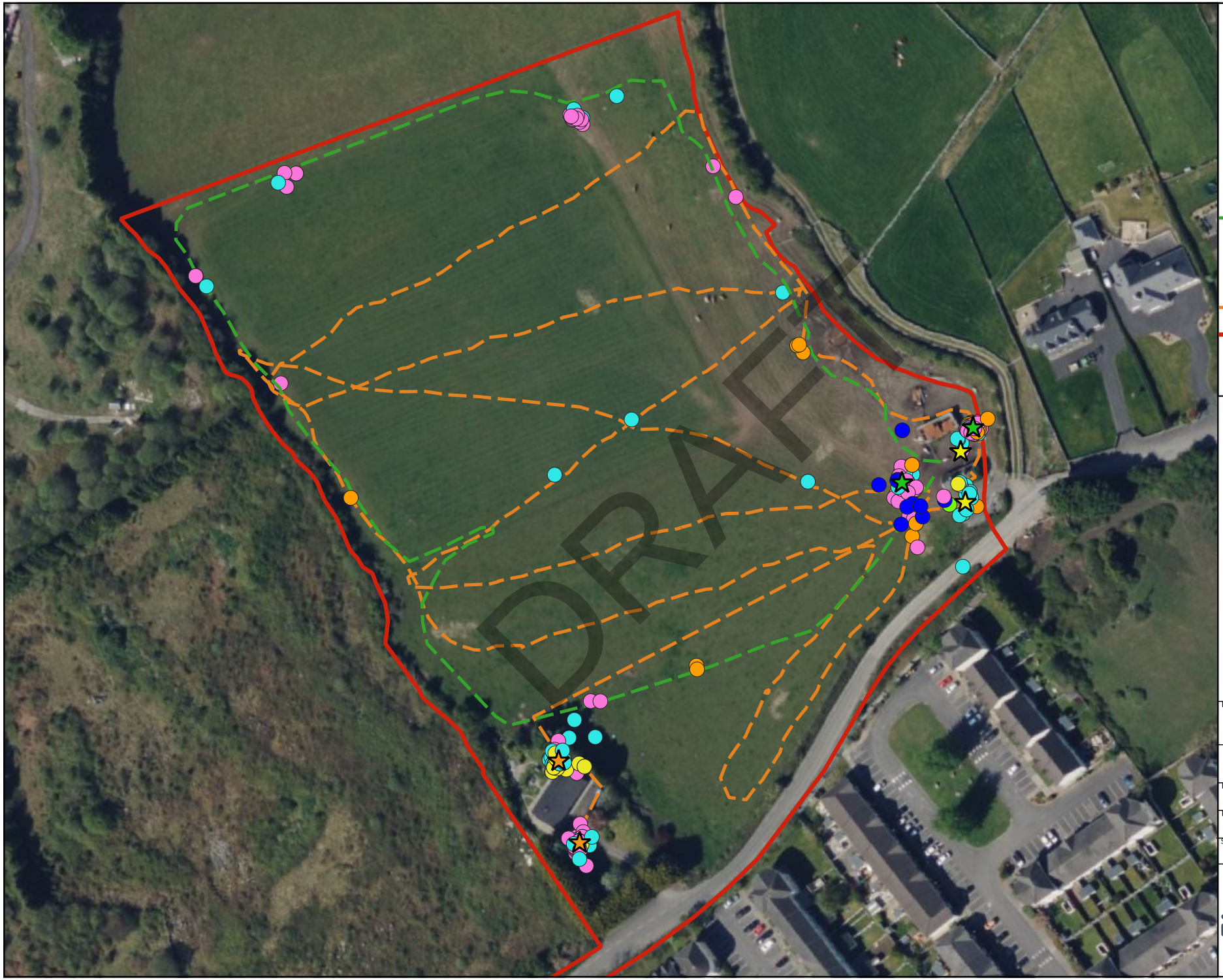
Table 3-8 Night Walkover survey results.

Date	Km	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat
16th July 2024	0.7	26	5	6	0
18th September 2024	1.5	3	4	0	1
Total	2.2	29	9	6	1

Walkover surveys followed dusk emergence surveys at PRFs and were aimed at assessing the use of linear features and other habitats by bats. The NBW on 16th July followed the perimeter of the field. Bat activity was dominated by Common pipistrelles. Soprano pipistrelles and Leisler's bats were also recorded to a lesser extent.

The NBW on 18th September followed the linear features along the site boundary and also covered the middle of the field. Bat activity was very low on this survey, with only 7 bat passes recorded. Activity was composed mainly of Soprano pipistrelle and Common pipistrelle, with a single brown long-eared bat recorded.

Figure 3-2 presents the spatial distribution of bat activity across the dusk emergence and night walkover surveys.



Map Legend

- Leisler's bat
- Nathusius pipistrelle
- Common pipistrelle
- Soprano pipistrelle
- Lesser horseshoe bat
- 16th July Surveyor Locations
- 16th July Transect Route
- 7th August Surveyor Locations
- 18th September Surveyor Locations
- Transect Route
- Site Boundary

N

Drawing Title
2024 Manual Results

Project Title
Bóthar an Chóiste

Drawn By	Checked By
NF	SF
Project No.	Drawing No.
240420	Figure 3-1
Scale	Date
1:1,500	21.02.2025

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

3.2.2.2 Static Detectors Surveys

Two SM4 static detectors were deployed on the site for a combined period of one month at two different locations (D01 and D02). The two detectors were deployed on the 16th July 2024 for a total of 14 nights; they were deployed again on 7th August 2024 for a total of 7 nights; and were deployed for the final time on the 18th of September, for a total of 14 nights. These detectors allowed a specified look into species composition, and activity rates across the site. Locations were chosen to represent areas of likely bat activity.

D01 was located near the two structures at the eastern boundary of the site, in an area of improved agricultural grassland, near a hedgerow. D02 was placed between the improved agricultural grassland and treeline at the north-west of the site. The location of the static detectors is shown in Figure 2-1.

In total 11,226 bat passes were recorded. Analysis of the detector recordings positively identified six bats to species level with *Myotis* genus also present. Common pipistrelle (*Pipistrellus pipistrellus*) made up the vast majority of the activity recorded within the site (n = 6,012), followed by Soprano pipistrelle *(Pipistrellus pygmaeus*, n = 3,805). Leisler's bat (*Nyctalus leisleri,* n = 841) and Lesser horseshoe bat (*Rhinolophus hipposideros,* n = 333) were less frequently recorded. Brown long-eared bat (*Plecotus auritus*), *Myotis* spp. and Nathusius' pipistrelle (*Pipistrellus nathusii*) were recorded infrequently at the site (n = 80, n = 79, and n = 76, respectively). Plate 3-6 shows total bat species composition recorded at the site. According to the Article 17 bat ranges the site is within the range of all nine resident bat species. **Error! Reference source not found.**7 shows total bat passes per detector, which are summarised i n Table 3-9.

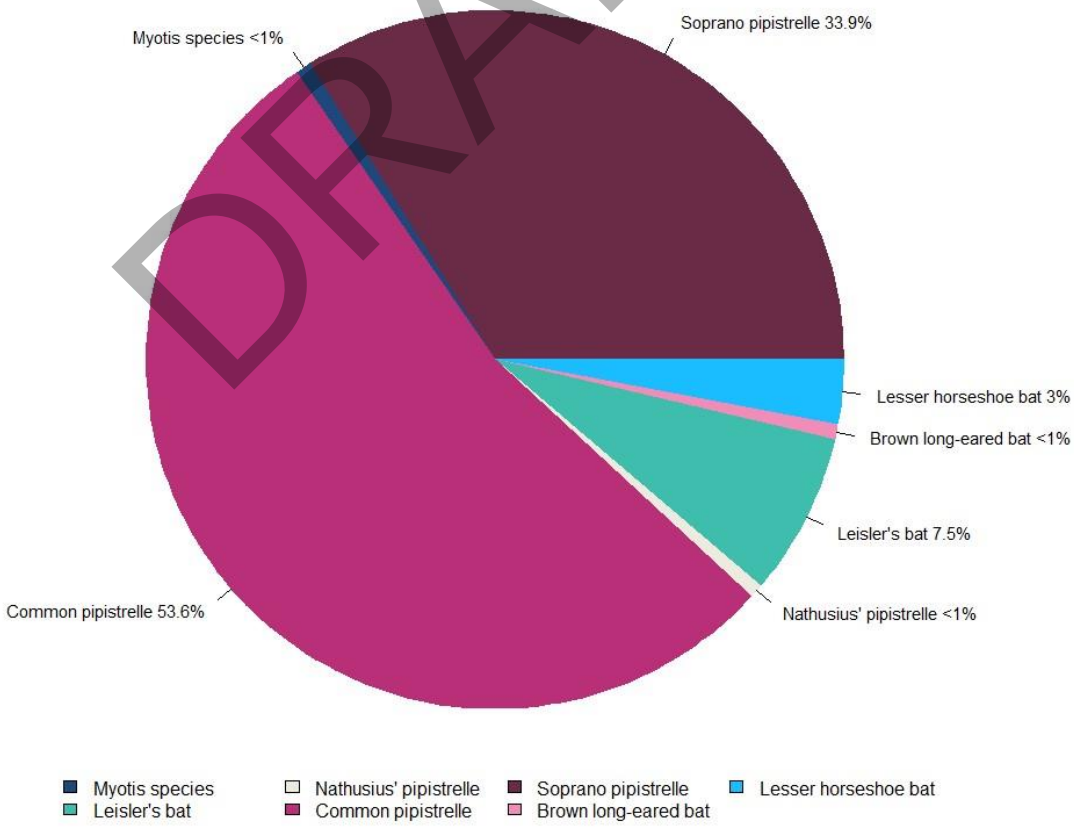


Plate 3-6 Bat species composition recorded across both detectors deployed at the Site.

Table 3-9 Static detector results, total bat passes.

Detector	Common Pipistrelle	Soprano Pipistrelle	Leisler's Bat	Nathusius' pipistrelle	Brown Long-eared Bat	*Myotis* spp.	Lesser Horseshoe Bat
D01	1,609	1,284	269	25	38	30	155
D02	4,403	2,521	572	51	42	49	178

Species composition was similar at both detectors. At both detectors, Common pipistrelles were recorded most frequently, followed by Soprano pipistrelle, and then by Leisler's bat and Lesser horsehoe bat, which recorded much lower activity than the two most recorded species. At both detectors, the activity of Myotis spp., Nathusius' pipistrelle and Brown long-eared bat were low. Overall, D02 recorded 2.7x more Common pipistrelle passes than D01, and approximately double the amount of Soprano pipistrelle, Leisler's bat, and Nathusius' pipistrelle passes. The remaining three species groups were recorded in very similar numbers across the two detectors.

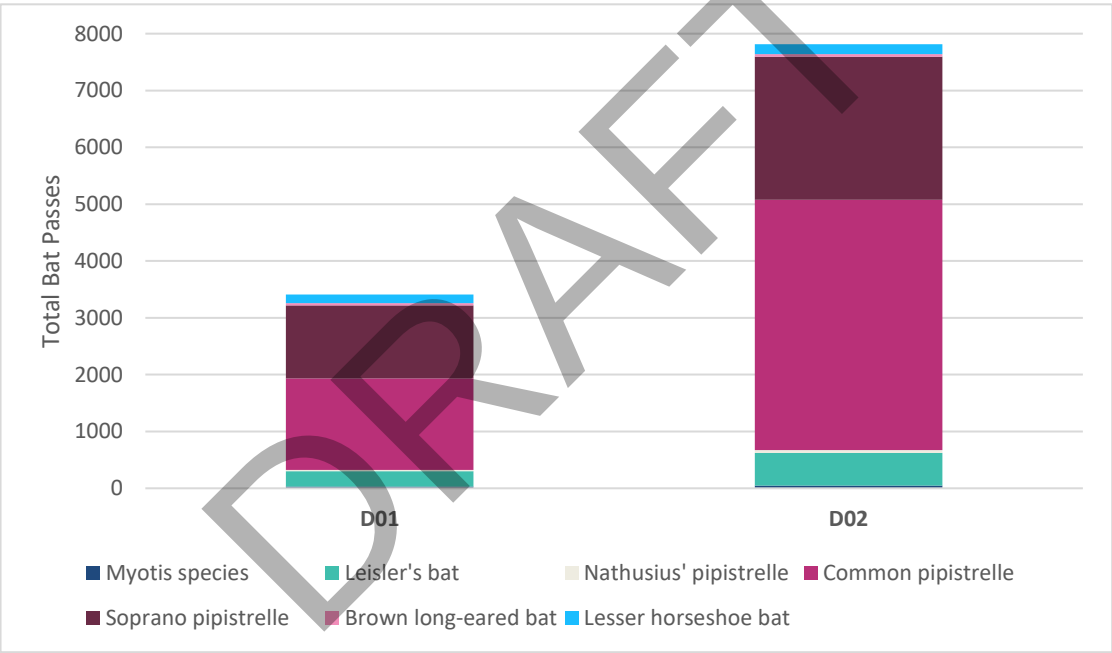


Plate 3-7 Total bat passes recorded at each detector.

Analysis of the detector recordings also highlighted the total bat passes per night. Species composition per night is shown in **Error! Reference source not found.**8. A large portion of the nights recorded an a ctivity level of 30 – 45 bat passes per hour. One night (8th August) recorded particularly high activity, with an activity level of 87.2 bat passes per hour recorded across detectors. On all nights, excluding one, activity was dominated by Common pipistrelles. A significant increase in Lesser horseshoe bat activity was noted during the third deployment.

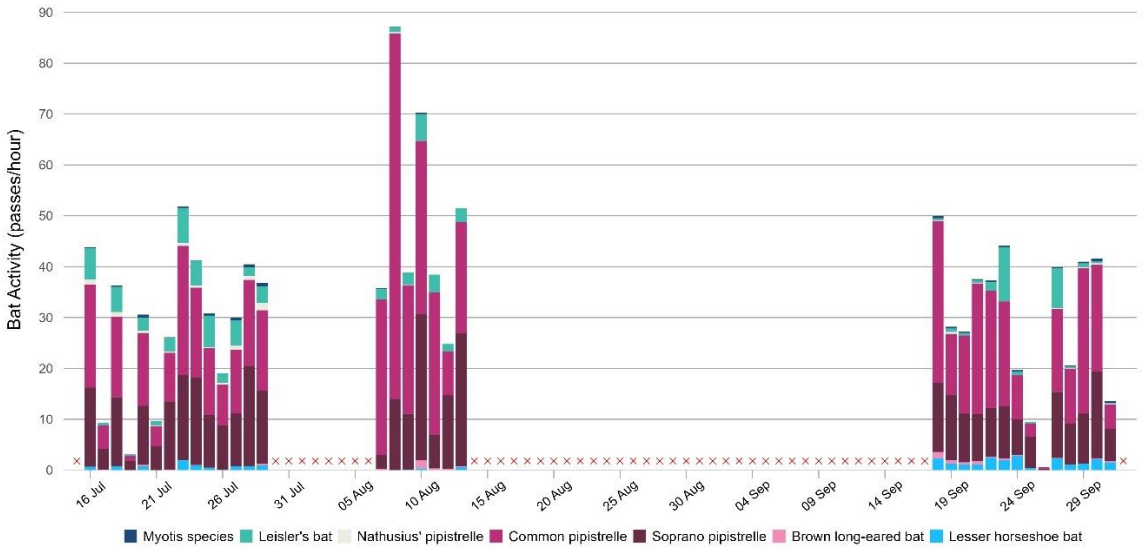


Plate 3-8 Species activity per night recorded at the Site. Red crosses symbolise nights that were not surveyed.

Table 3-10 presents values for minimum, median and max bat passes per hour recorded across the deployment nights at each detector.

Table 3-10 Minimum, median and maximum bat passes per hour, per species, recorded by the static detectors.

Detector	Value	Common Pipistrelle	Soprano Pipistrelle	Leisler's Bat	Nathusius' pipistrelle	Brown Long-eared Bat	*Myotis* spp.	Lesser Horseshoe Bat
D01	Min	0	0.2	0	0	0	0	0
	Median	4	3.1	0.4	0	0	0	0
	Max	14.1	17.5	3.7	0.5	1	0.4	1.7
D02	Min	0.2	0.2	0	0	0	0	0
	Median	9.5	7.2	1	0.1	0	0.1	0.4
	Max	71.5	17	10.3	1.3	0.8	0.5	1.9

4. DATA EVALUATION

4.1.1 Discussion and Interpretation

Detector D02 recorded significantly higher activity than D01, likely due to the use of the nearby woodland edge as an important commuting feature for local bat populations. Based on the median and maximum activity levels recorded, the site is considered to present moderate activity of common urban species such as soprano and common pipistrelles, as well as Leisler's bats, and lower activity levels of other species. This is in line with the location and use of the site.

It is likely that surrounding sites to the north and west of the proposed development provide better foraging grounds, however the site was considered a suitable commuting corridor. The north-south connectivity of the site in the form of the woodland edge and treelines surrounding the occupied dwelling appear to be important features for local bat populations, along with the hedgerow along the southern boundary of the site.

Lesser horseshoe bats were found to use the site for both commuting and roosting. The activity levels recorded for this species were relatively lower than other species, however considering their low echolocation calls, ~2 passes per hour are considered significant at the local level. Although there was a lesser horseshoe bat roost confirmed in the site, only one individual (along with a suspected crevice dweller) awas confirmed to be roosting in the structure. The lesser horseshoe bat was not observed during either inspection despite being a conspicuous species while roosting, it is therefore thought to be roosting in a small section of roof space just above the eaves of the ruin, which presents limited suitability for larger numbers of bats. It is likely that this roost is a satellite roost and may be in use sporadically all year round. The proposed development site is not considered a highly significant site for bats, however it is located along suitable foraging and commuting corridors, and the sustainable development of the site is important to allow its continued use by all bat species.

4.1.2 Importance of Bat Population Recorded at the Site

Ecological evaluation within this section follows a methodology that is set out in Chapter three of the '*Guidelines for Assessment of Ecological Impacts of National Roads Schemes'* (NRA, 2009).

All bat species in Ireland are protected under the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts 1976 (as amended). Bats as an Ecological Receptor have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the study area are utilized by a regularly occurring bat population of Local Importance. The Site, located in the suburbs of Galway city, is located approximately 3km from to a Lesser horseshoe bat roost of *National Importance*. This is considered outside he foraging range for the species. In addition to this and with consideration of the known lesser horseshoe bat activity around Galway City, the roost identified within the Site has been assigned *Local Importance*.

4.1.3 Survey limitations

A comprehensive suite of bat surveys were undertaken at the Proposed Development site. The surveys undertaken in accordance with BCT Guidance, provide the information necessary to allow a complete, comprehensive and robust assessment of the potential impacts of the Proposed Development on bats receptors. No significant limitations in the scope, scale or context of the assessment have been identified. Consideration of any potential limitations is presented below.

Access limitations can relate to static deployments and roost inspections:

- No significant access issues were encountered with the Site during static deployments, as the detectors were deployment where intended.
- Access was gained throughout the site and within all structures identified.

Survey limitations can relate to deployment coverage, data storage, equipment failure or deployment-related incidents:

- Good survey coverage of the site has been achieved, with two detectors being deployed across the site covering the range of habitats present at the site.
- MKO employs data storage redundancy methods to ensure no data is lost from the field to final analysis - no data was lost.
- SD card corruption or fill-up can prevent data from being collected during deployments – no issues with data on-site data storage were encountered.
- Bat detector's microphones are checked before every season to ensure they have good sensitivity for data collection, and detectors' software updates are installed as soon as they become available - no issues related to equipment were encountered during the surveys.
- Incidents during deployments, such as tampering or livestock interference, can prevent data from being collected effectively - no incidents were reported during the surveys.
- One limitation identified was the early termination of the dusk emergence survey carried out on 7th August 2024 due to unsuitable weather conditions for bat activity. This survey was terminated 1 hour and 5 minutes after sunset however results from the survey were considered useful for the assessment.

Activity assessment limitations can relate to data analysis procedures and a lack of standardised and Ireland-based assessment methods:

- MKO's data analysis methods include manually checking of 100% of bat passes identified by Auto ID Software, as well as noise and no ID files. Where multiple species, or multiple individuals of the same species, are identified within the same call, only one is reported, prioritising hard to detect species. This is due to the large volumes of data collected. While this method is likely to introduce a bias, it is not believed to affect the overall conclusions of the assessment, as only commonly recorded species might be underreported.
- No activity threshold currently exists for Irish bat species to objectively assess bat activity within a certain habitat, and no standardised assessment method has been proposed across the country. Ecobat software recommended by existing guidelines was not available for use at the time of the assessment, as it is under maintenance. MKO experience surveying habitats similar to those present within the site, particularly within Galway City, aided with the assessment.

5. CONCLUSION & RECOMMENDATIONS

The following points set out the main conclusions following the completion of the surveys described above:

- Six bat species, as well as *Myotis* sp. were recorded commuting and foraging across the proposed works site during the bat surveys carried out in July to October 2024, including Soprano pipistrelle, Common pipistrelle, Leisler's bat, brown long-eared bat, Nathusius' pipistrelle and lesser horseshoe bat.
- The existing landscape occurring within the grounds of the site provides suitable habitats for commuting and foraging bats.
- One of the buildings on site was confirmed as a Lesser horsehoe bat roost (one individual observed emerging). Another bat (unidentified crevice-dwelling species) was recorded emerging from the structure. Both other structures present on site have the potential to support roosting bats. However, no signs of bat activity were recorded in either of the structures and no emergences were recorded during the dusk emergence surveys.
- No large permanent or maternity roosts were recorded and there is limited suitability for this type of roost within the proposed development site.

A full assessment of the potential impacts on bats will be presented in the EcIA which will accompany the planning application. The following measures have been incorporated within the project design to mitigate for potential impacts:

- A bat derogation licence will be obtained for the demolition of the confirmed roost on site. If bats are found to be roosting in any of the other structures during the pre-commencement surveys, a bat derogation licence will be obtained from NPWS, and further mitigation prescribed by a licenced ecologist.
- A pre-commencement survey is recommended to inspect the buildings for bats prior to demolition. The requirement for a pre-commencement survey does not represent a lacuna in the survey assessment but is fully in line with industry best practice.
- Works will not be carried out on the confirmed roost during the bat activity season. We recommend the demolition of the known Lesser horseshoe bat roost to take place between October to December, under supervision of a qualified ecologist.
- Two alternative roosting locations are to be provided in the form of bespoke lesser horseshoe bat houses. One wooden bat house suitable for lesser horseshoe bats will be located to the west of the site. The bat house located to the east of the site, in proximity to the existing roost, will be a block structure designed in line with Vincent Wildlife Trust recommendations for agricultural schemes (McAney & Quish, 2023). Slates and other materials will be reclaimed from the existing roost structure during demolition. The new roost will be fenced to be protected from any light spill from the site as well as potential tampering.
- The existing western and eastern linear features will be retained. Replanting of native woodland areas, along with trees and native and evergreen hedgerows is also proposed. These have been designed in conjunction with the lighting plan to retain dark commuting corridors running along the western, and eastern site boundaries to maximise connectivity. A new east-west linear feature will be created along the northern boundary to maintain connectivity, as access roads to the south of the site are expected to partially sever connectivity in this area.
- The lighting plan for the operational phase of the proposed works, has been designed with consideration of the following guidelines: Bat Conservation Ireland guidelines; Bat Conservation Ireland (Bats and Lighting: Guidance Notes for Planners, Engineers, Architects and Developers, BCI, 2010) and the Bat Conservation Trust (Guidance Note 08/23 Bats and Artificial Lighting at Night (BCT, 2023), to minimise light spillage, thus reducing any potential disturbance to bats.

The surveys undertaken provide a good understanding of the use of the buildings and surrounding habitats by bats and the report provides an overview with regard to the likely challenges faced and constraints associated with the proposed works.

BIBLIOGRAPHY

Abbott, I., Aughney, T., Langton, S. and Roche, N. (2015) BATLAS 2020 Pilot Project Report. Bat Conservation Ireland, Virginia, Cavan.

Andrews, H. (2023) Bat Tree Habitat Key. AEcol, Bridgewater.

Aughney, T. (2008) An investigation of the impact of development projects on bat populations: Comparing pre- and post-development bat faunas. Irish Bat Monitoring Programme. Bat Conservation Ireland, Virginia, Cavan.

Aughney, T., Langton, S. and Roche, N. (2011) Brown long-eared bat roost monitoring scheme for the Republic of Ireland: synthesis report 2007-2010. Irish Wildlife Manuals, No.56. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Aughney, T., Langton, S. and Roche, N. (2012) All Ireland Daubenton's Bat Waterway Monitoring Scheme 2006-2011. Irish Wildlife Manuals, No. 61. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

Barataud, M. and Tupinier, Y. Écologie acoustique des chiroptères d'Europe: identification des espèces, étude de leurs habitats et comportements de chasse. Biotope, 2012.

BCI (2012b) Bats and Appropriate Assessment Guidelines, Version 1, December 2012. Bat Conservation Ireland, Virginia, Co. Cavan Berthinussen, A., Richardson. O.C. and Altringham, J.D. (2014) Bat Conservation: Global evidence for the effects of interventions. Exeter: Pelagic Publishing.

Carden, R., Aughney T., Kelleher C. and Roche, N. (2010) Irish Bat Monitoring Schemes. BATLAS Republic of Ireland Report for 2008-2009.

Collins, J. (ed.) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edn). The Bat Conservation Trust, London.

Hill D., Fasham, M., Tucker P., Shewry, M. and Shaw, P (eds) (2005) Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring, 433-449. Cambridge University Press, Cambridge.

Kunz, T.H. and Parsons, S. (2009). Ecological and Behavioral Methods for the Study of Bats, 2nd Edition. The Johns Hopkins University Press, USA.

McAney, K. and Quish, C. (2023). Mulkear Lesser Horseshoe Bat Conservation Project, Final Report, Vincent Wildlife Trust Ireland and Mulkear EIP.

Mitchell-Jones, A. J. and McLeish, A. P. (2004). The Bat Worker's Manual, 3rd Edition. JNCC, Peterborough.

Mitchell-Jones, A.J. (2004). Bat Mitigation Guidelines. English Nature.

Montgomery, W. I., Provan, J., McCabe, A. M., and Yalden, D. W. (2014). Origin of British and Irish mammals: disparate post-glacial colonisation and species introductions. Quaternary Science Reviews, 98, 144-165.

NPWS & VWT (2022) Lesser Horseshoe Bat Species Action Plan 2022- 2026. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

NRA (2006a) Best practice guidelines for the conservation of bats in the planning of national road schemes. National Roads Authority, Dublin, Ireland.

NRA (2006b) Guidelines for the treatment of bats during the construction of national road schemes. National Roads Authority, Dublin, Ireland.

Reason, P.F. and Wray, S. (2023). UK mitigation Guidelines, CIEEM

Regini, K. (2000) Guidelines for ecological evaluation and impact assessment, In Practice: Bulletin of the Institute of Ecology and Environmental Management, 29, 1-7.

Roche, N., Langton, S. & Aughney T. (2012) Car-based bat monitoring in Ireland 2003-2011. Irish Wildlife Manuals, No. 60. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.

Roche, N., T. Aughney, F. Marnell, and M. Lundy (2014). Irish Bats in the 21st Century. Bat Conservation Ireland, Virginia, Co. Cavan, Ireland.

Roche, N., Aughney T. & Langton S. (2015) Lesser Horseshoe bat: population trends and status of its roosting resource. Irish Wildlife Manuals, No 85. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

Russ, J. (2012). British bat calls: a guide to species identification. Pelagic publishing.

Schofield H. (2008). The Lesser Horseshoe Bat: Conservation Handbook. The Vincent Wildlife Trust, Ledbury, UK.

Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. December (2010). Valuing Bats in Ecological Impact Assessent, CIEEM In-Practice.