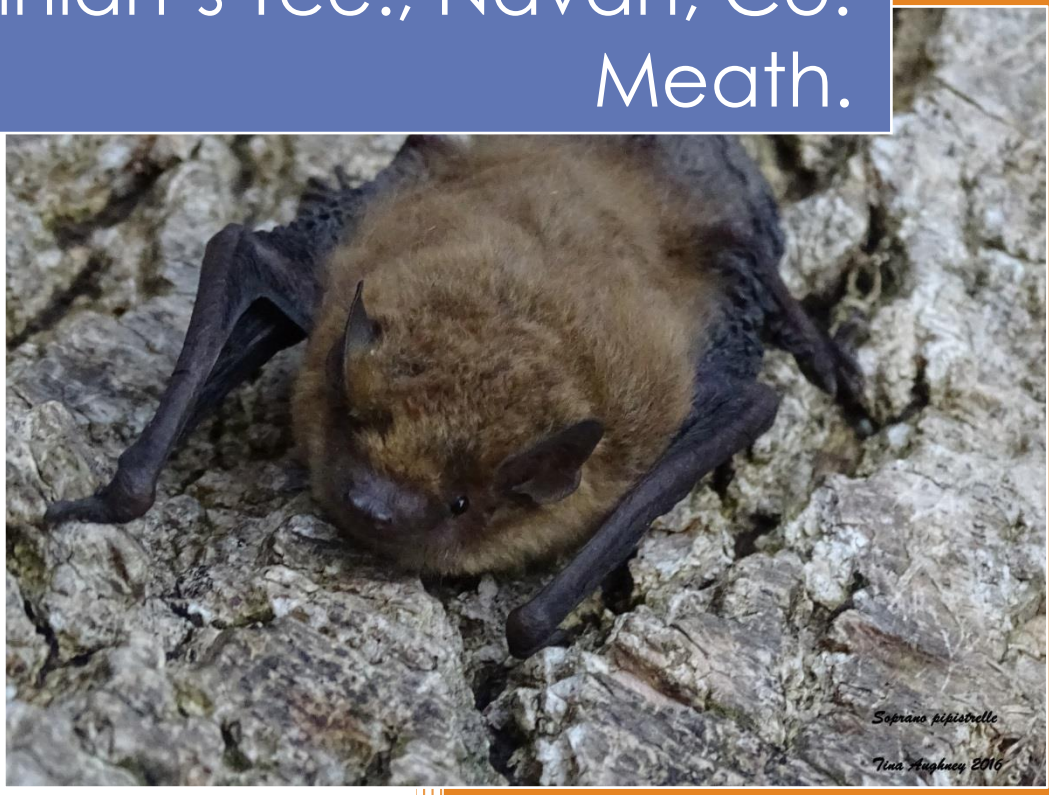
2021

Bat Assessment: St. Pat's Classical School, St. Finian's Tce., Navan, Co. Meath.



Dr Tina Aughney

Bat Eco Services

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Licenced 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 2019-138 (Survey licence, expires 29th March 2022).

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 2021-19 (Survey licence, expires 15th March 2022).

Client: Meath County Council

Project Name & Location: St. Pat's Classical School, St. Finian's Tce., Navan, Co. Meath

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
23rd February 2022	Final	Enda Weldon, by email

Purpose

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

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

Carbon Footprint Policy

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

Bat Record Submission Policy

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

Executive Summary

Project Name & Location: St. Pat's Classical School, Navan, Co. Meath

Proposed work: Renovation of building.

Bat Survey Results - Summary

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

Bat Survey Duties Completed (Indicated by red shading)

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

Contents

1. Introduction

Bat Eco Services was commissioned by Meath Co. Co. to undertake a bat survey of St. Pat's Classical School Navan, Co. Meath.

1.1 Relevant Legislation & Bat Species Status in Ireland

A small number of these animal and plant species are protected under Irish legislation (Nelson, *et al.,* 2019). The principal Irish legislation is the Wildlife Act 1976 (as amended). Amendments to the Wildlife Act and its Statutory Instruments have enacted and amended protection of individual species, notably in order to comply with EU legislation or other international agreements. The Birds Directive (Directive 2009/147/EC) and Habitats Directive (Council Directive 92/43/EEC) are the main EU legislation resulting in the legal protection of species in Ireland. The Acts and Statutory Instruments which list species within the broad taxonomic groupings are referred to in the relevant sections.

1.1.1 Irish Legislation

The Wildlife Act 1976 (Number 39 of 1976) as amended, in particular by the Wildlife (Amendment) Act 2000 (Number 38 of 2000). The Flora (Protection) Order 2015 (S.I. no. 356 of 2015) lists the plant species protected by Section 21 of the Wildlife Acts. The regulations that give rise to the protection of animal species under the Wildlife Acts are detailed in the relevant sections. See www.npws.ie/ legislation for further information.

The codes used for national legislation are as follows:

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

1.1.2 EU Legislation

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

1.1.3 IUCN Red Lists

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

1.1.4 Irish Red List - Mammals

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

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

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

1.1.5 Irish Bat Species

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

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is a notifiable action and a derogation licence has to be obtained from the *National Parks and Wildlife Service* before works can commence. Any works interfering with bats and especially their roosts, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations

1997 and Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law). The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

This circular states that:

"Under Regulation 23 of the Habitats Regulations 1997, any person who, in regard to the animal species listed in Annex IV of the Habitats Directive –

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 the eggs from the wild, or
d) Damages or destroys a breeding site or resting place of such an animal.

shall be guilty of an offence."

In summary the circular requires that an appropriate assessment is undertaken to identify where a risk of damage or disturbance to an Annex IV species may exist and where a risk is identified, alternative or modifications will be required to avoid risk. Where is it not possible to avoid risk, a derogation licence from the Minister under Regulation 23 of the Habitats Regulation should be considered. The Minister is empowered, within strict parameters, to grant a licence for derogation from complying with the requirements of the provisions of section 21 of the Wildlife Act 1976 and Regulations 23 and 24 of the Habitats Regulations as follows:

"Where there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range, the Minister may, in respect of those species, grant a licence to one or more persons permitting a derogation from complying with the requirements of the provision of section 21 of the Principal Act and Regulations 23 and 24".

There are eleven recorded bat species in Ireland, nine of which are considered resident. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species. A total of 41 SACs have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310).

Irish bat species list 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 *Myotis daubentonii*	Least Concern	Least Concern	Least Concern
Whiskered bat *Myotis mystacinus*	Least Concern	Least Concern	Least Concern
Natterer's bat *Myotis nattereri*	Least Concern	Least Concern	Least Concern
Leisler's bat *Nyctalus leisleri*	Least Concern	Least Concern	Least Concern
Nathusius' pipistrelle *Pipistrellus nathusii*	Least Concern	Least Concern	Least Concern
Common pipistrelle *Pipistrellus pipistrellus*	Least Concern	Least Concern	Least Concern
Soprano pipistrelle *Pipistrellus pygmaeus*	Least Concern	Least Concern	Least Concern
Brown long-eared bat *Plecotus auritus*	Least Concern	Least Concern	Least Concern
Lesser horseshoe bat *Rhinolophus hipposideros*	Least Concern	Least Concern	Least Concern
Possible Vagrants ^			
Brandt's bat Myotis brandtii	Data deficient	Least Concern	Least Concern
Greater horseshoe bat *Rhinolophus ferrumequinum*	Data deficient	Near threatened	Near threatened

^ Roche *et al.,* 2014

1.2 Relevant Guidance Documents

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

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.
- Bat Conservation Trust (2018) Bats and artificial lighting in the UK: bats and the built environment series. Guidance Note 08/2019. BCT, London.

Collins (2016) is the principal document used to provide guidance in relation to survey effort require 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.

Kelleher & Marnell (2006) is referred to for guidance in relation to survey guidance, derogation licences, mitigation measures.

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

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

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

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

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

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

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

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

In the context of terrestrial ecosystems, the impact of street lights may appear to be positive for some bats but over the long term impacts may be negative even for those species that seem to gain from exploiting insect swarms. As Rydell (2006) points out, there has been no research into whether or how bat predation at lights affects the size of moth populations. Moths that normally exhibit evasive responses to bats have been shown to be unable to avoid capture by bats under bright street lights (Svensson and Rydell 1998) and some bats that feed at street lights increase their consumption of moths compared with their normal catch in other habitats (Rydell 1992). By disorientating insects that would normally be feeding or engaging in reproductive behaviours, as well as increasing predation by bats, overall reproductive rates may well decrease for insects that are within range of light pollution sources. Therefore resulting in long-term overall decreased availability or diversity of prey species.

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.

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

- Attracting Prey Items;
- Reducing Foraging Habitat;
- Fragmenting The Landscape;
- Reducing Drinking Sites.

1.2.2 Assessment Criteria

Different parameters are considered for the assessment of the potential impact(s) of a proposed development on local bat populations. Reporting may consider all or some of the criteria presented below, depending on the nature of the project being assessed.

The ecological value of the bat populations of the survey site will be completed, where possible, according to Table 2, Section 1.2 (CIEEM, 2016).

With reference to the guidelines listed in Section 1.2 and the judgement of the bat specialist, the impacts proposed project on local bat populations will be assessed, where possible, using the following criteria:

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

Table 4a: Criteria for assessing impact quality based on EPA, 2017,

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

- Impact Significance of potential impact parameters on specific bat species in relation to particular elements (e.g. roosting sites, foraging area and commuting routes) are assessed with reference to the following:
    - Table 6.1 of Kelleher & Marnell, 2006;
    - the known ecology and distribution of the bat species in Ireland;
    - bat survey results including type of roosts (if any recorded), pattern of bat usage of the survey area, level of bat activity recorded etc.
    - and bat specialist experience.

  The scale of impact used in this report is divided in five categories (in increasing scale of impact):
    - Minor Impact
    - Minor-Moderate Impact
    - Moderate Impact
    - Moderate to Major Impact
    - Major Impact

- Overall Impact Significance of the proposed development on local bat populations maybe determine, where applicable, using the parameters listed in Table 4b (based on EPA, 2017).

Table 4b: Criteria for assessing significance of effects based on EPA, 2017,

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

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

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

Finally, how the impacts differ during the construction and operational phases will be presented, if applicable.

Specific guides utilised in the assessment process and mitigation design are:

- Table 6.1 in Kelleher & Marnell, 2006 (Page 47)
- Figure 21 in Kelleher & Marnell, 2006 (Page 49)
- P 60 - 64 in Kelleher & Marnell, 2006 in relation to roost design
- Schofield, H. (2008). *The Lesser Horseshoe Bat Conservation Handbook*. Herefordshire, England: The Vincent Wildlife Trust in relation to roost design
- Table 4.1 in Collins, 2016 (Page 35)
- Table 7.3 in Collins, 2016 (Page 52)
- Appendix 1 (Criteria for Bat Roosts of National or International Importance) in NRA (2006)

1.3 Project Description

1.3.1 Site Location

St. Pat's Classical School is located off St. Finian's Terrace within an enclosed area surrounded by tall vegetation and in between industrial buildings.

The building is in derelict condition with no roof.

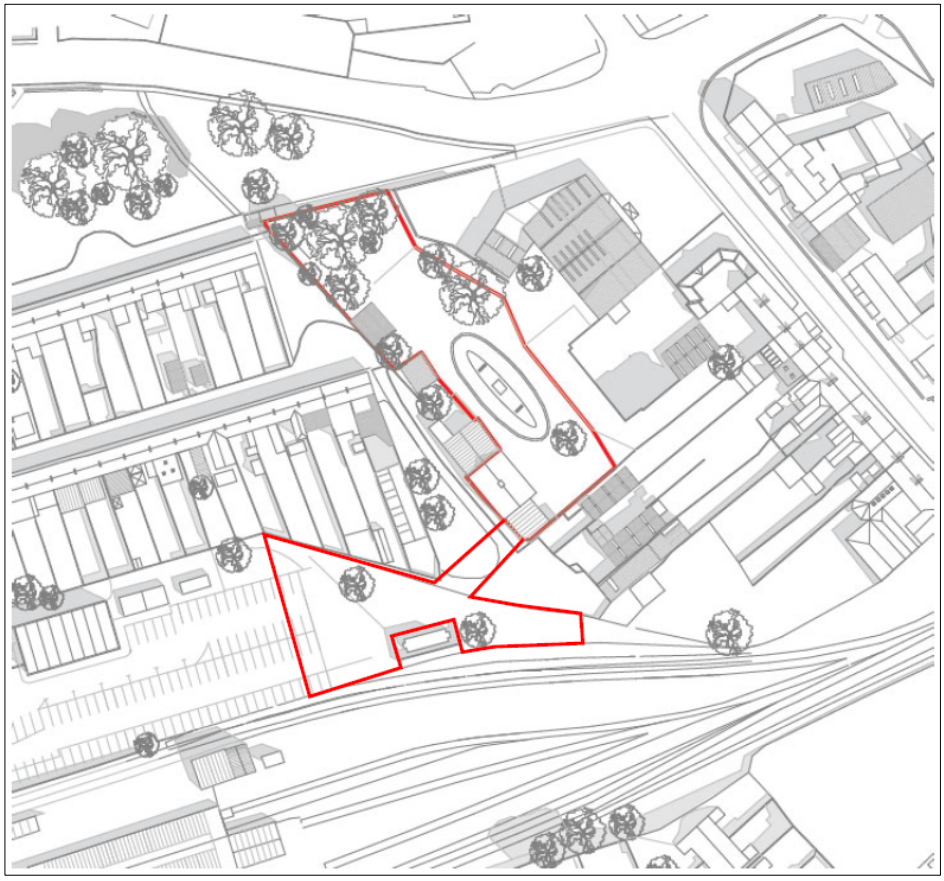
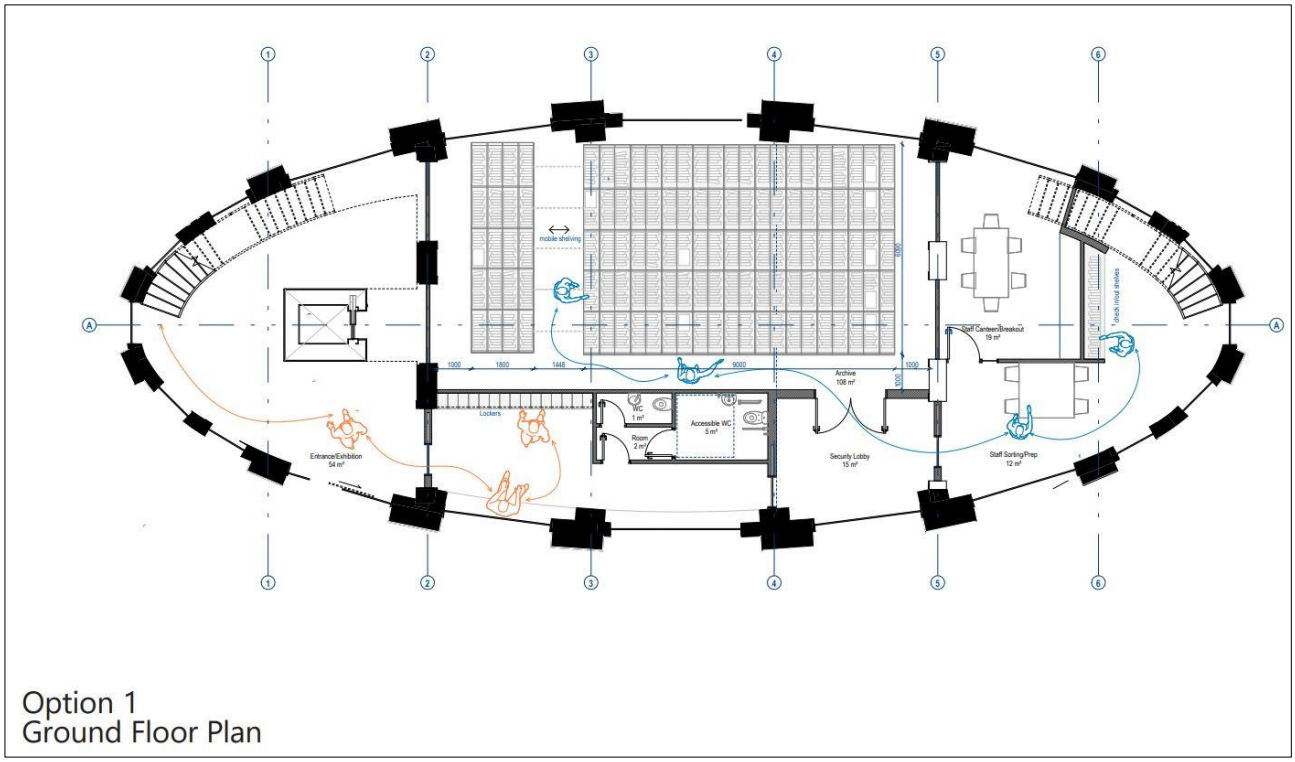


Figure 1a: Location of survey area – Red Line (Source: Meath Co. Co.).

1.3.2 Proposed Project

The works will consist of the conservation, restoration and adaptive reuse of the former St Patricks Classical School building for use as the Meath County Archive together with ancillary site and landscaping works.



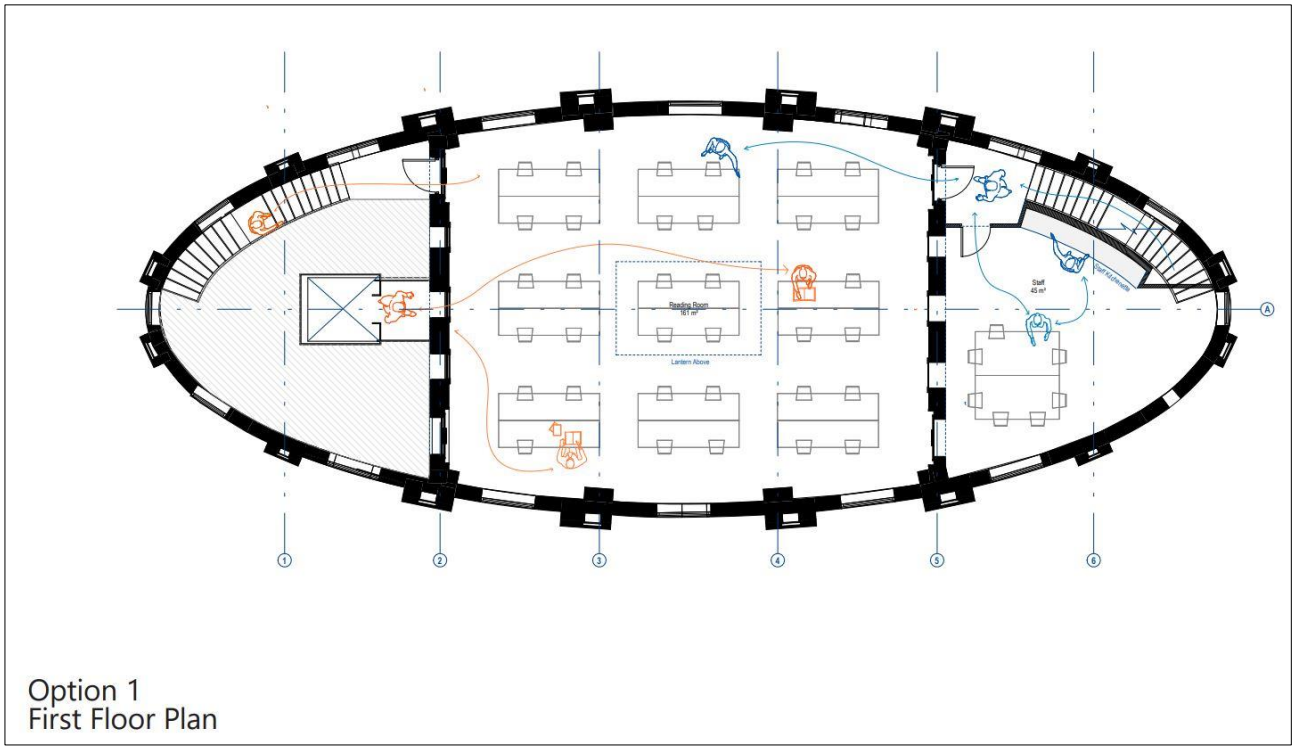


Figure 1b: proposed plans for St. Pat's Classical School building (Source: Meath Co. Co.).

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 type 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 Building & Structure Inspection

St. Pat's Classical School building was assessed for likely places that may provide a roosting space for bats during the daytime for evidence of bat usage on 23rd September 2021. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past.

Inspections are undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope).

The building was assessed to determine its suitability as a bat roost and described using the parameters Negligible, Low, Medium or High suitability in view of Table 5.1 of Kelleher & Marnell (2006). Surveying was carried out in the preferred months of May to September (Collins, 2016). The level of suitability informed the level of surveying required.

Table 5b: Building Bat Roost Classification System & Survey Effort (Adapted from Collins, 2016 and Kelleher & Marnell, 2006).

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).

2.1.2 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) on the 23rd September 2021. 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, 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) 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.

A series of inspections were undertaken. Phase 1 inspections aims to make a list of trees within the proposed development site that may be suitable as roosting sites for bats. Inspections were undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) during the daytime searching for PRFs, if visible. To aid this Phase 1 inspection, tree reports, where available, were consulted to supplement that data collected.

Phase 2 inspections are, generally, recommended once a complete list of trees that have been identified as PBRs, and are mark for felling in order for the proposed development to be undertaken. The Phase 2 inspection will generally involve a closer examination of individual trees using a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope) and where required (and/or possible), height surveys are completed using a ladder. If a tree is deemed to be a roost site then further surveying involving dusk and dawn surveys of the actual trees may be recommended to determine what bat species are present etc.

Table 5c: 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.

2.1.3 Bat Habitat & Commuting Routes Mapping

The survey site was assessed during daytime walkabout surveys on 23rd September 2023, 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 Bat Surveys

Dusk Emergence Surveys were completed on 23rd September 2021 from 10 minutes before sunset to at least 110 minutes post sunset and the surveyors position themselves adjacent to the building / structure to be surveyed to determine if bats are roosting within, location of roost(s), number of bats, bat species etc.

Dawn surveys were completed 28th September 2021 from 110 minutes before sunrise to 10 minutes after sunrise. Surveys are completed during mild and dry weather conditions with air temperature 8°C or greater. All bat encounters are noted during surveys.

The following equipment was used:

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

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

2.2.2 Filming

A Guide TrackIR Pro25 thermal imagery scope filming was also deployed to capture potential emerging bats from potential roosting sites. This was completed on 23rd September 2021 from 10 minutes before sunset till at least 120 minutes after sunset and 110 minutes before sunrise to 10 minutes after sunrise. Captured film was watched post-survey and any emerging bats were noted.

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

2.2.3 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 and the habitat type of where the bat detector is location is not to allow interpretation of the results (e.g. Open verses Edge verses Closed habitat types – see table below). 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. Wildlife Acoustics Song Meter SM4 FS Platform Units use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis. These results are depicted on a graph showing the number of bat passes per species per hour/night. Audio files are a maximum of 15 seconds long and each audio file is taken as a bat pass for each bat species recorded within the audio file. Each bat pass does not equate to the number of individuals of bats flying in vicinity of the recording device but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame (i.e. separate audio files within a small time frame) is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence of echolocation calls or bat pass is more likely to be indicative of individual bats.

The 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 unit were deployed for 5 nights from 23rd to 28th September 2021 during this static bat detector survey. This was located inside the building position on a ledge at the southern end.

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

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

Bats produce different types of echolocation calls and each bat species family have a characteristic bat echolocation call depending largely on their morphology and preferred habitat type. The different

types of echolocation calls (i.e. CF or Constant Frequency call verses a FM or Frequency Modulated call) provides different types of information and therefore are used to detect prey items or for orientation in different habitat types. These can be broadly defined as in the table below.

Table 6b: Bat Habitat Types definitions for Passive Static Bat Detector Surveys.

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

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-), Brow Long-eared Bat Roost Monitoring Scheme (2007-) and Lesser Horseshoe Bat Monitoring Scheme (1980s-). Apart from the latter survey, all monitoring data is stored on the BCIreland database.

- BATLAS 2020 & 2010

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

- Ad Hoc Bat Records

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

- Roost Records

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

A 1km radius search was requested for the Irish Grid Reference N8715767489.

2.3.2 Bat Conservation Landscape Favourability

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 BCIreland 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.

2.4 Photographic Record

A photographic record is completed for the survey and is presented in Section 9.

3. Bat Survey Results

3.1 Daytime Inspections

3.1.1 Building & Structure Inspection

The building was inspected for bat usage signs and not bat usage signs were recorded. However, there are a number of suitable crevices and gaps behind plaster. As the building has no roof, the suitability of it as a bat roost is reduced. While it is a dark site surrounded by trees, it is located in an urban setting. As a consequence, the suitability of the building as providing a roosting site for bats is of Medium value. According to Collins (2016) this building would require a minimum of two surveys (dusk and dawn) with one undertaken during the months of May to August. As the request for this survey was not made until mid-September, the latter requirement was not possible.

Table 7: Buildings / Structures inspection results.

Building Code	Description	Roost Type / Suitability	Bat Species
St. Pat's Classical School	Large derelict building, no roof. Natural stone and red brick walls with plaster. Located in an urban setting with housing and commercial businesses adjacent.	Gaps behind timber, plaster and crevices in stonework and bricks. Dense treeline along the majority of the boundary. Dark secluded site for its urban setting. Medium suitability	No signs of bat usage during daytime inspection.

3.1.2 Tree Potential Bat Roost (PBRs) Inspection

Trees adjacent to the building described above were inspected during the daytime. The treeline around the building is primarily ash and conifer trees planted as a boundary treeline.

Table 8: Tree PBR inspection results.

Tree No.	Tree Species	PRFs	Bat Usage	Value
X3 trees	Ash	Heavy ivy growth	No bats recorded emerging. Bats recorded foraging around trees.	Category 2

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.

Table 9a: Habitat types present within survey area.

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

Table 9b: 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

3.2.1 Dusk & Dawn Bat Survey

The suitability of the building as providing a roosting site for bat is of Medium value. According to Collins (2016) this building would require a minimum of two surveys with one undertaken during the months of May to August. As the request for this survey was not made until mid-September, the latter requirement was not possible. As a consequence, a static unit surveillance was also undertaken to gather additional information. The following figure summarises the results of the bat detector surveys completed.

Dusk Survey: 23/9/2021 (weather conditions: 16oC, clear sky, calm and dry).
Surveyor 1 – located within ground floor of the school building.
Surveyor 2 – located within the survey area, walking around the external walls of the school building.
Thermal Imagery camera – filming the northern wall of the school building.

Dawn Survey: 28/9/2021 (weather conditions: 12oC, patchy cloud cover, light breeze and dry).
Surveyor 1 - located within ground floor of the school building.

Table 10: Buildings / Structures survey results.

Building Code	Roost Type & Location	Bat Species (No. of bats)	Access Points	Vegetation / Lighting arrangement
School building – dusk survey	No roosts recorded	No bats recording roosting.	No applicable	Treelines. Street lighting adjacent to the survey site.
School building – dawn survey	No roosts recorded	No bats recording roosting.	No applicable	Treelines. Street lighting adjacent to the survey site.

Surveyor 1 did not record bats within the building during either surveys. Surveyor 2 recorded soprano pipistrelles commuting into the survey site from the direction of St. Finian's Tce and these individuals foraged within the survey area for the majority of the survey period of the Dusk Survey.

3.2.2 Passive Static Bat Detector Survey

The following table summarises the results recorded on the static unit deployed. This was located inside the building. Four species of bat was recorded, generally in low numbers of bat passes. A Medium level of common pipistrelles was recorded on Night 4 and due to the flight pattern of this species, it is likely to have been a small number of individuals foraging consistently in vicinity of the static unit. Brown long-eared bats were only recorded on Night 1 and these passes were recorded between 00:10 to 02:16 hrs. The timing of these passes are not associated with emergence at dusk or returning to roost at dawn. Therefore it is likely to have been individual bats seeking shelter or passing through the survey site.

Table 11: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Code	Location Description / Bat Habitat Type	Survey Period	Bat Species
Mini 8	Inside school building	23/9/21 to 28/9/2021 (5 nights)	Common pipistrelle, soprano pipistrelle, Leisler's bat and brown long-eared bat.

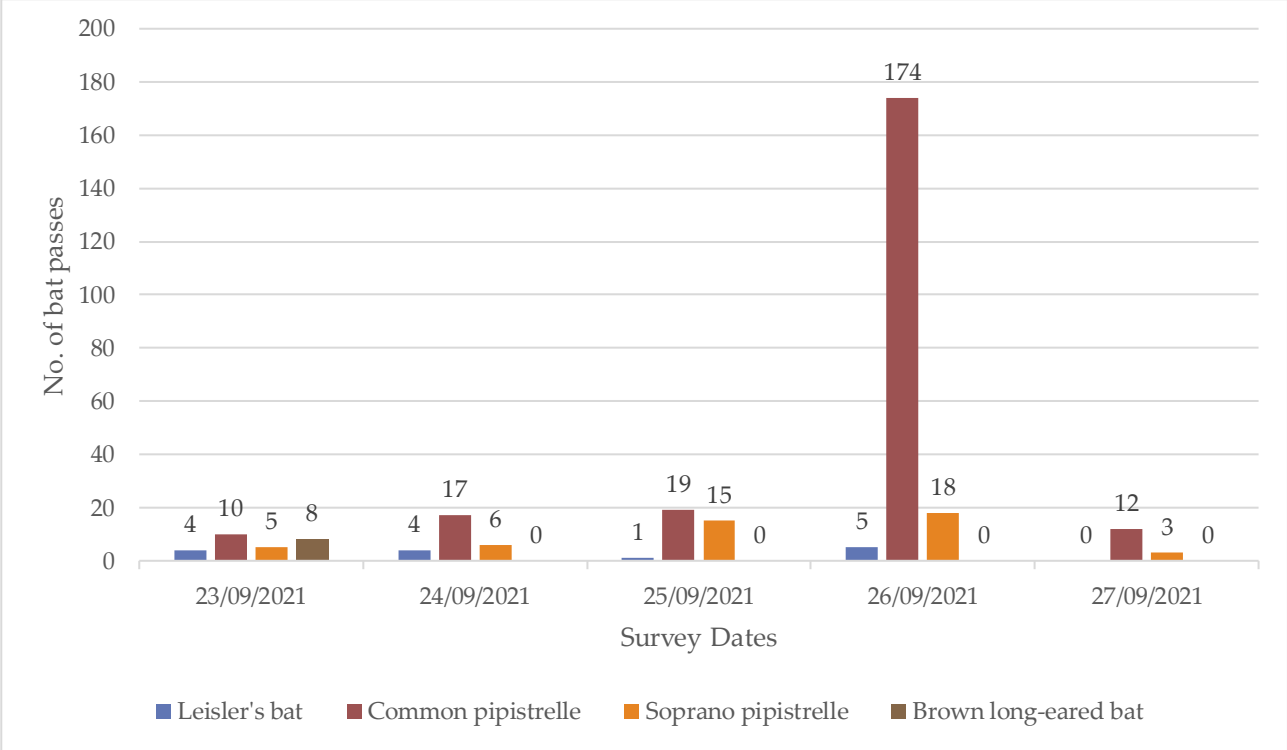


Figure 2: Number of bat passes recorded for each bat species recorded per night during the static surveillance.

3.3 Desktop Review

3.3.1 Bat Conservation Ireland Database

The bat records within a 1km radius of the proposed development on the BCIreland database. This dataset consists of 1x Roost, 13 x Transect and 5 Ad Hoc records. The number of records for each species is as follows:

Lesser horseshoe bat	0 records;
Common pipistrelle	9 records;
Soprano pipistrelle	10 records;
Pipistrellus species	1 records;
Leisler's bat	8 records;
Myotis species	2 records;
Daubenton's bat	15 records;
Natterer's bat	4 records;
Whiskered bat	2 records
Brown long-eared bat	3 records; and,
Nathusius' pipistrelle	1 record.

3.3.2 Bat Conservation Landscape Favourability

Figure 3 depicts the BCIreland Landscape Favourability Model (Lundy *et al.,* 2011). The county is divided into 5km squares and the darker the shading of the square, the higher favourability of the 5km square for bats. The 5km where the proposed development site is located has a Medium to High favourability for bat species, in general.

In relation to the four bat species recorded, the percentage favourability is as follows:

Common pipistrelle – 51% High

Soprano pipistrelle – 45% Medium to High

Leisler's bat – 51% High

Brown long-eared bat – 41% medium to High

Figure 3: Bat Landscape Favourability Model.

3.4 Survey Effort, Constraints & Survey Assessment

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

Table 12: Survey Effort, Constraints & Survey Assessment Results.

Category	Discussion
Timing of surveys	Outside the primary summer survey season to detect bat roosts.
Survey Type	Bat Survey Duties Completed (Indicated by red shading) Tree PBR Survey ■ Daytime Building Inspection ■ Static Detector Survey ■ Daytime Bridge Inspection ○ Dusk Bat Survey ■ Dawn Bat Survey ■ Walking Transect ○ Driving Transect ○ Trapping/Mist Netting ○ IR Camcorder filming ○ Endoscope Inspection ○ Other (Thermal Imagery) ■
Weather conditions	Appropriate for bat surveys.
Survey Constraints	Out of season survey.
Survey effort	The suitability of the building as providing a roosting site for bat is of Medium value. According to Collins (2016) this building would require a minimum of two surveys with one undertaken during the months of May to August. As the request for this survey was not made until mid-September, the latter requirement was not possible. As a consequence, a static surveillance survey was also undertaken to gather as much information as possible for the time frame of the survey.
Extent of survey area	Within the red line boundary of proposed development site.
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 completed the aims of the bat survey.

4. Bat Ecological Evaluation

4.1 Bat Species Recorded & Sensitivity

Four species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle and brown long-eared bat. The first three species are common bat species. The latter bat species was only recorded during static surveillance and was recorded in a low level of bat passes. This species of bat is less common but widespread.

The treeline and hedgerow boundaries are an active bat commuting and foraging linear features in an urban setting. Overall a Low to Medium level of bat activity was recorded for common pipistrelles while all other bat species were recorded in a Low level of bat activity.

The proposed development site is used as a foraging and commuting habitat for local bat populations. While the level of bat activity and the number of bat encounters do not indicate that the proposed development site is an important area for local bat populations, the treeline boundaries are commuting routes and foraging habitats.

There was no evidence of bats roosting in the structure but there are suitable sites within the exposed walls of the building.

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.,* 2021).
- The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.,* 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km.

Common pipistrelle

- Common pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national common pipistrelle population is considered to be significantly increasing trend (Aughney *et al.,* 2021).
- The modelled Core Area for common pipistrelle is a relatively large area that covers much of the island of Ireland (56,485km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.,* 2014).

Soprano pipistrelle

- Soprano pipistrelle is an Annex IV bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national soprano pipistrelle population is considered to be significantly increasing trend (Aughney *et al.,* 2021).
- The modelled Core Area for soprano pipistrelle is a relatively large area that covers much of the island of Ireland (62,020km^2). The Bat Conservation Ireland Irish

Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.,* 2014).

Brown long-eared bat

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

No Annex II bat species are known to occur in County Dublin (i.e. lesser horseshoe bat) and were not recorded within the survey.

5. Impact Assessment & Mitigation

Four species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle and brown long-eared bat.

The proposed development site is used as a foraging and commuting habitat for local bat populations. While the level of bat activity and the number of bat encounters do not indicate that the proposed development site is an important area for local bat populations, the treeline boundaries are commuting routes and foraging habitats.

There was no evidence of bats roosting in the structure but there are suitable sites within the exposed walls of the building. However the survey was undertaken outside the principal bat survey season and therefore mitigation measures are provided to address this. In addition, due to the fact that the proposed development will increase human usage of the site, additional bat mitigation measures are provided to reduce potential impact.

Impact assessment is that the proposed development will have a Permanent Slight negative impact on local bat populations. The implementation of the measures below will reduce this if undertaken as prescribed.

5.1 Bat Mitigation Measures

5.1.1 Re-Survey

It is recommended to re-survey the structure during the summer bat season to determine if the building is used as a roosting site. This should be a dusk survey during the months of May to August during mild weather conditions.

5.1.2 Lighting Plan

Bats are light sensitive bats 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).

- All luminaires used will lack UV/IR elements to reduce impact.
- LED luminaires will be used due to the fact that they are highly directional, lower intensity, good colour rendition and dimming capability.
- A warm white spectrum (<2700 Kelvins will be used to reduce the blue light component of the LED spectrum).
- Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Column heights should be carefully considered to minimise light spill. The shortest column height allowed should be used where possible.
- 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.

5.1.3 Tree Felling

In relation to trees proposed to be felled and identified as PBRs, the following is recommended:

i) 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).
   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.

5.1.4 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 recommended that a native hedgerow within individual trees (Alder, Birch, Crab apple, Rowan etc.) is planted along Boundary 1 and 2 linked in with the current landscaping measures. This additional planting will act as a buffer zone to ensure that there is dark zone along the specified boundaries.

5.1.5 Bat Conservation Measures

It is recommended that a bat box scheme should be erected within the landscaping plan for the proposed development. This is in the form of two rocket bat boxes to be erected within the boundary habitat.

Bat boxes scheme be sited carefully and this will be undertaken by a bat specialist. The rocket bat boxes are to be erected on a 5m pole fixed in $1m^3$ of 40 newton strength concrete (Please see appendices for details).

5.1.6 Monitoring

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

- Inspection of bat boxes within one year of erection of bat box scheme/rocket box. Register bat box scheme with Bat Conservation Ireland. This should be undertaken for a minimum of 2 years.

6. Survey Conclusions

Four species of bat was recorded within the survey area: Leisler's bat, soprano pipistrelle, common pipistrelle and brown long-eared bat.

The proposed development site is used as a foraging and commuting habitat for local bat populations. While the level of bat activity and the number of bat encounters do not indicate that the proposed development site is an important area for local bat populations, the treeline boundaries are commuting routes and foraging habitats.

There was no evidence of bats roosting in the structure but there are suitable sites within the exposed walls of the building. However the survey was undertaken outside the principal bat survey season and therefore mitigation measures are provided to address this. In addition, due to the fact that the proposed development will increase human usage of the site, additional bat mitigation measures are provided to reduce potential impact.

Impact assessment is that the proposed development will have a Permanent Slight negative impact on local bat populations. The implementation of the measures below will reduce this if undertaken as prescribed.

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8. Appendices

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 individuals 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	

Appendix 2 Light Treatments

Lighting, including street lights come in an array of different types. The Information Box provided below is taken from BCT, 2018 and provides an comprehensive summary of lighting types.

INFORMATION BOX – Type of Lights used in exterior lighting applications, (Taken directly from BCT, 2018)

Low-pressure sodium lamps (SOX) (orange lamps seen along roadsides). Light is emitted predominantly at one wavelength, contains no ultraviolet (UV) light, and has a low attraction to insects. The lamps tend to be large which makes it more difficult to focus the light from these lamps. These are in the gradual process of being removed or replaced, in part due to their poor colour rendition, and will not be available past 2019.

2. **High-pressure sodium lamps (SON)** (brighter pinkish-yellow lamps). Commonly used as road lighting. Light is emitted over a moderate band of long wavelengths giving little, if any, UV component, except for the version of the lamp used in horticulture. Insects are attracted to the brighter light. The lamp is of medium size and the light can be more easily directed than low pressure sodium. This lamp is still used for some main road lighting but this is being reduced; these lamps are expected to be phased out in the future.

3. **Mercury lamps (MBF)** (bluish-white lamps). These emit light over a moderate spectrum, including a larger component of UV light to which insects are particularly sensitive. Insects are attracted in large numbers along with high densities of certain tolerant bat species (Rydell & Racey 1993). They ceased to be available in the EU in 2015 and are rare now.

4. **White SON**. This is a reddish white light source. It is based on high pressure sodium technology and has the same UV component as SON. This source is no longer used and is not available now.

5. **Metal halide.** A small lamp and therefore more easy to focus light and make directional. Emits a small UV content. The light source is available in three forms a) quartz arc tube (HQI); b) ceramic arc tube (CDM-T) and c) CosmoPolis which is the newest of the ceramic forms. Still used by some for some exterior lighting applications.

6. **Light emitting diodes (LEDs)**. This is the light source of choice for most local authorities. The light emitted is more directional and normally controlled by lenses or sometimes reflectors. The light is produced in a narrow beam. It is an instant light source. LED is available in a number of colour temperatures. Older installations tend to use 'cool white' (blueish colour) at >5700° Kelvin. More recently, 4000°K has become more commonly used. 'Warm white' (more yellow/orange colour) at around 3000°K and as low as 2700°K can now be used with little reduction in lumen output. LED typically features no UV component and research indicates that while lower UV components attract fewer invertebrates, warmer colour temperatures with peak wavelengths greater than 550nm(~3000°K) cause less impacts on bats (Stone, 2012, 2015a, 2015b).

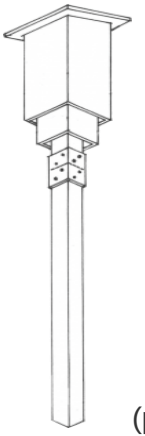
7. **Tungsten halogen**. Is not used in new lighting schemes but may be encountered as security light on a private household.

8. **Compact fluorescent.** Mostly in use in residential street lighting. It produces a white light; variants are available with minimal UV output. It can be used at a low wattage and therefore on a low output to achieve low levels of illuminance (measured in lux).

Appendix 3 Alternative Roosts

A) Alternative Bat Roosting (Tree Mitigation)

Habibat Double Chambered Rocket Box
Pole-mountable bat box to provide extensive roosting space



(please view on www.nhbs.com)

These can also be purchased as bespoke orders from EirEcology in Ireland.

9. Photograph Catalogue

Plate 1: External view of school building.

Plate 2: Internal view of school building.

10. Bat Species Profile

10.1 Leisler's bat

Ireland's population is deemed of international importance and the paucity of knowledge of roosting sites, makes this species vulnerable. However, it is considered to be widespread across the island. The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.,* 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km. In addition, of all Irish bat species, Leisler's bats have the most specific roosting requirements. It tends to select roosting habitat with areas of woodland and freshwater.

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

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

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

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

10.2 Common pipistrelle

This species is generally considered to be the most common bat species in Ireland. The species is widespread and is found in all provinces. The modelled Core Area for common pipistrelles is a large area that covers much of the island of Ireland (56,485km^2) which covers primarily the east and south east of the area (Roche *et al.,* 2014). The Bat Conservation Ireland Irish Landscape Model indicated that the Common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.,* 2014).

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

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

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

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

10.3 Soprano pipistrelle

This species is generally considered to be the second most common bat species in Ireland. The species is widespread and is found in all provinces, with particular concentration along the western seaboard. The modelled Core Area for soprano pipistrelle is a large area that covers much of the island of Ireland (62,020km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	0.54 to 1.2 million (2007-2012)
Estimate Core Area (km²) (Lundy *et al. 2011)*	62,020

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

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

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

10.4 Brown long-eared Bat

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

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2008-2013 Stable
Biographical Range	km²
Estimate Core Area (Lundy *et al. 2011)*	49,929 km²

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

Principal concerns for brown long-eared bats are poorly known in Ireland, but those that are relevant for this survey area are as follows:

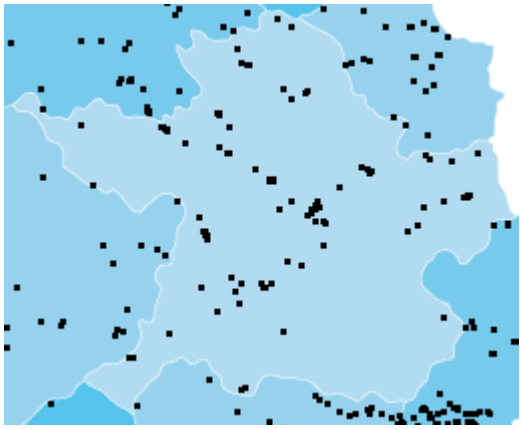
- Selection of maternity sites is limited to specific habitats;
- Lack of knowledge of winter roosts;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

10.5 Bat Conservation Ireland Bat Species Maps

Bat records for County Meath (Source: www.batconservationireland.org)

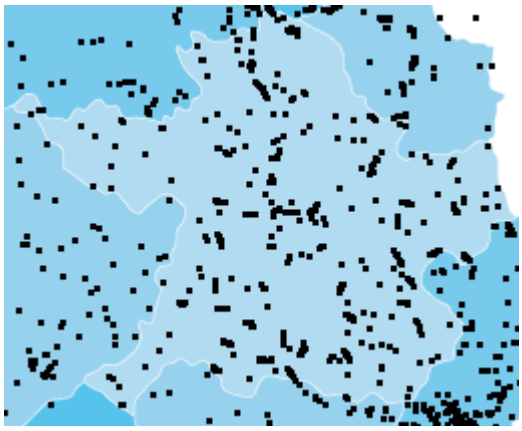
Whiskered bat

Natterer's bat

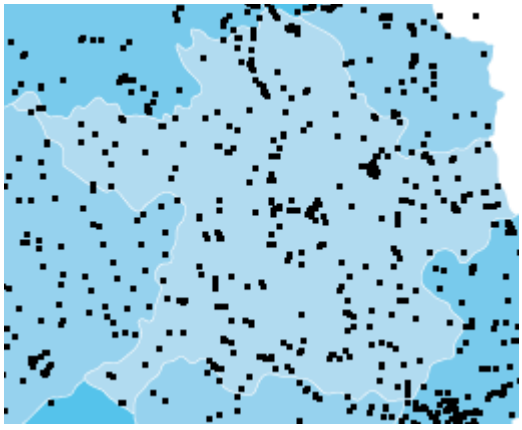


Daubenton's bat

Brown long-eared bat

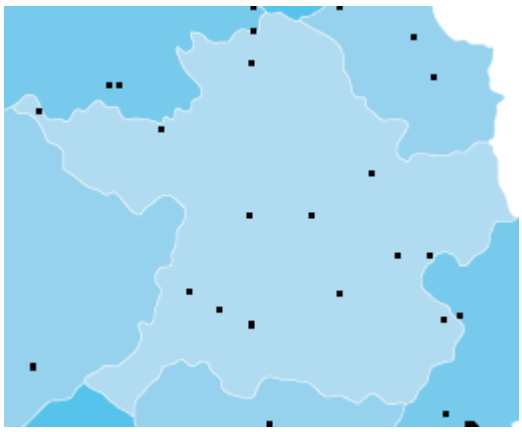


Common pipistrelle



Soprano pipistrelle

Leisler's bat



Nathusius' pipistrelle