

Bat Roost Survey and Assessment

St Catherine's Cemetery Extension

Kilcully

Co. Cork

Report prepared for Cork City Council

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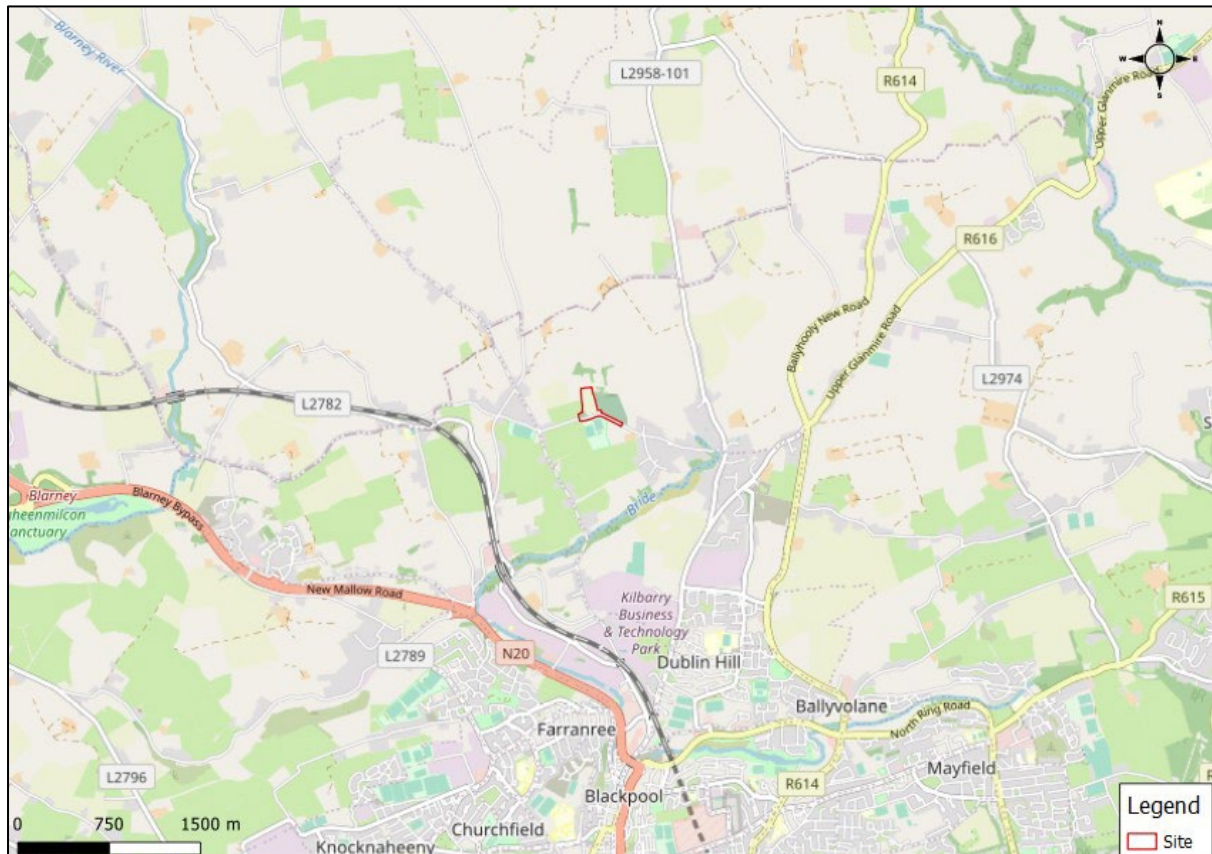
1 Introduction

This report has been prepared by Karen Banks, Greenleaf Ecology, at the request of Cork City Council. Planning consent is being sought for an extension to St Catherine's Cemetery, Kilcully, Co. Cork.

A protected species survey of the proposed site, comprising a bat survey, was undertaken to accompany the planning application.

The site is located in Kilcully, as illustrated in Figure 1.1.

Figure 1-1: Site Location Map



1.1 Description of the Permitted Project

The proposed project involves extending the existing St Catherine's cemetery burial ground located in the townland of Kilcully, north of Cork City. The proposed extension area is situated to the west of the existing cemetery in an agricultural grassland field and would connect the existing St Catherine's cemetery with the Old Kilcully church and its small surrounding burial grounds. It is proposed to develop the extension area to establish circa. 2199 new grave spaces, 880 burial ash plots and a natural burial ground area with associated works, while retaining much of the western natural field and old cemetery boundaries. The existing St Catherine cemetery car park is proposed to be extended to the west along the adjacent L-2962 local road, while retaining much of the natural road field boundary. This would result in an additional 47 cemetery car parking spaces, 6 disabled car parking spaces, a new pedestrian access to the Old Kilcully church grounds and the closing-up of accesses to the L-2962 local road from both an existing car park entrance and a field gate entrance. The proposed extension area comprises of 2.5 Hectares.

The works will include the demolition of the existing dwelling house and boundary walls.

1.2 Legislative Context

All Irish bats are protected under the Wildlife Acts. Also, the EU Habitats Directive, and Irish implementing legislation, seeks to protect rare species, including bats, and their habitats, and requires that appropriate monitoring of populations be undertaken. Moreover, the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982) exists to conserve all bat species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) protects migrant bat species across all European boundaries. Ireland has ratified both these conventions.

All bats are listed in Annex IV to the Habitats Directive (92/43/EC) and the Lesser Horseshoe bat is further listed under Annex II to the same Directive.

Destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence has to be obtained from the National Parks and Wildlife Service (NPWS) 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, (which transposed the EU Habitats Directive into Irish law) issued by the NPWS. 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*".

1.3 Objectives

The objectives of the bat survey were to: -

- Establish the location of any actual or potential bat roosts at the proposed site;
- Establish the value of the proposed site to bats for foraging and commuting;
- Assess the results of the survey and determine the potential impact of the proposed development on any bats that might use the site;
- Provide recommendations for the project design in light of the survey results as appropriate; and
- Provide recommendations for mitigation measures.

2 Methodology

2.1 Desk Study

A pre-survey data search was conducted in order to collate existing information from the footprint of the site and its surrounding area on bat activity, roosts and landscape features that may be used by bats. The data search comprised the following information sources:

- Collation of known bat records from the National Bat Database held by the National Biodiversity Data Centre (www.biodiversityireland.ie); and
- Review of Ordnance Survey mapping and aerial photography of the site and its environs.

2.2 Field Survey

This bat survey and assessment was undertaken in accordance with the following guidelines:-

- Bat Conservation Ireland, (2010). Guidance notes for Planners, Engineers, Architects, and Developers;
- Collins, J. (ed.) (2016). Bat Surveys for Professional ecologists: Good Practice Guidelines (3rd ed.). The Bat Conservation Trust, London;
- 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; and
- NRA (2006). Guidelines for the Treatment of Bats During the Construction of National Road Schemes.

2.3 Surveyor Information

The survey was undertaken by Karen Banks, MCIEEM.

Karen is an ecologist with 16 years’ experience in the field of ecological assessment. Karen is an experienced and skilled bat surveyor, first gaining a scientific licence to disturb bats from Natural England, UK in 2008. Karen is trained in bat handling and capture methods and currently holds a bat disturbance licence granted by the NPWS. Karen has undertaken bat survey and assessment for numerous projects, including bridge repair and replacement works, domestic dwelling repair and demolition works, wind farm developments and large-scale infrastructure projects such as flood relief schemes, road developments and pipeline schemes.

2.4 Bat Roost Survey

2.4.1 Preliminary Ecological Appraisal

A walkover survey of areas within the proposed site identified as potential roosting, foraging and commuting habitats during the desk top study were undertaken in September 2022 (site boundary illustrated in (Figure 2-1). Potential bat habitat was assessed using the criteria outlined in Table 2-1¹.

Table 2-1: Criteria for Assessing the Potential Suitability of the Proposed Development Site for Bats

Suitability	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	Habitat that could be used by small numbers of commuting bats such as gappy hedgerow or un-vegetated stream, but isolated, i.e. not very

¹ Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

	space, shelter, protection, appropriate conditions 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). 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.	well connected to the surrounding landscape by another 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 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 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.

2.4.2 Bat Roost Inspection Survey

Trees

A detailed inspection of the exterior of trees present at the site was undertaken on 13th September 2022 to look for features that bats could use for roosting (Potential Roost Features, or PRFs) from ground level. The aim of the survey was to determine the actual or potential presence of bats and the need for further survey and/or mitigation.

A detailed inspection of each potential tree roost within the site was undertaken. The inspection was carried out in daylight hours from ground level, and information was compiled on the tree, PRFs and evidence of bats. All trees surveyed were numbered and marked on a map and a description of each PRF observed was recorded. PRFs that may be used by bats include:

- Rot holes;
- Hazard beams;
- Other horizontal or vertical cracks or splits (e.g. frost cracks) in stems or branches;
- Lifting bark;
- Knotholes arising from naturally shed branches or branches previously pruned back to the branch collar;
- Man-made holes (e.g. flush cuts) or cavities created by branches tearing out from parent stems;
- Cankers in which cavities have developed;
- Other hollows or cavities;

- Double leaders forming compression forks with included bark and potential cavities;
- Gaps between overlapping stems or branches;
- Partially detached ivy with stem diameters in excess of 50mm; and
- Bat or bird boxes.

Signs of a bat roost (excluding the actual presence of bats), include:

- Bat droppings in, around or below a PRF;
- Odour emanating from a PRF;
- Audible squeaking at dusk or in warm weather; and
- Staining below the PRF.

It should be noted that bats or bat droppings are the only conclusive evidence of a roost and many roosts have no external signs. During this survey, PRFs were surveyed by a bat ecologist from ground level to ascertain their potential to support roosting bats. Trees were categorised according to the highest suitability PRF present.

Structures

On 13th September 2022 the existing building at the site was surveyed for potential roost sites and signs of bats. The survey utilised a high-powered torch, close focussing binoculars and an endoscope (Explorer Premium 8803 with 9mm camera) where required. The external inspection involved looking for bat droppings on the ground, stuck to walls, windowsills or in crevices in the stonework and recording suitable entry and exit points.

The building was not accessed for an internal inspection.

2.4.3 Bat Activity Survey

Bat activity surveys were conducted within the proposed site using an Anabat Walkabout detector, which records bat echolocation calls directly on to an internal SD memory card. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded. Data were then downloaded and all recordings were analysed using the Anabat Insight spectrogram sound analysis software Version 2.0.1. Dusk activity surveys (from sunset, for a minimum of 90 minutes) were conducted. These surveys enable a determination of the approximate numbers and species of bats present within the site, areas used for foraging and commuting routes to and from roosts. The approximate flying height and direction taken by bats were estimated and detailed where possible.

Assessment of bat activity was undertaken in September 2022. One dusk activity survey was undertaken on 19th September 2022. The weather at dusk was 14°C, Beaufort Force 2 with no rain.

In order to supplement the information gathered from the manual activity surveys, a passive monitoring system of bat detection was also deployed for this survey scheme (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 later analysis). This results in a far greater sampling effort over a shorter period of time. Bats are identified by their ultrasonic calls. The passive detectors record bat ultrasonic calls on a continuous basis and store the information onto an internal SD card. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded.

Passive monitoring was completed in September 2022 using Anabat Swift bat monitors. The passive monitoring survey was undertaken in accordance with *Bat Surveys for Professional ecologists: Good Practice Guidelines* (Collins, J. (2016)). Two monitors were deployed for the survey and were positioned in hedgerows at the south and west of the site (illustrated in Figure 2-1). The detectors

were set to record from approximately 30 minutes before sunset until sunrise and recorded for 6 nights at both locations. Data were then downloaded and bat echolocation calls were later analysed by the Anabat Insight software analysis programme version 2.0.1. Each time-stamped file was analysed and the species of bat recorded was noted as a bat pass.



Figure 2-1: St Catherine's Cemetery Extension- location of passive monitors

2.4.4 Emergence Roost Survey

A dusk survey of the building was undertaken by two people (Ms Karen Banks and Mr Cathal MacPartholan) on 19th September 2022 in order to watch and listen for bats exiting bat roosts to determine the presence or absence of bats at the time of survey. The dusk emergence survey commenced approximately 15 minutes before sunset and ended approximately 90 minutes after sunset and was undertaken in conjunction with the activity survey.

3 Results

3.1 Existing Bat Data

The review of existing records of bat species in the area of the site indicates that four of the ten known Irish species of bat have been recorded within a 4km radius of the proposed site, namely pipistrelle, soprano pipistrelle, Leisler’s and brown long-eared bat as shown in Table 3-1 below. There are no existing records of roosting bats from the proposed site and its environs.

Table 3-1: NBDC and NPWS bat records within a 4km radius of the proposed site

Common Name	Scientific Name	Present (Y/N)	Date of Last Record	Location of Known Roost (to 1km OS Grid Square Resolution)
Pipistrelle spp.	<i>Pipistrellus pipistrellus sensu lato</i>	Y	21/05/2016	None
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	Y	21/05/2016	None
Nathusius’s Pipistrelle	<i>Pipistrellus nathusii</i>	N	N/A	N/A
Leisler’s Bat	<i>Nyctalus leisleri</i>	Y	21/05/2016	None
Brown Long-eared Bat	<i>Plecotus auritus</i>	Y	21/05/2016	None
Daubenton’s Bat	<i>Myotis daubentonii</i>	N	N/A	N/A
Whiskered Bat	<i>Myotis mystacinus</i>	N	N/A	N/A
Natterer’s Bat	<i>Myotis nattereri</i>	N	N/A	N/A
Lesser Horseshoe Bat	<i>Rhinolophus hipposideros</i>	N	N/A	N/A
Brandt’s Bat	<i>Myotis brandtii</i>	N	N/A	N/A

The bat landscape association model (Lundy *et al*, 2011) suggests that the site is part of a landscape that is of moderate to high suitability for soprano pipistrelle, common pipistrelle, brown long-eared, Leisler’s, whiskered bat, Daubenton’s and natterer’s bat; and low suitability for Nathusius’ pipistrelle. The proposed site is outside of the core distribution range for lesser horseshoe bat (Roche *et al*, 2014).

3.2 Bat Roost Survey

3.2.1 Preliminary Ecological Appraisal

The proposed site comprises a field of improved agricultural grassland (Fossitt code GA1) bound by hedgerows (WL1) and walls. A disused house and car park (BL3) are located to the south-east of the site.

The immediate environs of the proposed site comprise the existing St Catherine’s Cemetery to the east, old St Catherine’s cemetery to the south-west and Saint Mary’s AFC to the south. Agricultural grassland bound by hedgerows and treelines and small pockets of woodland and scrub are present in the wider landscape.

There are no watercourses within the proposed site. The River Bride is located c.0.5km to the east of the site.

The site supports connectivity to the wider landscape via hedgerows/ treelines and small areas of woodland to the north and east of the site. In accordance with the criteria outlined in Table 2-1, the commuting and foraging habitats over the site are of moderate suitability for bats.

3.2.2 Bat Roost Inspection Survey

Trees

The field of agricultural grassland is bound by hedgerows comprising Willow (*Salix cinerea*), Hawthorn (*Crataegus monogyna*), Beech (*Fagus sylvatica*), Sycamore (*Acer pseudoplatanus*) and Crab Apple (*Malus sylvestris*). No features of potential as roosting or resting places for bats were recorded within the vegetation present within the proposed site.

Dwelling

The building is a two-storey disused dwelling with rendered walls, PVC soffits and a tile roof (Plate 3-1). A flat roof extension is present to the rear (north) of the dwelling (Plate 3-2).

Plate 3-1: Dwelling at the proposed site at Kilcully, Co. Cork.



Plate 3-2: Extension to rear of the dwelling



Potential access points to the dwelling for bats included raised chimney flashing, a raised roof tile on the north-western corner, a gap in the ridge tiles and a gap at the edge of the barge board on the western elevation; and a raised edge to the flat roof material at the rear of the building.

Plate 3-3: Potential access points via raised chimney flashing and a gap in the barge board on the western elevation



There is potential for bats to roost within the roof space, the soffits and under the flat roof material on the dwelling extension. However, no evidence of bats (e.g. actual sightings, droppings, feeding remains, scratch marks, urine stains) was observed during the external inspection of the building.

3.3 Bat Activity Survey

Six bat species were recorded during passive monitoring undertaken over 6 nights in September 2022. The most frequently recorded species was common pipistrelle, followed by soprano pipistrelle then Leisler's bat. Leisler's bat was recorded early in the evening (at sunset) on PM 2 to the south of the site. Whiskered bat and *Myotis* species of bat (unidentifiable to species level) were recorded commuting and foraging in low numbers on both monitors and natterer's bat was recorded on one occasion on PM1 at the south-west of the site. Brown long-eared bat call was also recorded in low numbers on PM2 (Table 3-3).

The calls recorded on the passive monitors are summarised in Table 3-3. The location of the passive detectors is illustrated in Figure 2-1.

Table 3-2: St Catherine’s Cemetery Extension- summary table of total bat passes recorded on the passive monitors, September 2022.

Species	PM1	PM2	Total
Common Pipistrelle	2,855 (59%)	1,181 (65%)	4,036
Soprano Pipistrelle	1,896 (39%)	349 (19%)	2,245
Pipistrelle species ²	0	12 (1%)	12
Leisler's	69 (1%)	249 (14%)	318
Brown Long-eared	0	7 (0%)	7
Natterer’s	1 (0%)	0	1
Whiskered	7 (0%)	1 (0%)	8
Myotis Species	5 (0%)	12 (1%)	17
Total	4,833(100%)	1,811 (100%)	6,644

No emergent bats or bat roosts were identified during the emergence roost survey of the building.

The bat activity survey undertaken in September 2022 recorded a relatively low amount of activity from three species of bat within the proposed site. These species were common pipistrelle, soprano pipistrelle and Leisler’s bat.

Leisler’s bat was recorded from 18 minutes after sunset commuting overhead and foraging along the site boundary. Common pipistrelle was recorded from 21 minutes after sunset foraging along the hedgerows at the site boundary, with the highest level of activity recorded to the south-west of the site adjacent to old St Catherine’s cemetery. Soprano pipistrelle was also recorded in relatively low numbers foraging at the site boundary.

² *Pipistrellus* spp. which have frequency of maximum energy, FMAXE, of c. 50kHz which cannot reliably be assigned to Common Pipistrelle (typical FMAXE of c. 45kHz) or Soprano Pipistrelle (FMAXE c. 55kHz)

4 Evaluation of Survey Results

A review of existing bat records from within a 4km radius of the proposed site indicates that four of the ten known Irish bat species had been observed. These include pipistrelle species, soprano pipistrelle, Leisler's and brown long-eared bat. There are no existing records of roosting bats from the proposed site and its environs.

Habitats within the proposed site that are of potential use by foraging and commuting bats include linear features such as hedgerows and treelines, which provide connectivity between the site and other foraging areas in the wider landscape. Overall, the study area is considered to be of moderate suitability for foraging and commuting bats due to the presence of connectivity to other suitable habitats in the wider landscape. Roosting opportunities at the site include the disused house at the south-east of the site; no potential roosting features were recorded within the vegetation at the proposed site.

Results from the bat surveys undertaken in September 2022 indicate that six species of bat, namely soprano pipistrelle, common pipistrelle, Leisler's bat, brown long-eared and whiskered bat regularly commute to the site to forage; natterer's bat was also recorded on one occasion. The level of activity and diversity of species recorded within the proposed site was moderate. Leisler's bat and common pipistrelle were recorded early in the evening and it is likely these species roost in the vicinity of the site. No bats were recorded emerging from the disused house at the south-east of the site.

In relation to the foraging and commuting bat species recorded at the site, the bat populations are considered to be of Local Interest (Higher Value) (in accordance with NRA, 2009).

The status of Irish bat species (Marnell *et al.*, 2019) is summarised in Table 4-1. The bat species recorded at the site are all of Least Concern.

The conservation status of all the bats recorded at the site is Favourable (NPWS, 2019).

Table 4-1: Status of 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
Sopranopipistrelle (<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	Near threatened	Least Concern
Possible Vagrants			
Brandt’s bat (<i>Myotis brandtii</i>)	Not Assessed	Least Concern	Least Concern
Greater horseshoe bat (<i>Rhinolophus ferrumequinum</i>)	Not Assessed	Near threatened	Least Concern

5 Potential Impacts

5.1 Construction Phase

This section details the principal potential impacts of the proposed cemetery extension during the construction phase, in the absence of mitigation.

5.1.1 Loss of Roosting Habitat

It is proposed to demolish the existing disused dwelling at the proposed site. The building supports potential roosting sites in features including the roof void and soffits, however there was no evidence of this, and no bats were recorded emerging from the building. No potential roosting features were recorded within vegetation present at the site, therefore there will be no significant adverse effects on bats as a result of loss of roosting habitat during the construction phase.

5.1.2 Loss of Foraging and Commuting Habitat

The results of the bat activity survey undertaken for the proposed development indicate that the site supports six species of foraging and commuting bat (soprano pipistrelle, common pipistrelle, Leisler's, natterer's, whiskered and brown long-eared bat).

The proposed clearance works will result in the removal of garden hedging and c.4m hedgerow at the west of the site for an access path to the old cemetery. These habitats provide foraging and commuting habitat for bats. As noted, no potential roosting features were recorded within the trees at the proposed site. The alteration and removal of this habitat would have a significant adverse impact to bat species (at a local geographic scale). This impact is mitigated by the proposed landscaping design (see Section 6) and the abundance of similar habitat beyond the proposed site, therefore, this project will have a slight temporary adverse impact to local bat species due to permanent local habitat loss of small sections of hedgerow onsite.

5.1.3 Lighting

Studies have found that Leisler's bat and pipistrelle bats can congregate around white mercury street lights and white metal halide lamps feeding on the insects attracted to the light. However, lighting can cause avoidance of an area for commuting bats and can prevent or reduce foraging for some species, including *Myotis* species³. Further, even bat species that have been shown to opportunistically forage in lit conditions have subsequently been recorded being impacted by artificial lighting. In cities, for example, common pipistrelles have been recorded avoiding gaps that are well lit, thereby creating a barrier effect⁴. Temporary lighting required during the construction phase may cause disturbance to bats commuting through or feeding at the proposed site. In the absence of mitigation, disturbance of bats due to construction phase lighting would have a temporary to short-term significant adverse impact at the local geographic scale.

5.2 Operational Phase

This section details the principle potential impacts of the proposed cemetery extension during the operational phase, in the absence of mitigation.

5.2.1 Lighting

No new lighting is proposed during the operational phase. Therefore, the proposed development will not result in an increase in light levels within the proposed site. No adverse effects on bats will occur due to light pollution during the operational phase of the development.

³ Stone E.L. (2013) Bats and Lighting: Overview of current evidence and mitigation.

⁴ Bat Conservation Trust and Institute of Lighting Professionals (2018) Guidance Note 08/18: Bats and artificial lighting in the UK. ILP, Rugby

6 Mitigation

6.1 Construction Phase

6.1.1 Loss of Foraging and Commuting Habitat

Loss of commuting and foraging habitat at the site will be mitigated by the landscaping proposals, which include retention of hedgerows and treelines on-site, which will be protected from any accidental damage during construction through use of measures such as fencing. Protective fencing barriers will be installed as outlined in Section 6.2, Barriers and Ground Protection, of BS 5837. Measures will be taken to ensure that trees and hedges being retained are incorporated into the development without being impacted upon. Protective fencing will be provided around trees and hedge vegetation being retained and this will enclose their Root Protection Areas (RPAs). The fencing will be at least 2.3m.

To mitigate for the loss of hedgerow, the landscaping proposals include the planting of a hedgerow, comprising native species from Irish stock, on the northern boundary of the car park and tree planting on the western and northern site boundary.

The planting schemes ensure connectivity to linear/ woodland habitats in the wider landscape.

6.1.2 Lighting

To minimise disturbance to bats and other fauna that are active at night, construction operations during the hours of darkness will be kept to a minimum. In circumstances where, during the bat activity period (April to September), daylight hours stretch beyond the likely permitted hours of operation on site, there will be no requirement for lighting to be used on the site during this period.

6.2 Operational Phase

No significant adverse effects on bats will occur during the operational phase, therefore no specific mitigation measures are required.

6.3 Enhancement

The following recommendations for enhancement are adapted from *Landscape and Urban Design for Bats and Biodiversity* (BCT, 2012). To attract nocturnal flying insects, the following planting shall be implemented:

- Mixtures of flowering plants, trees (including fruit trees) and shrubs to encourage a diversity of insects to sustain bats and other wildlife throughout the year. All new planting shall include pollinator friendly tree species including locally appropriate species listed in the Pollinator Friendly Planting Code⁵. Replacement and new hedgerows shall include a range of different species to provide food throughout the year, for example willows and blackthorn for early season nectar; hawthorn, bramble and rose for summer flowers and autumn berries; ivy for autumn nectar and later winter berries;
- Flowers that vary in colour, fragrance, shape, amount of nectar and time of flowering;
- Pale flowers that are more easily seen in poor light, so attracting insects at dusk;
- Single flowers, which tend to produce more nectar than double varieties; and
- Flowers with insect-friendly landing platforms and short florets, like those in the daisy or carrot families.

⁵ National Biodiversity Data Centre (2021) Pollinator Friendly Planting Code. All-Ireland Pollinator Plan 2021-2025. www.biodiversityireland.ie/pollinator-plan.

7 Residual Impacts

With the effective implementation of the mitigation measures outlined in Section 6, such as landscaping and the avoidance of use of lights during the construction phase during the months of April to September, as well as the minimisation of artificial light spill during the operational phase of the development, there will not be any significant negative effects on the conservation status of bat species from the proposed St Catherine's Cemetery Extension.

8 References

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A: Description of Irish Bat Species

Ireland has ten known bat species from two distinct families. Each is briefly described below. For a more comprehensive overview see Roche *et al* (2014). The conservation status of each species is derived from NPWS (2019).

Vespertilionidae:

Common pipistrelle (*Pipistrellus pipistrellus*)

This species was only recently separated from its sibling, the soprano or brown pipistrelle *P. pygmaeus*, which is detailed below (Barratt et al, 1997). The common pipistrelle's echolocation calls peak at 45 kHz. The species forages along linear landscape features such as hedgerows and treelines as well as within woodland. The conservation status of this species is Favourable.

Soprano pipistrelle (*Pipistrellus pygmaeus*)

The soprano pipistrelle's echolocation calls peak at 55 kHz, which distinguishes it readily from the common pipistrelle on detector. The pipistrelles are the smallest and most often seen of our bats, flying at head height and taking small prey such as midges and small moths. Summer roost sites are usually in buildings but tree holes and heavy ivy are also used. Roost numbers can exceed 1,500 animals in mid-summer. The conservation status of this species is Favourable.

Nathusius' pipistrelle (*Pipistrellus nathusii*)

Nathusius' pipistrelle is a recent addition to the Irish fauna and has mainly been recorded from the north-east of the island in Counties Antrim and Down (Richardson, 2000) and also in Fermanagh, Longford and Cavan. It has also been recorded in Counties Cork and Kerry (Kelleher, 2005). However, the known resident population is enhanced in the autumn months by an influx of animals from Scandinavian countries. The conservation status of this species is Favourable.

Leisler's bat (*Nyctalus leisleri*)

This species is Ireland's largest bat, with a wingspan of up to 320mm; it is also the third most common bat, preferring to roost in buildings, although it is sometimes found in trees and bat boxes. It is the earliest bat to emerge in the evening, flying fast and high with occasional steep dives to ground level, feeding on moths, caddis-flies and beetles. The echolocation calls are sometimes audible to the human ear being around 15 kHz at their lowest. The audible chatter from their roost on hot summer days is sometimes an aid to location. The conservation status of this species is Favourable.

Brown long-eared bat (*Plecotus auritus*)

This species of bat is a 'gleaner', hunting amongst the foliage of trees and shrubs, and hovering briefly to pick a moth or spider off a leaf, which it then takes to a sheltered perch to consume. They often land on the ground to capture their prey. Using its nose to emit its echolocation, the long-eared bat 'whispers' its calls so that the insects, upon which it preys, cannot hear its approach (and hence, it needs oversize ears to hear the returning echoes). As this is a whispering species, it is extremely difficult to monitor in the field as it is seldom heard on a bat detector. Furthermore, keeping within the foliage, as it does, it is easily overlooked. It prefers to roost in old buildings. The conservation status of this species is Favourable.

Natterer's bat (*Myotis nattereri*)

This species has a slow to medium flight, usually over trees but sometimes over water. It usually follows hedges and treelines to its feeding sites, consuming flies, moths, caddis-flies and spiders. Known roosts are usually in old stone buildings but they have been found in trees and bat boxes. The Natterer's bat is one of our least studied species and further work is required to establish its status in Ireland. The conservation status of this species is Favourable.

Daubenton's bat (*Myotis daubentonii*)

This bat species prefers feeding close to the surface of smooth water, either over rivers, canals, ponds, lakes or reservoirs but it can also be found foraging in woodlands. Flying at 15 kilometres per hour, it gaffs insects with its over-sized feet as they emerge from the surface of the water - feeding on caddis flies, moths, mosquitoes, midges etc. It is often found roosting beneath bridges or in tunnels and also makes use of hollows in trees. The conservation status of this species is Favourable.

Whiskered bat (*Myotis mystacinus*)

This species, although widely distributed, has been rarely recorded in Ireland. It is often found in woodland, frequently near water. Flying high, near the canopy, it maintains a steady beat and sometimes glides as it hunts. It also gleans spiders from the foliage of trees. Whiskered bats prefer to roost in buildings, under slates, lead flashing or exposed beneath the ridge beam within attics. However, they also use cracks and holes in trees and sometimes bat boxes. The conservation status of this species is Favourable.

Brandt's bat (*Myotis brandtii*)

According to NPWS (2013), whiskered and Brandt's bats are cryptic species and can only be told apart using DNA techniques. Brandt's bat has been confirmed only once from Ireland; a single specimen found in 2003 in Wicklow (Mullen, 2006). Following this discovery, an intensive re-survey, involving DNA testing, was undertaken of all known whiskered bat roosts in Ireland, by the Centre for Irish Bat Research. Woodland mist-netting was also conducted for the species. Despite the extensive survey-work, no further Brandt's bats were identified. The most recent Red Data List for Irish Mammals (Marnell *et al.* 2009) lists Brandt's bat as data deficient. There is no evidence of any roosts for this species in the country and at present the single record for the species is considered an anomaly. Boston *et al* (2010) concluded that "M. brandtii cannot currently be considered a resident species. This species is now considered a vagrant to the country and consequently, a detailed assessment has not been carried out.

Rhinolophidae:

Lesser horseshoe bat (*Rhinolophus hipposideros*)

This species is the only representative of the Rhinolophidae or horseshoe bat family in Ireland. It differs from our other species in both habits and looks, having a unique nose leaf with which it projects its echolocation calls. It is also quite small and, at rest, wraps its wings around its body. Lesser horseshoe bats feed close to the ground, gleaning their prey from branches and stones. It often carries its prey to a perch to consume, leaving the remains beneath as an indication of its presence. The echolocation call of this species is of constant frequency and, on a heterodyne bat detector, sounds like a melodious warble. The species is confined to six counties along the Atlantic seaboard: Mayo, Galway, Clare, Limerick, Kerry and Cork. The current Irish national population is estimated at 12,500 animals. This species is listed on Annex II of the EC Habitats Directive and 41 Special Areas of

Conservation have been designated in Ireland for its protection. Where it occurs, it is often found roosting within farm buildings. The conservation status of this species is Inadequate.