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VOLUME III | PART III
Appendices



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APPENDIX 11-1 Bat Report

Bat Fauna Impact Assessment for a Proposed Development at Ballymacaula, Circular Road, Ennis, Co. Clare.



16th June 2025

Prepared by: Bryan Deegan (MCIEEM) of Altemar Ltd.
On behalf of: Glenveagh Homes Ltd.

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Document Control Sheet			
Client	Glenveagh Homes Ltd.		
Project	Bat fauna impact assessment for a Proposed Development at Ballymacaula, Circular Road, Ennis, Co. Clare.		
Report	Bat Fauna Assessment		
Date	16 th June 2025		
Version	Author	Reviewed	Date
Planning	Bryan Deegan	Gayle O'Farrell	16 th June 2025

SUMMARY

Structure:	The site primarily consists of unmanaged agricultural grassland sectioned by clusters of native scrub, hedgerows, treelines, and old stone walls.
Location:	Ennis, Co. Clare.
Bat species present:	<p>Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>), Common Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>), and Lesser Noctule (<i>Nyctalus leisleri</i>) bat activity was recorded onsite during detector surveys by visual observation and using an <i>Echo meter touch 2 Pro</i> handheld detector.</p> <p>Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>), Common Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>), Lesser Noctule (<i>Nyctalus leisleri</i>), Brown Long-eared Bat (<i>Plecotus auritus</i>), Nathusius's Pipistrelle (<i>Pipistrellus nathusii</i>), and Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>) bat activity was recorded onsite by an Anabat Express Detector (static detector) positioned along the eastern hedgerow boundary adjacent to Ennis Golf Course.</p>
Proposed work:	Proposed Development at Ennis, Co. Clare
Impact on bats:	The proposed development will change the local environment as new lights and structures are to be erected and the existing vegetation will be removed. No bat roosts were noted within the site boundary. Increased lighting onsite during construction and operation has the potential to impact on foraging activity of bat species recorded onsite. Following implementation of a sensitive lighting strategy (in compliance with bat lighting guidelines) in consultation with an ecologist, in addition to mitigation, the species seen to occur onsite and in the surrounding area should persist. Consultation within the project team has taken place in relation to the impact of external lighting on bat foraging along linear ecological corridors (including watercourses, treelines, and hedgerows) both onsite and offsite. The proposed lighting has been modified to allow for foraging activity to continue on site. Compensatory planting, including woodland, will be established throughout the proposed development site to mitigate potential impacts on bat foraging. The eastern hedgerow located along the boundary adjacent to Ennis Golf Course (outside site outline) will be retained as part of the proposed development. Roosting enhancement measures have also been provided. The proposed development will result in a long term/low adverse/not significant/negative impacts on bats.
Survey by:	Bryan Deegan (MSc) (MCIEEM), Emma Peters (BSc), Gayle O'Farrell (BSc), & Jack Doyle (MSc).
Survey dates:	23 rd May 2025, 05 th June 2025, & 10 th June 2025.

Competency of Assessor

Bryan Deegan MSc, BSc (MCIEEM)

This report has been prepared by Bryan Deegan MSc, BSc (MCIEEM). Bryan has over 31 years of experience providing ecological consultancy services in Ireland. He has extensive experience in carrying out a wide range of bat surveys including dusk emergence, dawn re-entry and static detector surveys. He also has extensive experience reducing the potential impact of projects that involve external lighting on Bats. Bryan trained with Conor Kelleher author of the Bat Mitigation Guidelines for Ireland (Kelleher and Marnell (2022)) and Bryan is currently providing bat ecology (impact assessment and enhancement) services to Dun Laoghaire Rathdown County Council primarily on the Shanganagh Park Masterplan. The desk and field surveys were carried out having regard to the guidance: Bat Surveys for Professional Ecologists – Good Practice Guidelines 3rd Edition (Collins, J. (Ed.) 2016) and Marnell, Kelleher and Mullen (2022), Bat Mitigation Guidelines for Ireland V2 (which update and replace the Bat Mitigation Guidelines for Ireland published in 2006). Emma Peters BSc has extensive experience in bat detection through static detector surveys, dusk emergence, and down re-entry surveys and is a member of Bat Conservation Ireland.

Jack Doyle (MSc Sustainable Environments).

This report has been contributed to by Jack Doyle of Altemar Ltd. Jack is skilled in bat detection through static detector surveys, dusk emergence, and dawn re-entry surveys. Jack is skilled in habitat identification, native and non-native species identification and ecological conservation, having experience in mitigation measures in ecological assessment.

Gayle O'Farrell (BSc Agri-Environmental Sciences)

Gayle O'Farrell (BSc) is skilled in bat detection through static detector surveys, dusk emergence, and down re-entry surveys. She is also skilled in habitat assessment and has undertaken flora/invasive species surveys, breeding/wintering bird surveys and terrestrial mammal surveys to produce numerous ecological assessments on a range of residential, industrial and commercial projects.

Emma Peters (BSc Environmental Science)

Emma Peters (BSc) of Altemar Ltd. Emma has carried out a range of wintering and breeding ornithological surveys in Ireland. Emma has experience in bat detection through static detector surveys, dusk emergence, and down re-entry surveys and is a member of Bat Conservation Ireland. She is also skilled in habitat identification, native and non-native species identification and terrestrial mammal surveys.

Legislative Context

Wildlife Act 1976 (as amended by, inter alia, the Wildlife (Amendment) Act 2000).

Bats in Ireland are protected by the Wildlife (Amendment) Act 2000. Based on this legislation it is an offence to wilfully interfere with or destroy the breeding or resting place of any species of bat. Under this legislation it is an offence to "Intentionally kill, injure or take a bat, possess or control any live or dead specimen or anything derived from a bat, wilfully interfere with any structure or place used for breeding or resting by a bat, wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose."

Habitats Directive- Council Directive 92/43/EEC 1992 on the conservation of natural habitats and of wild fauna and flora has been transposed into Irish Law, including, via, *inter alia*, the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended). See Art.73 of the 2011 Regulations which revokes the 1997 Regulations.

Annex II of the Council Directive 92/43/EEC 1992 on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) lists animal and plant species of Community interest, the conservation of which requires the designation of Special Areas of Conservation (SACs); Annex IV lists animal and plant species of Community interest in need of strict protection. All bat species in Ireland are listed on Annex IV of the Directive, while the Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is protected under Annex II which related to the designation of Special Areas of Conservation for a species.

Under the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended), all bat species are listed under the First Schedule and, pursuant to, *inter alia*, Part 6 and Regulation 51, it is an offence to:

- Deliberately capture or kill a bat;
- Deliberately disturb a bat particularly during the period of breeding, hibernating or migrating;
- Damage or destroy a breeding site or resting place of a bat;
- Keep, sell, transport, exchange, offer for sale or offer for exchange any bat taken in the wild.

Site Description

The subject site is comprised of a series of interconnected fields on lands at Ballymacaula, Circular Road, Ennis, Co. Clare. The site primarily consists of unmanaged agricultural grassland sectioned by clusters of native scrub, hedgerows, treelines, and old stone walls. The site is bordered by the N85 to the west, residential developments to the south, Ennis Golf Course to the east, and the Inch River and agricultural fields to the north.

Description of Proposed Project

Altamar Ltd. have been commissioned by Glenveagh Homes Ltd. to produce a bat survey report for a proposed Large Scale Residential Development (LRD) including the construction of 300 no. residential units, a creche facility, and all associated site development works at Ballymacaula, Drumbiggle, Circular Road, Ennis, Co. Clare

The site outline, location, and layout plan are demonstrated in Figures 1 & 2.

Landscape

The landscape strategy for the proposed development has been prepared by Jane McCorkell Design. As detailed in the accompanying Landscape Design Strategy:

'Landscape treatment in all areas is proposed to include a mix of native and coastal tolerant species. The planting will provide a link between the surrounding landscape, and at the same time provide a degree of screening for adjacent roadways and communities. The planting strategy across the site focuses on strengthening local character, ecological value, and resilience. A considered mix of native and coastal -tolerant species has been proposed to reflect the surrounding landscape and provide natural screening where needed. The All -Ireland Pollinator Plan 2021 - 2025 planting code shall form the basis of plant selection to ensure the low impact design strategy with nature -based solutions can be achieved.'

The proposed landscape masterplan is demonstrated in Figure 3 and has been developed in consultation with Altamar Limited.



Figure 1: Site outline.



Figure 2. Proposed site layout plan



Figure 3. Proposed landscape masterplan

Arborist

An Arboricultural Impact Assessment has been prepared by Arbor-Care Ltd. to accompany this planning application. In relation to trees on site, the report outlines the following:

'Analysis of the Proposal in Respect of Trees

This impact assessment sets out the likely principal direct and indirect impacts of the proposed development on the trees on or immediately adjacent to the site and suitable mitigation measures to allow for the successful retention of significant trees or to compensate for trees to be removed, where appropriate.

A brief summary of trees to be removed, related to the Proposed Scheme are detailed within the table below
Table 1: Schedule of trees to be removed to accommodate the design

Tree number	Species	Age Class	Tree category
3980	Willow	Mature	B2
T4	Ash	Mature	B2
T5	ash	Mature	C2
T8	Ash	Mature	C2
T5	Ash	Mature	B2
T6	Ash	Mature	C2

Table 1A: Schedule of Hedgerows to be removed to accommodate the design

Hedgerow number	Species	Age Class	Hedge category
H-A Partial removal	Ash, hawthorn bramble	Mature	C2
H-B Partial removal	Removal	Mature	C2
He	Ash, hawthorn bramble	Mature	C2
HF	Ash, hawthorn bramble	Mature	C2
HG-Partial removal	Ash, hawthorn bramble	Mature	B2
H-H	Ash, hawthorn bramble	Mature	C2

Of the trees to be removed to accommodate the proposed design, these consist of 0 no. category A trees, 3 no. category B trees and 3 no. category C trees. 2 hedgerows to be fully removed and another 4 partially removed.

In accordance with BS 5837: 2012 Trees in relation to design, demolition and construction. Recommendations., Category B signifies those trees of a "moderate value and in such a condition as to be able to make a substantial contribution (A minimum life expectancy of 20 yrs is suggested)." Category C signifies those trees/hedgerows of "a low quality and value that are currently in an adequate condition to remain until new planting could be established (a minimum life expectancy of 10yrs is suggested)." Category U. This category signifies those trees that are in such a condition that any existing value would be lost within 10 years and which should, in the current context, be removed for reasons of sound arboricultural management.

Discussion & Conclusion

General Change

My assessment is that there will be low tree loss and that there will be no negative impact on the character and appearance of the immediate surrounding landscape.

Proposal in relation to local planning policy

The proposed development complies with local planning policy as it relates to trees. A tree survey has been carried out in accordance with best practice and where possible trees have been retained and can be successfully protected during construction.

'Conclusion

The proposal has been assessed in accordance with BS5837:2012 and special working methods have been recommended to minimise tree impacts.

Retained trees have been assessed and can be successfully protected during development by following the information provided within this report and adhering to industry best practice.

Provided the recommendations and methods of work, as outlined within this report, are adhered to, the proposed development can be successfully carried out without having a negative impact on the character or appearance of the surrounding landscape.'

The tree protection plan is demonstrated in figure 4.

Lighting

The proposed lighting design has been prepared by Molloy Engineering, in consultation with Altamar, to accompany this planning application. The following bat-friendly modifications have been implemented into the lighting design:

- All lights backing onto green / park areas will have back spill protection louver / baffles.
- The lighting design has been prepared in accordance with Best Practice as published by Bat Conservation Ireland & ILP Guidance Note 8: Bats and Artificial Lighting
- External lighting areas are designed to be placed where required, with no lighting in public open spaces unless necessary.
- Warm white LED lighting (2700K) with full cut-off optics to minimise impacts on bat foraging and reduce light spill towards treelines and hedgerow boundaries.

The proposed public lighting layout (sheets 1-4) is demonstrated in Figures 5 - 8.

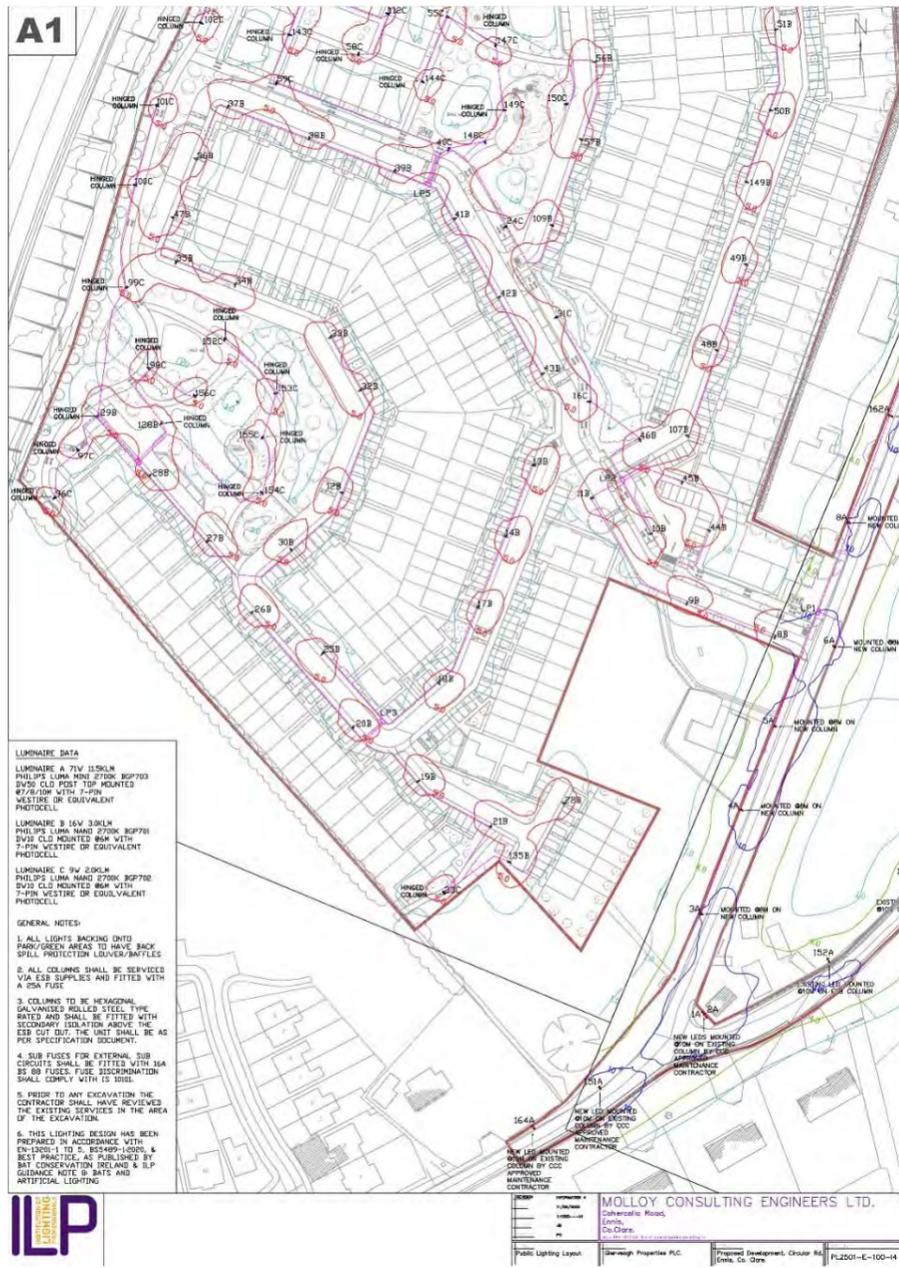


Figure 5. Public Lighting Layout – sheet 1

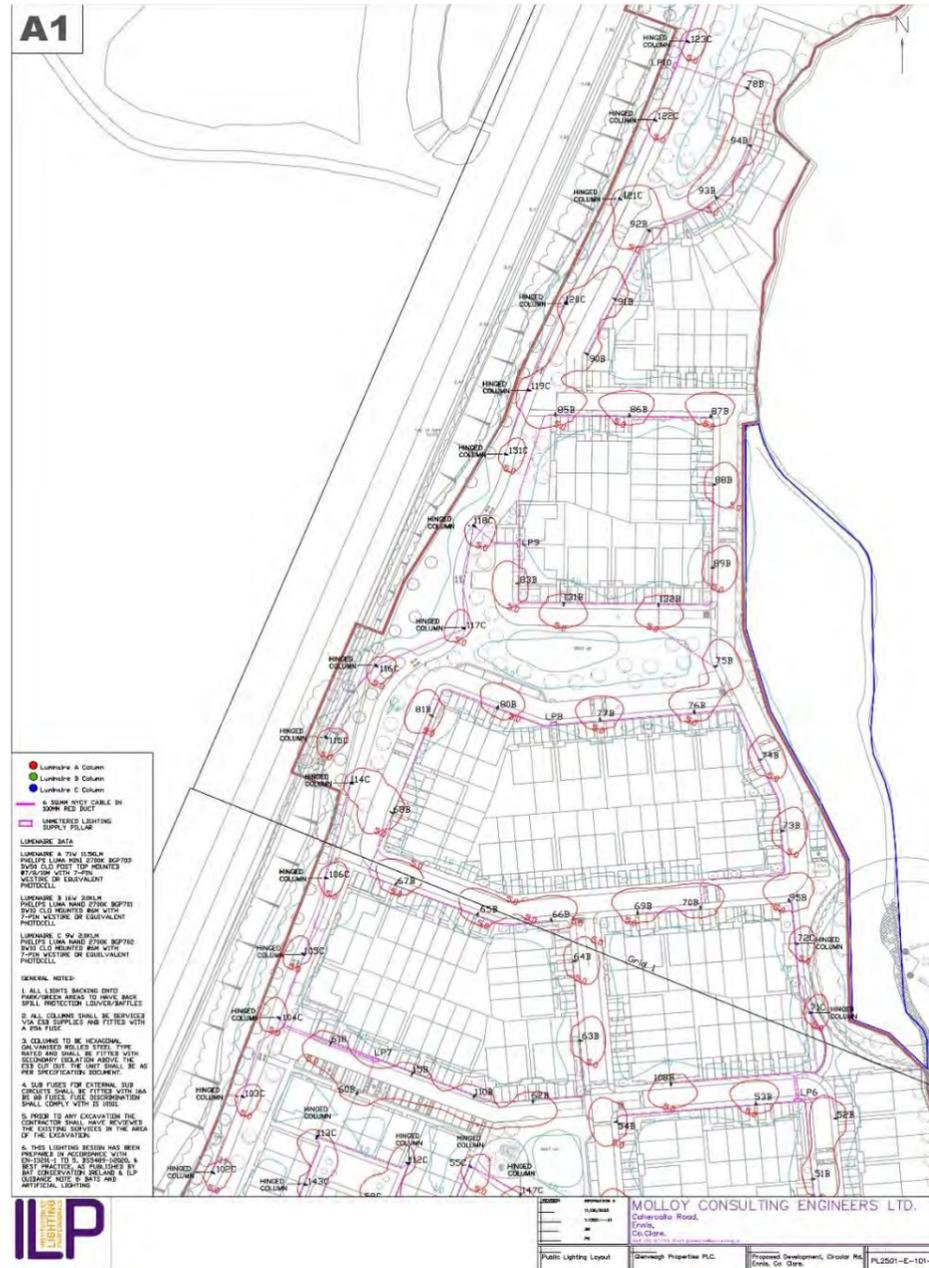


Figure 6. Public Lighting Layout – sheet 2

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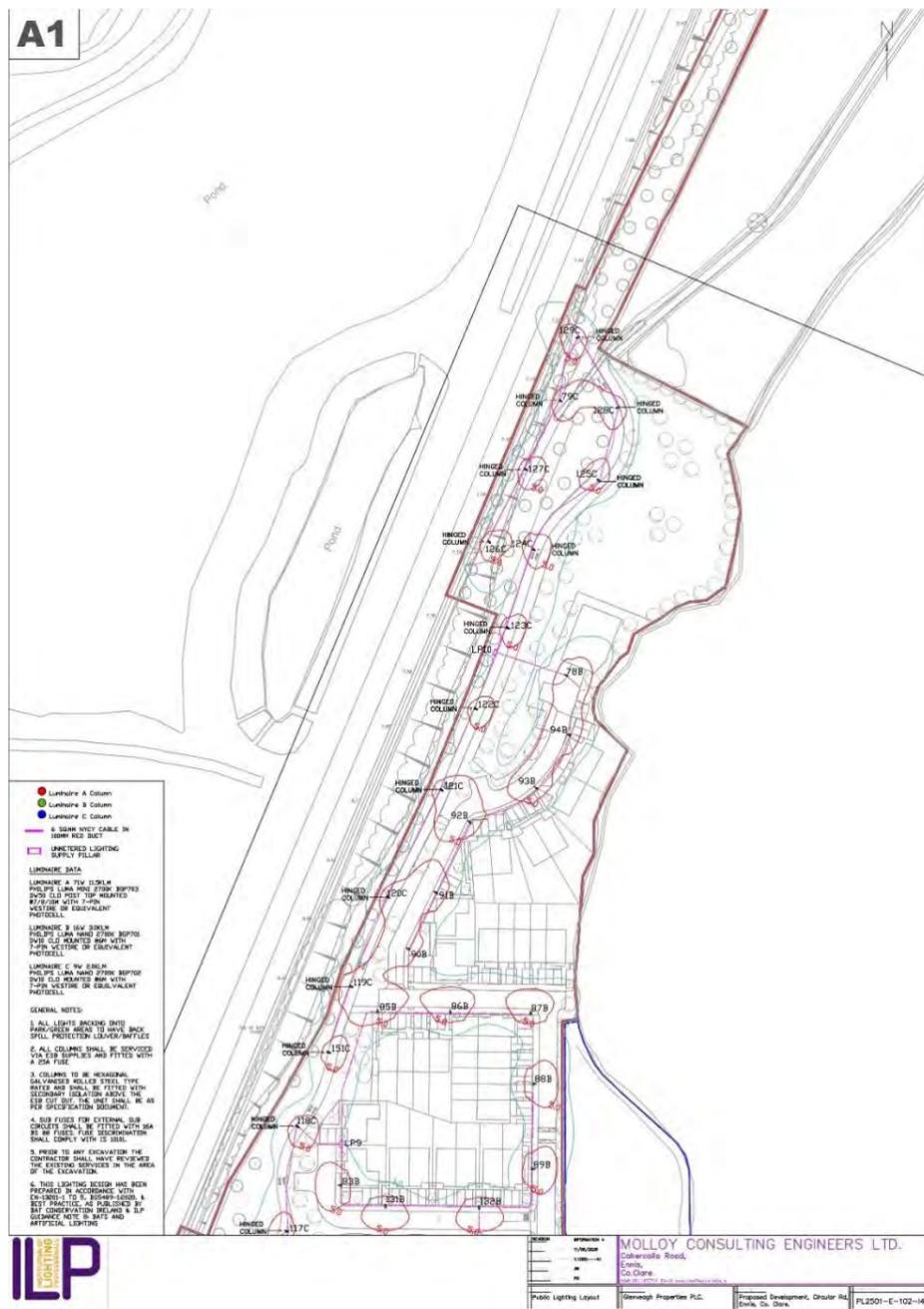


Figure 7. Public Lighting Layout – sheet 3

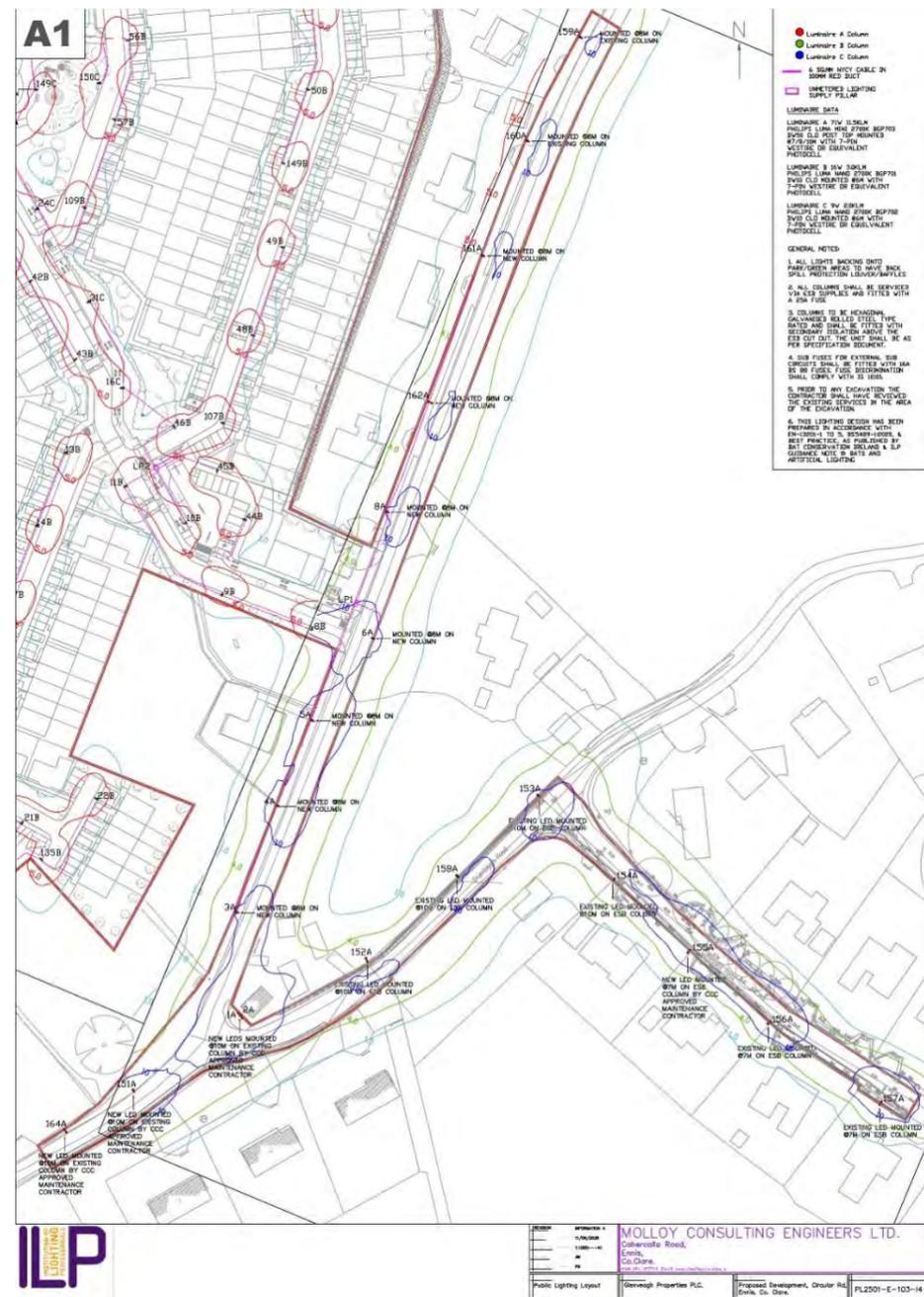


Figure 8. Public Lighting Layout – sheet 4

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Bat surveys

This report presents the results of handheld emergent and detector surveys carried out on the 23rd May 2025 (Emma Peters) and the 05th June 2025 (Bryan Deegan & Gayle O'Farrell). A dawn re-entry and detector survey was also carried out on the 10th June 2025 (Jack Doyle). In addition, a static detector survey was also undertaken (5th June – 10th June 2025) by Bryan Deegan (MCIEEM).

Survey Methodology

As outlined in Marnell et al. 2022 *'The presence of a large maternity roost can normally be determined on a single visit at any time of year, provided that the entire structure is accessible and that any signs of bats have not been removed by others. However, most roosts are less obvious. A visit during the summer or autumn has the advantage that bats may be seen or heard. Buildings (which for this definition exclude cellars and other underground structures) are rarely used for hibernation alone, so droppings deposited by active bats provide the best clues. Roosts of species which habitually enter roof voids are probably the easiest to detect as the droppings will normally be readily visible. Roosts of crevice-dwelling species may require careful searching and, in some situations, the opening up of otherwise inaccessible areas. If this is not possible, best judgement might have to be used and a precautionary approach adopted. Roosts used by a small number of bats, as opposed to large maternity sites, can be particularly difficult to detect and may require extensive searching backed up by bat detector surveys (including static detectors) or emergence counts.'* In relation to the factors influencing survey results the guidelines outlines the following *'During the winter, bats will move around to find sites that present the optimum environmental conditions for their age, sex and bodyweight and some species will only be found in underground sites when the weather is particularly cold. During the summer, bats may be reluctant to leave their roost during heavy rain or when the temperature is unseasonably low, so exit counts should record the conditions under which they were made. Similarly, there may be times when females with young do not emerge at all or emerge only briefly and return while other bats are still emerging thus confusing the count. Within roosts, bats will move around according to the temperature and may or may not be visible on any particular visit. Bats also react to disturbance, so a survey the day after a disturbance event, may give a misleading picture of roost usage.'*

The survey involved the methodologies outlined in Collins (2016) which included the roost inspection methodologies i.e. external methodology outlined in section 5.2.4.1 and the internal survey outlines in section 5.2.4.2 of the guidelines. In addition, the methodologies for Presence absence surveys (Section 7) was carried out for dust emergent surveys.' As outlined in Collins (2016) *'The bat active period is generally considered to be between April and October inclusive (although the season is likely to be shorter in northern latitudes). However, because bats wake up during mild conditions, bat activity can also be recorded during winter months.'*

Tree Potential Bat Roost Inspection

A ground level roost assessment was carried and used to examine the trees on/proximate to the site for features that could form bat roosts. Potential roosting features include heavy ivy growth, broken limbs, areas of decay, vertical or horizontal cracks, cracks in bark etc. All onsite trees were inspected for bat roosting potential during the daytime (23rd May 2025 & 05th June 2025), where possible, for evidence of bat usage.

Emergent / Dawn Re-Entry Surveys

An emergent survey was carried out on the 23rd May 2025 (Emma Peters) and the 05th June 2025 (Bryan Deegan & Gayle O'Farrell). A dawn re-entry survey was carried out on the 10th June 2025 (Jack Doyle). Bat activity was determined through visual observation and the use of an *Echo meter touch 2 Pro* handheld detector. Surveyors were positioned at areas containing features of bat roosting potential at dusk / dawn to determine evidence of bat roosting onsite.

Night-time Bat Detector Surveys

Following an emergent survey, a bat detector survey was carried out on the 23rd May 2025 (Emma Peters) and the 05th June 2025 (Bryan Deegan & Gayle O'Farrell). A bat detector survey was also carried out prior to the break of dawn on the 10th June 2025 (Jack Doyle). Detector surveys were carried out onsite using an *Echo meter touch 2 Pro* handheld detector to determine bat activity. Bats are identified by their ultrasonic calls coupled with behavioural and flight observations. All areas of the site were surveyed for bat activity during the detector surveys.

Static Bat Detector Survey

A passive static bat detector survey was carried out from the 05th June 2025 – 10th June 2025. This survey involved the placement of a static bat detector (specifically, and Anabat Express Detector) within a specific location set to record bat activity over a set period of time. This survey was undertaken in order to gather a wider dataset and determine prolonged usage of the site by bats. An Anabat Express Detector was positioned along the eastern hedgerow boundary adjacent to Ennis Golf Course as demonstrated in Figure 9 below.

Desk Study

A pre-survey bat data search was carried out in October 2024 and updated in April 2025. This included examining records and data from the National Parks and Wildlife Service (NPWS), National Biological Data Centre (NBDC), Bat Conservation Ireland (BCI), in addition to aerial, 6-inch maps and satellite imagery. Additionally, records of previous bat surveys undertaken within / proximate to the subject site were examined.

Survey Constraints

All surveys were conducted within the active bat season and the transects covered the entire site multiple times during the night. Weather conditions were good with mild temperatures of 10°C after sunset. Winds were light and there was no rainfall. Insects were observed in flight during all surveys.

As outlined in Collins (2016) in relation to weather conditions *'The aim should be to carry out surveys in conditions that are close to optimal (sunset temperature 10°C or above, no rain or strong wind.), particularly when only one survey is planned.... Where surveys are carried out when the temperature at sunset is below 10°C should be justified by the ecologist and the effect on bat behaviour considered.'* There were no constraints in relation to the surveys carried out. All areas of the site were accessible, and weather conditions were optimal for bat assessments.



0 100 200 300 400 500 m

Project: Large-scale Residential Development (LRD)
 Location: Ennis, Co. Clare
 Date: 16th June 2025
 Drawn By: Bryan Deegan (Altemar)

ALTEMAR
 Marine & Environmental Consultancy

Figure 9. Location of Static Bat Detector

Results

Buildings as Potential Bat Roosts

No buildings are located within the proposed development site.

Trees as Potential Bat Roosts.

No confirmed bat roosts, or signs of bat activity (e.g. droppings, staining), were recorded in any of the onsite trees during the ground level assessment. A number of trees onsite, and immediately adjacent to the site, were identified to contain features of Bat Roosting Potential (BRP). Features included gaps in bark, ivy-clad trunks, and broken limbs. Trees identified as containing features of BRP are listed in Table 2 below.

Table 2. Trees of BRP recorded during survey

Tree Number	Species	Retained / Removed
T1	Ash	Retained
T2	Oak	Retained
T3	Beech	Retained
T5	Ash	Removed
T9	Sycamore	Retained
T10	Sycamore	Retained
T11	Ash	Retained
3980	Willow	Removed

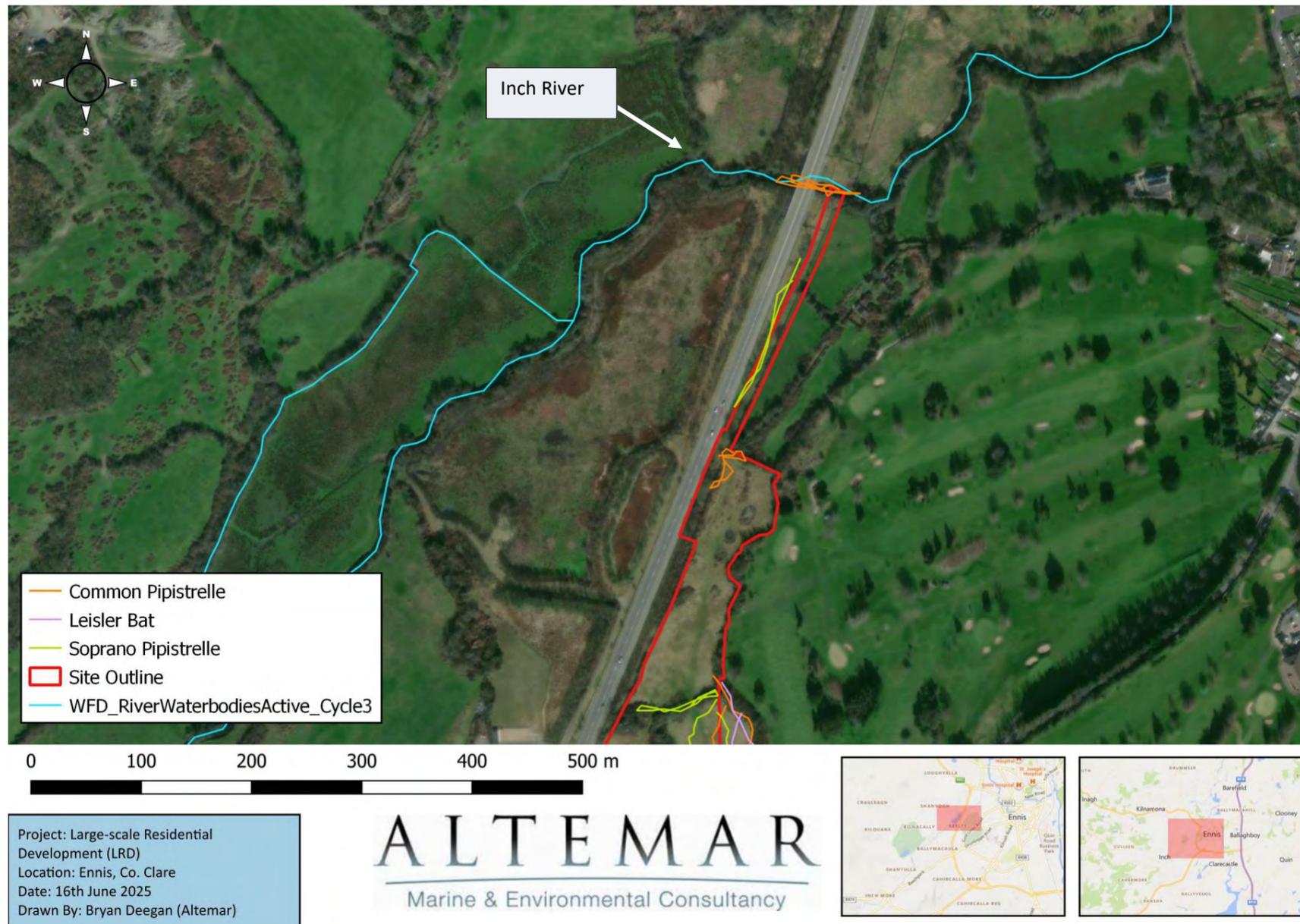
Emergent/Dawn Re-Entry/Detector Surveys.

No bats were recorded emerging from, or returning to, any onsite tree or nearby structure. No confirmed bat roosts were recorded onsite. Foraging and transiting activity of the following bat species was recorded across the emergent, dawn re-entry, and detector surveys:

- Common Pipistrelle (*Pipistrellus pipistrellus sensu lato*)
- Soprano Pipistrelle (*Pipistrellus pygmaeus*)
- Leisler Bat (Lesser Noctule (*Nyctalus leisleri*))

Specifically, Soprano Pipistrelle, Common Pipistrelle, and Lesser Noctule bats were recorded foraging and transiting along linear hedgerows throughout the site. Foraging activity of all three identified species concentrated along the eastern hedgerow boundary adjacent to Ennis Golf Course (see Figure 11). Foraging activity was consistent throughout all stages of the night across the three detector surveys undertaken onsite.

Bat activity recorded across the three detector surveys are demonstrated in Figures 10 & 11.



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Figure 10. Bat Activity Recorded Across 3x Detector Surveys (2025) (sheet 1).

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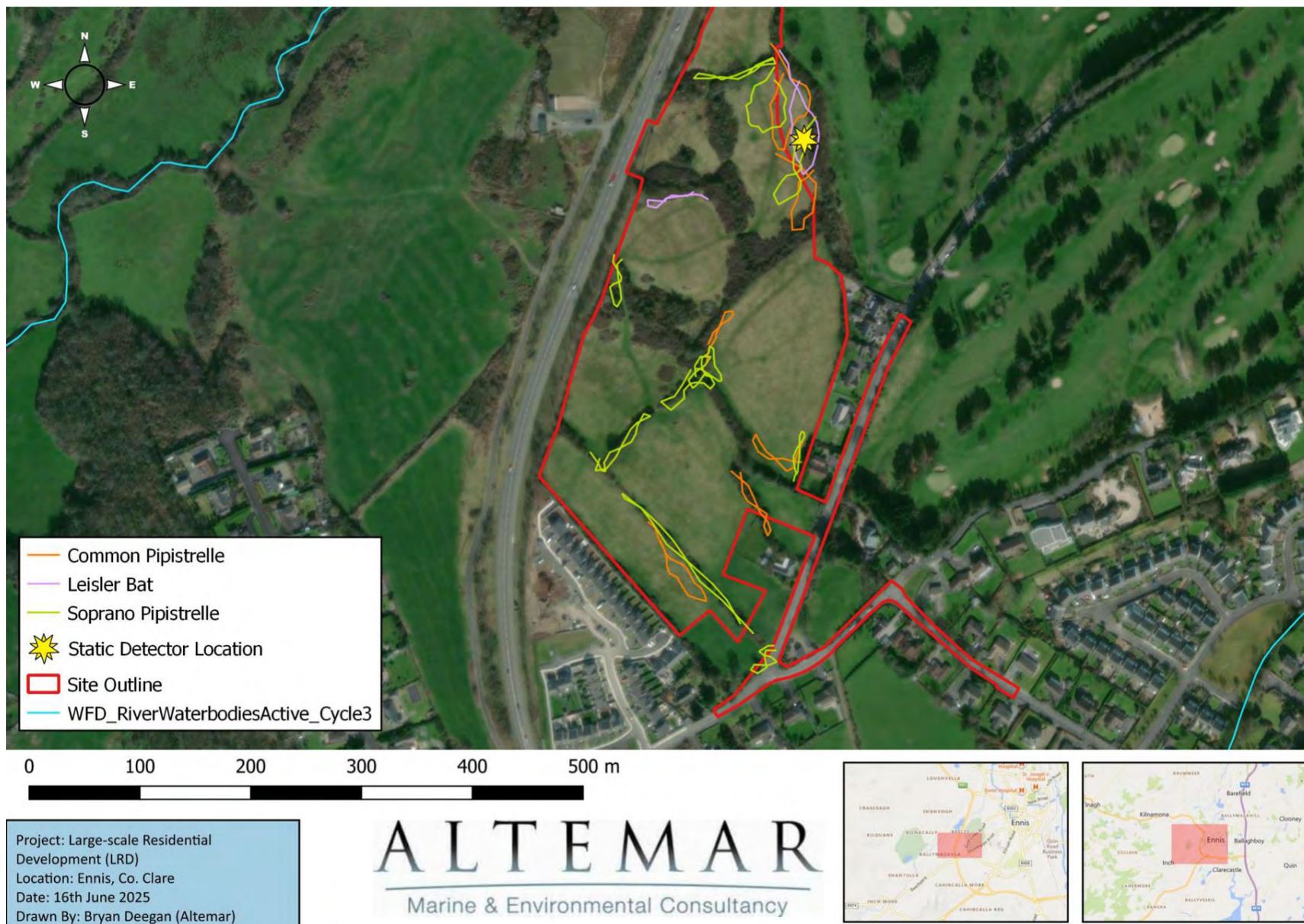


Figure 11. Bat Activity Recorded Across 3x Detector Surveys (2025) (sheet 2).

Static Detector Survey

A static detector survey was carried out from the 5th June 2025- 10th June 2025. An Anabat Express Detector was positioned along the eastern hedgerow boundary adjacent to Ennis Golf Course as demonstrated in Figures 9 & 11. This location was chosen due to the high level of bat activity recorded in this area during the handheld detector surveys. The following six bat species were recorded during the static surveillance:

Table 3. Summary of species and passes recorded from static surveillance over 6 nights.

Species	Number of passes recorded
Common Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>)	119
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	121
Leisler Bat (Lesser Noctule (<i>Nyctalus leisleri</i>))	48
Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>)	8
Nathusius' Pipistrelle (<i>Pipistrellus nathusii</i>)	31
Brown Long-eared Bat (<i>Plecotus auritus</i>)	1

Notably, 8 no. Lesser Horseshoe Bat (*Rhinolophus hipposideros*) passes were recorded by the static bat detector over the course of the surveillance period (6 nights).

Desk Study

European Sites Designated for Lesser Horseshoe Bat

The Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is protected under Annex II of the Habitats Directive which relates to the designation of Special Areas of Conservation (SAC) for a species. The Lesser Horseshoe Bat follows linear commuting routes from its roost to its foraging grounds, does not cross open ground, and utilises treelines and hedgerows for habitat connectivity (Schofield, 2008). Lesser Horseshoe Bats typically forage within 2.5km of their roosts (Schofield, 2008). An examination of proximate SACs to the proposed development site indicates that the Lesser Horseshoe Bat is a Qualifying Interest of 2 no. SACs within 2.5km of the proposed development (Figure 12):

- Pouladatig Cave SAC (1.7km from site boundary)
- Newhall and Edenvale Complex SAC (1.7km from site boundary).

Therefore, the proposed development site is within the 2.5km foraging range of Lesser Horseshoe Bats protected as Qualifying Interests of these SACs. Further site-specific details relating to Pouladatig Cave SAC and Newhall and Edenvale Complex SAC are outlined below.

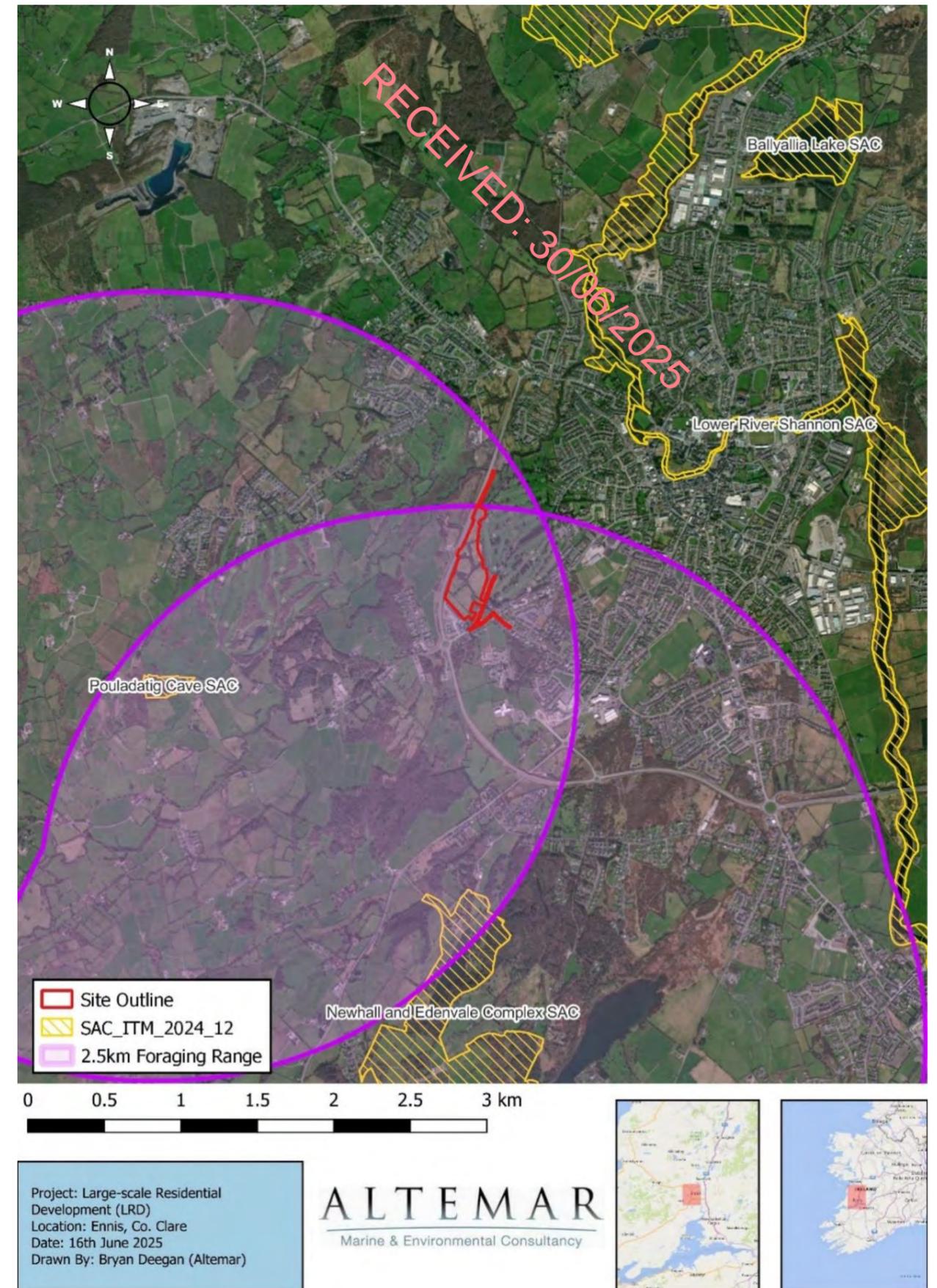


Figure 12. 2.5km Foraging Range Buffers of proximate SACs designated for Lesser Horseshoe Bats

Pouladatig Cave SAC

As outlined in the Pouladatig Cave SAC Site Synopsis¹ (NPWS, Version date 08.07.2013):

'Pouladatig cave is a natural limestone cave situated near Inch bridge, west of Ennis, Co. Clare. It is used as a hibernating site for the Lesser Horseshoe Bat.

The site comprises a relatively short, active stream cave with some rock falls and small chambers. The cave entrance is small and is sheltered by Hawthorn (Crataegus monogyna) trees. After the entrance there is a low bedding crawl but the cave then opens out into roomier passageways. Cave habitats include flowing water, mud banks, boulders, rock roof and walls.

The bats hang from the roof and along the walls of the main passageway. The surrounding scrub vegetation and hedgerows are included in the site as they provide suitable foraging habitat areas and shelter for the bats.

Lesser Horseshoe Bats have been using this cave for many years and approximately 100 bats have been recorded at this site each winter since 1986. The site is therefore of international importance.

Although there is an active stream in the cave, this does not pose any threat of flooding to the bats. This site is not subject to visitor disturbance and is considered to be a safe hibernating site for the Lesser Horseshoe Bat'

Newhall and Edenvale SAC

As outlined in the Newhall and Edenvale SAC Site Synopsis² (NPWS, Version date 11.12.2013):

'Newhall and Edenvale Complex SAC is situated approximately 4 km south of Ennis in Co. Clare. It consists of three distinct locations which are used, at various times throughout the year, by the Lesser Horseshoe Bat.

Newhall and Edenvale Caves are natural fossil limestone caves. Newhall is a narrow, dry passage formed along an inclined joint. The main passage of Edenvale Cave runs into a cliff for 15 m and is crossed by a number of other passages. The side passages run in two directions at acute angles to each other, forming many intersections, hence the local name "The Catacombs". The two caves are used as winter hibernation sites by the bats, while a two-storey farm out-building is used as a breeding site. Two of the locations, Newhall Cave and the farm building, are in the grounds of Newhall House, and the second cave, Edenvale Cave, is in the grounds of Edenvale House, within 1 km of Newhall House. The bats have uninterrupted access to all sites. In 1983 grilles were fitted to both caves.

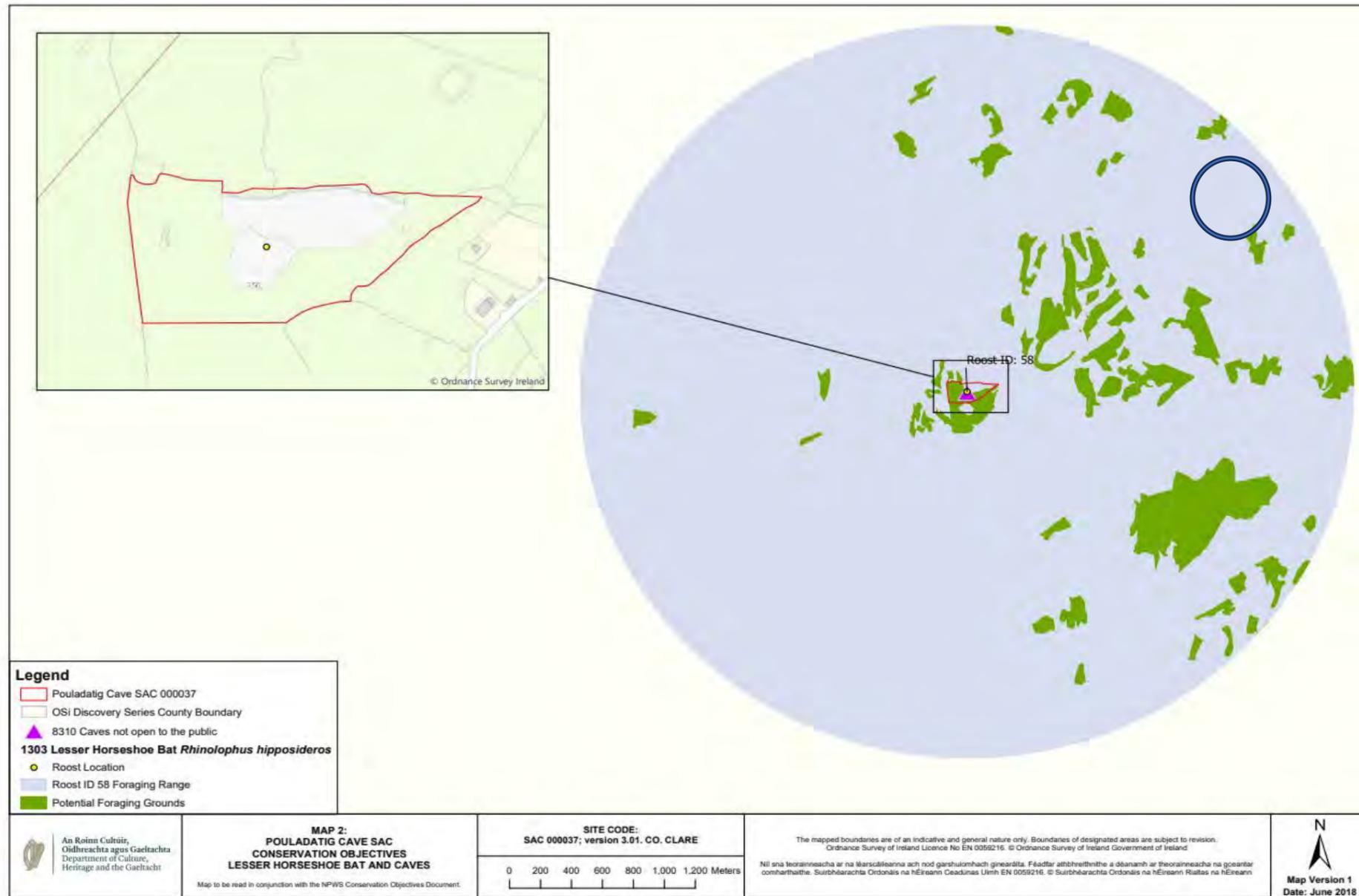
The surrounding areas of mature mixed woodland, parkland and lakes provide ideal foraging habitat and shelter for the bats throughout the year and are included within the site.

Bats have been recorded at this site since 1983 and the population is estimated at more than 500 individuals. The site is of international importance for Lesser Horseshoe Bat, and ranks as one of the most important sites in Europe for the species.'

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¹ <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000037.pdf>

² https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000037.pdf



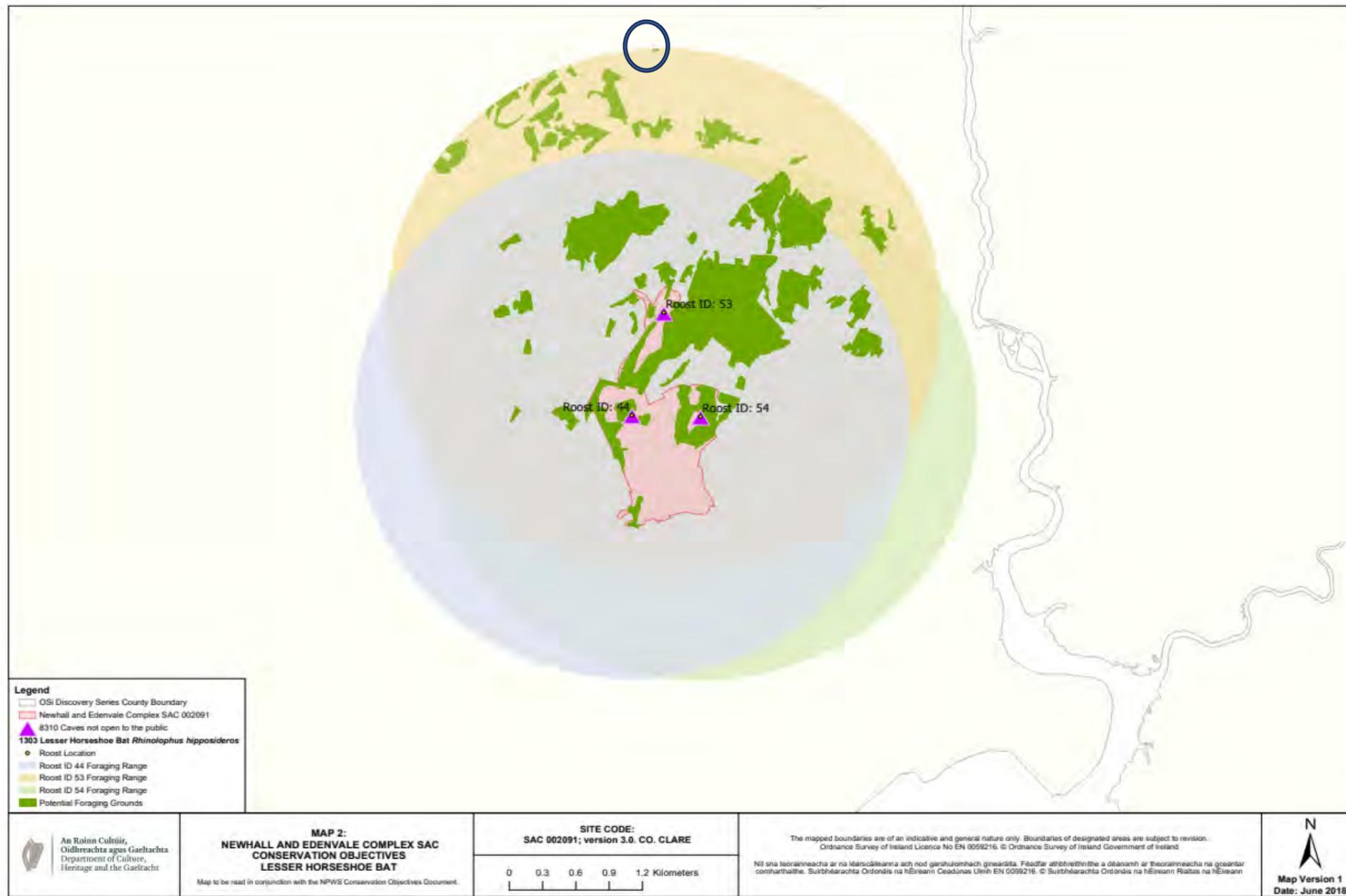
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Figure 13. Location of Pouladatic Cave SAC and map demonstrating the 2.5 km foraging range of Lesser Horseshoe Bat (approximate site location blue circle)

Table 4. Pouladatig Cave SAC Conservation Objectives specific to Lesser Horseshoe Bat

Pouladatig Cave SAC (000037)			
Attribute	Measure	Target	Notes
To maintain the favourable conservation condition of Lesser Horseshoe Bat in Pouladatig Cave SAC, which is defined by the following list of attributes and targets:			
Population per roost	Number	Minimum number of 322 bats for the winter roost (roost id. 58 in NPWS database).	A figure of 100 bats for summer roosts and 50 bats for winter roosts was set as a minimum qualifying standard (MQS) when SACs were being selected for lesser horseshoe bat (<i>Rhinolophus hipposideros</i>). NPWS conduct annual counts at each qualifying roost. Qualified means from the 2013-2017 winter data have been calculated whereby the year with the highest maximum count and the year with the lowest maximum count were removed and the mean of the remaining years was calculated. This mean is set as the target figure for the winter roost (roost id. 58 in NPWS database) in Pouladatig Cave SAC. See the conservation objectives supporting document for lesser horseshoe bat (NPWS, 2018) for further information on all attributes and targets.
Winter roosts	Condition	No decline	Pouladatig Cave SAC has been selected for lesser horseshoe bat because of the presence of one internationally important winter roost (roost id. 58 in NPWS database). Damage or disturbance to the roost or to the habitat immediately surrounding it will lead to a decline in its condition (Mitchell-Jones et al., 2007)
Auxiliary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. Night roosts are also considered an integral part of core foraging areas and require protection (Knight and Jones, 2009). In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. A database of all known lesser horseshoe bat roosts is available on the National Biodiversity Data Centre website. NB further unrecorded roosts may also be present within this SAC.
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.	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.	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)

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Figure 14. Location of Newhall and Edenvale Complex SAC and map demonstrating the 2.5 km foraging range of Lesser Horseshoe Bat (Approximate site location blue circle)

Table 5. Newhall and Edenvale Complex SAC Conservation Objectives specific to Lesser Horseshoe Bat

Newhall and Edenvale Complex SAC (002091)			
Attribute	Measure	Target	Notes
To maintain the favourable conservation condition of Lesser Horseshoe Bat in Newhall and Edenvale Complex SAC, which is defined by the following list of attributes and targets:			
Population per roost	Number	Minimum number of 212 bats for the summer roost (roost id. 44 in NPWS database); minimum number of 298 bats for the winter roost with roost id. 53 and minimum number of 102 bats for the winter roost with roost id. 54.	A figure of 100 bats for summer roosts and 50 bats for winter roosts was set as a minimum qualifying standard (MQS) when SACs were being selected for lesser horseshoe bat (<i>Rhinolophus hipposideros</i>). NPWS conduct annual counts at each qualifying roost. Qualified means from the 2012-2016 data for the summer roost and the 2013-2017 data for the winter roosts have been calculated whereby the year with the highest maximum count and the year with the lowest maximum count were removed and the mean of the remaining years was calculated. This mean is set as the target figure for each roost in Newhall and Edenvale Complex SAC. See the conservation objectives supporting document for lesser horseshoe bat (NPWS, 2018) for further information on all attributes and target
Winter roosts	Condition	No decline	Newhall and Edenvale Complex SAC has been selected for lesser horseshoe bat because of the presence of two internationally important winter roosts (roost id. 53 and roost id. 54 in NPWS database). Damage or disturbance to these roosts or to the habitat immediately surrounding the roosts will lead to a decline in their condition (MitchellJones et al., 2007)
Summer roosts	Condition	No decline	Newhall and Edenvale Complex SAC has been selected for lesser horseshoe bat because of the presence of one internationally important summer roost (roost id. 44 in NPWS database). Damage or disturbance to the roost or to the habitat immediately surrounding it will lead to a decline in its condition (Kelleher and Marnell, 2006)
Auxiliary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. Night roosts are also considered an integral part of core foraging areas and require protection (Knight and Jones, 2009). In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. Several other winter roosts that support lesser horseshoe bats, but at numbers below the MQS figure, are known from Newhall and Edenvale Complex SAC. A database of all known lesser horseshoe bat roosts is available on the National Biodiversity Data Centre website. NB further unrecorded roosts may also be present within this SAC.
Extent of potential foraging habitat	Hectares	No significant decline within 2.5km of qualifying roosts	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 roosts and identifies potential foraging grounds
Linear features	Kilometres	No significant loss within 2.5km of qualifying roosts.	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 roosts or along commuting routes within 2.5km of those roosts.	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).

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Review of Bat Records

The review of existing bat records (sourced from Bat Conservation Ireland’s National Bat Records Database) within a 2km² grid (Reference grid R371) encompassing the study area reveals that eight of the nine known Irish species have been observed locally (Table 6). The National Biodiversity Data Centre’s online viewer was consulted in order to determine whether there have been recorded bat sightings in the wider area. This is visually represented in Figures 15 - 18.

Table 6: Status of bat species within the 2km² grid encompassing the subject site (Reference no. R371)

Species name	Count	Date of last record	Designation
Brown Long-eared Bat (<i>Plecotus auritus</i>)	4	07/08/2022	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
Common Pipistrelle (<i>Pipistrellus pipistrellus sensu stricto</i>)	119	07/08/2022	
Daubenton's Bat (<i>Myotis daubentonii</i>)	23	26/08/2019	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
Leisler's Bat (<i>Nyctalus leisleri</i>)	96	07/08/2022	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>)	8	06/08/2022	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex II Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
Nathusius's Pipistrelle (<i>Pipistrellus nathusii</i>)	1	06/08/2022	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>)	2	21/09/2010	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	138	07/08/2022	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts



Figure 15. Brown Long-eared Bat (*Plecotus auritus*) (purple), Common Pipistrelle (*Pipistrellus pipistrellus sensu stricto*) (yellow), and both Brown Long-eared bat and Common pipistrelle (orange) (Source NBDC). Approx. site area– red circle.

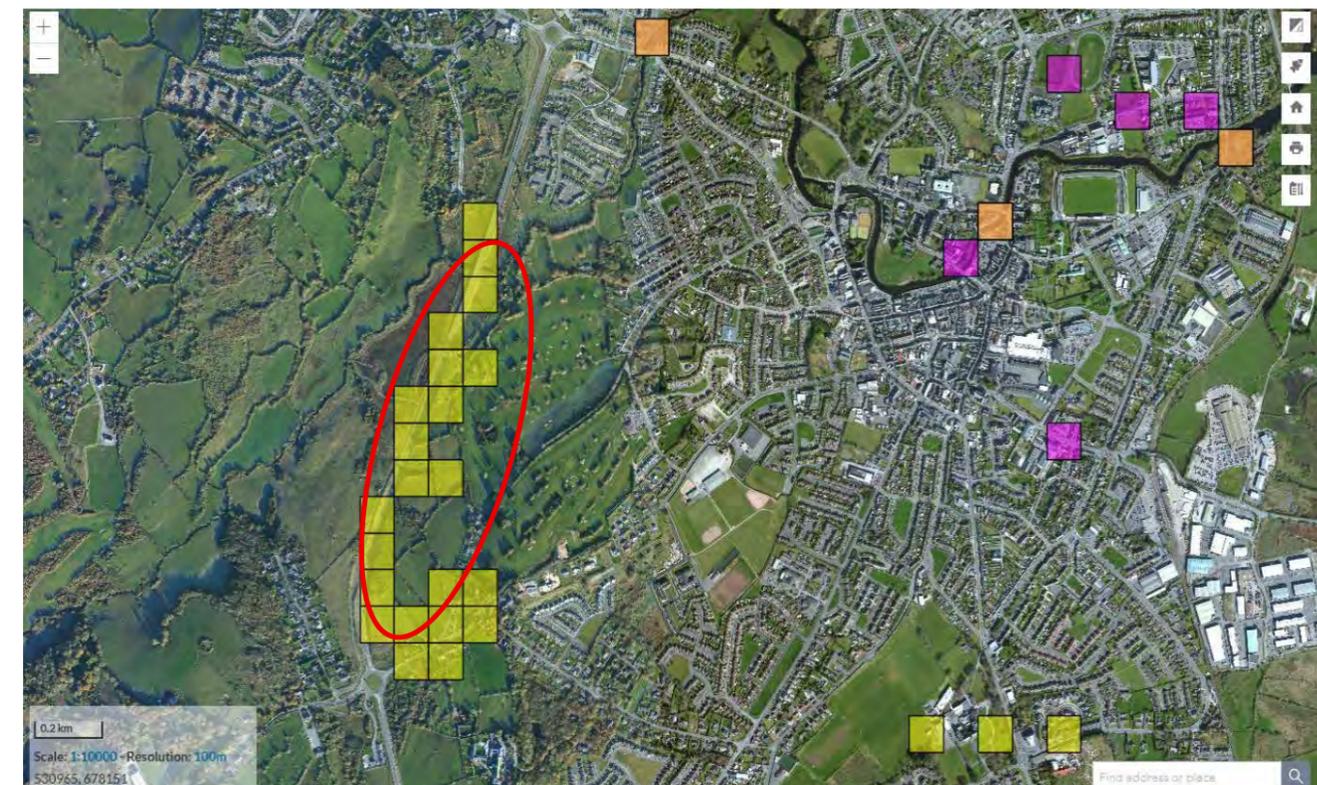


Figure 16. Daubenton's Bat (purple), Leisler's Bat (*Nyctalus leisleri*) (yellow), and both Daubenton's Bat & Lesser Noctule (orange) (Source NBDC). Approx. site area– red circle.

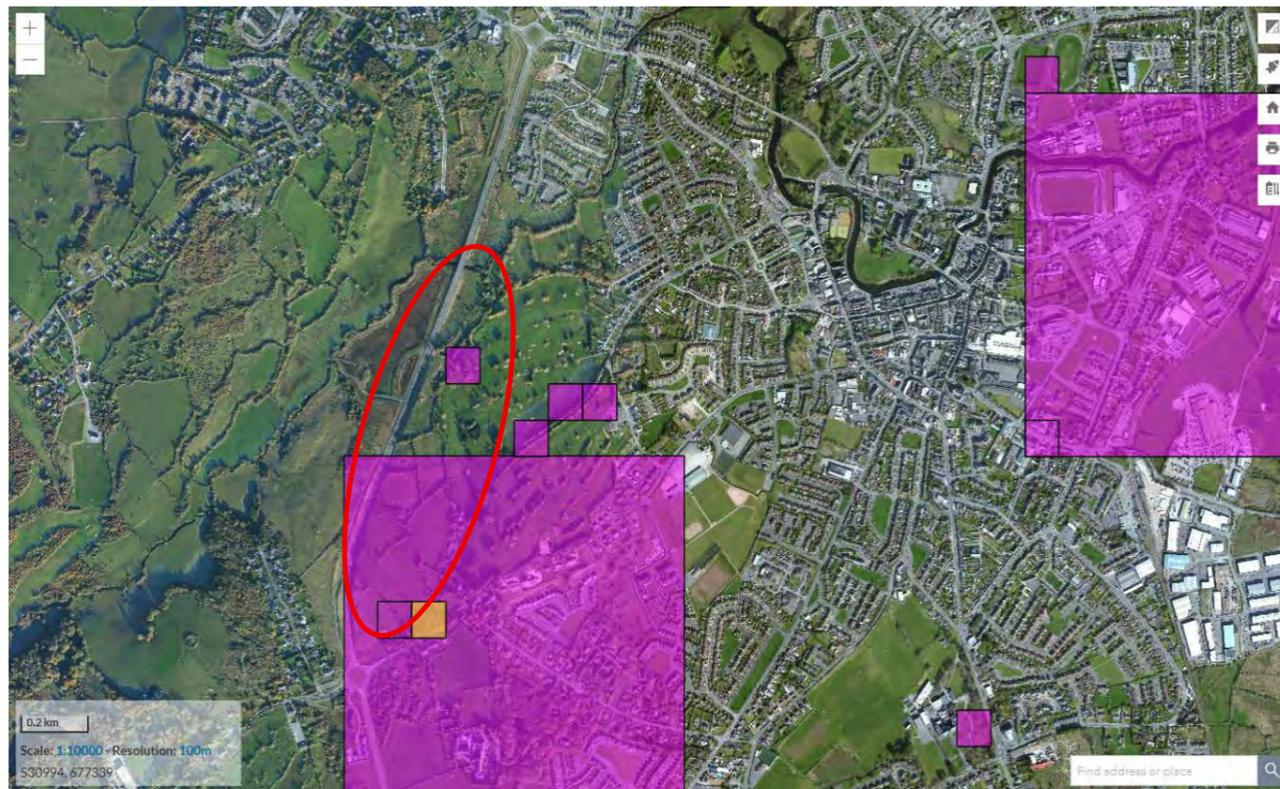


Figure 17. Lesser Horseshoe Bat (*Rhinolophus hipposideros*) (purple) and both Lesser Horseshoe Bat & Nathusius's Pipistrelle (orange) (Source NBDC). Approx. site area— red circle.



Figure 18. Pipistrelle (*Pipistrellus pipistrellus sensu lato*) (purple), Soprano Pipistrelle (*Pipistrellus pygmaeus*) and both Pipistrelle & Soprano Pipistrelle (orange) (Source NBDC). Approx. site area— red circle.

Previous Bat Surveys

A number of previous bat surveys have been undertaken on lands encompassing the subject site. Detailed findings of bat surveys previously undertaken onsite are outlined below.

Scott Cawley – Bat Survey Report³

2 no. walkover surveys and an automatic static detector survey were undertaken by Scott Cawley on the 03rd & 08th May 2017. The following bat species were recorded:

- Common Pipistrelle (Walkover & Static Detector)
- Soprano Pipsitrelle (Walkover & Static Detector)
- Leisler's Bat (Walkover & Static Detector)
- *Myotis* species (Static Detector Only)
- Lesser Horseshoe Bat (Static Detector Only)

The results of these surveys are as follows:

Walked Dusk Transects

Three species of bat were noted using the site over the course of the two dusk transect surveys; common pipistrelle bat, soprano pipistrelle bat and Leisler's bat. Soprano pipistrelle bat was the most frequently encountered species. Bats were recorded flying in close proximity to boundary hedgerows present on site. No lesser horseshoe bats were identified during the walking transects.

On the 3rd May (first dusk transect) the first bat recorded was a common pipistrelle bat. This was recorded simultaneously with a soprano pipistrelle bat at 21:59. Leisler's bat was first recorded at 22:14. On the 8th May (second dusk transect) the first bat recorded onsite was again a common pipistrelle bat, recorded at 22:02. This bat was seen flying in the most northerly part of the site, along the hedgerow and stone wall which form the northern boundary. Soprano pipistrelle was first recorded at 22:31, again in the northern portion of the site along the eastern boundary with Ennis Golf Club. Leisler's bat was first recorded at 22:53 in the scrubby area in the centre of the site. The last bat recorded was a soprano pipistrelle bat identified at 23:17, on the R474 to the south of the site.'

Automated Static Detector Results

Approximately 950 bat passes were recorded on site over the survey period, between the three automated static detectors deployed. A range of species were identified from these recordings- common pipistrelle, soprano pipistrelle, Leisler's bat, Myotis species and lesser horseshoe bat. Bat passes were recorded throughout the night for most dates- from dusk right through to dawn. Generally, the most frequently encountered bat species were common pipistrelle and soprano pipistrelle bats. Lesser horseshoe bats were detected by static detector (B) and static detector (C), which were located on hedgerows in the south-east of the site and the centre of the site respectively. Lesser horseshoe bats were not recorded on the static detector deployed on the most southerly hedgerow (static detector (A)).'

³ Scott Cawley (2018) Bat Survey Report: Proposed Residential Development at Ballymacaula, Ennis, Co. Clare.

Ash Ecology – Preliminary Bat Survey Report⁴

A preliminary bat survey were undertaken by Ash Ecology on the 07th September 2021. The following bat species were recorded:

- Common Pipistrelle
- Soprano Pipsitrelle
- Leisler’s Bat
- Brown Long-eared Bat
- Natterer’s Bat
- Lesser Horseshoe Bat

Bat activity recorded during this survey is demonstrated in Figure 19 below:

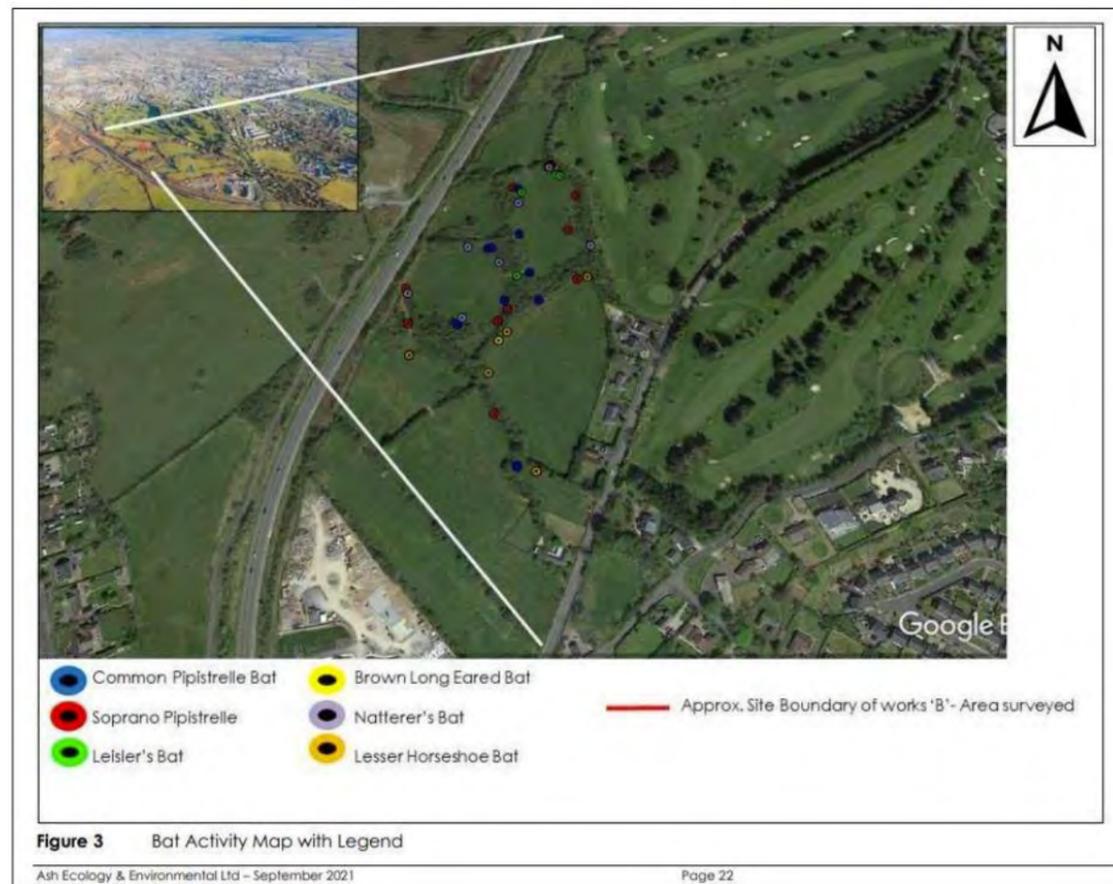


Figure 19. 2021 bat survey results (Source: Ash Ecology, 2021)

⁴ Ash Ecology (2021) Preliminary Bat Survey Report: Golf Links Road, Ennis, Co. Clare. Report prepared for Enviroguide Consulting.

Bat Eco Services – Bat Assessment Report⁵

Dusk, dawn and walking transect bat surveys were carried out by Dr. Tina Aughney (Bat Eco Services) on the 6th and 7th August 2022. A static detector survey was also carried out on the 1st to 6th August 2022.

The Bat Assessment Report (2022) details the following:

‘Six species of bat was recorded within the survey area: Leisler’s bat, soprano pipistrelle, common pipistrelle, lesser horseshoe bat, Natterer’s bat and brown long-eared bat. The first three species were recorded during bat detector surveys and static surveillance. bat activity levels were indicative of commuting and foraging individuals. The latter three bat species were recorded at a lower level of bat passes, which is to be expected as these three bat species are less common.

Overall, the survey results demonstrate that bats commuted to the proposed development site from an easterly, westerly and northerly direction and foraged, primarily along the boundary habitats. The eastern boundary, with Ennis Golf Course, is particularly important for foraging local bat populations and this may be due to the mature hedgerow and the fact that there is no outdoor lighting in this area.

A medium level of bat activity common and more light-tolerant bat species were recorded along the boundary with the N85, where outdoor lighting is present. None of the three light sensitive bat species (lesser horseshoe bat, brown long-eared bat and Natterer’s bat) were recorded along this boundary. All bat species were generally recorded at a Low level of bat activity during the static surveillance.

However, due to the quiet echolocation calls of lesser horseshoe bats, Natterer’s bats and brown long-eared bats, their presence is significant. There are no recorded bat roosts within the proposed development site but there are four trees recorded as Potential Bat Roosts (PBRs) are proposed to be felled. The majority of the internal network of hedgerows and the scrub habitat will be removed as part of the proposed development.’

It should be noted that the static detector survey only recorded Lesser Horseshoe Bat activity along the eastern boundary with Ennis Golf Course (see position of Mini 2 in Figure 20 below).



⁵ Bat Eco Services (2022) Bat Assessment: Ballymacaula, Circular Rd., Ennis, Co. Clare.

Bat Assessment Findings

The bat surveys comply with bat survey guidance documentation including Marnell et al (2022) and Collins (2016).

No confirmed bat roosts were recorded onsite. No bats were recorded or observed emerging / returning to any onsite tree or proximate offsite structure. There are trees of bat roosting potential noted on site, a number of which are to be felled as part of the proposed development (see Table 2). 6 total bat species were recorded foraging / transiting through the proposed development site:

- common pipistrelle (Handheld & Static Detector),
- soprano pipistrelle (Handheld & Static Detector),
- lesser noctule (Handheld & Static Detector),
- brown long-eared bat (Static Detector only),
- Nathusius's pipistrelle (Static Detector only), and
- lesser horseshoe bat (Static Detector only).

Linear Habitats Onsite

The Inch River is located along the northern boundary of the site. This watercourse provides a suitable ecological corridor for local bat populations. Bat activity recorded along the northern portion of the site indicates that bats utilise this linear ecological corridor to access the proposed development site. As a result, the site's ecological connectivity (via treelines and hedgerows) to the adjacent Inch River is considered to provide an important ecological corridor for local bat populations.

Recorded bat activity (including transiting & foraging) onsite concentrated along linear hedgerow and scrub habitats that section and border the subject site. In particular, recorded bat activity concentrated along the eastern hedgerow boundary adjacent to the Ennis Golf Course. As such, linear hedgerow and scrub habitats located onsite provide important transiting and foraging habitats for local bat populations.

Brown long-eared bat, Nathusius's pipistrelle, and lesser horseshoe bat activity was only recorded by a static bat detector located along the eastern hedgerow boundary adjacent to Ennis Golf Course (location demonstrated in Figure 9). There is currently no external lighting in this area, and the presence of these light-sensitive species within this dark area indicates that the eastern hedgerow provides a valuable ecological corridor for bat foraging and transiting activity. It should be noted that this hedgerow is located outside of the proposed development site. As the southern and western boundaries of the site currently experience light spill from neighbouring roads and residential developments, the darkened northern (Inch River) and western (Ennis Golf Club) boundaries provide important habitat connectivity for the identified bat species recorded along the eastern boundary of the site.

These findings are consistent with the results of a number of bat surveys undertaken by Bat Eco Services (2022) within the subject site.

Lesser Horseshoe Bats

Lesser horseshoe bat activity has been recorded onsite in each of the outlined past bat surveys (2017, 2021, 2022). Lesser horseshoe bat activity onsite was again confirmed by Altamar in 2025. This species follows linear commuting routes (e.g. treelines, hedgerows) from its roost to its foraging grounds, does not cross open ground, and is sensitive to external lighting (Schofield, 2008). In 2025, lesser horseshoe bat activity was recorded by a static bat detector along the eastern hedgerow boundary adjacent to Ennis Golf Course. As detailed above, there is currently no external lighting along this habitat and is therefore within a dark zone. As a result, darkened linear features along the eastern and northern boundaries of the site are considered important commuting habitats for this species. In concurrence with the Bat Assessment Report (2022), it is likely that lesser horseshoe bats are accessing the site via the Inch River to the north of the proposed development site.

Further, the desktop study revealed that the proposed development site is located 1.7km from two SACs designated for lesser horseshoe bats (Pouladatig Cave SAC and Newhall and Edenvale SAC), and therefore within the identified 2.5km foraging range of lesser horseshoe bats (Schofield, 2008). The repeated recording of lesser horseshoe bat activity onsite (2017, 2021, 2022, & 2025) and the proximity of the proposed development site to Pouladatig Cave SAC and Newhall and Edenvale SAC (within 2.5km foraging range (Schofield, 2008)) indicates that the subject site may provide foraging and commuting habitats for lesser horseshoe bats protected under the two identified SACs.

Potential Impact of the Development on Bats

Construction Phase

No bat roosts were recorded on site; however, several trees of bat roosting potential proposed for felling are located onsite. The removal of vegetation on site will reduce bat foraging habitat for the six species recorded on site. The site is currently characterised by low illumination, with minimal light spill from surrounding areas. Lighting during construction has the potential to impact on foraging of bats on site in the absence of mitigation. Mitigation measures are required to minimize light spill and protect retained bat foraging areas, particularly along the eastern site boundary adjacent to Ennis Golf Course. This area is considered a likely important commuting corridor for Lesser Horseshoe Bat populations associated with nearby SACs. There is the potential for habitat loss, habitat fragmentation, and disturbance impacts (human activity, lighting, & noise pollution) on this species during the construction phase of development.

In the absence of mitigation, the proposed development would be seen to have a negative, moderate adverse, short term, not significant, international and likely effect on bat fauna during construction. Mitigation is required.

Operation Phase

The removal of trees and hedgerows on site will result in a loss of foraging areas for bats. Loss of foraging sites and commuting habitat may temporarily displace species found to utilise the site. There is potential for bat foraging to be impacted by the artificial lighting on site, and in particular foraging and commuting of lesser horseshoe bat, given they are considered a 'Light Sensitive' species. The proposed lighting strategy has been discussed and modified to reduce the potential impact of the development on bats. This has included only lighting areas where required and not lighting public open spaces unless necessary. Warm white LED lighting (2700K) with full cut-off optics is proposed to minimise impacts on bat foraging and reduce light spill towards treelines and hedgerow boundaries. Compensatory planting for removal of linear and scrub habitats has been incorporated into the landscape strategy. It should be noted that large linear lengths of woodland planting will be placed on site. These will provide tall linear corridors to provide bat foraging areas.

Impacts in the absence of mitigation: negative, moderate adverse, international, permanent, not significant. Mitigation is required including consultation with the project ecologist in relation to lighting and a post lighting inspection by the ecologist.

Mitigation Measures

As outlined in Marnell et al. (2022) “Mitigation should be proportionate. The level of mitigation required depends on the size and type of impact, and the importance of the population affected.” In addition as outlined in Marnell et. al (2022) ‘Mitigation for bats normally comprises the following elements:

- Avoidance of deliberate, killing, injury or disturbance – taking all reasonable steps to ensure works do not harm individuals by altering working methods or timing to avoid bats. The seasonal occupation of most roosts provides good opportunities for this
- Roost creation, restoration or enhancement – to provide appropriate replacements for roosts to be lost or damaged
- Long-term habitat management and maintenance – to ensure the population will persist
- Post-development population monitoring – to assess the success of the scheme and to inform management or remedial operations.’

The following mitigation measures will be implemented:

Mitigation by Design

- Retention of 401 linear metres of native hedgerows within the site boundary. In addition, native hedgerows located along the western and eastern boundaries (outside the red line) are to be retained.
- Approximately 344 trees, including species such as oak, ash, and beech, will be planted across the site. These will be arranged in structured treelines, with additional woodland planting areas integrated into the overall landscape design strategy. This planting scheme is intended to support and enhance bat foraging activity on site.

Construction & Operation Mitigation

In addition, the following measures in relation to bats will be implemented during the construction and operational phases of development. The mitigation measures outlined below are consistent with those devised in the Bat Assessment Report (Bat Eco Services, 2022):

Lighting

“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, 2018). 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.

Additional measures were also recommended:

- Removal of specific luminaires to prevent light spillage on the boundary with the golf course.”

Bat Box Scheme

“The total number of bat boxes required to mitigate for general conservation of local bat populations:

- 4 summer bat boxes (Schwegler Woodcrete 1FF bat box or equivalent – source www.nhbs.com or www.veldshop.nl) to be erected on mature trees within the Proposed Development site.

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.”

Lesser Horseshoe Bat Conservation Measures

“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, it is important that additional measures are undertaken to conservation local Lesser Horseshoe Bat populations. These measures will entail the following:

- Compensatory planting for the removal of linear habitats.
- Compensatory planting for the removal of scrub habitats.
- Specific measures to reduce lighting impacts.
- Lesser Horseshoe Bat conservation zone – zone of land along a linear strip to the north of the Proposed Development site and connected to the boundary of the Inch River. This area has been selected because it is outside the Lighting Plan zone and it is adjacent to the Inch River

which is deemed as the likely commuting route for Lesser Horseshoe Bats to the Proposed Development area. This river also allows direction commuting to lands with the Ennis Golf Course where Lesser Horseshoe Bat activity was also recorded.

- This area is approximately 20m wide and 170m long and it is proposed that the following measures are undertaken: Erection of Day Roost.”

A Day Roost consists of a “small structure building of concrete block (externally plastered) with a natural slate roof and bitumous felt. It is designed according to VWT Day Roost recommendations and full details of the plans are provided in the appendices” [of the Bat Assessment Report (2022) accompanying this application].

“The provision of such features within the 2.5km radius of Lesser Horseshoe Bat SACs is considered by The Vincent Wildlife Trust (VWT) as an important component to the support network for maternity and hibernation roosts.

- Dark free zone connected to Inch River no lighting permitted withing this area.
- Landscaping in vicinity of Day Roost and Inch River.
- Approximately 200m of hedge planting (Hawthorn).⁶
- Approximately 10 small trees (e.g. Rowan, Birch and Crab Apple).

Landscape Design

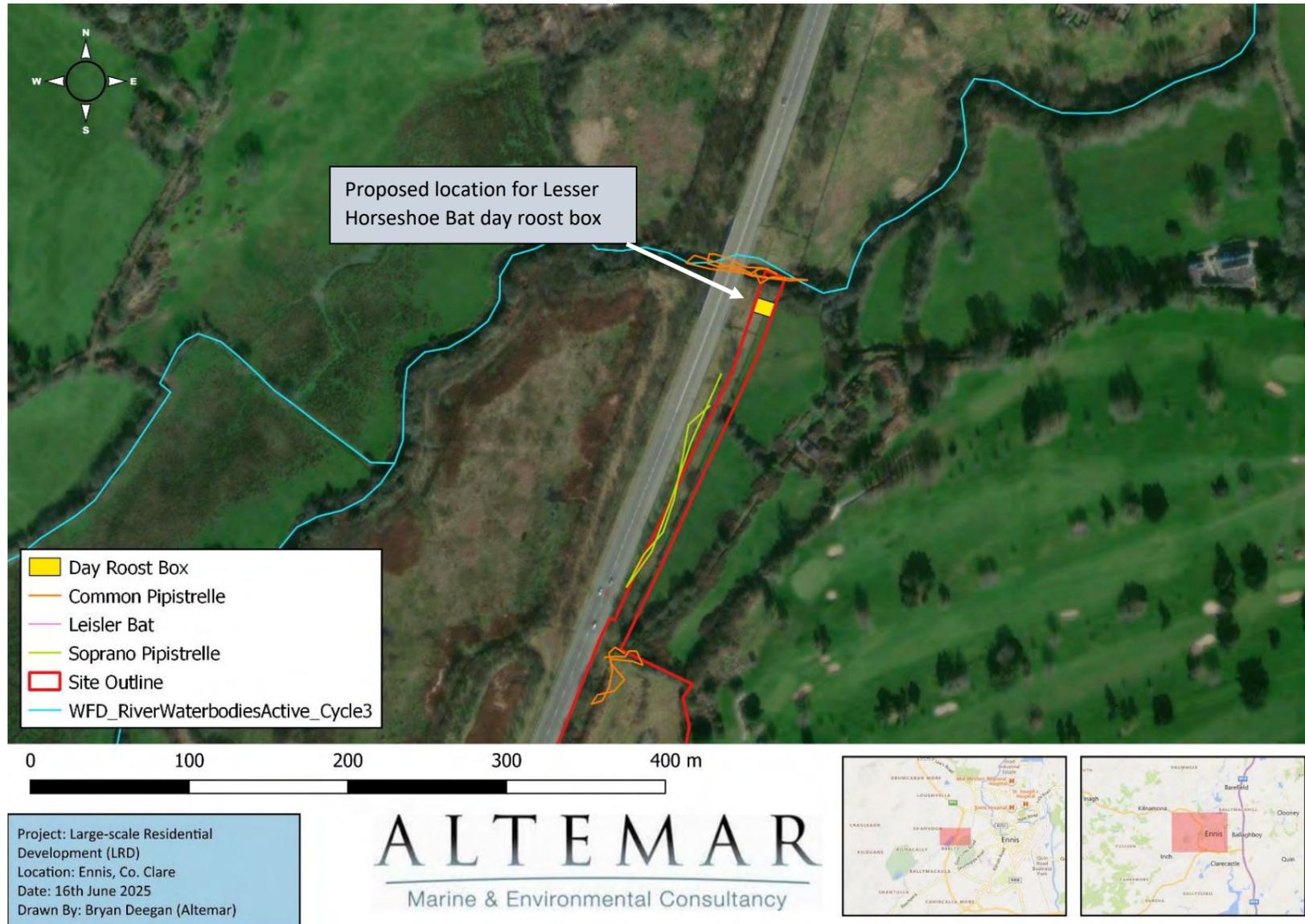
“It is recommended that native tree, shrub, and plant species are included in the landscaping plan. It is recommended that night-scented planting is also undertaken to encourage foraging areas for local bat populations. As such, night scented-floral species, including Honeysuckle *Lonicera periclymenum* and Star Jasmine *Trachelospermum jasminoides*, will be included within the proposed hedgerows and areas of ornamental planting on Site, as outlined within the Landscape Design Plan, to provide foraging habitat for local bats.

It is essential that the northern and eastern boundary with the Ennis Golf Course is protected. Any gaps or opportunity to undertaken planting to increase the height and width of this boundary should be undertaken and planting should be with native tree and shrub species. “The retention of the hedgerows along this boundary, along with the proposed compensatory woodland planting and native infilling to these hedgerows, as outlined in the Landscape Design Plan, will protect this ecological corridor.

It should be noted that the proposed development has increased the level of hedgerow planting to include more linear woodland planting across the boundary of the site which includes oak. This will result in taller treelines in the long-term than the granted development which would provide superior foraging corridors and greater light spill containment.

⁶ Note that this has been increased in 2025 to taller woodland planting which would provide increased foraging and light spill reduction.

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Figure 21. Location of Proposed Bat Roost Box



Predicted Residual Impact of Planned Development on Bats

The proposed development will change the local environment as new lights and structures are to be erected and the existing vegetation will be removed. No bat roosts were noted within the site boundary. Increased lighting onsite during construction and operation has the potential to impact on foraging activity of bat species recorded onsite. Following implementation of a sensitive lighting strategy (in compliance with bat lighting guidelines) in consultation with an ecologist, in addition to mitigation, the species seen to occur onsite and in the surrounding area should persist. Consultation within the project team has taken place in relation to the impact of external lighting on bat foraging along linear ecological corridors (including watercourses, treelines, and hedgerows) both onsite and offsite. The proposed lighting has been modified to allow for foraging activity to continue on site. Compensatory planting, including linear woodland planting, will be established throughout the proposed development site to mitigate potential impacts on bat foraging. The eastern hedgerow located along the boundary adjacent to Ennis Golf Course (outside site outline) will be retained as part of the proposed development. The proposed development will result in a long term/low adverse/not significant/negative impacts on bats.

Figure 22. Site Layout Plan – Compensatory planting to maintain habitat connectivity to Inch River

References

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APPENDIX 11-2 SHD Bat Report

2022

Bat Assessment: Ballymacaula, Circular Rd., Ennis, Co. Clare.



Dr Tina Aughney
Bat Eco Services

Bat Eco Services, Ulex House, Drumheel, Lisduff, Virginia, Co. Cavan. A82 XW62.

Licensed Bat Specialist: Dr Tina Aughney, (tina@batecoservices.com, 086 4049468)
NPWS licence C13/2020 (Licence to handle bats, expires 31st December 2022);
NPWS licence 08/2020 (Licence to photograph/film bats, expires 31st December 2022) ;
NPWS licence DER/BAT 2022-36 (Survey licence, expires 24th March 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 is a monitoring co-ordinator and trainer for Bat Conservation Ireland. 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.

All analysis and reporting is completed by Dr Tina Aughney. Data collected and surveying is completed with the assistance of a trained field assistant.

Mr. Shaun Boyle (Field Assistant) NPWS licence DER/BAT 2022-37 (Survey licence, expires 24th March 2025).

Applicant Name: Glenveagh Homes Ltd

Project Title: Residential Development

Application Address: Ballymacaula, Circular Road, Ennis, Co. Clare

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
16 th August 2022	Draft 1	By email to Enviroguide Consulting
23 rd August 2022	Final	By email to Enviroguide Consulting

Purpose

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

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

Carbon Footprint Policy

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

Bat Record Submission Policy

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

Executive Summary

Project Title: Ballymacaula, Circular Road, Ennis, Co. Clare

Application Address: Ballymacaula, Circular Road, Ennis, Co. Clare

Proposed work: Residential Development.

Bat Survey Results - Summary

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

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	●	Other	○

Citation: Bat Eco Services (2022) Bat Assessment: Ballymacaula, Circular Road, Ennis, Co. Clare. Unpublished report prepared for Enviroguide Consulting.

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1. Introduction

Bat Eco Services was commissioned by Enviroguide Consulting to undertake a bat survey of a proposed development site located at Ballymacaula, Circular Road, Ennis, Co. Clare and this entailed daytime inspection, dusk and dawn surveys, static surveillance and walking transects.

1.1 Relevant Legislation & Bat Species Status in Ireland

1.1.1 Irish Statutory Provisions

A small number of animals and plants are protected under Irish legislation (Nelson, *et al.*, 2019). The principal statutory provisions for the protection of animal and plant species are under the Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. The Flora (Protection) Order 2015 (S.I. no. 356 of 2015) lists the plant species protected by Section 21 of the Wildlife Acts. See www.npws.ie/legislation for further information.

The codes used for national legislation are as follows:

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

1.1.2 EU Legislation

The Birds Directive (Directive 2009/147/EC) and Habitats Directive (Council Directive 92/43/EEC) are the legislative instruments which are transposed into Irish law, *inter alia*, by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) ('the 2011' Regulations), as amended.

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

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

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

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

Article 12 of the Habitats Directive requires Member States to take measures for the establishment of a strict protection regime for animal species listed in Annex IV(a) of the Habitats Directive within the whole territory of Member States. Article 16 provides for derogation from these provisions under defined conditions. These provisions are implemented under Regulations 51 and 54 of the 2011 Regulations.

1.1.3 IUCN Red Lists

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

1.1.4 Irish Red List - Mammals

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

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

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

1.1.5 Irish Bat Species

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

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

Regulation 51(2) of the 2011 Regulations provides –

“(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).

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 has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species’ current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species. A total of 41 SACs have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat ‘Caves not open to the public’ (8310).

Irish bat species list is presented in Table 1 along with their current status.

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

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

^ Roche *et al.*, 2014

1.2 Relevant Guidance Documents

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

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- 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).
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.
- Bat Conservation Trust (2018) Bats and artificial lighting in the UK: bats and the built environment series. Guidance Note 08/2019. BCT, London.
- Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final.

- EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Collins (2016) is the principal document used to provide guidance in relation to bat survey effort required but the level of surveying is assessed on a case-by-case basis taking into consideration the historical bat records for the survey area, presence of built, structures and trees potentially suitable for roosting bats and the presence of suitable bat habitats for foraging and commuting. 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 following section and in the section on methodology.

Marnell *et al.* (2022) is referred to for guidance in relation to survey guidance (timing and survey design), derogation licences and mitigation measures.

1.2.1 Bat Survey Requirements & Timing

With reference to Collins (2016) and Marnell *et al.* (2022), the information presented in this section is used to determine the bat survey requirements for the proposed development site. Collins (2016) provides a trigger list in relation to determining if a bat survey is required and this is presented Appendix 3 (Figure B) for reference. In addition, Chapter 2 of Collins (2016) discusses that a bat survey is required when proposed activities are likely to impact on bats and their habitats. The level of surveying is to be determined by the ecologist and these are influenced by the following criteria:

- Likelihood of bats being present;
- Type of proposed activities;
- Scale of proposed activities;
- Size, nature and complexity of the site;
- Species concerned;
- No. of individuals.

Collins (2016) also provides the following table detailing when different survey components should be undertaken.

Table 2.2 Recommended UK survey times for survey types described in these guidelines.

Survey type	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Preliminary ecological appraisal - fieldwork												
Preliminary roost assessment - structures ^a												
Emergence/re-entry survey for maternity or summer roosts ^b												
Emergence/re-entry ^c survey for transitional roosts ^b												
Emergence survey for mating roosts ^b												
Hibernation survey - structures ^a												
Preliminary ground level roost assessment - trees ^d												
Potential roost feature (PRF) inspection survey - trees												
Ground level bat activity survey - transects and automated/static												
Pre-, during and post-hibernation - automated/static bat activity survey												
Swarming survey												
Back-tracking survey												
Trapping survey ^e												
Radio tagging and tracking survey ^e												

= optimal period
 = sub-optimal period
 = weather or location dependent (i.e. may not be suitable due to spring and autumn conditions in any one year or in more northerly latitudes). Note that October surveys are not acceptable in Scotland.

Figure 1a: Table 2.2 reproduced from Collins (2016).

1.2.1.1 Buildings & Structures

In Marnell *et al.* (2022), Table 3 (The applicability of survey methods) provides information on the type of surveys that can be undertaken according to the different seasons.

Marnell *et al.* (2022) states that it is more suitable to survey buildings in the summer months. The following is a summary of the principal points:

1. The presence of a significant bat roost (invariably a maternity roost) can normally be determined on a single visit at any time of year, provided that the entire structure is accessible and that any signs of bats have not been removed by others. However, a visit during the summer or autumn has the advantage that bats may be seen or heard.
2. Roosts used by a small number of bats, as opposed to maternity sites, can be particularly difficult to detect and may require extensive searching backed up (in summer) by bat detector surveys or emergence counts.
3. If the entire building is not accessible or signs of bats may have been removed by others, or by the weather, bat detector or exit count methodologies may be required to back up a limited search.

Table 3. The applicability of survey methods.

Season	Roost type	Inspection	Bat detectors and emergence counts
Spring (Mar – May)	Building	Suitable (signs, perhaps bats)	Limited, weather dependent
	Trees	Difficult (best for signs before leaves appear)	Rarely useful
	Underground	Suitable (signs only)	Static detectors may be useful
Summer (June- August)	Building	Suitable (signs and bats)	Suitable
	Trees	Difficult	Limited; use sunrise survey
	Underground	Suitable (signs only)	Rarely useful
Autumn (September –November)	Building	Suitable (signs and bats)	Limited, weather dependent
	Trees	Difficult	Rather limited, weather dependent; use sunrise survey?
	Underground	Suitable (signs, perhaps bats)	Static detectors may be useful
Winter (December- February)	Building	Suitable (signs, perhaps bats)	Rarely useful
	Trees	Difficult (best for signs after leaves have gone)	Rarely useful
	Underground	Suitable (signs and bats)	Static detectors may be useful

Figure 1b: Table 3 reproduced from Marnell *et al.* (2022).

The following table is used to determine the level and timing of surveys for buildings/structures with reference to the surrounding habitat. Buildings are assessed to determine their suitability as a bat roost and are described using the parameters Negligible, Low, Medium 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, 2016 (Note: These two tables are presented in Appendix 1 but a summary is provided in the table below).

Table 2a: Building Bat Roost Classification System & Survey Effort (Adapted from Collins, 2016 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 or dawn survey.
Medium	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 surveys (one dusk and one dawn).
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 (at least one dusk survey and one dawn survey).

1.2.1.2 Trees

Marnell *et al.* (2022) recommends the following in relation to detecting roosts in trees:

- “The best time to carry out surveys for suitable cavities is between November and April, when the trunk and branches are not obscured by leaves. If inspection suggests that the tree has suitable cavities or roost sites, a bat detector survey at dusk or dawn during the summer may help to produce evidence of bats, though the nomadic nature of most tree-dwelling species means that the success rate is very low.
- It can also be difficult to pinpoint exactly which tree a bat emerged from. A dawn survey is more likely to be productive than a dusk one as swarming bats returning to the roost are much more visible than those leaving the roost. Because tree-dwelling bats move roosts frequently, a single bat-detector survey is unlikely to provide adequate evidence of the absence of bats in trees that contain a variety of suitable roosting places.
- Several dawn or dusk surveys spread over a period of several weeks from June to August will greatly increase the probability of detecting significant maternity roosts and is recommended where development proposals will involve the loss of multiple trees”.

As a consequence, the BTHK (2018) Potential Roost Features (PRFs) list and the classification system adapted from Collins (2016) is recommended as part of the daytime inspection of trees to determine their PBR or Potential Bat Roost value. Details of the methodology followed is presented in Section 3.2.2.

1.2.1.3 Underground Structures

Marnell *et al.* (2022) recommends the following in relation to underground structures:

1. Underground structures are used mainly for hibernation, so surveys should generally be carried out during the winter.

1.2.2 Evaluation & Assessment Criteria

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

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

Ecological Value	Geographical Scale of Importance
International	International or European scale
National	The Republic of Ireland or the island of Ireland scale (depending on the bat species)
Regional	Province scale: Leinster
County	County scale: County Dublin
Local	Proposed development and immediate surroundings
Negligible	None, the feature is common and widespread

If bat roosts are recorded, their roost status is determined using Figure 20 from Marnell *et al.* (2022). This figure is presented below (Figure 1c). This figure is also used to determine the conservation significance of the roost in order to prepare appropriate bat mitigation measures.

Impacts on bats can arise from activities that may result in:

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

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

The guidelines consulted recommend that the potential impacts of a proposed development on bats are assessed as early as possible in the design stage to determine any areas of conflicts. In particular the Table 4 (presented as Figure 1d below) and Figure 20 (presented as Figure 1c) from Marnell *et al.* (2022) are referenced during this process.

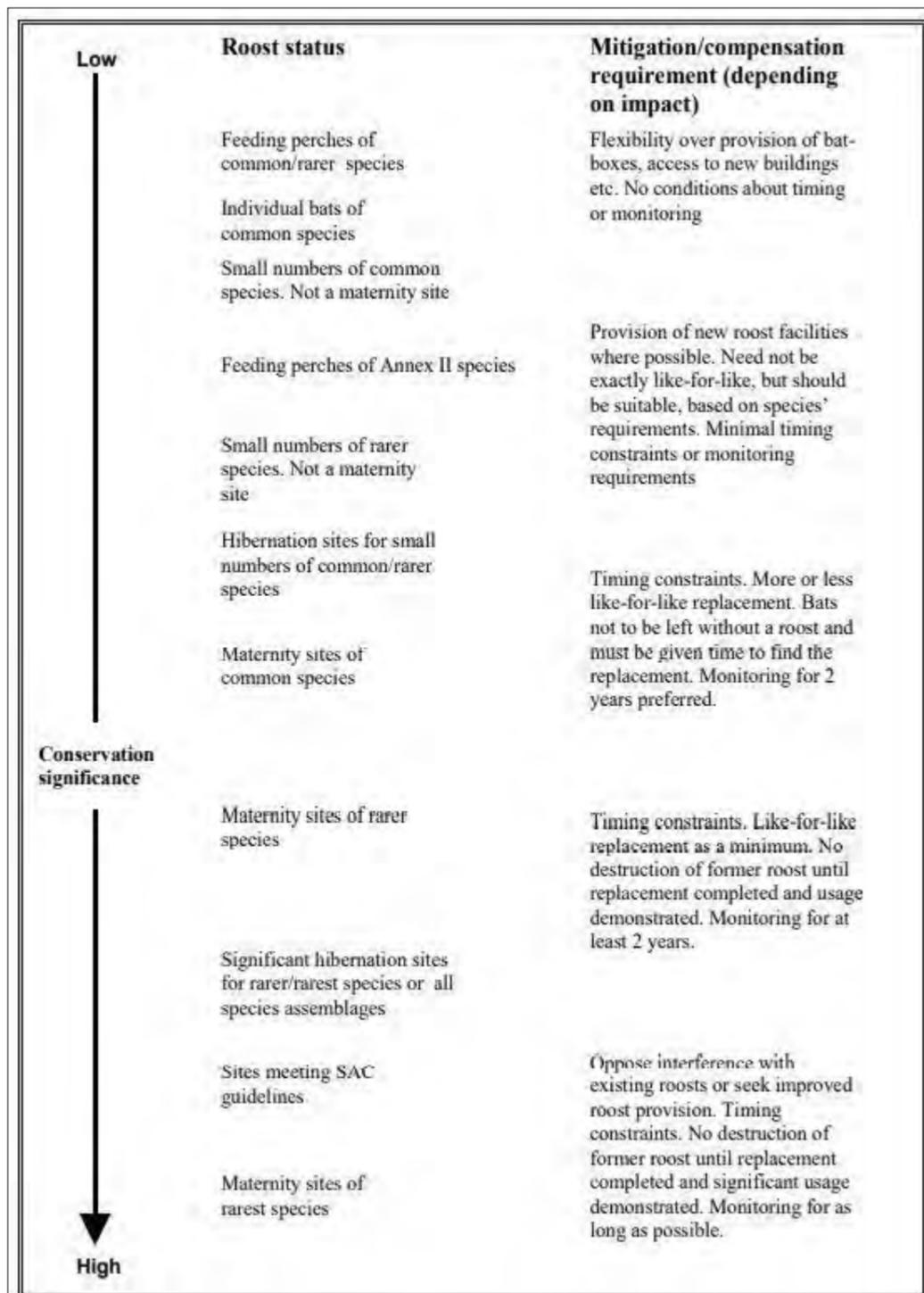


Figure 20 Guidelines for proportionate mitigation. The definition of common, rare and rarest species requires regional interpretation.

Figure 1c: Figure 20 (p 46) Reproduced from Marnell *et al.* (2022).

Table 4 The scale of main impacts at the site level on bat populations. [NB This is a general guide only and does not take into account species differences. Medium impacts, in particular, depend on the care with which any mitigation is designed and implemented and could range between high and low.]

Roost type	Development effect	Scale of impact		
		Low	Medium	High
Maternity	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside breeding season	✓		
	Post-development interference			✓
Major hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference			✓
Minor hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction, modification		✓	
	Modified management		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference		✓	
	Temporary destruction, then reinstatement	✓		
Mating	Destruction		✓	
	Isolation caused by fragmentation		✓	
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		
Night roost	Destruction	✓		
	Isolation caused by fragmentation	✓		
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		

Figure 1d: Table 4 (p 44) Reproduced from Marnell *et al.* (2022).

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, 2022, Table 3.4)

Table 2c: Criteria for assessing impact quality based on EPA, 2022,

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:
 - o Table 4 of Marnell *et al.* (2022) (Figure 1a);
 - o the known ecology and distribution of the bat species in Ireland;
 - o bat survey results including type of roosts (if any recorded), pattern of bat usage of the survey area, level of bat activity recorded etc.
 - o and bat specialist experience.
- Impact Significance of the proposed development on local bat populations maybe determine, where applicable, using the parameters listed in Table 2d (based on EPA, 2022, Table 3.4).

Table 2d: Criteria for assessing significance of effects based on EPA, 2022.

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 probability and duration of the potential effects (selected from EPA, 2022, Table 3.4):

Describing the Probability of Effects Descriptions of effects should establish how likely it is that the predicted effects will occur so that the CA can take a view of the balance of risk over advantage when making a decision.	Likely Effects The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	Momentary Effects Effects lasting from seconds to minutes.
	Brief Effects Effects lasting less than a day.
	Temporary Effects Effects lasting less than a year.
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years.
	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years.
	Reversible Effects Effects that can be undone, for example through remediation or restoration.
Frequency of Effects Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).	

Figure 1e: Criteria for assessing significance of effects based on EPA, 2022 (Taken from Table 3.4),

This table continues to provide terminology in relation to “Describing the Types of Effects” as presented below.

Describing the Types of Effects	Indirect Effects (a.k.a. Secondary or Off-site Effects)
	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.
	'Do-nothing Effects' The environment as it would be in the future should the subject project not be carried out.
	'Worst-case' Effects The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects When the full consequences of a change in the environment cannot be described.
	Irreversible Effects When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SO _x and NO _x to produce smog).

Figure 1f: Criteria for assessing significance of effects based on EPA, 2022 (Taken from Table 3.4),

1.2.3 Bat Mitigation Measures

1.2.3.1 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 3: Potential light sensitivity of the Irish bat fauna using categories described by Rydell, 2006.

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

1.2.3.1.1 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:
 - o Dynamic lighting schemes, where possible.
 - o 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.
 - o 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.
 - o 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.
 - o 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.

1.2.3.2 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.

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

Species	Summer/ maternity	Summer/ roosting/ breeding	Hibernation*	Notes
<i>Rhinolophus hipposideros</i>	N/A	N/A	N/A	Horseshoe bats cannot use bat boxes
<i>Myotis daubentonii</i>	H	H		
<i>Myotis mystacinus</i>	H	H		
<i>Myotis nattereri</i>	H	?		
<i>Pipistrellus nathusii</i>	H	H		
<i>Pipistrellus pipistrellus</i>	C	C/H	C	H are rarely used as maternity roosts.
<i>Pipistrellus pygmaeus</i>	C	C/H	C	
<i>Nyctalus leisleri</i>	H	H	H?	
<i>Plecotus auritus</i>	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 1g: Table 7 (p 58) Reproduced from Marnell *et al.* (2022).

1.2.3.2.1 Effectiveness of Bat Boxes as a Mitigation Measure

Two publications that provide good scientific advice 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 demolition 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 boxes 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 Schwegler 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.

1.2.3.3 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.

1.2.3.4 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.

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

Figure 1h: 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 Project Description

1.3.1 Site Location

The application site is located at Ballymacaula, Circular Road, Ennis, Co. Clare. It is located between the N85 national road, Ennis Golf Course and local road network.



Figure 2a: Red line boundary of proposed development (Supplied by Enviroguide Consulting).

1.3.2 Proposed Project

The Proposed Development will consist of the following components:

1. The construction of 289 no. residential units comprising a mixture of 12 no. 1 bed apartments, 78 no. 2 bed townhouse/duplex units, 165 no. 3 bed dwelling houses, and 34 no. dwelling houses which will have an option of a 3 or 4 bedroom house-type;
2. A 400.7m² creche/childcare facility;
3. The provision of landscaping, open space and amenity areas, including play/exercise equipment, a linear amenity walkway, informal play areas and local play areas;
4. The provision 2 no. pedestrian connections to the existing public footpath along the N85, 2 no. pedestrian connections into Ballymacaula View Estate, improvements/upgrades to the pedestrian footpaths along Circular Road including an uncontrolled pedestrian crossing and pedestrian footpath provision along part of the Drumbiggle and Cahercalla Roads;
5. All associated infrastructure and services including 1 no. vehicular access point onto Circular Road, car parking and bin storage, lighting, 2 no. ESB substations, drainage and 1 pumping station, boundary treatments at Ballymacaula, Drumbiggle, Circular Road, Ennis, Co. Clare.



Figure 2b: Layout of proposed development (Supplied by Enviroguide Consulting).

2. Bat Survey Methodology

2.1 Daytime Inspections

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

Table 5a: Bat Roost Types (adapted from Collins 2016).

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

2.1.1 Tree Potential Bat Roost (PBRs) Inspection

Trees that may provide a roosting space for bats were classified using the Bat Tree Habitat Key (BTHK, 2018) and the classification system adapted from Collins (2016). The Potential Roost Features (PRFs) listed in this guide were used to determine the PBR value of trees.

Trees identified as PBRs were inspected during the daytime (1st and 6th August 2022), 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.

Daytime inspections were undertaken of all of the trees within the proposed development site. These inspections followed the Phase 1 guidance (Collins, 2016) in order to make a list of trees within the proposed development site that may be suitable as roosting sites for bats. Inspections were undertaken visually, from the ground, with the aid of a strong torch beam (LED Lenser P14.2) during the daytime searching for PRFs.

Table 5b: Tree Bat Roost Category Classification System (adapted from Collins, 2016).

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

2.1.2 Bat Habitat & Commuting Routes Mapping

The survey site was assessed during daytime walkabout surveys (1st & 6th August 2022), in relation to potential bat foraging habitat and potential bat commuting routes. Such habitats were classified according to Fossit, 2000 (Appendix 1, Table 1.B) while hedgerows were classified according to BATLAS 2020 classification (Bat Conservation Ireland, 2015) (Appendix 1, Table 1.A). Bat habitats and commuting routes identified were considered in relation to the wider landscape to determine landscape connectivity for local bat populations through the examination of aerial photographs.

2.2 Night-time Bat Detector Surveys

2.2.1 Dusk, Dawn & Walking Transect Bat Surveys

Dusk, Dawn and Walking Transect Bat Surveys were completed on the 6th and 7th August 2022 from 10 minutes before sunset to 110 minutes post sunset and the surveyors position themselves within the proposed development site to determine the general bat activity of the proposed development site. This was following by a walking transect of the proposed development site and immediate vicinity of the proposed development site. A dusk survey was to be completed on the 1st August 2022 but this was cancelled due to poor weather conditions.

The following equipment was used:

Surveyor 1: Anabat Walkabout Bat Detector and Pettersson D200 Heterodyne Bat Detector.

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

2.2.2 Passive Static Bat Detector Survey

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

The microphone of the unit was positioned horizontally to reduce potential damage from rain. Bat Logger A+ units and Wildlife Acoustics Song Meter SM2, SM2 BAT+ SM4 Bat FS and SM3 BAT 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. These results are depicted on a graph showing the number of bat passes per species per hour/night. Each bat pass does not correlate to an individual bat but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats.

The recordings are analysed using Wildlife Acoustics Kaleidoscope Pro. 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. The following static units were deployed during this static bat detector survey (1st to 6th August 2022).

Table 6: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
Mini 2, 7, 11	Wildlife Acoustics SongMeter Mini Bat	Passive Full Spectrum	SMM-U2

2.3 Desktop Review

2.3.1 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 >60,000 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-), Brown 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 BC Ireland database.

- BATLAS 2020 & 2010

BC Ireland 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 BC Ireland members are also stored on the BC Ireland 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 O2152823161.

2.3.2 Bat Conservation Ireland Bat Landscape Favourability Model

Bat Conservation Ireland produced a landscape conservation guide for Irish bat species using their database of species records collated during the 2000 - 2009 survey seasons. An analysis of the habitat and landscape associations of all bat species deemed resident in Ireland was undertaken and reported in Lundy *et al.*, 2011. The geographical area suitable for individual species was used to identify the core favourable areas of each species. This was produced as a GIS layer for local authorities and planners in order to provide a guide to the consideration of bat conservation. The island is divided into 5km squares and the landscape favourability of each 5km square for each species of bat was modelled. A caveat is attached to the model and it is that the model is based on records held on the BC Ireland database, while core areas have been identified, areas outside the core area should not be discounted as unimportant as bats are a landscape species and can travel many kilometres between roosts and foraging areas nightly and seasonally. This model was used as part of the desktop study for this report.

2.3.3 International & National Site Designations

National Parks and Wildlife Service mapping provides the locations and details of environmental designations (Source: www.npws.ie). This mapping facility was queried for a 15km radius of the proposed development site.

2.4 Past Bat Survey Results

A preliminary bat survey was undertaken in September 2021. The following bat species were recorded: common pipistrelle, soprano pipistrelle, Leisler's bat, lesser horseshoe bat, Natterer's bat and brown long-eared bat. The following map taken from the bat survey report depicts the location of the bat encounters.

Report: Ash Ecology (2021) Preliminary Bat Survey Report: Golf Links Road, Ennis, Co. Clare. Report prepared for Enviroguide Consulting.

Table 5 Bat Results Summary Data – 7th September 2021

Species	Name	Species Name – Latin	Number of Passes	Peak Frequency (kHz)
Common				
Common Pipistrelle		<i>Pipistrellus pipistrellus</i>	10	46.5
Soprano Pipistrelle		<i>Pipistrellus pygmaeus</i>	15	55.5
Leisler's Bat		<i>Nyctalus leisleri</i>	6	26.9
Brown Long Eared Bat		<i>Plecotus auritus</i>	1	35.0
Natterer's Bat		<i>Myotis nattereri</i>	8	50.0
Lesser Horseshoe Bat		<i>Rhinolophus hipposideros</i>	5	109.8

Figure 3a: 2021 Bat Survey Results (Taken from Ash Ecology, 2021).

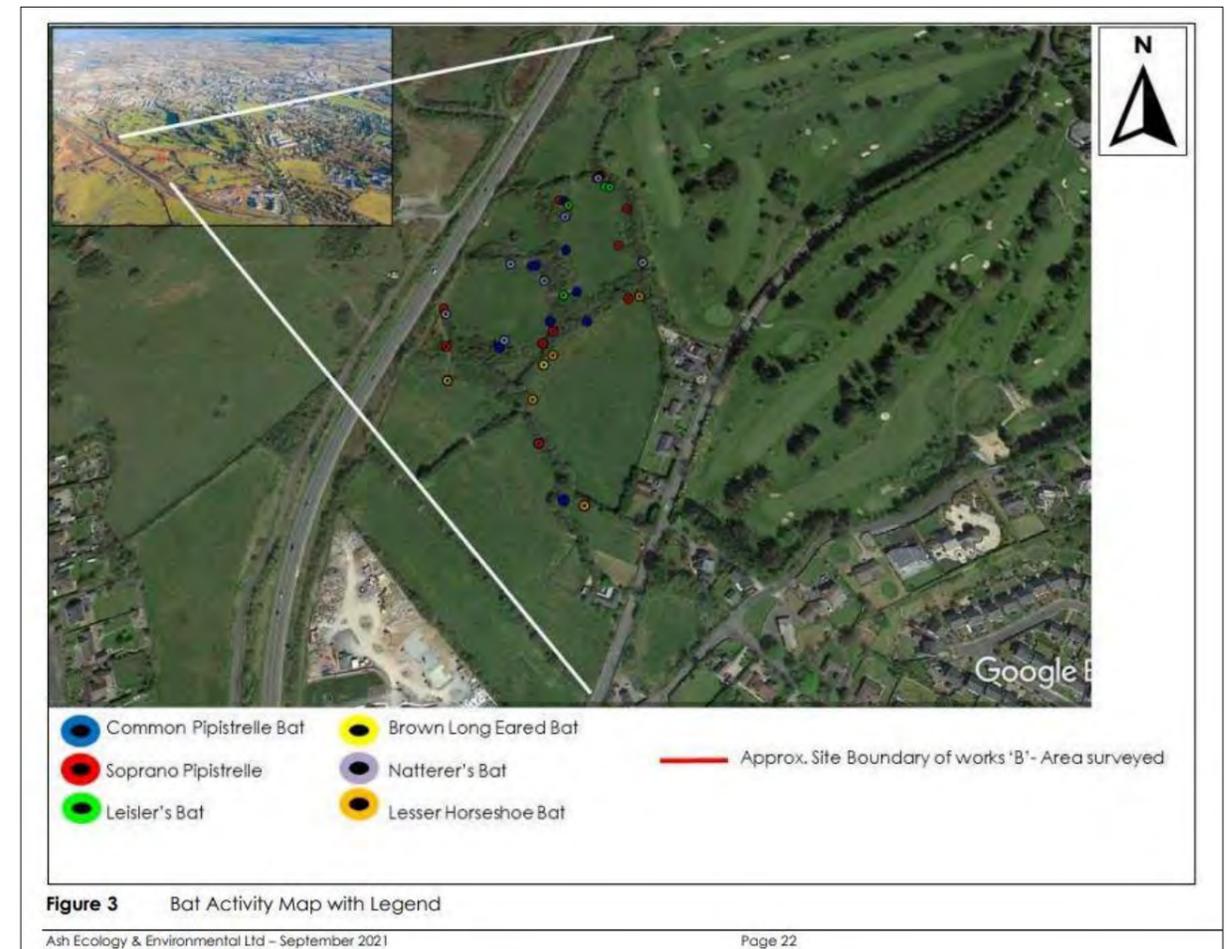


Figure 3: 2021 Bat Survey Results (Taken from Ash Ecology, 2021).

3. Bat Survey Results

3.1 Daytime Inspections

3.1.1 Building & Structure Inspection

There are no buildings within the proposed development site.

3.1.2 Tree Potential Bat Roost (PBRs) Inspection

The majority of tall vegetation within the proposed development site consisted of scrub and hedgerows along the boundaries. There are mature trees present.

The arboriculture report states that a total of 23 individual trees plus nine hedgerows were surveyed for the entire site. The arboriculture impact of the proposed development on the site will include the removal of seven individual trees along with four hedgerow removals and two partial hedgerow removals. The following table indicates the trees proposed to be removed. Of this list, the following is considered to have a Potential Bat Roost (PBR) potential (value Category 2): 3980, T4 and T5 (x2 Ash trees).

Table 1: Schedule of trees to be removed to accommodate the design (To be read in conjunction with Appendix 1 and the Tree Protection Plan)

Tree number	Species	Age Class	Tree category
3980	Willow	Mature	B2
T4	Ash	Mature	B2
T5	ash	Mature	C2
T8	Ash	Mature	C2
T5	Ash	Mature	B2
T6	Ash	Mature	C2
T11	Ash	Mature	C2

Figure 4a: Tree proposed to be felled (Source: Arboriculture Impact Assessment report).

3.1.3 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. This proposed development site is predominately a green field site with scrub and grassland areas surrounded by hedgerows and trees. There are mature trees within the boundaries.

Table 7a: 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	

The surrounding landscape is primarily rural with individual houses with large gardens.

Table 7b: 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	

3.2 Night-time Bat Detector Surveys

The primary purpose of the night-time surveys were to determine the bat activity usage of the survey area. While there was no access to adjacent private buildings, where possible the surveyors located themselves at different accessible points within the survey area to determine direction of commuting bats from possible roosting sites in local buildings. The R474 and N85 road network was also surveyed to document bat distribution in the local area.

3.2.1 Dusk, Dawn & Walking Transect Bat Surveys

Bat detector surveys were completed on 6/8/2022 (Dusk Survey & Walking Transect - Weather conditions: 17oC, clear skies, calm and dry) and 7/8/22 (Dawn Survey – weather conditions: 8oC, patchy cloud cover, calm and dry).

3.2.1.1 Dusk Survey & Walking Transect 6/8/2022

Two surveyors were present for this survey. Surveyor 1 was located to rear of private dwelling at the southern end of the survey site while Surveyor 2 was located to the rear of buildings along the eastern boundary of the proposed development site adjacent to the boundary with Ennis Golf course. The surveyors were to determine if there are roosts present in adjacent buildings and to determine the direction of commuting bats into the proposed development site.

The following is a synopsis of the bat activity recorded during the Dusk Survey 1:

Surveyor 1: No roosts were noted in the building surveyed. It was noted that one of the hedgerows located in this area was used as a commuting route and/or foraging for a number of bat species. A single lesser horseshoe bat (2 passes) was recorded commuting along the hedgerow from a west to east direction. Along this same hedgerow, Natterer's bats (2 passes) were recorded commuting and foraging. Soprano pipistrelles were also recorded commuting through the survey area from west to east while individuals of soprano pipistrelles and common pipistrelles foraged along the hedgerows.

Surveyor 2: No roosts were noted in the buildings surveyed. Leisler's bats were noted commuting through the area. During the walking transects, Natterer's bats (4 passes) were recorded along the boundary hedgerow with Ennis Golf Course while soprano pipistrelles, common pipistrelles and Leisler's bats were recorded foraging along the internal hedgerow network.

During the walking transects of the local road network the following was noted:

- Lesser horseshoe bats were recorded (3 passes) at three points along the road between the two sections of Ennis Golf Club. The section of the road is unlit and treelined on both sides allowing this light-sensitive bat species to commute through the landscape.
- Common pipistrelles and soprano pipistrelles were frequently encountered along the R474.
- Brown long-eared bat was encountered at the Drumbiggle Road junction with the R474.

- Leisler's bats was most frequently encountered along the boundary with the N85 foraging around street lights. This bat species is light-tolerant.

3.2.1.2 Dawn Survey 7/8/2022

During the Dawn Survey, Surveyor 1 was located along the R474 to observe potential bat roosts (i.e. detect swarming bats). Surveyor 2 undertook a walking transect of the middle section of the proposed development site. Seven soprano pipistrelles were recorded commuting from the proposed development site across the R474 to a private dwelling that is likely to be a roosting site. Swarming of this species was noted within the large mature trees in the mature garden of the dwelling. No tree roosts within the proposed development site was recorded.

The following maps provide a summary of the bat encounters recorded during the bat surveys. Soprano pipistrelles were the most frequently recorded bat species (134 bat passes) followed by common pipistrelle (116 bat passes) and Leisler's bat (92 bat passes). Natterer's bats were encountered 6 times, lesser horseshoe bats were encountered five times and brown long-eared bats were recorded at two locations.

Guides to maps :

Circles = bat encounters

Arrows = commuting routes and indicating direction of commuting recorded.



Figure 4b: Distribution of bat encounters of soprano pipistrelles during bat surveys.



Figure 4c: Distribution of bat encounters of common pipistrelles during bat surveys.



Figure 4d: Distribution of bat encounters of Leisler's bats during bat surveys.



Figure 4e: Distribution of bat encounters of lesser horseshoe bats during bat surveys.



Figure 4f: Distribution of bat encounters of Natterer's bats and brown long-eared bats.

3.2.2 Passive Static Bat Detector Survey

3.2.2.1 Static Surveillance

The following tables provides details with regards to the static units deployed in 2022 (Please see Figure 5 for locations) during the bat survey. Three static units were deployed for five nights and were located on trees in treelines/hedgerows to document foraging and commuting bats. A full break down of the static surveillance results are presented in the Appendices but these results are also presented as graphs below for each bat species recorded.



Figure 5: Location of static units during static surveillance.

Lesser horseshoe bats were only recorded on the static unit Mini 2 located along the boundary with Ennis Golf Course. All other five bat species recorded during night-time surveys are detected on all three static units: common pipistrelle, soprano pipistrelle, Leisler's bat, Natterer's bat and brown long-eared bat. This is a high level of bat biodiversity for a small survey area indicating the importance of the tree and hedgerow network in this landscape coupled with the Ennis Golf Course.

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

Static Code	Location Description	Survey Period	Results
Mini 2	ITM 532239, 677203 Boundary with gold course	1/8/2022 to 6/8/2022 (5 nights)	Leisler's bat, common pipistrelle, soprano pipistrelle, brown long-eared bat, lesser horseshoe bat and Natterer's bat.
Mini 7	ITM 532072, 676752	1/8/2022 to 6/8/2022 (5 nights)	Leisler's bat, common pipistrelle, soprano pipistrelle, brown long-eared bat, lesser horseshoe bat and Natterer's bat.
Mini 11	ITM 532193, 676996	1/8/2022 to 6/8/2022 (5 nights)	Leisler's bat, common pipistrelle, soprano pipistrelle, brown long-eared bat, lesser horseshoe bat and Natterer's bat.

Static Unit Mini 2 (located in the north of the survey site, along the boundary with Ennis Golf Course) had the highest level of Leisler's bat and common pipistrelle activity. The highest level of soprano pipistrelle activity was recorded on Static Unit Mini 11, located in the area of scrub in the middle of the proposed development site.

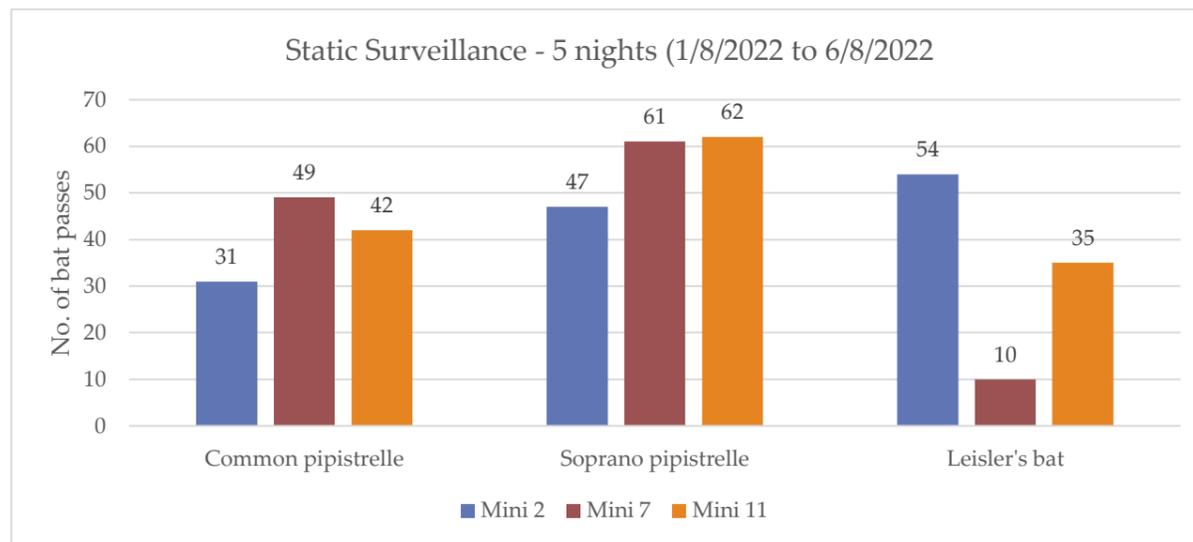


Figure 6a: Static surveillance results for common bat species on all static units.

The remaining three bat species are recorded in lower number of bat passes, but this is to be expected as these are less common bat species in Ireland. Brown long-eared bats and Natterer's bats were recorded on all three static units with higher level on Static Unit Mini 11 (located in the area of scrub in the middle of the proposed development site) while a single lesser horseshoe bat pass was recorded on Static Unit Mini 2 (located in the north of the survey site, along the boundary with Ennis Golf Course).

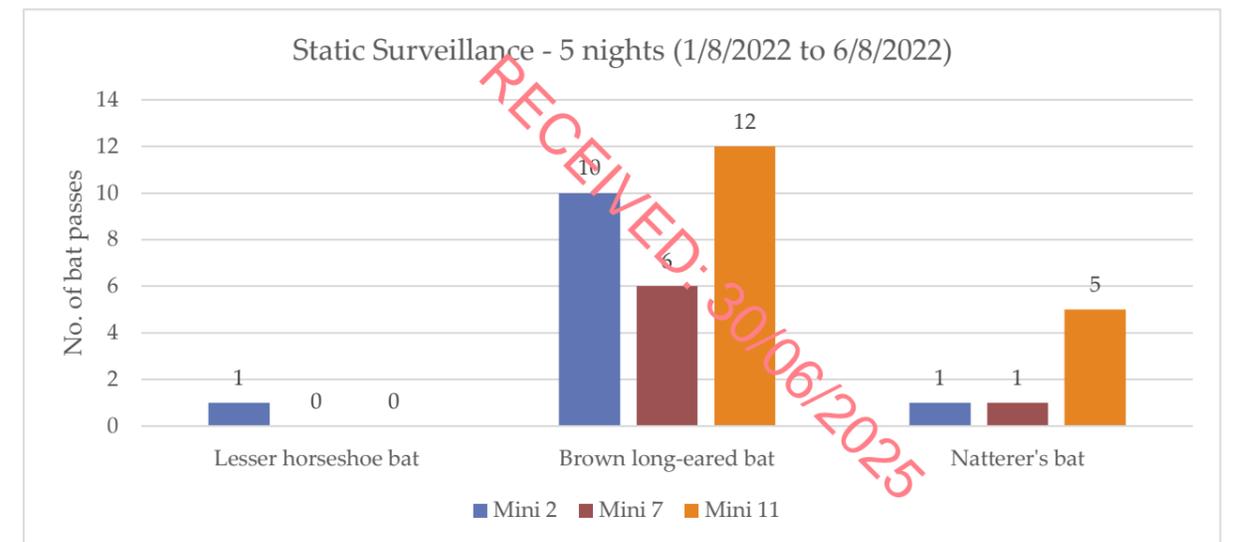


Figure 6b: Static surveillance results for less common bat species on all static units.

As a general guide, activity level is determined by the author as follows: Low = <10 bat passes/hr; Medium = >10 - <50 bat passes/hr; High = >50 bat passes/hr). At this time of the year, 8 hours per night is generally available to foraging bats (21:30 hrs to 05:30 hrs). (Please see tables in Appendices for nightly breakdown of activity).

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 foraging as they commute and therefore are regularly observed flying up and down a treeline or hedgerow before moving on in the landscape. Leisler's bats fly high in the sky and therefore can be observed flying fast through the landscape, occasionally foraging over treetops as they commute. As a consequence, Pipistrellus species bat activity tends to result in a higher number of bat passes recorded on static units compared to Leisler's bats. In relation to other bat species recorded, as they tend to be less common in the landscape compared to common pipistrelles, soprano pipistrelles and Leisler's bats, their recorded presence is notable. Exceptions to this would include Daubenton's bats on a waterway or a static located adjacent to a known bat roost.

Over the course of the surveillance period, the average level of bat activity per hr recorded on the static units was calculated for each bat species based on the total number of bat passes. All bat species were recorded at a Low level of bat activity. However, due to the quiet echolocation calls of lesser horseshoe bats, Natterer's bats and brown long-eared bats, their presence is significant.

Table 8b: Level of bat activity recorded on Static Bat Detectors deployed during Static Bat Detector Surveys.

	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Lesser horseshoe bat	Brown long-eared bat	Natterer's bat
Mini 2	Low	Low	Low	Low	Low	Low
Mini 7	Low	Low	Low	None	Low	Low
Mini 11	Low	Low	Low	None	Low	Low

3.3 Desktop Review

3.3.1 Bat Conservation Ireland Database

One roost record and one Ad Hoc bat records are listed within a 1km radius of the proposed development on the Bat Conservation Ireland database. The number of records for each species is as follows:

Lesser horseshoe bat	1 roost record;
Common pipistrelle	1 Ad Hoc record;
Soprano pipistrelle	1 Ad Hoc record.

The bat surveys undertaken for this proposed development site provides additional bat species records for the 1km zone with new bat records for brown long-eared bat, Natterer's bat and Leisler's bat.

3.3.2 Bat Conservation Ireland Bat Landscape Favourability Model

Figure 7 depicts the BCIreland Bat Landscape Favourability Model (Lundy *et al.*, 2011) for all bat species (individual species values are presented in the table below). The county is divided into 5km squares and the darker the shading of the square, the higher favourability of the 5km square for bats. This GIS layer is hosted on the NBDC website www.biodiversityireland.ie. The proposed development site is approximately located in the Blue Box. The 5km square has a High favourability for bats. For the bat species recorded during this bat survey, the 5km square has a High favourability value for six recorded bat species recorded during the surveys: common pipistrelle, soprano pipistrelle, Natterer's bat, lesser horseshoe bat, brown log-eared and Leisler's bat.

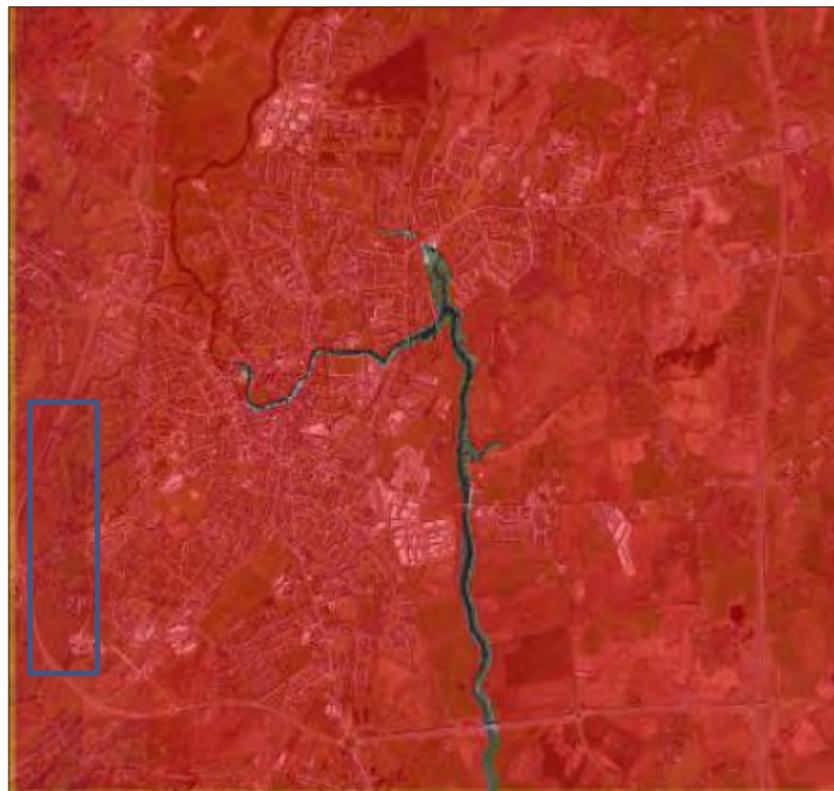


Figure 7: Bat Landscape Favourability Model (All Bats) (Source: NBDC) – Blue Box = approximate location of proposed development area.

Table 9: Bat Conservation Ireland Bat Landscape Favourability Model – 5km Square value.

Bat species	5km Square
Common pipistrelle	61% (High)
Soprano pipistrelle	57% (High)
Nathusius' pipistrelle	13% (Low to Medium)
Leisler's bat	68 % (High)
Brown long-eared bat	79% (High)
Daubenton's bat	53% (High)
Natterer's bat	62% (High)
Whiskered bat	64% (High)
Lesser horseshoe bat	51% (High)

3.3.3 International & National Site Designations

National Parks and Wildlife Service mapping provides the locations and details of environmental designations (Source: www.npws.ie). This mapping facility was queried for a 15km radius of the proposed development site.

Within a 15km buffer of the proposed development site the following Special Area of Conservation (SACs) is present:

- Pouladatig Cave SAC (Site Code 000037)
 - o Lesser horseshoe bat is listed as a qualifying interest for this SAC.

Pouladatig Cave SAC has been selected for lesser horseshoe bat because of the presence of one internationally important winter roost (roost id. 58 in NPWS database).

The conservation objectives, in relation to lesser horseshoe bat, as presented in the list publications.

NPWS (2018) Conservation Objectives: Pouladatig Cave SAC 000037. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht

The Site Synopsis for this SAC site states the following:

“Pouladatig cave is a natural limestone cave situated near Inch bridge, west of Ennis, Co. Clare. It is used as a hibernating site for the Lesser Horseshoe Bat.

The site comprises a relatively short, active stream cave with some rock falls and small chambers. The cave entrance is small and is sheltered by Hawthorn (*Crataegus monogyna*) trees. After the entrance there is a low bedding crawl but the cave then opens out into roomier passageways. Cave habitats include flowing water, mud banks, boulders, rock roof and walls.

The bats hang from the roof and along the walls of the main passageway. The surrounding scrub vegetation and hedgerows are included in the site as they provide suitable foraging habitat areas and shelter for the bats.

Lesser Horseshoe Bats have been using this cave for many years and approximately 100 bats have been recorded at this site each winter since 1986. The site is therefore of international importance.

Although there is an active stream in the cave, this does not pose any threat of flooding to the bats. This site is not subject to visitor disturbance and is considered to be a safe hibernating site for the Lesser Horseshoe Bat.”

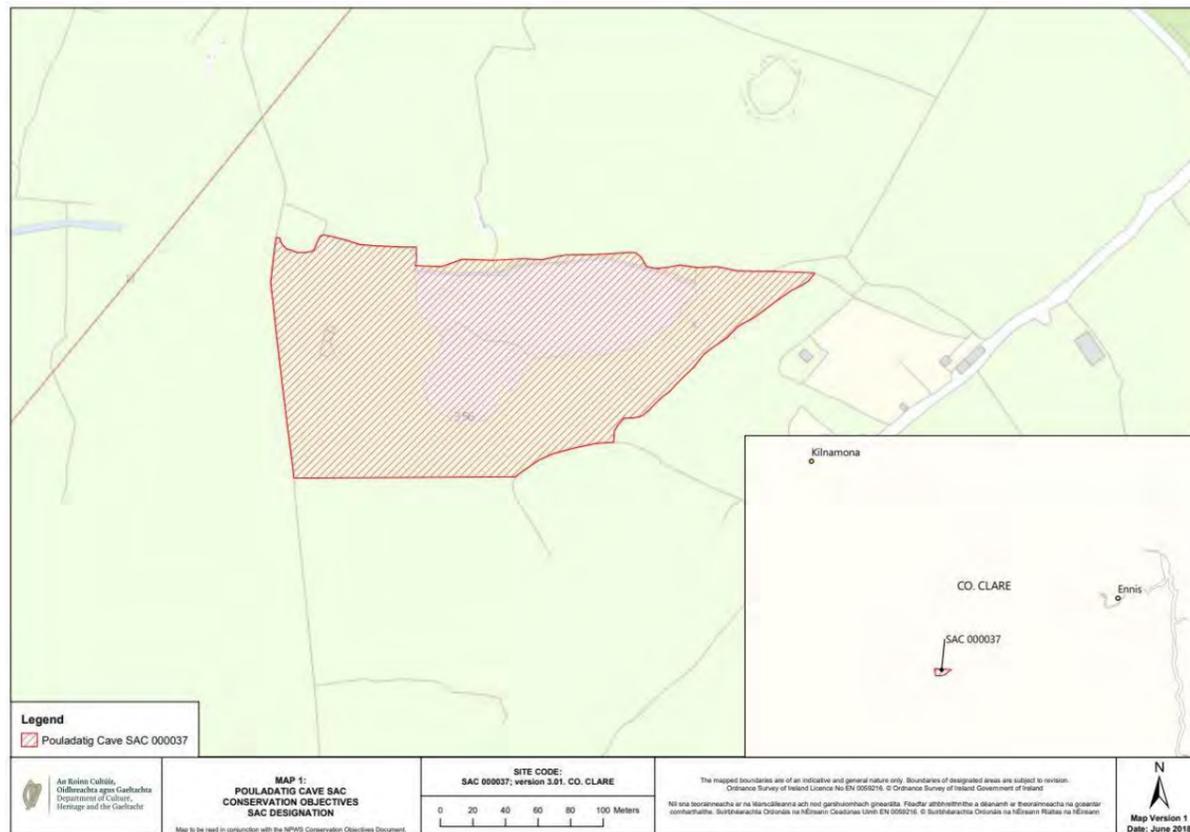


Figure 8a : Location of Pouladatic Cave SAC (Site Code 000037), Co. Clare (Source: NPWS).

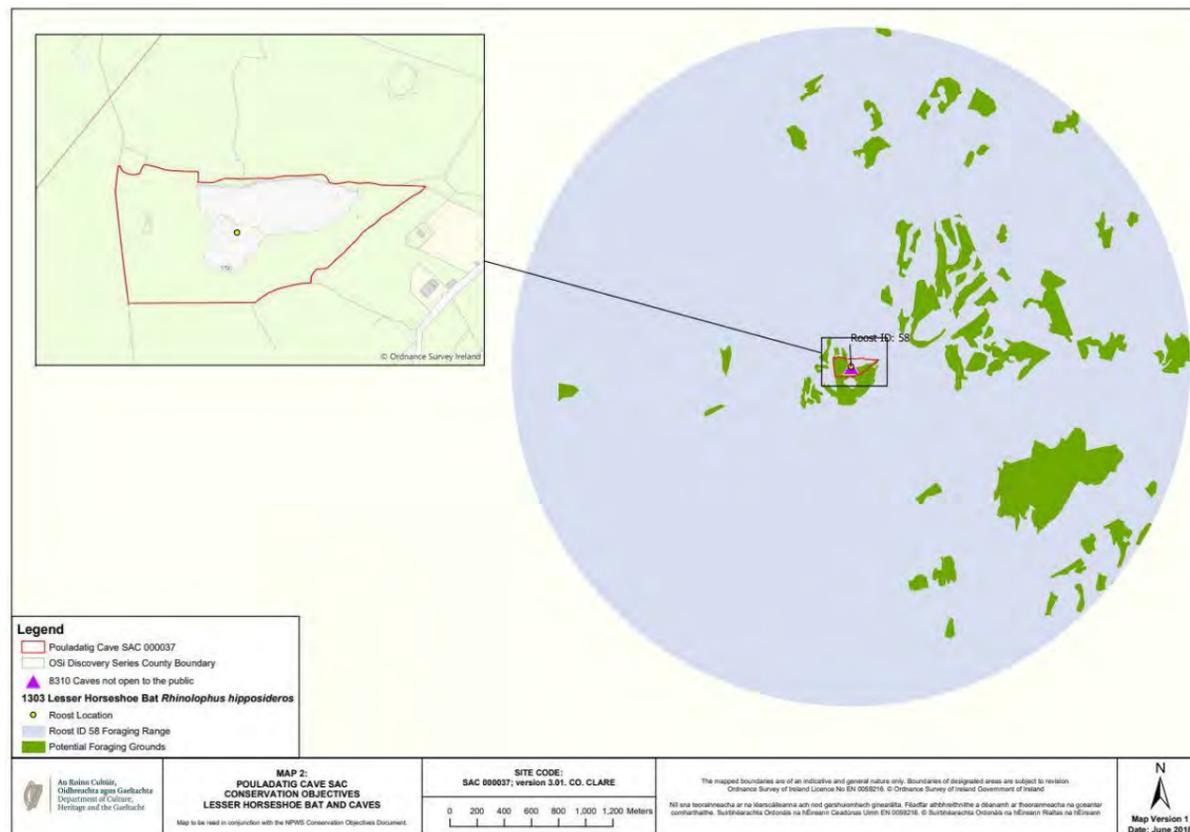


Figure 8b: 2.5km Buffer foraging zone of Pouladatic Cave SAC (Site Code 000037), Co. Clare (Source: NPWS).

Within a 15km buffer of the proposed development site the following Special Area of Conservation (SACs) is also present:

- Newhall & Edenvale Complex SAC (Site Code 002091)
 - o Lesser horseshoe bat is listed as a qualifying interest for this SAC.

Newhall and Edenvale Complex SAC has been selected for lesser horseshoe bat because of the presence of one internationally important summer roost (roost id. 44 in NPWS database) and two internationally important winter roosts (roost id. 53 and roost id. 54 in NPWS database). Therefore, within this complex, there are three bat roost locations.

The conservation objectives, in relation to lesser horseshoe bat, as presented in the list publications.

NPWS (2018) Conservation Objectives: Newhall and Edenvale Complex SAC 002091. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

The Site Synopsis for this SAC site states the following:

“Newhall and Edenvale Complex SAC is situated approximately 4 km south of Ennis in Co. Clare. It consists of three distinct locations which are used, at various times throughout the year, by the Lesser Horseshoe Bat.

Newhall and Edenvale Caves are natural fossil limestone caves. Newhall is a narrow, dry passage formed along an inclined joint. The main passage of Edenvale Cave runs into a cliff for 15 m and is crossed by a number of other passages. The side passages run in two directions at acute angles to each other, forming many intersections, hence the local name “The Catacombs”. The two caves are used as winter hibernation sites by the bats, while a two-storey farm out-building is used as a breeding site. Two of the locations, Newhall Cave and the farm building, are in the grounds of Newhall House, and the second cave, Edenvale Cave, is in the grounds of Edenvale House, within 1 km of Newhall House. The bats have uninterrupted access to all sites. In 1983 grilles were fitted to both caves.

The surrounding areas of mature mixed woodland, parkland and lakes provide ideal foraging habitat and shelter for the bats throughout the year and are included within the site.

Bats have been recorded at this site since 1983 and the population is estimated at more than 500 individuals. The site is of international importance for Lesser Horseshoe Bat, and ranks as one of the most important sites in Europe for the species”.

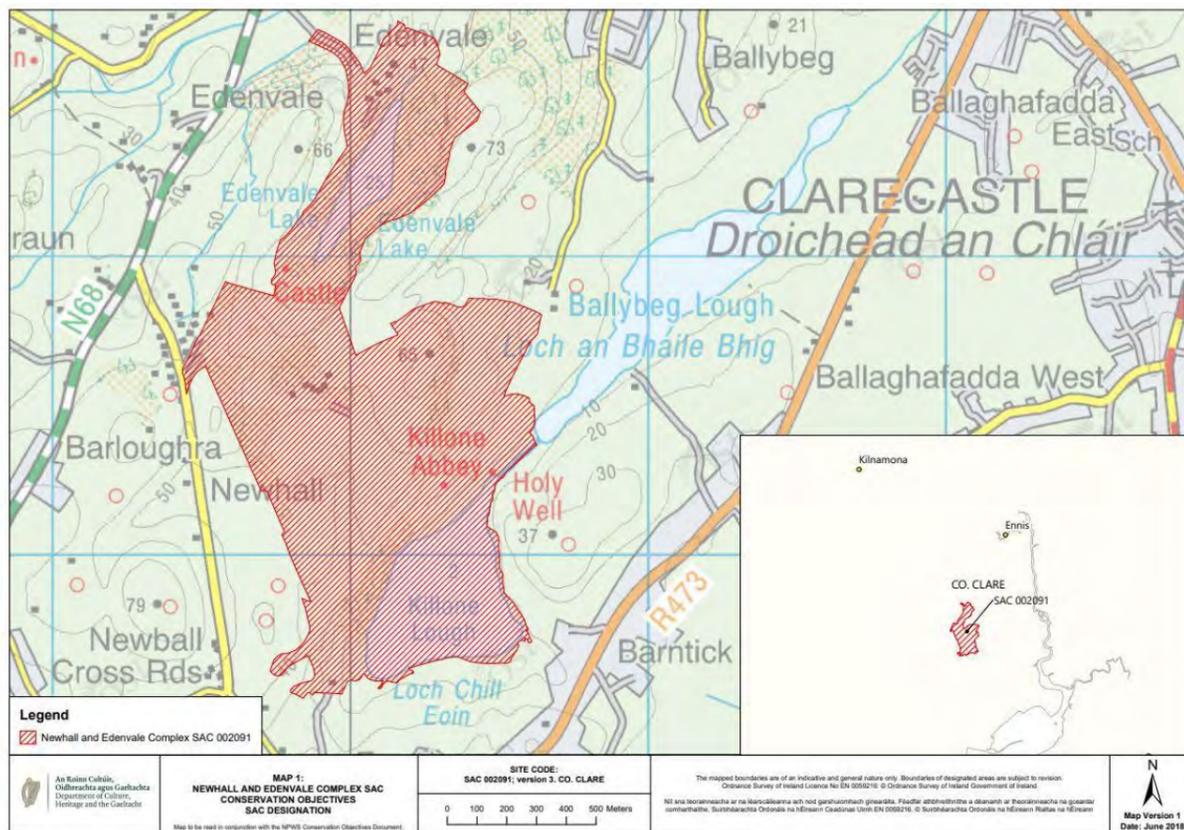


Figure 8c: Location of Newhall & Edenvale Complex SAC (Site Code 002091), Co. Clare (Source: NPWS).

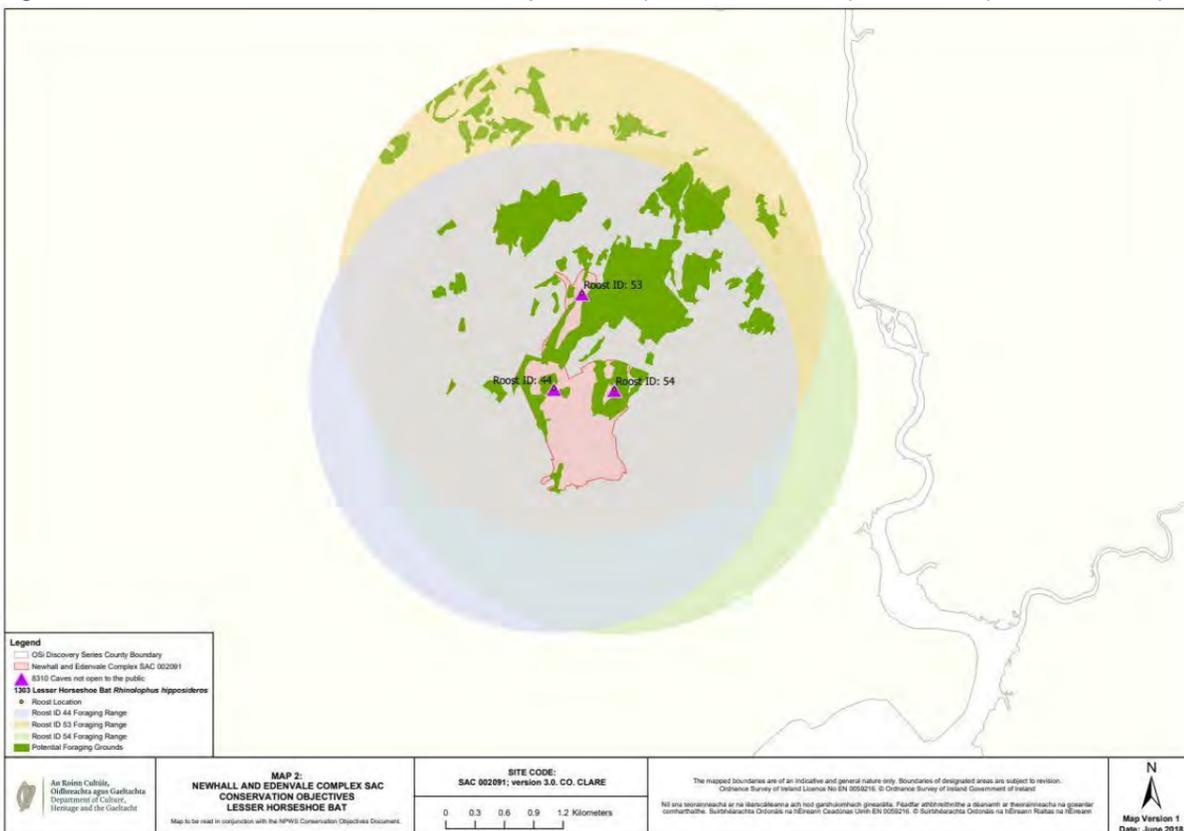


Figure 8d: 2.5km Buffer foraging zone of Newhall & Edenvale Complex SAC (Site Code 002091), Co. Clare (Source: NPWS).

The primary conservation objectives for the two SAC sites relevant to the proposed development 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 8e: 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.

3.3.3.1 Lesser Horseshoe Bat Population Trends & Distribution Gaps

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).

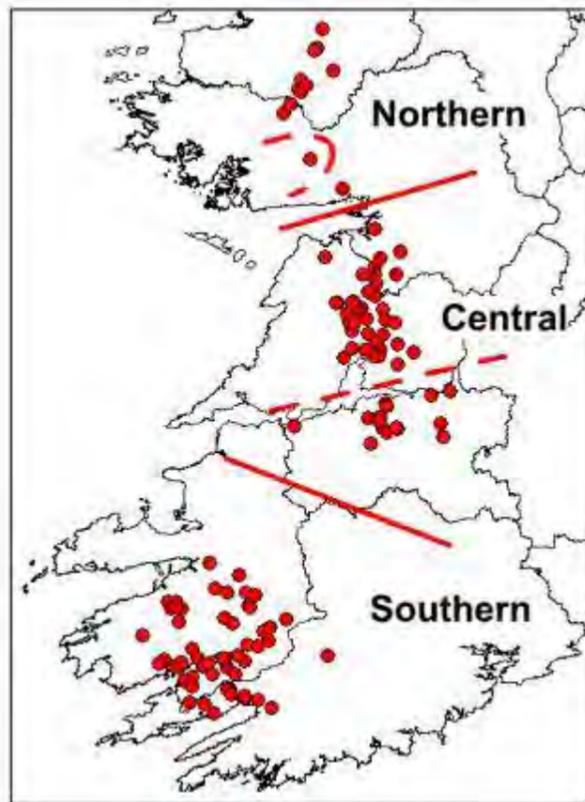


Figure 8f: Taken from NPWS & VWT (2022).

3.4 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 Surveying meets Collins, 2016 guidelines.	2022 Summer bat survey: 1 st to 7 th August 2022 – bat surveys																								
Survey Type Full suite of surveys completed to ensure sufficient information was collated for bat assessment. Surveys completed according Collins, 2016 guidelines.	Bat Survey Duties Completed (Indicated by red shading) <table border="0"> <tr> <td>Tree PBR Survey</td> <td>■</td> <td>Daytime Building Inspection</td> <td>○</td> </tr> <tr> <td>Static Detector Survey</td> <td>■</td> <td>Daytime Bridge Inspection</td> <td>○</td> </tr> <tr> <td>Dusk Bat Survey</td> <td>■</td> <td>Dawn Bat Survey</td> <td>■</td> </tr> <tr> <td>Walking Transect</td> <td>■</td> <td>Driving Transect</td> <td>○</td> </tr> <tr> <td>Trapping/Mist Netting</td> <td>○</td> <td>IR Camcorder filming</td> <td>○</td> </tr> <tr> <td>Endoscope Inspection</td> <td>■</td> <td>Other (Thermal Imagery)</td> <td>○</td> </tr> </table>	Tree PBR Survey	■	Daytime Building Inspection	○	Static Detector Survey	■	Daytime Bridge Inspection	○	Dusk Bat Survey	■	Dawn Bat Survey	■	Walking Transect	■	Driving Transect	○	Trapping/Mist Netting	○	IR Camcorder filming	○	Endoscope Inspection	■	Other (Thermal Imagery)	○
Tree PBR Survey	■	Daytime Building Inspection	○																						
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Walking Transect	■	Driving Transect	○																						
Trapping/Mist Netting	○	IR Camcorder filming	○																						
Endoscope Inspection	■	Other (Thermal Imagery)	○																						
Weather conditions	Suitable weather conditions for bat surveys on the 2 nd to 7 th August 2022.																								
Survey Constraints	None																								
Survey effort TOTAL = 136 hrs	2022 - Summer bat survey: Daytime inspection – 3 hrs Dusk & Dawn Surveys, Walking Transects (x2, 2 surveyors) – 12 hrs Static Surveillance (x3 units, 5 nights) – 72 hrs																								
Extent of survey area	Summer bat survey: proposed development area and local road network																								
Equipment	All equipment 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.

It is therefore deemed that the Scientific Assessment completed is Appropriate in order to complete the aims of the bat survey.

4. Bat Ecological Evaluation

4.1 Bat Species Recorded & Sensitivity

Six species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle, lesser horseshoe bat, Natterer's bat and brown long-eared bat. The first three species were recorded during bat detector surveys and static surveillance bat activity levels were indicative of commuting and foraging individuals. The latter three bat species were recorded at a lower level of bat passes, which is to be expected as these three bat species are less common.

Soprano pipistrelles were the most frequently recorded bat species (134 bat passes) followed by common pipistrelle (116 bat passes) and Leisler's bat (92 bat passes). Natterer's bats were encountered 6 times, lesser horseshoe bats were encountered five times and brown long-eared bats were recorded at two locations.

Overall, the survey results demonstrate that bats commuted to the proposed development site from a easterly, westerly and northerly direction and foraged, primarily along the boundary habitats. The eastern boundary, with Ennis Golf Course, is particularly important for foraging local bat populations and this may be due to the mature hedgerow and the fact that there is no outdoor lighting in this area. A medium level of bat activity common and more light-tolerant bat species were recorded along the boundary with the N85, where outdoor lighting is present. None of the three light sensitive bat species (lesser horseshoe bat, brown long-eared bat and Natterer's bat) were recorded along this boundary.

All bat species were recorded at a Low level of bat activity during the static surveillance. However, due to the quiet echolocation calls of lesser horseshoe bats, Natterer's bats and brown long-eared bats, their presence is significant.

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 (5,993km²). 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 (52,820km²). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.*, 2014). The landscape model emphasised that this is a

species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km.

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 (56,485km²). 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 (62,020km²). The Bat Conservation Ireland Irish Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.*, 2014).

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 km²). 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 (52,864km²). 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.

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. Two SACs designated for this species of bat are located with 2.5km of the proposed development site.

There are no recorded bat roosts within the proposed development site and therefore no assessment is completed for bat roosts. Four trees were recorded as Potential Bat Roosts (PBRs) are proposed to be felled.

The proposed development site is a small area and an overall medium level of bat activity was recorded and the results indicate that the boundaries and internal network of hedgerows/treelines/scrub of the proposed development site are commuting and foraging habitat for local bat populations.

4.2 Bat Foraging Habitat & Commuting Routes

The northern and eastern boundary of the proposed development site with Ennis Golf Course is an active bat commuting and foraging habitat and therefore an important linear habitat feature. This is reflected by the level of bat activity and the number of bat species recorded during the bat surveys and the static surveillance results. Figure 9a indicates the linear habitats proposed to be removed (marked in Red). With reference to this figure depicting the loss of hedgerows, Hedge No. H was recorded as a commuting route for both lesser horseshoe bats and Natterer's bats and therefore is an important linear habitat feature. The internal scrub area was recorded as a foraging area for four of the six bat species recorded.

An examination of the commuting routes recorded during the bat survey also indicates that bats are commuting to the Ennis Golf Course to forage in this dark zone. Two lesser horseshoe bat SACs are located within 2.5km of the proposed development site. These are located west and south of the proposed development site. If individuals from these roosts are commuting towards the proposed development site, due to their morphology and type of echolocation calls, they will commute along dark linear habitats. One such linear habitat is the Inch River which flows along the northern boundary of the proposed development site (Please see Figure 9b for location of the river in relation to the proposed development site). It is likely that this river facilitates the movement of lesser horseshoe bats into the survey area, including the Ennis Golf Course and therefore it is an important linear habitat to protect, particularly from light spillage.

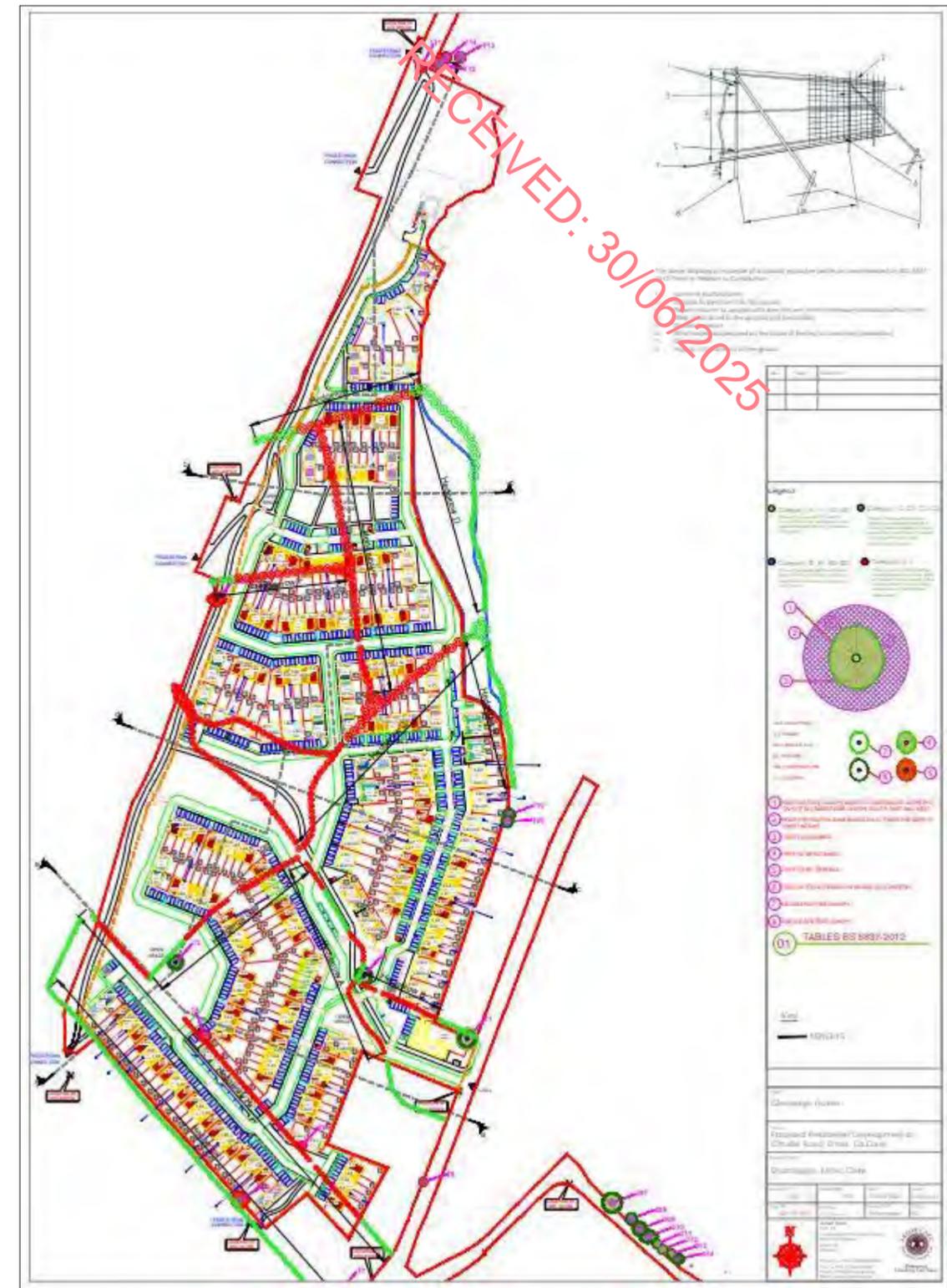


Figure 9a: Linear habitat removal as part of the proposed development.

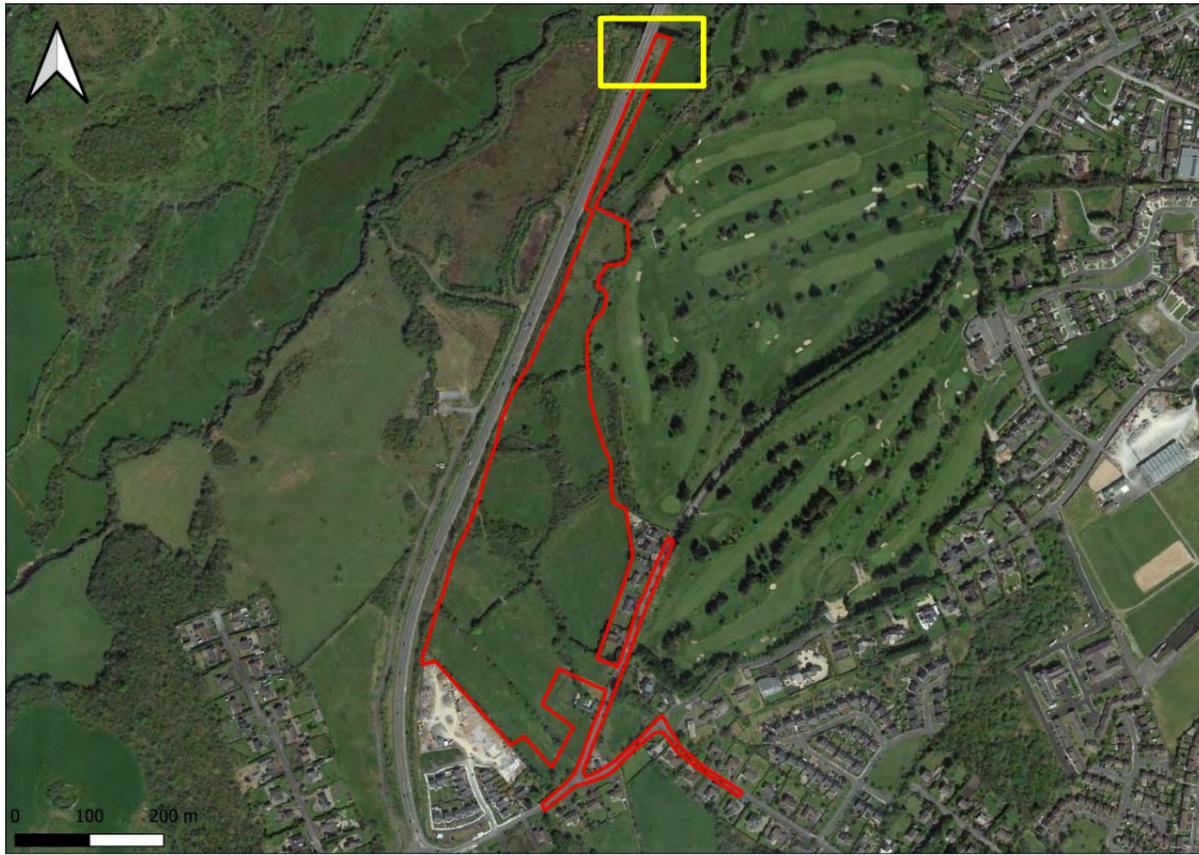


Figure 9b: Red line boundary of proposed development and Yellow Box to indicate location of Inch River (Supplied by Enviroguide Consulting).

4.3 Zone of Influence – Bat Landscape Connectivity

The proposed development site is located on the western edge of the urban area of Ennis, Co. Clare. While there is existing street lighting along the N85, the Inch River flows under the N85 and along the northern boundary of the proposed development site. It is likely that this river facilitates the movement of lesser horseshoe bats into the survey area, including the Ennis Golf Course. As a consequence there is landscape connectivity for local bat populations to move to and from the proposed development site.

However, the proposed development will increase human activity (associated noise and lighting), particularly, along the western boundary of the Ennis Golf Course, which is currently the principal area for foraging and commuting bats.

The Conservation Objectives for lesser horseshoe bat SACs is to ensure that there is not a significant loss of foraging and commuting habitat within a 2.5km of the designated sites. The proposed development is located within the 2.5km zone of two SACs (4 roosts) and therefore the potential loss of foraging and commuting habitat is to be considered. In addition, due to the fact that this species is a “Light Sensitive” bat species, the potential negative impact of lighting, which can act as a barrier to lesser horseshoe movement, may also impact on connectivity within the 2.5km zone. Lundy et al., (2011) indicated that the current distribution of habitats favoured by lesser horseshoe bats is limited and the most recent Article 17 report (NPWS, 2019) states that the short-term trend for foraging habitat for this species is decreasing (NPWS & VWT, 2022). This small core area represents the only suitable range for this species in the country and that the conservation of exiting suitable foraging and commuting habitat is important for this bat species. Therefore 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 important and should be retained.

The proposed development site is a small area but there is a good network of hedgerows with individual trees present. The proposed development will result in the loss of this internal linear habitat network (Total length of linear habitat proposed to be removed is 1.16km (Source: Enviroguide Consulting). In addition, there is an additional 0.26 ha of scrub that is proposed to be removed. This represents 3% of the total area of the proposed development site (Total area = 11.32 ha). As the proposed development site is located within the 2.5km Buffer Radius for the two SACs located to the west and south of the proposed development site, it is important to ensure that the landscape plan incorporates compensatory planting to mitigate for this linear habitat loss and scrub habitat loss.

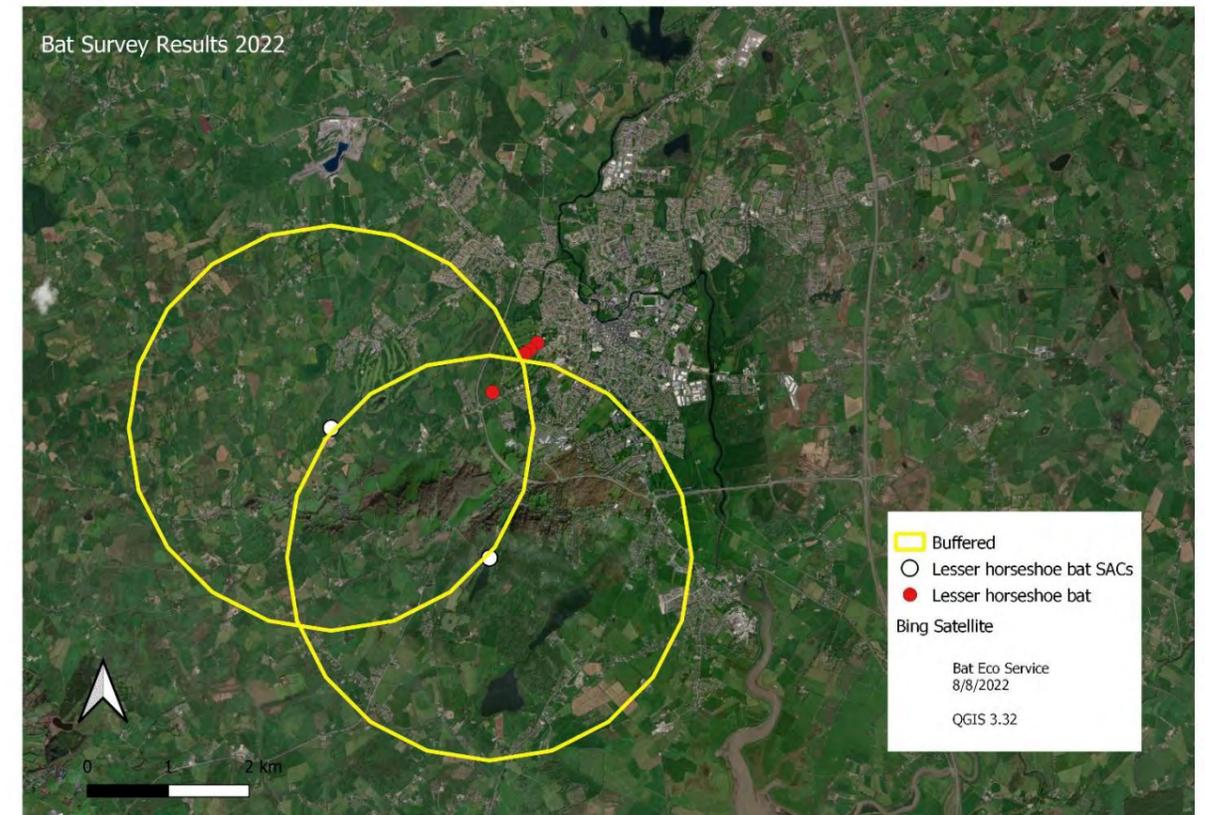


Figure 9c: 2.5km Buffer Radius around Lesser horseshoe bat SACs with reference to lesser horseshoe bat records collated during 2022 bat surveys.

4.4 Landscape Plan & Tree Protection Plan

The Landscape Plan proposed the following:

- New native hedgerow length – 553m
- Area of native woodland mix – 1898 m² (0.1898 ha)
- Area of meadow grass – 4088 m²
- Approximate number of specimen trees to be planting - open space trees approx. 321 no. & 93 no. Street trees (Please note - this does not include whips for woodland planting).
- Length of hedgerow to be retained 729m
- No. of feature trees to be retained. – 5 no within red line boundary

Landscaping is an important tool to provide a buffer against light spillage. Therefore it is important that there is a continuous tall vegetation boundary along the proposed development, particularly along the northern and eastern boundary with Ennis Golf Course. This will ensure that there is a dark commuting corridor for local bat populations.

Native tree and hedgerow planting will also be required to compensate for the loss of the internal linear hedgerow network. The length of hedgerow proposed to be removed will required to be planted and planting should be of a similar plant mix of the hedgerows proposed to be removed.

4.5 Lighting Plan

The proposed lighting plan indicates that there will lighting along pedestrian access from the N85 and increased lighting along the local road R474 and adjacent to the boundary with the Ennis Golf Club. While the lower range of LUX will be tolerated by light tolerant or semi-tolerant bat species (Please see Table 3: common pipistrelle, soprano pipistrelle and Leisler's bats), the entire range of LUX will prevent light-sensitive bat species from utilising the area. Therefore, strict bat-friendly lighting is required to reduce the potential impact of the lighting plan on local bat populations. As boundary with the Ennis Golf Course is an important boundary for local bat populations, additional steps are required to reduce the potential impact on local bat populations.

To minimise impact on bat life, the lighting design has incorporated the following:

- LED luminaires will be used as they have low UV output, sharp cut-off, lower intensity, good colour rendition and dimming capability.
- Luminaire is a fixture that is mounted horizontally, ensuring minimal up-light.
- As per BCT recommendations luminaires should be mounted on poles of minimum height possible (preferably 6m and less).
- The LEDs used are 2700K or less, which is deemed acceptable by the BCT guidelines to preserve bat life. However, as there are lesser horseshoe bats present within the survey area, it is recommended that 2200K is used to further reduce potential impact on local bat populations.
- Glare shields will be utilized in order to minimise any unnecessary light spill onto bat routes along the boundary if this site.

On examination of the horizontal luminance map, the LUX means that glare shields are essential to further reduce light spillage along these linear habitats, particularly the eastern boundary. Specific lamp posts were requested to be moved to reduce light spillage on the boundary with the Ennis Golf Course.

Commitment was made to ensure that the measures listed relation to bat friendly lighting will be implemented:

"Following consultation with Bat Ecologist latest revision specifies 2200K version of light types C and D mounted on reduced height 5M columns. This will help mitigate light spill into hedging at boundaries of estate." (Taken from lighting report).

5. Impact Assessment & Mitigation

Six species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle, lesser horseshoe bat, Natterer's bat and brown long-eared bat. The first three species were recorded during bat detector surveys and static surveillance bat activity levels were indicative of commuting and foraging individuals. The latter three bat species were recorded at a lower level of bat passes, which is to be expected as these three bat species are less common.

Soprano pipistrelles were the most frequently recorded bat species (134 bat passes) followed by common pipistrelle (116 bat passes) and Leisler's bat (92 bat passes). Natterer's bats were encountered 6 times, lesser horseshoe bats were encountered five times and brown long-eared bats were recorded at two locations.

Overall, the survey results demonstrate that bats commuted to the proposed development site from a easterly, westerly and northerly direction and foraged, primarily along the boundary habitats. The eastern boundary, with Ennis Golf Course, is particularly important for foraging local bat populations and this may be due to the mature hedgerow and the fact that there is no outdoor lighting in this area. A medium level of bat activity common and more light-tolerant bat species were recorded along the boundary with the N85, where outdoor lighting is present. None of the three light sensitive bat species (lesser horseshoe bat, brown long-eared bat and Natterer's bat) were recorded along this boundary.

All bat species were recorded at a Low level of bat activity during the static surveillance. However, due to the quiet echolocation calls of lesser horseshoe bats, Natterer's bats and brown long-eared bats, their presence is significant.

There are no recorded bat roosts within the proposed development site but there are four trees recorded as Potential Bat Roosts (PBRs) are proposed to be felled. The majority of the internal network of hedgerows and the scrub habitat will be removed as part of the proposed development.

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 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.

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 low bat activity, it is considered that this will 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 impact on named bat species (according to criteria set out in Tables 2c and d, Section 1.2.2). This is primarily in relation to the lighting plan for the proposed development scheme, removal of linear and scrub habitats, loss of mature trees and the presence of light-sensitive bat species.

Bat mitigation measures are presented in order to reduce the potential impact of 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 night 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.

5.1 Bat Mitigation Measures

5.1.1 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, 2018). 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, 2018 measures will be implemented as part of the proposed lighting plan.

Table 11: Lighting Recommendations to be implemented to reduce impact on local bat populations.

BCT, 2018 Guidelines	Included in Lighting Plan	Action
All luminaires used will lack UV/IR elements to reduce impact	YES	Yes
LED luminaires will be used due to the fact that they are highly directional, lower intensity, good colour rendition and dimming capability	YES	LED will be used
A warm white spectrum (<2700 Kelvins will be used to reduce the blue light component of the LED spectrum).	Yes <2700 Kelvins is proposed.	2,200 Kelvins will be used.
Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats	YES	Yes
Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible	Minimum height	6m poles and 5m poles (where possible) to meet local authority guidelines.
Only luminaires with an upward light ratio of 0% and with good optical control will be used.	YES	Yes
Luminaires will be mounted on the horizontal, i.e. no upward tilt.	YES	Yes
Any external security lighting will be set on motion-sensors and short (1min) timers	No external security lighting proposed	No action required
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.	For luminaires where <1 LUX level is not achieved along bat commuting routes, this is required.	Glare shields will be utilized in order to minimise any unnecessary light spill onto bat routes along the eastern boundary of this site.

As a consequence of consultation, the proposed lighting plan meets the recommendations of the guidelines BCT, 2018.

Additional measures were also recommended:

- Removal of specific luminaires to prevent light spillage on the boundary with the golf course.

5.1.2 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 four trees 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 months of February and March (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 2: Any ivy covered trees which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape.

5.1.3 Bat Box Scheme

The total number of bat boxes required to mitigate for general conservation of local bat populations:

- 4 summer bat boxes (Schwegler Woodcrete 1FF bat box or equivalent – source www.nhbs.com or www.veldshop.nl) to be erected on mature trees within the proposed development site.

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.

5.1.4 Lesser Horseshoe Bat Conservation Measures

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, it is important that additional measures are undertaken to conservation local lesser horseshoe bat populations. These measures will entail the following:

- Compensatory planting for the removal of linear habitats.
- Compensatory planting for the removal of scrub habitats.

- Specific measures to reduce lighting impacts (Please see Section 5.1.1)
- Lesser horseshoe bat conservation zone – zone of land along a linear strip to the north of the proposed development site and connected to the boundary of the Inch River. This area has been selected because it is outside the Lighting Plan zone and it is adjacent to the Inch River which is deemed as the likely commuting route for lesser horseshoe bats to the proposed development area. This river also allows direction commuting to lands with the Ennis Golf Course where lesser horseshoe bat activity was also recorded.
- This area is approximately 20m wide and 170m long and it is proposed that the following measures are undertaken:
 - o Erection of Day Roost (VWT design – 2m x 2m x 3.325 (Please see Figure 10b).

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.

- o Dark free zone connected to Inch River no lighting permitted within this area.
- o Landscaping in vicinity of Day Roost and Inch River.
 - Approximately 200m of hedge planting (Hawthorn).
 - Approximately 10 small trees (e.g. Rowan, Birch and Crab Apple).

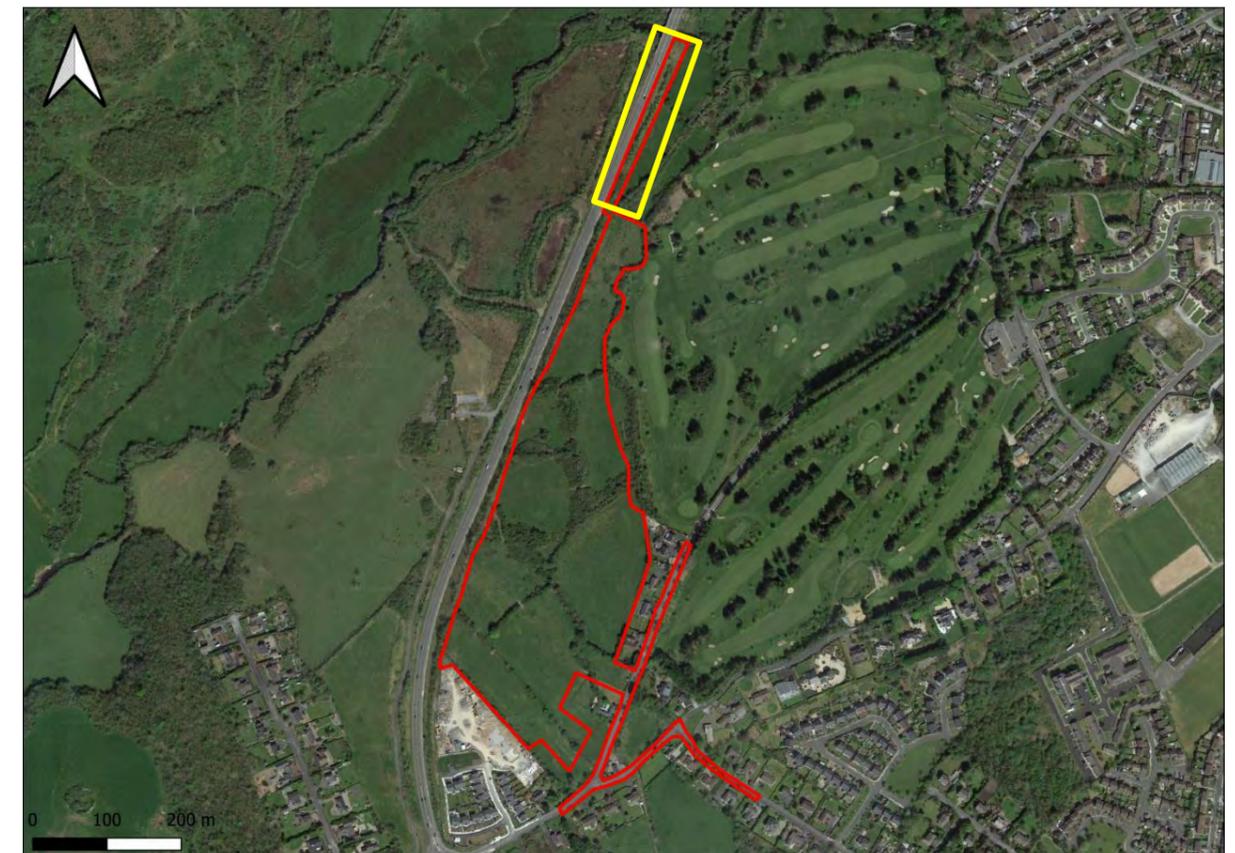


Figure 10a: Red line boundary of proposed development and Yellow Box to indicate location of Lesser Horseshoe Bat Conservation Measures (Supplied by Enviroguide Consulting).



- Yellow Box – location of Day Roost.
- Red Lines – Hedge planting.
- Blue Circles – Tree planting.

Figure 10b: Location of Lesser Horseshoe Bat Conservation Measures.

5.1.5 Landscaping

It is recommended that native tree, shrub and plant species are included in the landscaping plan. It is recommended that night-scented planting is also undertaken to encourage foraging areas for local bat populations.

It is essential that the northern and eastern boundary with the Ennis Golf Course is protected. Any gaps or opportunity to undertaken planting to increase the height and width of this boundary should be undertaken and planting should be with native tree and shrub species.

It is highly recommended that the Lesser Horseshoe Bat Conservation Measures described above are incorporated into the Landscape Plan. These additional measures will add to the compensatory requirement to ensure that there is no accumulative loss of linear habitats within the 2.5km zone for Lesser Horseshoe Bat SACs.

5.1.6 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:

- v) A Phase Two PBR survey is recommended for the three trees 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.

- vi) 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.
- vii) Trees proposed to be removed, should be felled on mild days during the autumn months of September, October or November or Spring months of February and March (felling during the spring or autumn months avoids the periods when the bats are most active).
- viii) 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 2: Any ivy covered trees which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape.
 - b. Category 2: Any PBR with deadwood should be survey prior to felling and felling should entail slow dismantling of the tree (i.e. large dead limbs to be removed prior to felling of main tree).

5.1.7 Monitoring

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

- Inspection of bat boxes within one year of erection of bat box scheme/rocket box. Register bat box scheme with Bat Conservation Ireland. This should be undertaken for a minimum of 2 years.
- Monitoring of Day Roost: Monitoring should involve:
 - o Inspection of internal space for evidence of bat usage once per year for two years;
 - o Static surveillance for a minimum of 10 days/year to record any bat activity during the summer months in Year 2.
 - o Installation of a temperature data logger for 2 year surveillance.
- Monitoring of any other bat mitigation measures. All mitigation measures should be checked to determine that they were successful. A full summer bat survey is recommended post-works.
- Specific monitoring is recommended in relation to the proposed lighting scheme to determine that a level of <1 Lux is achieved along the boundaries of the proposed development site.

6. Survey Conclusions

Six species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle, lesser horseshoe bat, Natterer's bat and brown long-eared bat. The first three species were recorded during bat detector surveys and static surveillance bat activity levels were indicative of commuting and foraging individuals. The latter three bat species were recorded at a lower level of bat passes, which is to be expected as these three bat species are less common.

Overall, the survey results demonstrate that bats commuted to the proposed development site from a easterly, westerly and northerly direction and foraged, primarily along the boundary habitats. The eastern boundary, with Ennis Golf Course, is particularly important for foraging local bat populations and this may be due to the mature hedgerow and the fact that there is no outdoor lighting in this area. A medium level of bat activity common and more light-tolerant bat species were recorded along the boundary with the N85, where outdoor lighting is present. None of the three light sensitive bat species (lesser horseshoe bat, brown long-eared bat and Natterer's bat) were recorded along this boundary.

All bat species were generally recorded at a Low level of bat activity during the static surveillance. However, due to the quiet echolocation calls of lesser horseshoe bats, Natterer's bats and brown long-eared bats, their presence is significant.

There are no recorded bat roosts within the proposed development site but there are four trees recorded as Potential Bat Roosts (PBRs) are proposed to be felled. The majority of the internal network of hedgerows and the scrub habitat will be removed as part of the proposed development.

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 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.

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 low bat activity, it is considered that this will 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 impact on named bat species (according to criteria set out in Tables 2c and d, Section 1.2.2). This is primarily in relation to the lighting plan for the proposed development scheme, removal of linear habitats and the presence of light-sensitive bat species.

A large number of bat mitigation measures have been provided to reduce the potential impact of the proposed development on local bat populations. 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, additional measures are recommended to conserve local lesser horseshoe bat populations.

If bat mitigation measures are all fully committed too and implemented, the proposed development will have less of an impact on local bat populations and this is likely to be Permanent Negative scale of Slight-Moderate.

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8. Appendices

8.1 Appendix 1 Bat Habitat & Commuting Route Classifications

Table 1.A: Hedgerow Category (Bat Conservation Ireland, 2015)

Type of Hedgerow / Treeline	Code	Description / Bat Potential
Small Hedgerow	SH	Hedgerow is less than approximately 1.5 m high, there are no, or very few, protruding bushes or trees. This type of hedgerow would provide little shelter to bats. 
Medium Hedgerow	MH	Hedgerow is approximately 1.5 to 3 m high. This type of hedgerow will provide foraging and commuting potential for bats. 
Sparse Treeline Hedgerow	ST	Hedgerow, low or medium in height, with individual trees (where tree canopies, for the most part, do not touch).

		
Dense Treeline Hedgerow	DT	Large uncut hedgerows or treelines, dominated by mainly large tree or very tall scrub species (e.g. tall hawthorn, blackthorn or hazel), where the canopies are mostly touching. 

Table 1.B: Habitat Classification (Bat Conservation Ireland, 2015, based on Fossit, 2000)

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

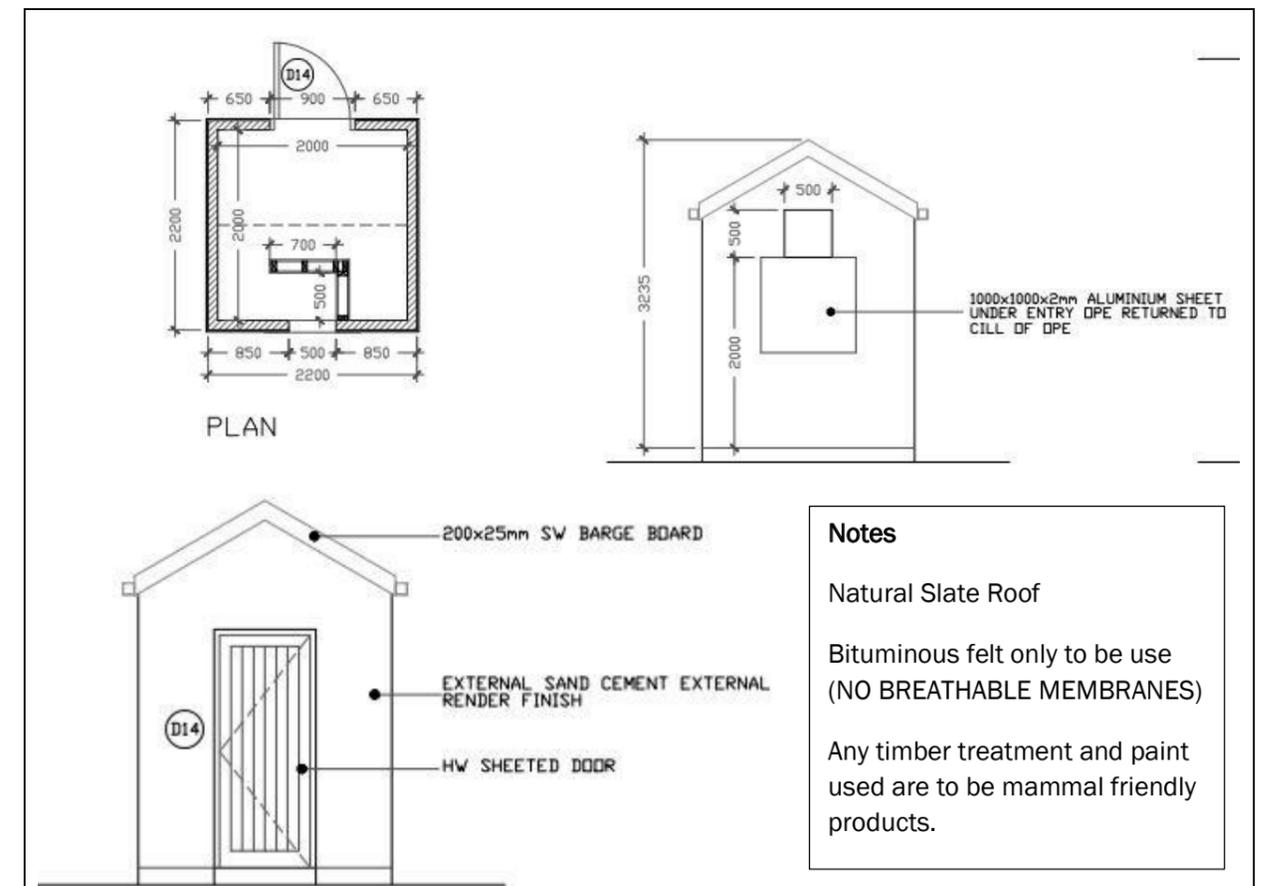
8.2 Appendix 2 Summer Bat Boxes & Day Roost

Woodcrete Bat Boxes (IFF Design) – to be erected on trees



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Day Roost – Design



Notes

- Natural Slate Roof
- Bituminous felt only to be use (NO BREATHABLE MEMBRANES)
- Any timber treatment and paint used are to be mammal friendly products.



Plate A: Day Roost – front and rear views of Night Roost described in plans.

8.3 Appendix 3 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 un-vegetated 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).

<p>(1) Conversion, modification, demolition or removal of buildings (including hotels, schools, hospitals, churches, commercial premises and derelict buildings) which are:</p> <ul style="list-style-type: none"> ○ 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.
<p>(2) Development affecting built structures:</p> <ul style="list-style-type: none"> ○ 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).
<p>(3) Floodlighting of:</p> <ul style="list-style-type: none"> ○ 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.
<p>(4) Felling, removal or lopping of:</p> <ul style="list-style-type: none"> ○ 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).
<p>(5) Proposals affecting water bodies:</p> <ul style="list-style-type: none"> ○ in or within 200m of rivers, streams, canals, lakes, reed beds or other aquatic habitats.
<p>(6) Proposals located in or immediately adjacent to:</p> <ul style="list-style-type: none"> ○ quarries or gravel pits; ○ natural cliff faces and rock outcrops with crevices or caves and swallets.
<p>(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).</p>
<p>(8) All proposals in sites where bats are known to be present! This may include proposed development affecting any type of buildings, structures, feature or location.</p>
<p>Notes:</p> <p>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.</p>

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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Small and draughty Heavily disturbed In urbanised areas Smooth surfaces with few roosting opportunities

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

8.4 Appendix 4 – Static Surveillance 2022

Mini 2	CP	SP	Leis	LHB	BLE	Myotis
01/08/2022	0	0	0	0	0	0
02/08/2022	3	3	16	0	2	0
03/08/2022	16	20	15	1	3	1
04/08/2022	5	14	11	0	4	0
05/08/2022	7	10	12	0	1	0
	31	47	54	1	10	1
Mini 7	CP	SP	Leis	N Pip	BLE	Myotis
01/08/2022	11	8	4	0	0	0
02/08/2022	16	5	2	0	0	0
03/08/2022	19	39	4	0	6	1
04/08/2022	3	9	0	0	0	0
05/08/2022	0	0	0	0	0	0
	49	61	10	0	6	1
Mini 11	CP	SP	Leis	N Pip	BLE	Myotis
01/08/2022	1	4	2	0	0	0
02/08/2022	11	29	8	0	6	2
03/08/2022	12	17	16	0	4	3
04/08/2022	6	12	7	0	2	0
05/08/2022	12	0	2	0	0	0
	42	62	35	0	12	5

9. Bat Species Profile

9.1 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 (52,820km²). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.*, 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km. In addition, of all Irish bat species Leisler's bats have the most specific roosting requirements. It tends to select roosting habitat with areas of woodland and freshwater.

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

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

9.2 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 (56,485km²) which covers primarily the east and south east of the area (Roche *et al.*, 2014). The Bat Conservation Ireland Irish Landscape Model indicated that the Common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.*, 2014).

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

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

9.3 Soprano pipistrelle

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

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

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

9.4 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 (52,820km²) 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
Estimated Irish Population Size	64,000 -115,000 (2007-2012)
Estimate Core Area (Lundy <i>et al.</i> 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 hedge rows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

9.5 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 (52,864km²). 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 <i>et al.</i> 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).

RECEIVED: 30/06/2025

CHAPTER TWELVE

NOISE AND VIBRATION

APPENDIX 12-1 Acoustic Design Statement
APPENDIX 12-2 Glossary of Acoustic Terminology



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APPENDIX 12-1 Acoustic Design Statement

Appendix 12.1 Acoustic Design Statement

12.1 Introduction – Operational Phase Acoustic Design Statement

The acoustic design statement (ADS) has been presented separately as it refers to the inward impact assessment of the residential properties within the development, rather than the outward impact assessment carried out in Section 12.8 of EIAR Chapter 12 Noise and Vibration. **Error! Reference source not found.** As discussed in Section 12.4.3 of EIAR Chapter 12 Noise and Vibration, an ADS is required for new residential developments as per the current Clare County Council Noise Action Plan (NAP) 2024 – 2028.

This assessment relates to the residential units in the Large Scale Residential Development (LRD) at Ballymacaula, Drumbiggle, Keelty, Circular Road, Ennis, Co. Clare.

12.2 Stage 1 – Noise Risk Assessment

12.2.1 Baseline Survey

There are no published EPA noise maps (Round 4) for this area. Environmental noise surveys have previously been outlined in Section 12.6 of EIAR Chapter 12 Noise and Vibration. Daytime attended measurements across the site at 1.5m height range between 52 to 57 dB $L_{Aeq, 15 mins}$. The unattended noise survey was located with a direct line of sight to the N85 to the west. On review of the measured data at 4m height, it is confirmed that the noise levels to the west of the site were as follows:

- Average daytime ambient noise level was 64 dB $L_{Aeq,T}$; and,
- Average night time ambient noise level was 55 dB $L_{Aeq,T}$.

Additionally, a review of L_{Amax} events has been undertaken for the night period. The measured data indicates that a noise level of 75 dB L_{Amax} is not exceeded to the western boundary of the site and 71 dB L_{Amax} is the most commonly occurring value.

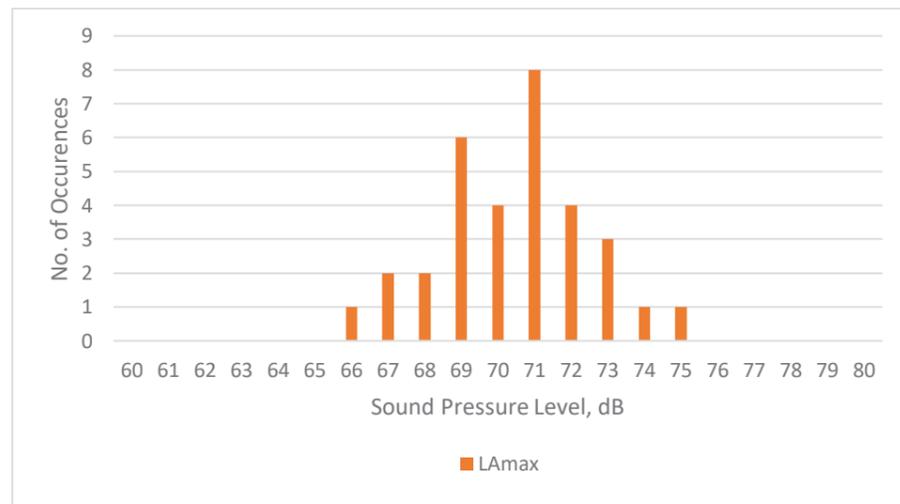


Figure A12.1: Number of dB L_{Amax} events at each noise level during the night period

12.2.2 Methodology

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment.

Paragraph 2.9 of ProPG states that:

“The noise risk assessment may be based on measurements or prediction (or a combination of both) as appropriate and should aim to describe noise levels over a “typical worst case” 24 hour day either now or in the foreseeable future.”

Figure A12.2 presents the basis of the initial noise risk assessment, it provides appropriate risk categories for a range of continuous noise levels either measured and/or predicted on site.

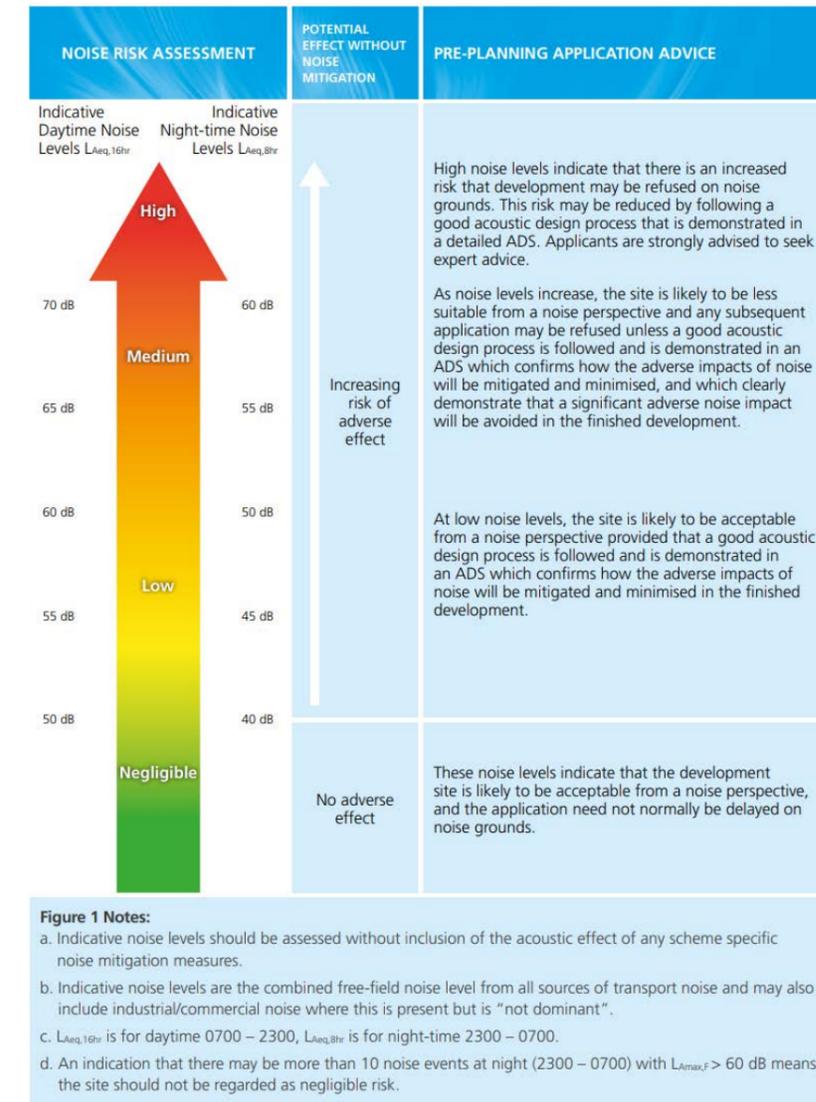


Figure A12.2: ProPG initial noise risk assessment

It should be noted that a site should not be considered a negligible risk if more than 10 L_{AFmax} events exceed 60 dB during the night period and the site should be considered a high risk if the L_{AFmax} events exceed 80 dB more than 20 times a night.

ProPG states the following with respect to the initial risk assessment:

“The risk assessment should not include the impact of any new or additional mitigation measures that may subsequently be included in development proposals for the site and proposed as part of a subsequent planning application. In other words, the risk assessment should include the acoustic effect of any existing site features that will remain (e.g. retained buildings, changes in ground level) and exclude the acoustic effect of any site features that will not remain (e.g. buildings to be demolished, fences and barriers to be removed) if development proceeds.”

In this instance there are no buildings to be demolished and the site topography is not expected to change significantly during construction. An existing NRA fence along the western side of the site has also been included in the noise model.

In this instance a 3D computer noise model of the development site has been developed to predict the noise levels across the entire site in order to investigate the initial noise risk. Noise levels measured on site will be used to validate the model.

12.2.3 Noise Model

Noise levels recorded or calculated from the baseline noise survey were used to calibrate the noise model. It is considered that a strong correlation in respect of predicted noise levels has been achieved. Noise levels are calculated over daytime periods, (07:00 to 23:00 hrs) and night-time periods (23:00 to 07:00 hrs).

Table A12.1 details the results of the noise model predictions and compares them to the measured values at the survey location.

Location	Period	Measured (dB L_{Aeq})	Predicted in Model (dB L_{Aeq})
AN3	Day	55	56
UN1	Day	64	64
	Night	55	55

Table A12.1: Noise model validation

Figures A12.3 and A12.4 present the noise model output across the undeveloped site for noise levels during daytime and night-time periods.

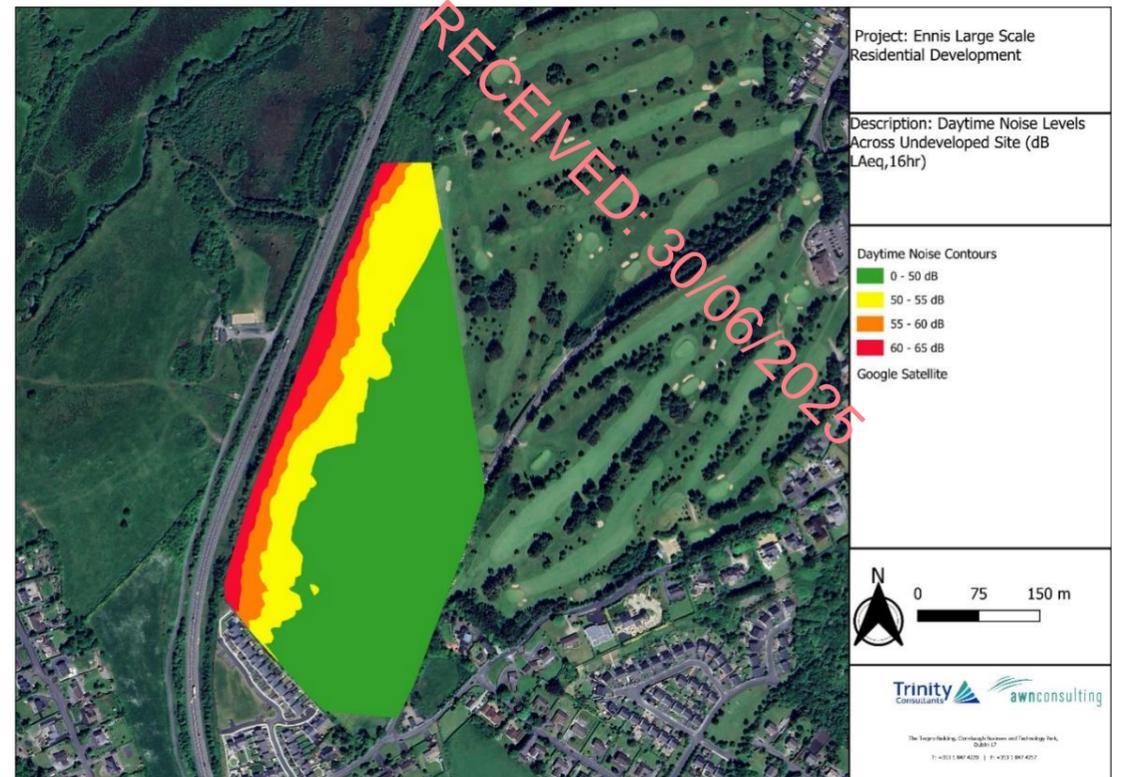


Figure A12.3 Daytime noise levels across undeveloped site (dB $L_{Aeq,16hr}$)



Figure A12.4 Night-time noise levels across undeveloped site (dB $L_{Aeq,8hr}$)

Review of the predicted noise levels across the overall site, concludes the following:

Daytime: Across the majority of the site the modelled noise levels range are less than 50 dB $L_{Aeq,16hr}$, which fall within the negligible noise risk category. Within 100m of the site boundary to the west, the noise levels range between 50 to 65 dB $L_{Aeq,16hr}$ and therefore fall within the low to medium noise risk categories.

Night-time: Across the majority of the site the modelled noise levels range are less than 40 dB $L_{Aeq,8hr}$, which fall within the negligible noise risk category. Within 125m of the site boundary to the west, the noise levels range between 40 to 60 dB $L_{Aeq,8hr}$ and therefore fall within the low to medium noise risk categories.

12.2.3.1 Noise Risk Assessment Conclusion - Proposed Development

Giving consideration to the measured and predicted noise levels presented in the previous sections the site noise risk assessment has concluded that the level of risk across the site varies from negligible to medium noise risk.

ProPG states the following with respect to negligible to medium risks:

Negligible Risk These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.

Low Risk At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

Medium Risk As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.

Given the above it can be concluded that the development site may be categorised as Negligible to Medium Risk and as such an Acoustic Design Strategy will be required to demonstrate that suitable care and attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impact will be avoided in the final development.

It should be noted that ProPG states the following with regard to how the site noise risk assessment is to be used,

“2.12 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered

as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematic site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design.”

Therefore, following the guidance contained in ProPG does not preclude residential development on sites that are identified as having medium noise levels. It merely identifies the fact that a more considered approach will be required to ensure the developments on the higher risk sites are suitably designed to mitigate the noise levels. The primary goal of the approach outlined in ProPG is to ensure that the best possible acoustic outcome is achieved for a particular site.

Comment on Negligible to Low Areas Across Site

Internal Noise Levels

In the first instance, it is important to note the typical level of sound reduction offered by a partially open window is typically applied as 15 dB¹ to 18 dB. Considering the internal design criteria outlined in Table 12.7 (Internal noise design range for residential buildings (BS 8233:2014)) of Chapter 12 of this EIAR, and a sound reduction across an open window of 15 dB, the free-field noise levels that would be required to ensure that internal noise levels do not exceed good internal noise levels with windows open have been summarised in Table A12.2 below.

Internal Noise Environment Level Desired	External Noise Levels	
	Daytime 07:00 to 23:00hrs	Night-time 23:00 to 07:00hrs
Good (i.e. at or below BS 8233 internal noise design criteria)	50 – 55 dB $L_{Aeq,16hour}$	45 dB $L_{Aeq,8hour}$

Table A12.2: External noise levels required to achieve desirable internal noise levels with windows open

Making reference to the modelled noise levels across the site, the desirable internal noise levels for living rooms and bedrooms will be achieved across an open window in the green and yellow shaded areas in Figure A12.3 and Figure A12.4. No further noise control measured at required in these areas.

Areas across the site that have been identified as greater than a daytime noise level of 55 dB $L_{Aeq,16hour}$ or night-time noise level of 45 dB $L_{Aeq,8hour}$ will be further reviewed in ProPG Stage 2 in a full acoustic assessment.

¹ Section 2.33 of ProPG, additional information can be found in the DEFRA NANR116: ‘Open/Closed Window Research’ Sound Insulation Through Ventilated Domestic Windows’

12.3 Stage 2 – Full Acoustic Assessment Western Section

12.3.1 Element 1 – Good Acoustic Design Process

Based on the ProPG guidance, in practice, good acoustic design (GAD) should deliver the optimum acoustic design for a particular site without adversely affecting residential amenity or the quality of life of occupants or compromising other sustainable design objectives. It is important to note that ProPG specifically states that good acoustic design is not equivalent to overdesign or ‘gold plating’ of a new development but that it seeks to deliver the optimum acoustic environment for a given site.

Section 2.23 of the ProPG outlines the following checklist for Good Acoustic Design:

- Check the feasibility of relocating, or reducing noise levels from relevant sources;
- Consider options for planning the site or building layout;
- Consider the orientation of proposed building(s);
- Select construction types and methods for meeting building performance requirements;
- Assess the viability of alternative solutions; and
- Assess external amenity area noise.

In the context of the Proposed Development i.e. LRD units to the immediate western boundary of the site overlooking the N85, each of the considerations listed above have been addressed in the following subsections.

12.3.1.1 Application of GAD Process to Proposed Application

Relocation or Reduction of Noise from Source

The main noise sources are located outside the site boundary and, therefore, it is beyond the scope of this proposed development to introduce any noise mitigation at source.

Planning, Layout and Orientation

Consideration has been given to the location of both the buildings and external amenity areas. In the first instance, a primary consideration was to ensure that residential buildings are located as far as possible from the busy roads. Where this cannot be accommodated along the western section a review for the need of additional façade noise attenuation measures will be incorporated into the design.

The orientation of the site is such that the residential buildings themselves screen many of the common external amenity areas associated with the development.

Select Construction Types for meeting Building Regulations

A mixture of masonry, brick and timber insulated constructions will be used in the external walls of the proposed development. These construction types offers high levels of sound insulation performance. However, as is typically the case, the glazed elements and any required ventilation paths to achieve compliance with Part F of the Building Regulations will be the weakest elements in the façade in terms of sound insulation performance.

Consideration will therefore be given to the provision of upgraded glazing and acoustic ventilators, where required. For units where it will not be possible to achieve the desirable internal acoustic environments with windows open, the proposal here will be to provide dwelling units with glazed elements and ventilators that have good acoustic insulation properties so that when the windows are closed the noise levels internally are good. Inhabitants will be able to open the windows if they wish. However, doing so will increase the internal noise level. This approach to mitigation is supported in ProPG where it states the following (emphasis has been added in bold):

*“2.22: Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; **occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open.** Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for this approach, is not regarded as good acoustic design. Any reliance upon building envelope insulation with closed windows should be justified in supporting documents.”*

“Note 5: Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded.”

“2.34: Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide “whole dwelling ventilation” in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal L_{Aeq} target noise levels should not generally be exceeded.”

It is very important to note that it is impractical to achieve the good internal noise levels with windows open across the vast majority of development sites in close proximity to major infrastructure such as roads. Such sites would need to be classified as having a negligible risk in accordance with the ProPG noise risk assessment approach. For this reason, there are no guidance documents either at a local level or an international level that AWN is aware of which would support the approach of achieving the ideal internal noise levels in the open window scenario. It is, therefore, considered entirely

justifiable to provide building façades with a moderate degree of sound insulation, such that with windows closed but vents opened, a good internal acoustic environment is achieved.

Impact of Noise Control Measures on Fire, Health and Safety

The good acoustic design measures that have been proposed on site do not have any significant impact on other issues.

Assess Viability of Alternative Solutions

Due to the height and location of the proposed buildings it is considered that any acoustic screens along the boundary of the site to attenuate traffic noise would be ineffective and is not proposed anywhere on the site.

Assess External Amenity Area Noise

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

“The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB LAeq,16hr.”

Noise levels across external amenity areas associated with the development are presented in Section 12.3.3 of this Appendix.

Summary

Considering the constraints of the site, in so far as possible and without limiting the extent of the development area, the principles of GAD have been applied to the Proposed Development.

In terms of viable alternatives to acoustic treatment of façade elements, currently it is not considered likely that there will be further options for mitigation outside of proprietary acoustic glazing and ventilation (if required).

12.3.2 Element 2 – Internal Noise Guidelines

12.3.2.1 Internal Noise Criteria

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS8233:2014. The recommended indoor ambient noise levels are set out previously in Table 12.7 of Chapter 12 of this EIAR and reproduced below for reference.

Activity	Location	Day (07:00 to 23:00hrs) dB LAeq,16hr	Night (23:00 to 07:00hrs) dB LAeq,8hr
Resting	Living room	35 dB LAeq,16hr	-
Dining	Dining room/ area	40 dB LAeq,16hr	-
Sleeping	Bedroom	35 dB LAeq,16hr	30 dB LAeq,8hr

Activity	Location	Day (07:00 to 23:00hrs) dB LAeq,16hr	Night (23:00 to 07:00hrs) dB LAeq,8hr
(daytime resting)			45 dB LAmax,T ²

Table A12.3: Internal noise design range for residential buildings (BS 8233:2014)

In addition to these absolute internal noise levels, ProPG provides guidance on flexibility of these internal noise level targets. For instance, in cases where the development is considered necessary or desirable, and noise levels exceed the external noise guidelines, then a relaxation of the internal LAeq values by up to 5 dB can still provide reasonable internal conditions.

In terms of the ventilation strategy it is understood that the air supply will be via mechanical ventilation (MVHR) which typically provides a sound insulation performance substantially improved over passive in-frame or wall vents.

12.3.2.2 Noise Levels Across Proposed Development Based on Modelled Noise Results

As demonstrated in Section 12.2.3 of this Appendix, the current or potential impact in relation to noise across the site is categorised as medium noise risk along the immediate western boundary of the site.

The proposed site layout has been modelled to determine the calculated noise levels at the façades of the development buildings, these are presented in Figure A12.5 and Figure A12.6 for daytime and night-time, respectively.

Daytime noise levels at western facing façades across the western section of the site (Unit Type G in Construction Phase 1, Type F in Construction Phase 2 and 3 only) are predicted to be no greater than 64 dB LAeq,16 hour. Night-time noise levels are predicted to be no greater than 54 dB LAeq,8 hour. Table A12.4 presents the noise levels predicted to be incident on the various façades to the immediate western boundary of the site.

Ref	Period (T)	LAeq,T dB	Octave Band Centre Frequency (Hz)					
			125	250	500	1k	2k	4k
Red	Day (16hr)	64	54	51	52	62	56	43
	Night (8hr)	54	47	42	44	53	47	34

Table A12.4: Summary of predicted façade noise levels

Where façade noise levels are less than 55 dB LAeq,16hr during the day and 50 dB LAeq,8hr at night it is possible to achieve reasonable internal noise levels while also ventilating the dwellings with open windows. Therefore, for those properties where the façade noise levels are less than 55 dB LAeq,16hr during the day and 50 dB LAeq,8hr at night no further mitigation is required i.e. across the majority of the site due to screening from buildings within the development itself.

² The document comments that the internal LAfmax,T noise level may be exceeded no more than 10 times per night without a significant impact occurring.

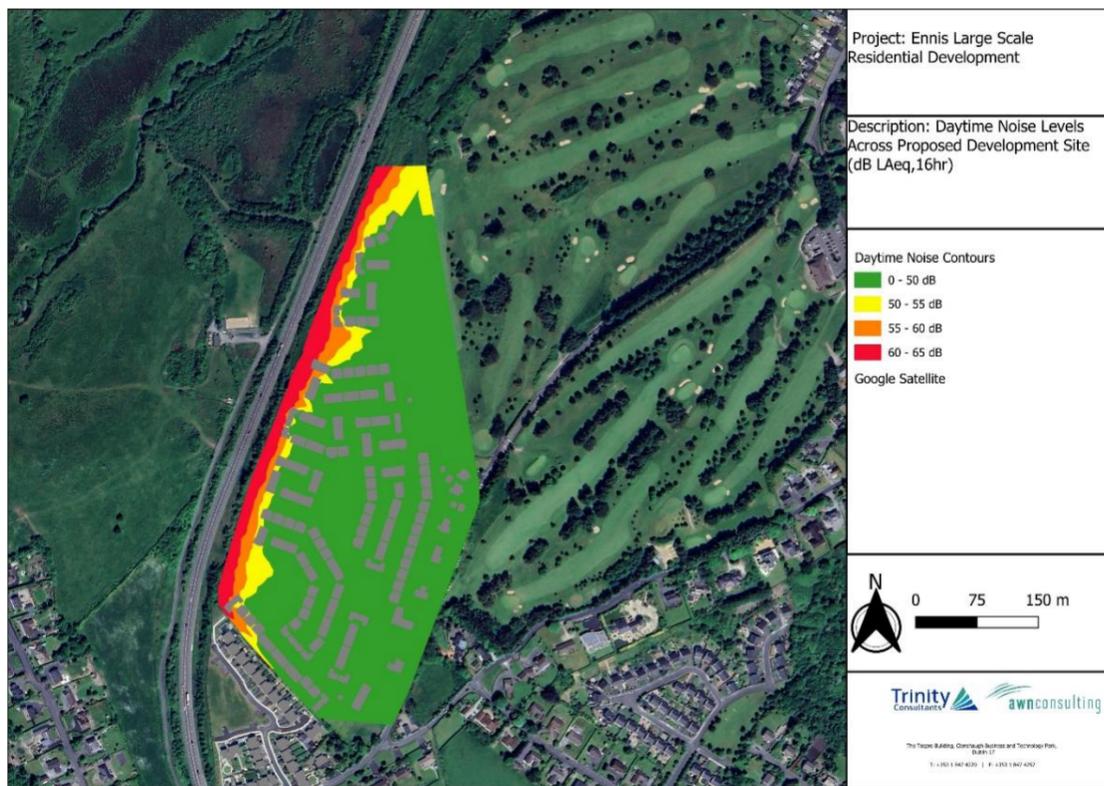


Figure A12.5 Daytime noise levels across proposed development site (4m contour) (dB LAeq,16hr)

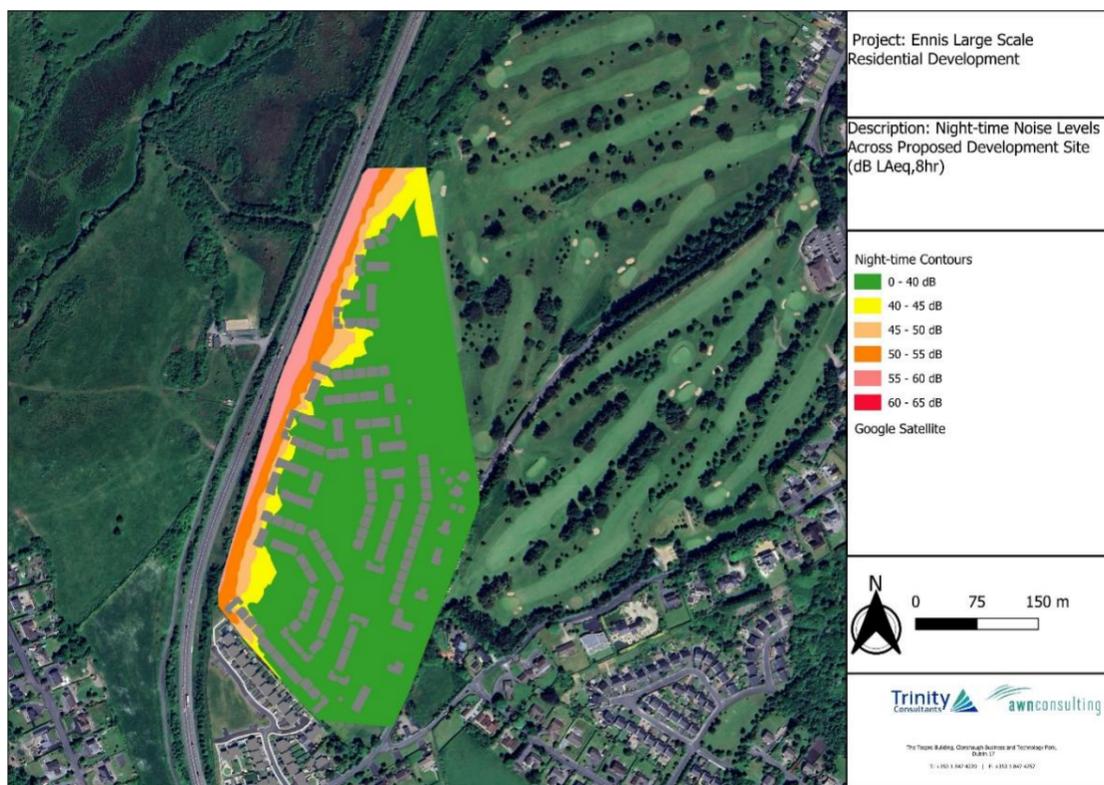


Figure A12.6 Night-time noise levels across proposed development site (4m contour) (dB LAeq,8hr)

12.3.2.3 Proposed Façade Treatment

The British Standard BS EN 12354-3: 2000: *Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound* provides a calculation methodology for determining the sound insulation performance of the external envelope of a building. The method is based on an elemental analysis of the building envelope and can take into account both the direct and flanking transmission paths.

The Standard allows the acoustic performance of the building to be assessed taking into account the following:

- Construction type of each element (i.e. windows, walls, etc.);
- Area of each element;
- Shape of the façade, and;
- Characteristics of the receiving room.

The principles outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G of BS8233 provides a calculation method to determine the internal noise level within a building using the composite sound insulation performance calculated using the methods outlined in BS EN 12354-3. The methodology outlined in Annex G of BS8233 has been adopted here to determine the required performance of the building façades.

Glazing

As is the case in most buildings, the glazed elements of the building envelope are typically the weakest element from a sound insulation perspective. In this instance it has been calculated that the various façades are to be provided with standard double glazing that, when closed, achieve the recommended internal noise criteria.

Wall Construction

In general, all wall constructions (i.e. block work or concrete) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal. The calculated internal noise levels across the building façade have assumed a minimum sound reduction index of 54 dB R_w for this construction.

Ventilation

A mechanical heat recovery ventilation (MHRV) system is proposed for the development therefore there is no requirement to have windows open to achieve background ventilation requirements. A standard double glazing acoustic specification for windows shall be provided in this instance to ensure the rooms achieve good internal noise levels.

Mechanical ventilation systems typically offer a high performance in terms of preventing sound intrusion from external sources, consequently there is no assessment of the ventilation system required for this noise impact assessment.

Internal Noise Levels

Taking into account the external façade levels and the specified building envelope, the internal noise levels have been calculated. In all instances the good internal noise criteria are achieved for daytime and night-time periods with standard double glazing across the site.

12.3.3 Element 3– External Amenity Area Noise Assessment

12.3.3.1 External Noise Levels

Figure A12.7 presents the calculated day time noise levels across the site with the development buildings in place. The contours are calculated for a height of 1.5m.

External noise levels within all of the communal open spaces across the development site are less than the recommended range of noise levels from ProPG of between 50 – 55 dB $L_{Aeq,16hr}$ as illustrated in Figure A12.7. The east facing private rear gardens of the dwellings are also below the 55 dB $L_{Aeq,16hr}$. It is considered that the objectives of achieving suitable external noise levels is achieved within the overall site, therefore no further mitigation is required to control external noise levels across amenity areas.



Figure A12.7 External Amenity daytime noise levels across proposed development site (1.5m contour) (dB $L_{Aeq,16hr}$)

12.3.4 Element 4– Assessment of Other Relevant Issues

Element 4 gives consideration to other factors that may prove pertinent to the assessment, these are defined in the document as:

- 4(i) compliance with relevant national and local policy;
- 4(ii) magnitude and extent of compliance with ProPG;
- 4(iii) likely occupants of the development;
- 4(iv) acoustic design v unintended adverse consequences; and
- 4(v) acoustic design v wider planning objectives.

Each is discussed in turn below.

12.3.4.1 Compliance with Relevant National and Local Policy

There are no National policy documents relating to the acoustic design of residential dwellings. Locally the Clare County Council Noise Action Plan 2024 – 2028 specifies that the guidance contained within ProPG should be used in assessing the noise impact on new residential developments.

This Acoustic Design Statement has been prepared in compliance with the requirements of ProPG and therefore complies with the requirements of local policy.

12.3.4.2 Magnitude and Extent of Compliance with ProPG

As discussed within this appendix, the following conclusion has been drawn with regards to the extent of compliance with ProPG:

- All dwellings as part of the development have been designed to achieve the good level of internal noise levels specified within ProPG. The LRD units to the immediate western boundary of the site, overlooking the N85 and that have western façade facing bedroom, will require closed windows to achieve this level i.e. at the closest facades facing onto the dominant N85 road external to the site.
- External amenity areas have been assessed and calculated and they comply with the recommended criterion set out in ProPG.

Based on the preceding, it is concluded that the proposed development is in compliance with the requirements of ProPG.

12.3.4.3 Likely Occupants of the Development

The criteria adopted as part of this assessment are based on those recommended for permanent dwellings and are, therefore, considered robust and appropriate for the likely occupants.

Acoustic Design v Unintended Adverse Consequences

Unintended adverse consequences did not occur in relation to this proposed development.

Acoustic Design v Wider Planning Objectives

There are no wider planning objectives that effect the acoustic design that are apparent at the time of writing.

12.3.5 Acoustic Design Statement Conclusion – LRD Western Section (Unit Type G in Phase 1, Type F in Phase 2 and 3 only)

An initial site noise risk assessment has been carried out in respect of the proposed development for the LRD Western Section (Unit Type G in Construction Phase 1, Type F in Construction Phase 2 and 3 only). The assessment has classified the immediate western section of the site as having 'low to medium' noise risk. This was determined through on site noise monitoring.

Further discussion is presented in terms of the likely noise impact of both the external and internal areas of the proposed development. It is not necessary to provide enhanced acoustic glazing beyond standard double glazing to ensure that when windows are closed that the internal noise environment is good. The noise level internally with the windows open will be higher than ideal at the western facing bedrooms at the units to the immediate western boundary of the site, overlooking the N85. However, inhabitants will have the option to close the window to reduce the noise level internally with mechanical ventilation.

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APPENDIX 12-2 Glossary of Acoustic Terminology

Appendix 12.2 Glossary of Acoustic Terminology

Ambient noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
Background noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micropascals (20 μ Pa).
dB(A)	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'-weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$D_{n,e,w}$	Weighted element-normalized level difference. This is the value of sound insulation performance of a ventilator measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature for acoustic ventilators typically presents sound insulation data in terms of the $D_{n,e,w}$ parameter.
Hertz (Hz)	The unit of sound frequency in cycles per second.
$L_{Aeq,T}$	This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.
L_{AFN}	The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.
L_{AF90}	Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.

L_{AF10}	Refers to those A-weighted noise levels in the upper 10 percentile of the sampling interval; it is the level which is exceeded for 10% of the measurement period. It is typically representative of traffic noise levels. Measured using the "Fast" time weighting.
L_{AFmax}	is the instantaneous fast time weighted maximum sound level measured during the sample period.
Octave band	A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.
Noise Sensitive Location (NSL)	An dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
R_w	Weighted Sound Reduction Index – This is the value of the sound insulation performance of a partition or element measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature typically presents sound insulation data in terms of the R_w parameter.

CHAPTER FIFTEEN

CULTURAL HERITAGE

- APPENDIX 15-1 Photographic Record
- APPENDIX 15-2 Excavation Database entries
- APPENDIX 15-3 Letter from Archaeologist & Geophysical Surveyor

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APPENDIX 15-1 Photographic Record

Appendix 15.1: Photographic Record



Plate 15. 1: View of Field 1 (June 2021)



Plate 15. 2: View of Field 1 (June 2021)



Plate 15. 3: Section of boundary wall (June 2021)



Plate 15. 4: View of Field 2 (June 2021)



Plate 15. 5: View of Field 2 (June 2021)



Plate 15. 6: Field 3 (June 2021)



Plate 15. 9: Field 4 (June 2021)



Plate 15. 7: Field 3 (June 2021)



Plate 15. 10: Field 5 (June 2021)



Plate 15. 8: Field 4 (June 2021)



Plate 15. 11: Field 5 (June 2021)



Plate 15. 12: Field 6 (June 2021)



Plate 15. 15: Field 7 (June 2021)



Plate 15. 13: Field 6 (June 2021)



Plate 15. 16: Field 8 (June 2021)



Plate 15. 14: Field 7 (June 2021)



Plate 15. 17: Field 8 (June 2021)



Plate 15. 18: Field 9 (June 2021)



Plate 15. 19: Field 1 (February 2025)



Plate 15. 20: Field 5 (February 2025)



Plate 15. 21: Field 8 (February 2025)

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APPENDIX 15-2 Excavation Database entries

Appendix 15.2: Excavation Database entries

Townland: Keelty

Licence: 03E0857

Author: Dermot Nelis

The N18 Ennis Bypass would involve the construction of a 13.8km eastern bypass of Ennis from Latoon, outside Newmarket, to north of Barefield, at Cragard, along with a 7.1km western relief road from Killow to Claireen, outside Ennis. Site AR39 was recorded as a circular enclosure or raised area of approximately 20m in diameter in the environmental impact statement. It is depicted on the first-edition 6-inch OS map. A slightly raised area of stones defines the site. It was considered that the site's low-lying location on the edge of the flood-plain of the Claireen River would suggest that it was possibly a crannog. The area surrounding the potential crannog was also considered to have a high potential for the presence of remains of archaeological significance due to the presence of a number of identified archaeological sites and its location on the flood-plain. The excavation of six test-trenches totalling 252m² within site AR39 failed to produce any material of archaeological significance. In all trenches the topsoil directly sealed the natural subsoil. It is suggested that this is not the site of a crannog but rather an area of non field-clearance. The solid geology of large boulders was not cleared, with the result that no farming practices took place in this immediate area and the tree cover was allowed to grow. Conversation with the landowner confirmed that the wider area had previously been cleared. This project was funded by Clare County Council.

Townland: Keelty

Licence: 04E0025

Author: Graham Hull

A substantial, stone-built limekiln dating to the second half of the 19th century was excavated on the N18 Ennis bypass. The limekiln is thought to be an element of an estate, probably associated with the Keane family, notorious land agents at the time of the potato failure and after. Artefacts (clay tobacco pipe, china and a high-quality glass inkpot) support cartographic and documentary evidence indicating 19th-century semi-industrial activity. Excavation and historical research has demonstrated that the structure was built after 1840 (and probably after 1855) and was a ruin by 1894. The 40-year period in which the kiln could have operated is relatively well documented and it will be interesting to examine further the social and economic environment of the time. It is very possible that the Keelty limekiln was a commercial venture of the wealthy Keane family. Limekilns are not uncommon in Ireland; indeed, many townlands had their own. In the west of the country small round kilns were typical. The larger, well-built types with arched recessed fronts, built onto hillsides, are characteristic of richer farm areas and were often associated with local estates. Limekilns convert limestone to highly alkaline burnt lime. Burnt lime was primarily used to reduce the acidity of boggy land in order to improve fertility. No direct evidence of the type of fuel used in the Keelty kiln was found during the excavation but it is very likely that peat, for fuel, was the reciprocal goods for the wagon-loads of alkaline burnt lime that were required to bring acid bogs into cultivation. Other uses of burnt lime in the 19th century included house rendering and disinfectant, water purification, and applications in the tanning industry. Limekilns were in use in rural County Clare until the 1950s, but, more generally, the demise of the limekiln came first with the import of South American guano in the later 19th century and then with commercial limestone crushing in the 20th century.

Townland: Claireen

Licence: 04E0026

Author: Dermot Nelis

A near perfectly circular gully with a diameter of 6m was excavated on the N18 Ennis bypass. The gully was 0.5-1m wide and had a typical depth of 0.15-0.2m. The gully profile was V-shaped with a steeper edge at the inside. Charcoal-rich patches, in some cases with cremated bone, formed discrete deposits in the gully. It is very likely that the enclosure is prehistoric in date and the cremated bone indicates a funerary function. Similar small funerary enclosures have been excavated nearby (for example excavations by Thaddeus Breen and the writer at Ballygirreen on the N18 Newmarket-on-Fergus bypass, Excavations 2000, No. 45, 00E0284). Three tiny glass beads (two yellow and one blue) were found in the sieved soil from the ring-gully. The beads did not seem to have been affected by heat and were probably placed in the ground with the dead person's (or persons') burnt remains. The low weight of the bone in each deposit indicated that they may not have been in situ pyre deposits but rather redeposited material or only representative memorial or cenotaph burials. It is noteworthy that ring-barrow and ring-gully funerary patterns in the later centuries BC and early centuries AD involved cremation with occasional small or token bone deposits and sometimes with small but significant items of glass or bronze. The Claireen burial site may thus be Later Iron Age in date.

Townland: Ballymacaula

Licence: 17E0336

Author: Red Tobin

In advance of the development of this site a test excavation was carried out as part of an archaeological assessment. The desk top survey and site inspection was supplemented by a test excavation which demonstrated that the development site maintains a uniform stratigraphy unbroken by any evidence for archaeological activity.

Townland: Drumbiggle

Licence: 03E1029

Author: Martin Jones

Topsoil-stripping was monitored at the proposed location of 34 of a total of 69 detached and semi-detached houses and their ancillary works at Drumbiggle, Golf Links Road, Ennis, Co. Clare, between 7 and 9 July 2003. The site is located on a low east-facing slope in rough pasture. No known archaeological sites are recorded in the vicinity of the subject site. The area stripped measured approximately 300m east-west by 130m. The stratigraphy consisted of a mid- to dark-brown clay loam over a mid-brown gravelly clay loam which was absent from the eastern area of the site. These topsoil deposits overlay an orange to mid-brown sandy silty clay containing medium to large stones. Small and irregular deposits of sterile pink till containing limestone gravel and bedrock outcrops were also visible intermittently below the topsoil deposits. Nothing of archaeological significance was noted during the course of monitoring. A single cut feature identified was modern and associated with a nearby house.

Townland: Drumbiggil

Licence: 06E1223

Author: Graham Hull

Test-trenching in advance of construction of 116 residential units, one crèche, four offices, two retail units and a nursing home on a 6.5ha site to the west of Ennis did not locate archaeological deposits.

Townland: Cahercalla More

Licence: 13E0308

Author: Tracy Collins

Monitoring was carried out of groundworks associated with the extension of a hospital at Cahercalla Woods, Cahercalla Road, Ennis, Co. Clare. Ringfort-rath CL033-171— is nearby. Approximately two

thirds of the site had been stripped of topsoil prior to the engagement of an archaeologist. The site consisted of an open grass covered grazing field. Two areas (Areas 1 and 2) were stripped as part of the development. Area 1 was located at the north-western corner of the site and measured 42m north-south by 8m with a topsoil depth ranging from 0.2-0.35m. The topsoil consisted of a dark brown clayey silt and the natural consisted of a light orangey brown clayey silt with occasional large stones. No archaeological features were noted. Area 2 was located at the western side of the site and measured 43m east-west by 17m with a topsoil depth ranging from 0.2-0.3m. A stone-lined well with an iron pipe built into the southern wall was located to the eastern end of Area 2. Also located to the south of Area 2 was a possible water trough. The well and trough appear to be associated with the nearby Cahercalla House and outbuildings. The well and trough are probably of 19th-century date. They were covered over and remain intact subsurface. No archaeological features were found in Areas 1 and 2.

Townland: Cahercalla More

Licence: 09E0170

Author: Red Tobin

Cuan An Chláir are developing part of the Cahercalla Hospital property to accommodate twelve sheltered housing units and a daycare centre for the elderly. The site will be fully serviced including parking and access through the grounds of Cahercalla Hospital. The planning application was returned with a request for further information, including a request for archaeological information. An assessment was requested involving a research component alongside a programme of test excavation. Fifteen trenches were proposed to assess this site fully. Test-trenching was carried out on 22 and 23 April 2009. Over 1.5km of test-trenches were excavated over the three test areas. No features or deposits of archaeological origin were identified during the trenching exercise.

In the area designated for later development as a link road and further housing, directly north of the farmyard and coach yard, a number of archaeological sites were identified. These were a bivallate ringfort, which had not been previously identified and a two-part perforated stone, perhaps the base of a standpipe or a wheelwright's stone. One of the test-trenches was excavated across the ramparts of the ringfort, clarifying the presence of two heavily denuded dump-construction banks with external ditches. The features were covered with heavy gauge plastic and backfilled. Both sites were reported to the National Monuments Service and the County Clare archaeologist.

Townland: Keelty (Site AR130)

Licence: 04E0030

Author: Kate Taylor, TVAS Ireland Ltd.

This excavation on the N18 Ennis bypass found a late 19th/early 20th-century refuse dump. The dumped material may have been burnt on site and this caused underlying stones to crack and clay to oxidise. The fact that the stones overlay a field drain demonstrates that the burnt-stone deposit was modern and certainly could not have had a prehistoric origin as was suspected at the time of testing. The deposit was in a field that was liable to flood and it is therefore likely that, if the burning was of any antiquity, it would have been sealed by alluvium.

The relatively high status of the refuse (fine china, writing slate, window glass) might suggest rubbish from a wealthy household. A prime candidate for the source of the dumped material would be The Hermitage, home of the land agent Keane family in the 19th century.

Townland: Cahircalla More, Ennis

Licence: 19E0538

Author: Red Tobin (RedArc Consulting Ltd)

Cuan an Chláir Housing Association has developed part of the Cahircalla Hospital property to accommodate sheltered housing units and a day care facility for the elderly. This initial development is now complete and Cuan an Chláir is proceeding with a second phase of development. The Phase 2 development involves the restoration and conversion of the coach yard and stabling block to accommodate more sheltered housing units. It is also intended to erect a terrace of four housing units along the western boundary of the site. The Phase 2 development will also require extensions to the existing road network and all associated services. This Phase 2 development partially encroaches into the constraint area around the Ringfort site CL033-171.

Monitoring took place in advance of construction on 14 October. Monitoring was confined to the area where groundworks associated with the construction of the 4 terraced houses encroached into the 20m buffer zone. A Heras fence was erected as a fixed barrier between the development and the RMP site and buffer zone. This will remain in place until the completion of the Phase 2 development. Topsoil was stripped from the western boundary of the development site along the line of the Heras fence to include the footprint of the terrace, parking area and access from the road. The topsoil strip showed the soil cover to be quite thin overlying surface outcrops of karst limestone from the western boundary extending eastwards. The soil cover became deeper as the monitoring extended to the east. Throughout the topsoil strip, pockets of agricultural and household waste were unearthed. No archaeology was found.

Phase 1 testing was undertaken by Red Tobin under licence 09E0170.

Townland: Drumbiggle, Ennis

Licence: 01E0469

Author: Billy Quinn, Archaeological Services Unit Ltd.

Monitoring on the site of a proposed housing development at Drumbiggle, Golf Links Road, Ennis, Co. Clare, was carried out on 7-8 June 2001.

The proposed site, located opposite Ennis Golf Club, comprised a wooded area sloping from south-west to north-east, with good views of Ennis to the west.

Prior to topsoil-stripping, the site was partially cleared of trees and scrub. An initial examination revealed no above-ground features of archaeological interest.

Topsoil-stripping to an average depth of 0.2m exposed a natural stratigraphy consisting of a loosely compact, dark brown silt below a topsoil layer. All the finds recovered were of modern date.

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APPENDIX 15-3 Letter from Archaeologist & Geophysical Surveyor

Appendix 15.3: Letter from Archaeologist & Geophysical Surveyor

Ger Dowling, PhD MIAI
Archaeologist & Geophysical Surveyor

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Nenagh, Co. Tipperary Email: dowling.gb@gmail.com

John Cronin,
John Cronin & Associates,
3a Westpoint Business Centre,
Link Road,
Ballincollig,
Co. Cork

31st March 2025

Dear John,

With reference to a proposed archaeogeophysical survey of lands at Keelty and Ballymacaula townlands, Ennis, Co. Clare (Figures 1 & 2), I am writing to inform you that in addition to reviewing the site description provided by you, I conducted an inspection of the subject lands (Fields 1-9, c.9.5 ha) on Saturday, 29th March 2025. From this, it is clear that the site does not offer suitable conditions for a geophysical survey. This is due to the widespread presence of dense, bunched clumps of grass and areas of dense scrub vegetation and trees (Plates 1-5); the latter are particularly thick at field edges and across portions of the northern part of the site. Indeed, access between some of the fields is restricted to narrow, heavily overgrown paths that will likely obstruct movement of the survey cart (Plate 6).

These ground conditions and potential physical obstructions would greatly compromise the quality of survey data. As such, it is not possible to undertake a geophysical survey at the present time. For the investigation to proceed, the grass and scrub vegetation to be cut flat to below 0.20m and access between fields widened to ensure free movement of the survey cart and other equipment. Alternatively, if site clearance is not possible, then I would recommend that an alternative method of archaeological site investigation be considered (e.g., test trenching).

Kind regards,

Ger Dowling

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Figure 1. Proposed survey area outlined in red.

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Figure 2. Proposed survey area, showing field numbers (Image courtesy of John Cronin & Associates).

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Plate 1. Field 4, looking north.



Plate 2. Looking north over Field 6.

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Plate 3. Field 7, looking northwest.



Plate 4. Field 8, viewed from the south.

Registration. No.: 747550

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Plate 5. Field 9, looking east.



Plate 6. Access path between Fields 3 and 4.

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