Comhairle Cathrach & Contae Luimnigh

Limerick City & County Council

Limerick City Greenway (UL to Annacotty), Co. Limerick

Bat Activity Survey 2024

RYAN HANLEY

1 Galway Business Park, Upper Newcastle Road, Dangan, Galway H91A3EF
Floor 5 Jervis House, Jervis Street, Dublin 1, D01 E3W9
Unit 1203, Building 1000, Gateway Business Park, New Mallow Road, Cork T23 HDW9
Innovation House, Monneen Road, Castlebar, Co. Mayo, F23E400

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Table of Contents

1 INTRODUCTION

Ryan Hanley has been commissioned by Limerick City and County Council (LCCC) to undertake a Bat Activity Survey along the route of the proposed Limerick City Greenway (University of Limerick (UL) to Annacotty). The site had previously been surveyed by O'Donnell Environmental in 2021, but in this timeframe the scope of works has changed, with proposed routes being altered, necessitating the requirement to resurvey.

1.1 Aims & Objectives

The aims of the study were to determine the following:

- The areas and habitats within the zone of influence of the proposed works which are being used by bats (including commuting routes and foraging areas), focusing on the new route locations;
- The diversity and relative abundance of bats present; and
- Comparison of results with the data collected by O'Donnell Environmental in 2021.

Figure 1.1 shows the proposed cycle route, along with the zone of influence determined to be 50m. The proposed development adjoins the River Shannon.

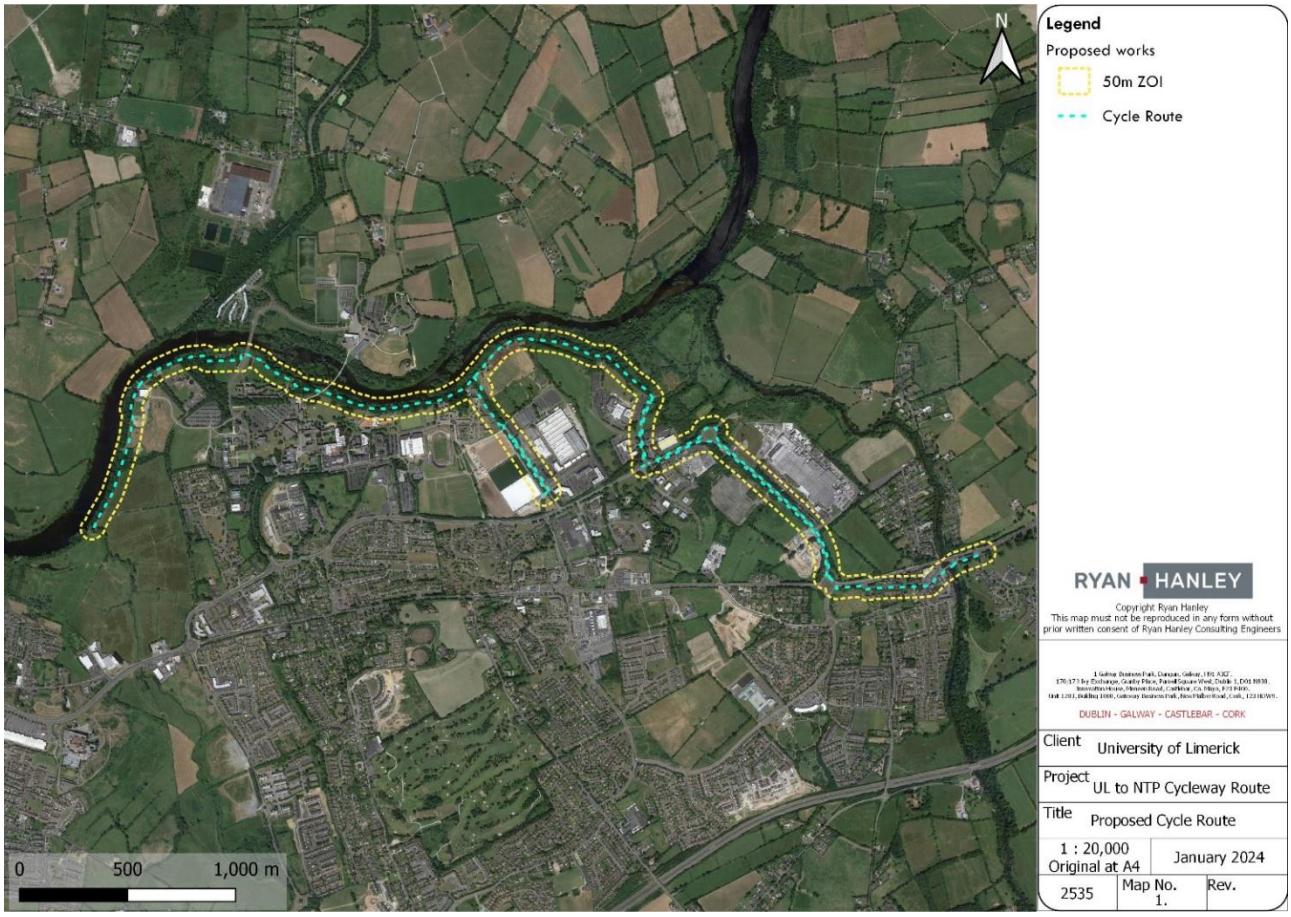

Figure 1.1: Aerial Imagery Showing Proposed Cycle Route for Bat Activity Survey

1.2 Legislative Context

All bat species occurring in Ireland are protected under both European and National legislation. All species are European Protected Species, listed on Annex IV of the EU Habitats Directive (92/43/EEC), transposed into Irish law under the European Communities (Birds and Natural Habitats) Regulations 2011. Lesser Horseshoe Bat (*Rhinolophus hipposideros*) are afforded special protection as an Annex II listed species. At national level, all bat species are protected under the Wildlife Acts (1976 and 2000), as amended.

1.3 Conservation Status

A total of nine species of bats are resident in Ireland. The overall conservation status of each of these species, as assigned by the NPWS (2019) is as follows:

- Lesser Horseshoe Bat is inadequate and deteriorating - although population in Ireland appears to be increasing steadily;
- Common Pipistrelle is favourable and improving;
- Soprano Pipistrelle is favourable and improving;
- Nathusius Pipistrelle is unknown;
- Natterer's Bat is favourable and stable;
- Daubenton's Bat is favourable and improving;
- Whiskered Bat is favourable and stable;
- Brown long-eared bat is favourable and improving; and
- Leisler's bat is favourable and improving.

1.4 Proposed Development

Limerick City and County Council (LCCC) intend to develop a 5.5km long greenway from the River Groody Bridge, along the River Shannon, through Annacotty, and terminate at Cappamore junction. The proposed works will involve the construction of 3.1km of haul roads, six construction compound sites, six new bridges, public lighting, and clearance of trees and shrubs.

Elements of the proposed works which have potential to impact on bats include the following:

- Loss of trees and disturbance to man-made structures with potential for bat roosting;
- Loss of potential foraging or commuting habitat for bats; and
- Disturbance from artificial lighting and noise within the proposed works area.

To facilitate the construction of the 5.5km cycle pathway, the removal of some vegetation, deadwood and the felling of 85 trees will be required, while the existing path is to be widened, requiring the pruning or removal of trees at sections. Bats and their roosts are protected by law, under the Wildlife

Act 1976 (as amended), as such it is an offence to disturb, injure or kill bats or disturb or destroy bat roosts.

2 METHODOLOGY

2.1 Desk Study

A search for records of bat species held by the National Biodiversity Data Centre (NBDC) website for 10km hectad R65 (10km grid square study site is located within) was completed on January 5th 2024 and updated on the 23rd of July 2024. The bat landscapes suitability index hosted on the NBDC website, https://maps.biodiversityireland.ie/Map for the project site and surrounding area was also reviewed. A review of previous bat surveys completed for this project was also conducted.

2.2 Bat Activity Survey

Bat activity was surveyed by completing nighttime bat walkover (transect) surveys and by deployment of passive detectors (automated/static surveys). Guidelines for planning and conducting bat activity surveys were followed as per the Bat Conservation Trust, "Bat Surveys for Professional Ecologists, Good Practice Guidelines" (Collins, 2023).

2.2.1 Nighttime bat walkover (Transect Surveys)

Walked dusk transects were undertaken on the 19th of June and 10th of July 2024 by Ryan Hanley Ecologists Aoife Fogarty and Breda Quinn. The surveys were carried out in suitable weather conditions (minimum 10°C, light wind and no precipitation). Surveys were carried out using a Full Spectrum Anabat Scout recorder and a Magenta 5 heterodyne recorder. Devices were swapped on the second survey occasion to ensure each transect was assessed at least once with the Anabat Scout.

The aim of the nighttime bat walkovers was to investigate bat activity in the zone of influence of the proposed works in the new route locations and to detect any bats which may be emerging from roosts at dusk. While a daytime visual inspection may detect signs of any large aggregations of roosting bats, smaller numbers of bats or bats roosting in discrete locations may not be apparent during daytime visual inspection. The night-time activity surveys primarily utilised visual detection, with the support of ultrasonic detection equipment.

Transect surveys were carried out on foot. Figure 3.3 shows the survey routes used as recorded by the Anabat Scout. The transect routes were selected to cover areas that may not have been captured in the O'Donnell 2021 surveys due to route amendments and to provide an updated reflection of bat activity in the area. All transects were walked at least once and the direction of travel was alternated between survey nights.

2.2.2 Passive (Automated/Static) Detector Survey

Passive ultrasonic bat detectors were deployed in two locations along the proposed scheme. The locations chosen had suitable bat habitat and had been identified in previous surveys as areas with high suitability for bat foraging. The locations of passive bat monitoring points are shown in **Figure 3.3**. Both passive

detectors were located in areas of broadleaf woodland where the woodland borders the current pathway near sections of riparian vegetation and the banks of the River Shannon.

Recording was carried out at 'Bat_01' for 7 nights from the nights of 19th of June to the 25th of June 2024 inclusive. Recording was carried out at 'Bat_02' for 7 nights from the 3rd of July to the 9th of July 2024 inclusive. Anabat Swift full spectrum detectors were utilised for passive surveys. Details of the survey period including average nightly weather conditions are shown in **Table 2.1.** The purpose of passive surveys was to supplement information gathered during the nighttime bat walkover (transect) surveys to identify any species present in the area which may not have been detected during the active surveys. The passive recording results also provide a robust baseline for future monitoring.

Table 2.1 – Details of passive monitoring survey period

Date [night of]	Sunrise	Sunset	Temp. °C	Wind km/h	Precipitation
19/06/2024	05:10	22:01	13	14	Dry
20/06/2024	05:10	22:02	13	13	Dry
21/06/2024	05:10	22:02	13	19	Dry
22/06/2024	05:10	22:02	14	15	Dry
23/06/2024	05:11	22:02	18	11	Dry
24/06/2024	05:11	22:02	18	11	Dry
25/06/2024	05:11	22:02	15	13	Dry
03/07/2024	05:16	22:00	13	17	Dry
04/07/2024	05:17	21:59	13	17	Dry
05/07/2024	05:18	21:59	13	17	Dry
06/07/2024	05:19	21:58	17	19	Light Rain
07/07/2024	05:20	21:57	19	33	Dry
08/07/2024	05:21	21:57	16	11	Dry
09/07/2024	05:22	21:56	15	6	Dry

Weather information: https://www.timeanddate.com/

Solar information: https://www.timeanddate.com/

2.2.3 Data Analysis

Bat activity sonograms were analysed using Anabat Insight sound analysis software and identifications were manually verified.

2.2.4 Evaluation & Impact Assessment

Evaluation of ecological features follows the NRA (now TII) publication 'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (2009). Impact assessment follows 'Guidelines on The Information to be Contained in Environmental Impact Assessment Reports' published by the EPA (2017).

Reporting follows Chartered Institute of Ecology and Environmental Management (2018) 'Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater, Coastal and Marine'.

3 RESULTS

3.1 Desktop Review

3.1.1 Existing Environment

The proposed scheme runs through an area of mixed broadleaf forestry, mostly along an existing pathway and roads, with smaller pockets running through woodland.

Table 3.1: Habitats within Proposed Scheme

Habitat (Fossitt Code)	Description	Approx. % Cover in ZoI
(Mixed) broadleaved woodland (WD1)	Dense population of broadleaved species forming primary aspect of survey. Forming large spreading canopy in open mature woodland. Species include Oak (*Quercus* spp.), Sycamore (*Acer pseudoplatanus*), Beech (*Fagus sylvatica*).	20%
Depositing/lowland rivers (FW2)	Deep, fast-flowing river in the form of the River Shannon. Runs adjacent to the proposed scheme for about 50% of the route.	15%
Buildings and artificial surfaces (BL3)	Residential accommodation, industrial facilities, commercial facilities and outlets. Habitat also includes road surfaces and carparks.	22%
Treelines (WL2)	Narrow strips of tree-lined roads, laneway and property boundaries. Treelines are planted, with even spacing between.	10%
Scrub (WS1)	Small, dispersed open pockets of scrub throughout ZoI, mainly comprised of Bramble (*Rubus fructicosus*).	5%
Riparian woodland (WN5)	Occurring along river margin fringe of WD1 to FW2 habitat, species included Willow *Salix* spp.	18%
Wet grassland (GS4)	Damp underfoot flat lowland areas. Species present include Rushes (*Juncus* spp.), small sedges (Carex spp.), and fringing Yorkshire fog (*Holcus lanatus*).	3%
Amenity grassland (improved) (GA2)	Intermittent pockets of managed species-poor grasslands forming sections of industrial or accommodational properties.	7%

3.1.2 National Biodiversity Data Centre (NBDC)

A review of National Biodiversity Data Centre (NBDC) revealed historical records for bat species within the area of search shown in **Table 3.2.** It is important to note that an absence of other bat species records is reflective of a lack of surveys undertaken to date rather than absence of bat species.

Table 3.2: Bat Species recorded in Hectad R65 Over the Previous 12 Years (National Biodiversity Data Centre)

Species Name	Record Count	Title of Dataset	Date of Last Record
Brown Long Eared Bat (*Plecotus auritus)*	1	National Bat Database of Ireland	28/09/2004
Daubenton's Bat (*Myotis daubentonii*)	143	National Bat Database of Ireland	25/08/2021
Lesser Horseshoe Bat (Rhinolophus hipposideros)	9	National Lesser Horseshoe Bat Database	27/01/2015
Lesser Noctule (*Nyctalus leisleri*)	8	National Bat Database of Ireland	22/05/2019
Myotis Bat species (*Myotis*)	1	National Lesser Horseshoe Bat Database	29/06/2014
Common Pipistrelle (Pipistrellus pipistrellus sensu lato)	10	National Bat Database of Ireland	07/06/2022
Soprano Pipistrelle (*Pipistrellus pygmaeus*)	9	National Bat Database of Ireland	22/05/2019

Bat Conservation Ireland conducted a search of available bat records within 10km of the study area on 15th November 2021 at the request of O'Donnell Environmental, and roost records were provided, and these are described in **Table 3.3.** The locations are shown in **Figure 3.1** and refer to the 1km grid square in which the roost was recorded. There are previous records for a Brown Long-eared roost within the boundaries of the proposed cycleway (Irish Grid Reference: R6158). There are previous records for a roost of the Annex II (EU Habitats Directive) species Lesser Horseshoe Bat roost at Doonass, Parteen, Co. Limerick (Irish Grid Reference: R6461), approximately 2.2km from the proposed works.

Table 3.3– Bat Conservation Ireland records for bat roosts within 10km of the study area.

Grid Reference	Species	Address
R5353	Soprano Pipistrelle, Brown Long-eared Bat	Dromdarrig, Mungret, Co. Limerick
R5860	Lesser Horseshoe Bat, Brown Long-eared Bat, *Myotis* sp.	Parteen, County Clare
R6461	Lesser Horseshoe Bat	Doonass, Parteen, Co. Limerick
R6163	Leisler's Bat	Clonlara, Co. Clare
R6158	Brown Long-eared Bat	Garraun, Co. Limerick

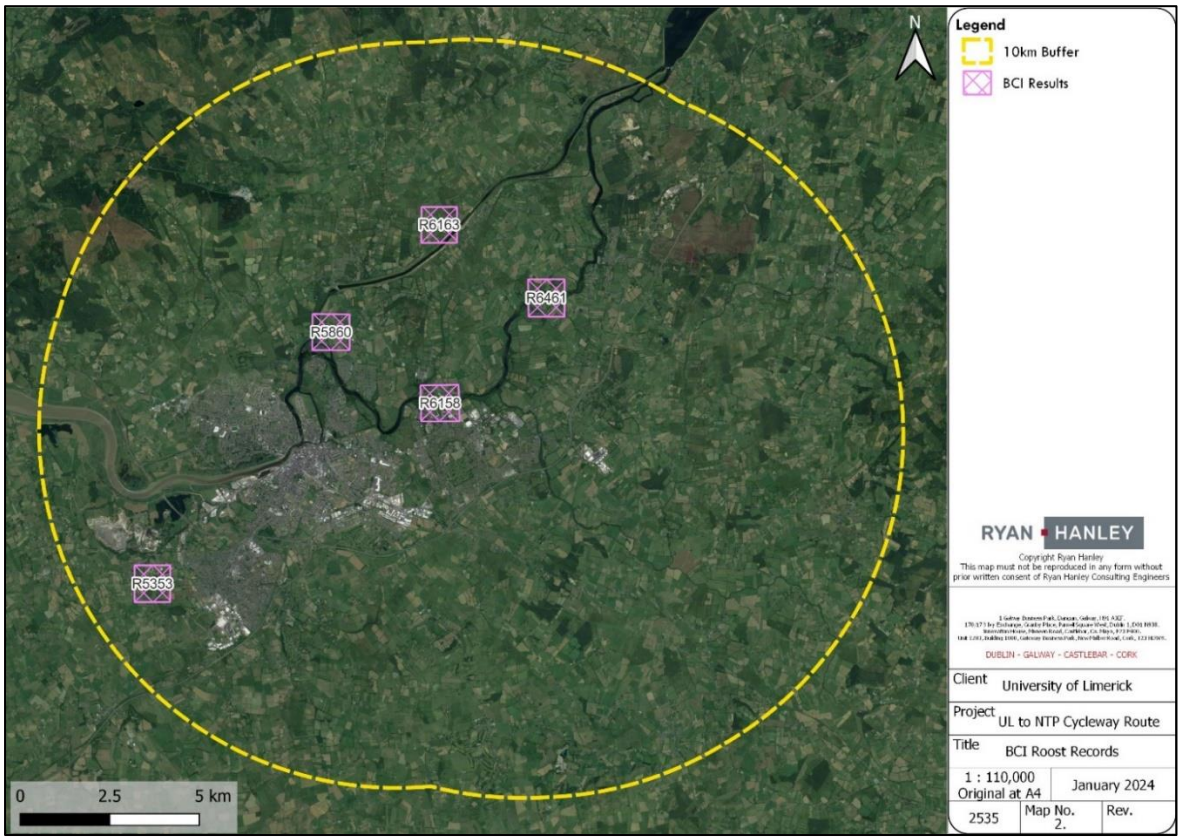

Figure 3.1: Roost Records Within 10km Of Proposed Cycle Route (Bat Conservation Ireland).

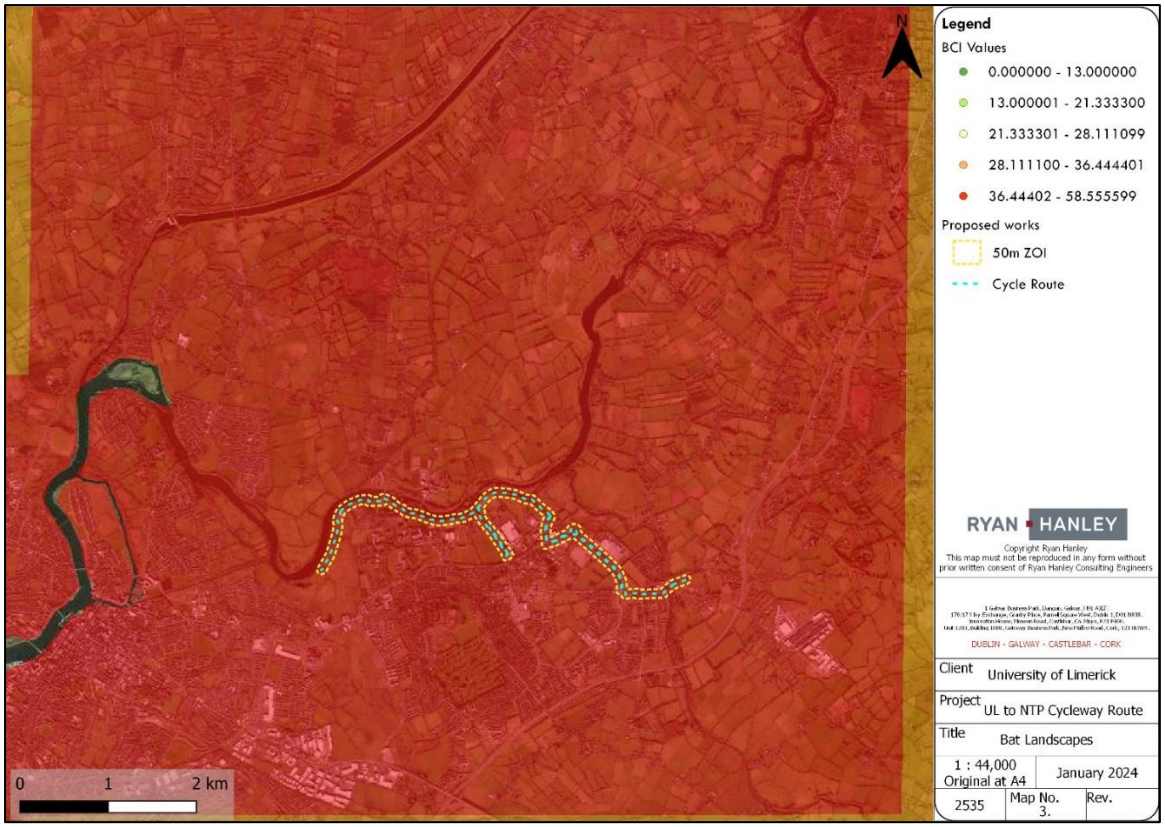

Figure 3.2: Bat Habitat Landscape

The All-Ireland Bat Landscape Classification has classified the area in which the project site is located as being of high potential (>36.44401) for supporting all bat species occurring in Ireland. *Note, results depicted in January 2024 map were confirmed as accurate by updated review of NBDC bat suitability index map on the 23rd of July 2024.*

The overall bat suitability index value (42.56 as per NBDC) according to 'Model of Bat Landscapes for Ireland' (Lundy *et al.* 2011) suggests the landscape in which the proposed works will take place is of high suitability for bats in general. Species specific scores are provided in **Table 3.4.** The Annex II (EU Habitats Directive) listed bat species, Lesser Horseshoe Bat, is assigned a score of 18.

Table 3.4: Bat Landscape scores: Suitability of the study area for the bat species according to 'Model of Bat Landscapes for Ireland' (Lundy *et al.* 2011) – accessed via NBDC database.

Common name	Scientific name	Suitability index
All bats		42.56
Soprano Pipistrelle	Pipistrellus pygmaeus	56
Brown long-eared bat	Plecotus auritus	55
Common Pipistrelle	Pipistrellus pipistrellus	64
Lesser horseshoe bat	Rhinolophus hipposideros	18

Leisler's bat	Nyctalus leisleri	64
Whiskered Bat	Myotis mystacinus	38
Daubenton's bat	Myotis daubentonii	42
Nathusiius Pipistrelle	Pipistrellus nauthusii	16
Natterer's bat	Myotis nattererii	30

3.1.3 Sites of International Importance

Under the EU Habitats Directive (92/43/EEC) and Birds Directive (2009/147/EC), areas which support habitats and species of conservation importance which are designated for the conservation of flora, fauna and habitats of European importance are referred to as a Special Area of Conservation (SAC). Areas which are designated for the protection and conservation of bird species and habitats of European importance are referred to as a Special Protected Area (SPA). These protected sites form part of Natura 2000, a network of protected areas throughout the European Union (EU). The development site is located within such a site: the Lower River Shannon SAC. Seven additional Natura 2000 sites are located within the potential zone of influence of the proposed works. The Natura 2000 site Dane's Hole, Poulnalecka SAC (000030) lists the Annex II Lesser Horseshoe Bat as one of the site's conservation objectives. No other internationally designated sites are relevant to the current assessment.

Table 3.5: SAC & SPA within the potential zone of influence of the proposed works

Site Name	Site Code	Distance (km)
Lower River Shannon SAC	002165	0
Glenomra SAC	001013	8.8
Glenstal Wood SAC	001432	9.3
Clare Glen SAC	000930	12.7
Slieve Bernagh Bog SAC	002312	13.9
Dane's Hole, Poulnalecka SAC	000030	14.9
River Shannon and River Fergus Estuaries SPA	004077	3.4
Slievefelim to Silvermines Mountains SPA	004165	12.3

3.1.4 Sites of National Importance

In Ireland, at a national level, Natural Heritage Areas (NHA) or proposed Natural Heritage Areas (pNHA) are designated to protect habitats, flora, fauna and geological sites of national importance.

There are no NHAs within 5km of the proposed site. Five pNHA sites are located within 5km of the proposed site (see **Table 3.6**). Two pNHA sites are nationally important as they are bat roosts. Castleconnell pNHA (000433) was designated as nationally important as it is a residential dwelling that is host to a maternity roost of Daubenton's Bats. Cloonlara House pNHA is a Leisler's Bat maternity roost. This site supports one of the largest maternity roosts of Leisler's Bats in Ireland and Europe which makes it internationally important as well.

Table 3.6 NHA/pNHA within the potential zone of influence of the proposed works

Site Name	Site Code	Distance (km)
Castleconnell (Domestic Dwelling, Occupied) pNHA	000433	2.4
Knockalisheen Marsh pNHA	002001	3.4
Cloonlara House pNHA	000028	3.4
Inner Shannon Estuary – South Shore pNHA	000435	4.3
Fergus Estuary And Inner Shannon, North Shore pNHA	002048	2.9

3.1.5 Previous Surveys

O'Donnell Environmental (O'Donnell, 2021) conducted a suite of bat surveys for this project in December 2021. This consisted of:

- -Daytime walkover surveys to identify any bat roosting potential which may exist within the zone of influence of the proposed works;
- -Structure Surveys: Non-destructive, and relevant visual inspections to identify any evidence of bat roosting. Signs of bat use include bat droppings, feeding remains, potential bat access points identified by characteristic staining and scratches, noise made by bats etc. Buildings and bridges were surveyed in July and September 2021; and Bat activity surveys in the form of
    - Transect Survey (Now called Night-time Bat Walkover (Collins, 2023)) undertaken July 19th and September 9th, 2021;
    - Passive Detector Survey with detectors deployed at two locations along the proposed scheme layout for 13 nights from the nights of 9th September to 21st September 2021 inclusive. These results can be seen in the Appendix, in sections A-D; and
    - Ground-level roost assessments were carried out on 19th July 2021 and October 2021 during daylight hours.

A ground level tree assessment (GLTA) was carried out in January 2024 along the proposed cycle route by Ryan Hanley Ecologist Damien McAndrew. The objective of the GLTA was to assess a tree potential to support roosting bats. The survey involves a surveyor making an external assessment of the tree whilst

stood on the ground, noting potential bat entry/exit points, potential roosting features (PRFs), and any evidence of bats seen. The trees are graded for their potential to support roosting bats (None, Further Assessment Required (FAR), Potential Roost Feature (PRF) or specialist Inspection Surveys required (PRF-Insp.)) in accordance with Bat Conservation Trust guidelines (Collins, 2023), which will inform the need for further survey effort if required such as a Potential Roost Feature (PRF) Inspection.

This survey primarily focused on trees and built structures which have the potential to be impacted (earmarked for felling and demolition) as a result of works on the existing pathways to accommodate the proposed route and newly added sections of the route, and any other trees and structures in the site ZoI which have the potential to contains PRFs. While no bat roosts were identified during this survey, bat boxes were noted within the 50m ZoI of the proposed development, which should be considered potential bat roosts, along with a large bat house (UL Bat House).

3.1.6 Previous Results

3.1.6.1 Roost survey 2021

During the O'Donnell Environmental 2021 survey, no bat roosts were identified during inspections of structures within the survey area. Structures were assessed for their suitability for roosting bats following Collins (2016).

- Three buildings (or clusters of buildings) were identified within the 'zone of influence' which had 'moderate' suitability to support roosting bats. These included two ruined castles and an unfinished/disused house. The two castle ruins had considerable number of crevices between the masonry work and unfinished/disused house along the waterway has numerous entry points for bats in the eaves of the roof.
- -Three buildings (or clusters of buildings) were identified within the 'zone of influence' which had 'low' suitability for roosting bats. Two of the structures with low suitability for roosting bats included detached residential dwellings that were occupied and based on visual inspection from public area, numerous small gaps between the eaves and the wall of the houses were apparent. The third low suitability structure included a cluster of residential dwellings on the eastern side of the proposed development.
- Remaining structures were considered to have 'negligible' potential to support roosting bats based on available information. The buildings considered to have negligible suitability for roosting bats were mainly those of student accommodation, office buildings and a sports centre; these were all relatively recently built.
- No roosting bats were encountered in trees, and no unoccupied roosts which contained signs of bat occupation were encountered. A total of seven trees were identified to have 'low' suitability for roosting bats. Trees with 'low' potential are described where they are within or immediately adjoining the proposed works area. No 'moderate' or 'high' suitability trees were present. None of the potential roosting features in trees inspected during the current survey had potential as a

maternity roost for any bat species. Mature trees tend to occur in the western areas of the scheme.

- All seven trees considered to have low value PRFs were mature and consisted of three tree species: Oak (*Quercus petraea*), Beech (*Fagus sylvatica*) and Sweet Chestnut (*Castanea sativa*). All of these had some or all of the following PRFs: welts, wounds, tear-outs, hazard beams and compression forks or had dense ivy surrounding the stem of the tree. These features can provide roosting space for bats within the trees for crevice dwelling bat species. It is likely that some of these features may be used at least occasionally by bats and their value to bats may increase over time (O'Donnell, 2021).

3.1.6.2 Echolocation survey 2021

O'Donnell Environmental conducted a bat activity survey using active bat activity (walked transect) surveys and passive bat surveys. These were carried out to characterise bat activity in the zone of influence of the proposed works and to detect any bats which may be emerging from roosts at dusk.

Bat echolocation detections are quantified here as bat "registrations". A registration for the relevant species is attributed when any bat echolocation signal occurs in one recording, which are up to 15 seconds in length. Bat registrations do not equate to numbers of bats as individual bats of the same species cannot be differentiated. A single bat continuously foraging in proximity to the detector can generate a large number of registrations in one night. Variability occurs in the likelihood of detection between species. For example, Leisler's Bats emit a loud low frequency call which travels further and is more easily detected than the quiet higher frequency calls of Brown Long-eared Bats.

Eight species of bat were recorded (discussed below) including the Annex II (EU Habitats Directive) listed Lesser Horseshoe Bat. The following species were recorded along the proposed cycleway during the passive and active surveys:

- Soprano Pipistrelle;
- Brown Long-eared Bat;
- Common Pipistrelle;
- Leisler's Bat;
- Lesser Horseshoe Bat;
- Daubenton's Bat;
- Natterer's Bat; and
- Whiskered Bat

3.1.6.3 Active bat surveys 2021

Over 350 individual registrations of bats were recorded during the course of the bat transect surveys. These surveys were carried out in July and September 2021. Soprano Pipistrelles were the most frequently recorded species during both active surveys. At least six species were recorded on handheld

bat detectors during active surveys. These species were Soprano and Common Pipistrelle, Leisler's Bat, Daubenton's Bat, Natterer's Bat and Lesser Horseshoe Bat. Lesser Horseshoe Bat was recorded during the transect survey in July 2021 (3 registrations) only. Overall, Common and Soprano Pipistrelle and Leisler's Bat were highly abundant along the walked transect. It is likely that they utilise all habitat types within the zone of influence (50m buffer surrounding the proposed development). Leisler's bats were mainly recorded along the treeline edge when in the vicinity of open habitat, e.g., playing pitches or disused rough grasslands, while Pipistrelle species were more associated with the treeline along the water's edge and along those connectivity corridors running north-south from the river into the main campus (near the Kilmurry Student Village and along McLaughlan Road). Daubenton's Bats were only recorded where access to the water's edge was available to Surveyors, e.g., swimming areas or where there was no bankside vegetation. However, it is considered extremely likely that they utilise all sections of the waterway bordering the proposed development. Lesser horseshoe bats were recorded along the central connectivity corridor, near the Kilmurry Student Village. These passes were likely from an individual foraging or commuting along this treeline. Relatively lower levels of bat activity were recorded in the western areas of the scheme during transect surveys. This is likely to be because of a smaller productive foraging habitat and light pollution from nearby buildings and public lights when compared to eastern areas (O'Donnell, 2021).

3.1.6.4 Passive survey 2021

Two passive detectors were deployed at suitable locations on the scheme to provide a larger dataset and detect species which may not have been recorded during active surveys. Eight species of bat were recorded on the passive detectors. A high level of bat activity was recorded during the passive survey period. 22,282 bat registrations were recorded on the passive detectors during the survey period. Registrations and results for individual species are detailed below in the Appendix, sections A-D.

3.1.6.5 Conclusion (2021 surveys)

O'Donnell Environmental conducted a comprehensive and appropriate study to identify the importance of the study area for bats. No bat roosts were identified but some suitable bat roosting opportunities were identified for crevice dwelling bats in trees and structures within the study area. A high level of bat activity was recorded overall from at least eight species during the active bat surveys.

Taking all the above into consideration, the work carried out by O'Donnell in 2021 concluded the study area is considered to be of '**local importance, higher value**' to bats. No roosting bats were encountered during the surveys carried out, and no bat roosts are likely be disturbed as a result of the works assuming the mitigation measures outlined in the report (O'Donnell 2021) are implemented. Overall, the report completed by O'Donnell in 2021 concluded the proposed works overall are likely to have a '**not significant' negative** impact on bat conservation at a local scale.

3.1.6.6 Ground Level Tree Assessment (GLTA) 2024

A *Ground Level Tree Assessment* at sections focused along the cycle route was carried out on 10/01/2024. None of the potential roosting features in trees inspected during the survey were identified as having potential as a maternity roost for any bat species. No unoccupied roosts which contained signs of bat occupation (droppings, staining) were encountered. Overall, the trees assessed on site have some minor potential to function as hibernating roost for bats and have some potential to function as roosting sites for bats during the bat activity season.

Trees earmarked in the area to be felled do not support viable PRFs and offer no potential roosting habitat for bat species. The felling of these trees is not predicted to result in the loss of any moderate to high potential roosting features. Ivy was recorded on the majority of trees; no growth was greater than 5cm or detached from these trees. Ivy growth on trees was not fully accessible to assess, due to height and may have potential to support hibernating bats within the higher reaches. One tree (Ash (*Fraxinus excelsior*) near a footbridge at the start of the proposed cycleway route with a large split, hazard beam, and lifted bark has a number of features namely splits in limbs, lifted bark, and fissures as well as smaller cracks that increase the potential for roosting bats to lower. This tree is not located in an area marked for tree felling and so will not be directly impacted by the proposed works. Mitigation measures outlined in the later sections in this report with regards to lighting, noise and root exclusion zones will ensure that there is no significant impact on this tree during the proposed works.

Based on the field survey findings during the ground level tree assessment in January 2024, the habitats on site are deemed to be of local ecological importance for bat species and provide suitable grounds for both commuting and foraging bats. The River Shannon in particular is an important corridor which bisects the busier urban area of University of Limerick and adjacent areas of Limerick suburbs, and the agricultural landscape beyond. The findings of GLTA indicate there is potential roosting habitat within the vicinity of the proposed route, but no significant potential roosting features were noted during the survey, with the exception of the bat house established at Dromroe Student Village and ruins of Black Castle.

3.2 Bat Activity Survey 2024 Results

Bat activity was surveyed in June and July 2024 using nighttime bat walkover (transect) surveys and passive (automated/static) bat surveys. These were carried out to characterise bat activity in the zone of influence of the proposed works and to detect any bats which may be emerging from roosts at dusk.

Eight species of bat were recorded. The following species were recorded along the proposed cycleway during the passive and active surveys:

- Soprano Pipistrelle;
- Brown Long eared Bat;
- Common Pipistrelle.

- Leisler's Bat;
- Daubenton's Bat;
- Natterer's Bat;
- Whiskered Bat; and
- Nathusius' Pipistrelle.

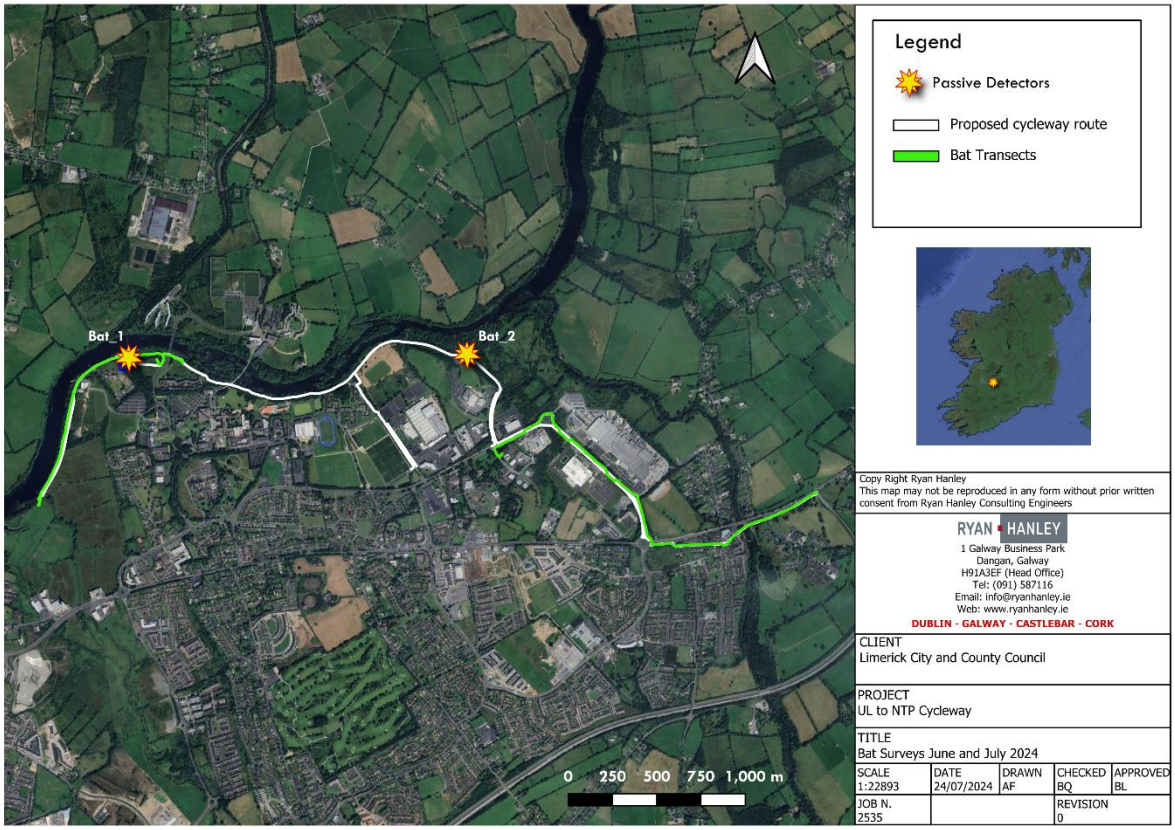

Figure 3.3: Map of Passive Detector and Transect Locations in UL in Limerick

3.2.1 Active: Nighttime bat walkover (transect) surveys

350+ individual registrations of bats were recorded during the course of the nighttime walkover (transect) surveys. These surveys were carried out in June and July 2024. Soprano Pipistrelles were the most frequently recorded species along the river near UL boathouse on the 19th of June 2024 whereas Common Pipistrelles were most frequently recorded in the western section of the scheme near the National Technology Park on the 10th of July 2024. At least four species were recorded on handheld bat detectors during the transect surveys. These species were Soprano and Common Pipistrelle, Leisler's Bat and Daubenton's Bat. The locations of all registrations are shown in **Figure 3.4**.

Overall, Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat were highly abundant along the walked transects. It is likely that they utilise all habitat types within the zone of influence (50m buffer surrounding the proposed development). Daubenton's Bats were only recorded where access to the

water's edge was available to surveyors, e.g. along the Bridge in Annacotty or along more visible sections of the River Shannon. However, it is likely that they utilise all sections of the waterway bordering the proposed development. This is consistent with findings by O'Donnell Environmental in 2021 who recorded similar levels of bat activity and species during their active surveys.

Relatively lower levels of bat activity were recorded in the eastern transect through the National Technology Park into Annacotty. This is likely because there is less productive foraging habitat for bat species relative to the transect following the river in the west. The area is quite built up with light pollution from nearby commercial buildings and regular streetlights. There is a large wind turbine along the route also and regular car and bus traffic. The treelines in the northern section of this transect had the highest levels of activity as well as the treelines and adjacent grasslands in the southeastern section. The bridge in Annacotty was also a site of high activity and had a number of Daubenton's bats foraging under it during the survey on the 19th of June 2024.

Table 3.7 – Registrations for each species recorded during nighttime walkover (transect) surveys in 2024.

Detector	19th June 2024	10th of July 2024
Daubenton's Bat	Heterodyne recordings	Heterodyne recordings
Leisler's Bat	38	19
Common Pipistrelle	44	49
Soprano Pipistrelle	152	42
Total	**237**	**113**

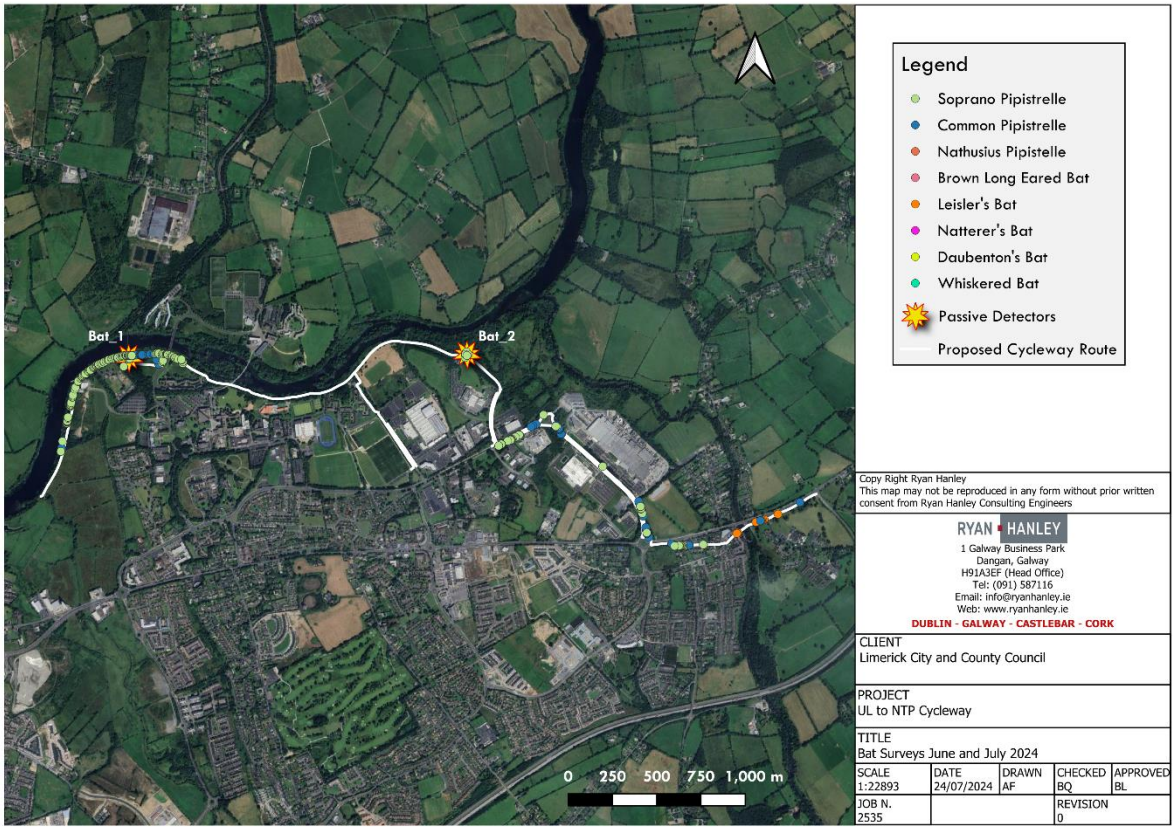

Figure 3.4: Map of Bat Species Identified during activity surveys

3.2.2 Passive Bat Surveys

Two passive detectors were deployed at suitable locations on the scheme to provide a larger dataset and detect species which may not have been recorded during active surveys. Eight species of bat were recorded on the passive detectors. A high level of bat activity (2285 bat registrations) was recorded during the passive survey period. Soprano pipistrelles, Common Pipistrelles and Daubenton's Bats were the most common species recorded. Registrations for individual species are detailed below in **Table 3.8.**

Table 3.8– Registrations for each species recorded during passive surveys in 2024.

Detector	Bat_1 (19th -25th of June 2024)	Bat_2 (03rd to 09th of July 2024)
Daubenton's Bat	95	277
Whiskered Bat	9	25
Natterer's Bat	3	2
Leisler's Bat	82	23
Common Pipistrelle	134	30
Soprano Pipistrelle	817	756

Brown Long-eared Bat	11	0
Nathusius' Pipistrelle	2	0
Total	**1163**	**1122**

Figure 3.5 presents the time distribution of all bat registrations recorded over the 7-night survey period at 'Bat_1' (19th to the 25th of June 2024) and 'Bat_2' (03rd to the 9th of July 2024) and the recordings taken during the transect surveys on the 19th of June and the 10th of July 2024.

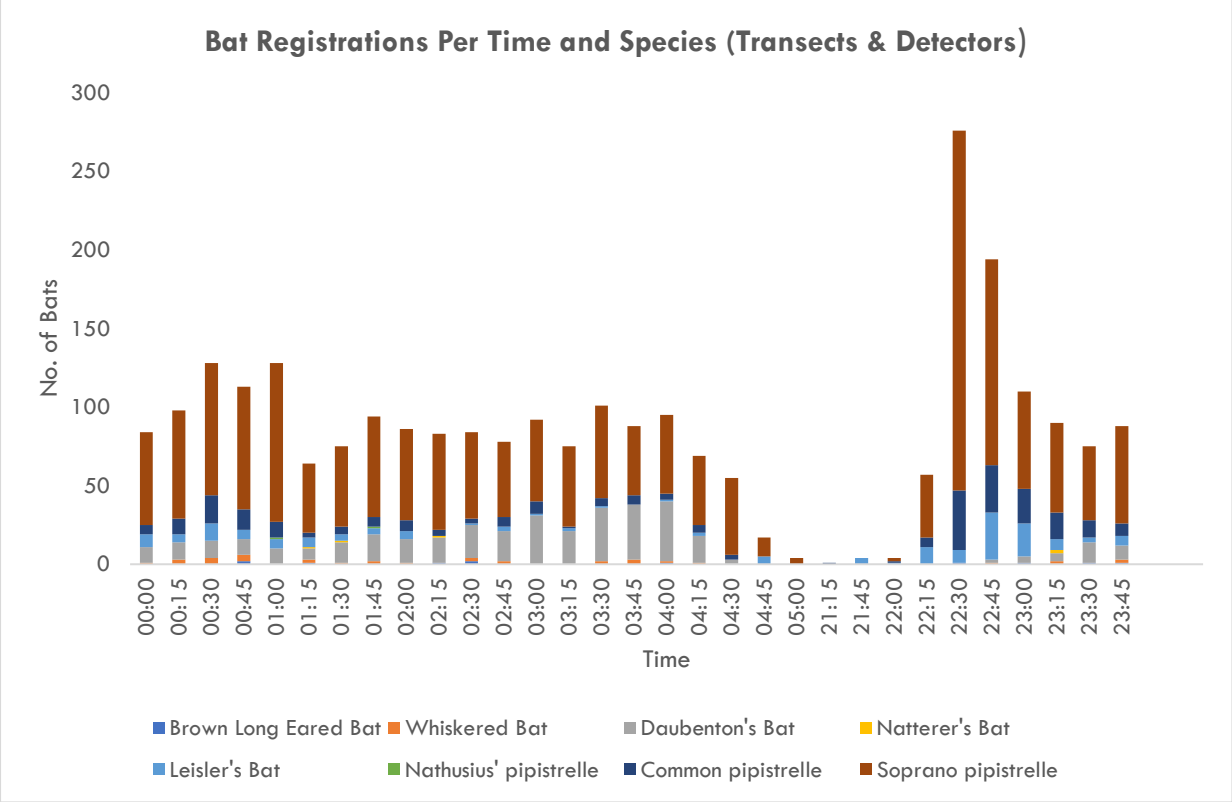

Figure 3.5: Time Distribution of All Bat Registrations (Passive and Transects)

Figure 3.6 and **Figure 3.7** present the time distribution of all bat registrations recorded over the 7-night survey period at 'Bat_1' and 'Bat_2' respectively.

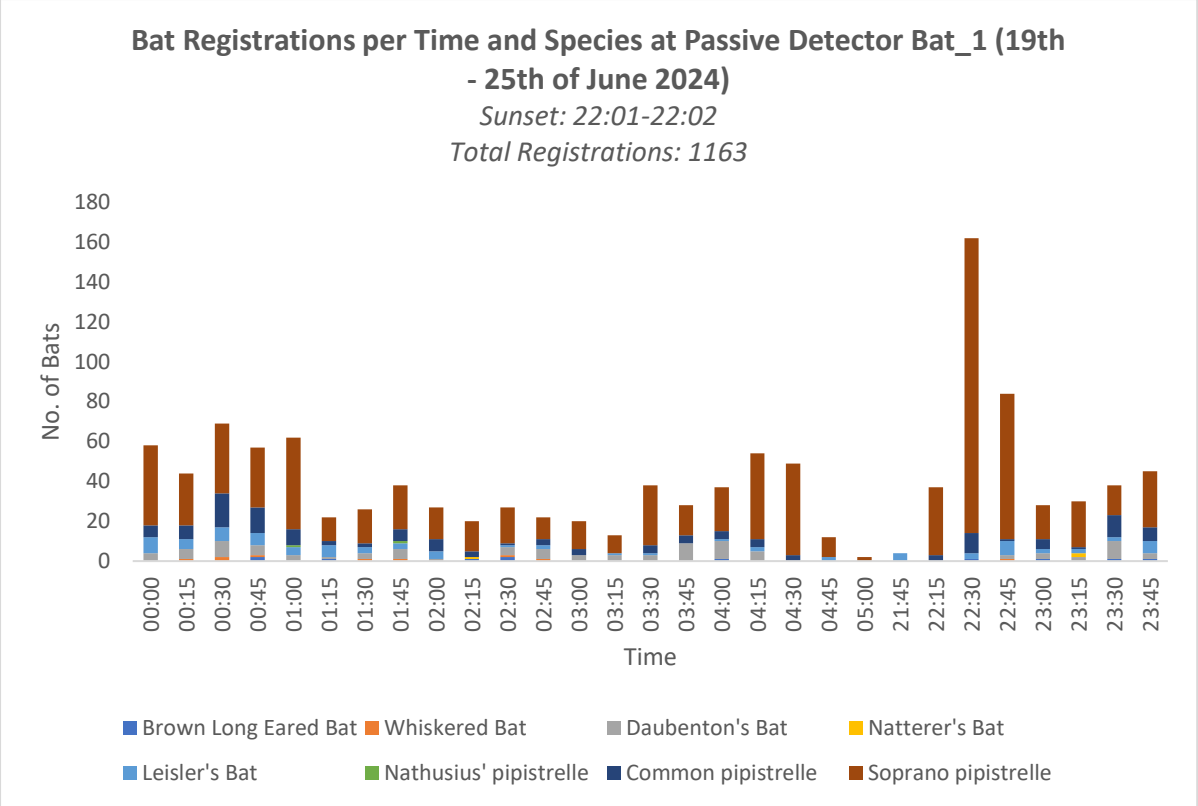

Figure 3.6: Time Distribution of Bat Registrations (Bat_1)

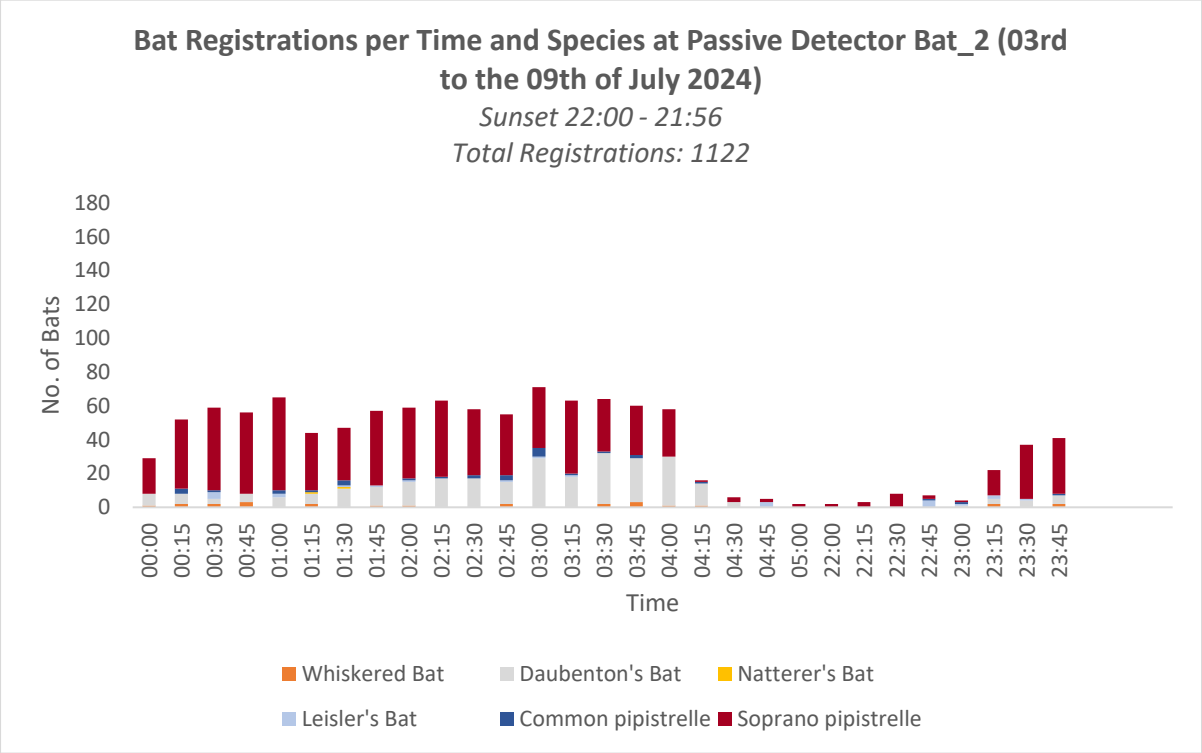

Figure 3.7: Time Distribution of Bat Registrations (Bat_2)

Relatively higher levels of activity are observed in the earlier part of the night with a drop and then consistent patterns of activity throughout the night which gradually dissipates closer to dawn. The river corridor is used particularly by Soprano Pipistrelles in the earlier part of the night, and to a lesser extent Common Pipistrelle and Daubenton's Bat. This is consistent with the findings from O'Donnell Environmental in 2021 who also reported a large number of Soprano Pipistrelles emerging soon after sunset in the western section of the scheme.

The high level of activity shortly after sunset in Bat_1 in the western section of the scheme would suggest that there is a Soprano pipistrelle roost nearby this area as high numbers of recordings are registered approximately 30 mins after sunset. The relatively consistent numbers throughout the night would suggest this area is also a good foraging and commuting area. Less activity in the earlier part of the night is seen in Bat_2 in the eastern part of the scheme. There are low levels of activity shortly after sunset that gradually increase as the night goes on and remains consistent until close to dawn. It is likely this is a good foraging area that bats commute to regularly throughout the night. Similar levels of bat activity were observed at both detectors although Bat _1 had a slightly higher number (1163 vs 1122) and a greater variety of species (8 vs 6). Bat_1 was deployed slightly closer to the river than Bat_2 which may place it along the commuting routes of more species. Two species were detected at Bat_1 that were not detected at Bat_2. Nathusius' pipistrelle is a rare-occasional bat species and is typically associated with wetlands, waterbodies and broadleaf woodland. Brown Long Eared bats typically prefer sheltered habitats such as wooded river valleys and dense woodland edge. This species also tends to forage close to roost sites (within 2km) in woodland. Despite their absence from the Bat_2 registrations in the eastern part of the scheme, the habitat where the detector was deployed would still be suitable for both species as it is a dense patch of woodland close to the River Shannon.

Soprano Pipistrelles were the most frequently recorded species on both detectors during the passive survey period. The first detection of this species was frequently a few minutes after sunset. The average emergence time for Soprano Pipistrelles is approximately 20-30 minutes after sunset. Soprano Pipistrelle bats (and possibly other species) are likely to be roosting in relative proximity to the site due to the relatively early detection of this species on the passive detectors, particularly at Bat_1 in the western section of the scheme. There are a wide variety of roosting opportunities present locally which may be exploited by crevice dwelling bat species such as Pipistrelles. Common pipistrelles are more likely to be found along linear habitats which might explain the higher numbers detected at Bat_1 which was placed close to the existing path at a woodland edge bordering the River Shannon. More Common pipistrelles were detected in the east by O'Donnell Environmental in 2021, however the detector at this time was placed along the Mulkear River (riparian linear habitat).

Daubenton's Bats were recorded widely throughout the route with higher numbers detected in the eastern part of the scheme at Bat_2. This is consistent with findings by O'Donnell Environmental in 2021 who detected more Daubenton activity in the eastern section of the route (Detector deployed in 2021 was located close to the Mulkear River). As the proposed cycleway route closely follows the River Shannon,

the presence of this species is expected. These bats tend to forage over open water and areas of complex bankside vegetation such as riparian woodland. They can, on occasion forage in woodlands away from water also. This species generally avoids street lighting which may explain the higher numbers of this species recorded by Bat_2 in the northeastern part of the route. Bat_2 was placed in a bit more secluded area than Bat_1 which was located on a more established walking path by the river and in close proximity to UL campus and a number of residential buildings. The adjacent black castle ruins at near Bat_2 may also be an attractive roost spot for this species.

More Leisler's Bats were detected in the western section at Bat_1. Contrastingly the 2021 surveys detected higher numbers of Leisler's in the east although this difference may be accounted for by the detectors location along the Mulkear river in 2021. This species is very adaptable and can utilise most habitats although can favour pasture and areas of freshwater. It is often found in urban parks and forages on medium sized swarming insects. It is often observed feeding on insects attracted to streetlights and this may explain the higher numbers detected by Bat_1 which was less secluded than Bat_2 and in closer proximity to street lighting and parkland by the UL campus. Leisler's bats emerge early (typically 10-15 minutes before sunset) which explains the detections recorded prior to sunset at Bat_1.

A higher number of whiskered bats were detected in the eastern section of the scheme at Bat_2. This species favours riparian mixed woodland as a foraging ground and generally avoids wetland and grassland areas. The denser woodland cover where Bat_2 was located may explain the higher numbers detected at this location. This is consistent with findings from the 2021 surveys which also recorded higher numbers of this species in the east.

No Annex II Lesser Horseshoe Bat activity was detected during either the passive or active transect surveys during 2024 however registrations were detected by O'Donnell Environmental in 2021. Lesser horseshoe bats were recorded along the central connectivity corridor, near the Kilmurry Student Village. These passes were likely from an individual foraging or commuting along this treeline. 16 registrations were also recorded by a passive detector along the Mulkear River in the east in 2021. This species favours broadleaved woodland and riparian vegetation and avoids artificial light at night and urban areas. The lesser horseshoe bat is listed on Annex 2 of the EU's Habitats Directive and there are 41 Special Areas of Conservation for which this species is a Qualifying Interest. The most recent estimate of the lesser horseshoe bat's population is 12,790 individuals. Although population monitoring indicates that the species' numbers are increasing, the bat is confined to six western counties, occurring in clusters, with large areas that contain few or no colonies (NPWS & VWT, 2022).

The results overall were consistent with the surveys carried out by O'Donnell Environmental in 2021. Although higher levels of activity were detected by the surveys carried out in 2021, the passive detectors deployed at this time were left out for 13 nights in comparison with the 7 nights in 2024. The location of the detectors was also slightly different between the two years. 16,000+ registrations were detected at the passive detector deployed along the Mulkear River in 2021. This area would have a greater variety of semi natural habitats that could be utilised by bat species, and it is along a linear riparian

habitat that would be highly attractive as a commuting and foraging route. The timing of the deployments may also cause some difference in activity levels. The passive detectors in 2021 were deployed in September. At this point in the year, females and new young will have left the maternity roosts to forage on late summers insects and mating usually takes place from mid-August onwards. The 2024 surveys took place in late June and early July when it is likely more female bats will be in the maternity roost. Numbers of bats in a nursery roost build gradually until the time that the mothers give birth, around late June or early July (BC1 website, accessed July 2024).

4 DISCUSSION

High levels of bat activity and species diversity were recorded along the proposed scheme, particularly in the early hours of the night in the western part of the scheme suggesting roosts in close proximity to the study area.

The consistent levels of activity throughout the night suggest the area is regularly used by bat species for foraging and commuting and is of local ecological importance. The area is classed as a high potential bat landscape (NBDC & Lundy *et al.*, 2011) and the River Shannon in particular is an important corridor which bisects the busier urban area of UL and the agricultural landscape beyond.

Species and levels of activity recorded were consistent with survey results from O'Donnell Environmental in 2021. While Annex II Lesser Horseshoe Bat was not detected during the surveys carried out in 2024, it was identified in the 2021 surveys. Considering this finding alongside the records reported by the NBDC, BCI and protected areas (SAC/pNHA) in the zone of influence of the scheme with this species as their qualifying interest, it is prudent to assume Lesser Horseshoe Bat will be active in the area. The high levels of Soprano pipistrelles detected early in night at Bat_1 near UL Boathouse suggest there is a potential roost in close proximity to this area. This is consistent with findings by O'Donnell Environmental in 2021.

The ground level tree assessment in January 2024 indicate there is potential roosting habitat within the vicinity of the proposed route, but no significant potential roosting features were noted during the survey, with the exception of the bat house established at Dromroe Student Village and ruins of Black Castle.

Taking this into account, the proposed cycleway development, while on a small scale may result in negative consequences on local populations of bats which utilise the River Shannon corridor and parkland as a commuting route or foraging habitat.

5 POTENTIAL IMPACTS

Lighting:

Illumination of treelines and woodland at night can disturb roosting, commuting and foraging bats. It can delay emergence from roosts, impede commuting routes and reduce available foraging space. Delayed emergence from roosts can reduce available foraging time and cause bat species to miss out on peak nocturnal insect abundance (typically around dusk). It can also increase the chances of predation by aerial predators such as owls. Bats will often rely on visual clues (e.g., treelines, hedgerows) in addition to using echolocation for both commuting and foraging, with their vision functioning better in low lit areas. Illuminated areas can upset bat activity by affecting visibility. Bats may also adjust their behaviour to avoid illuminated areas. Light sensitive species such as Lesser Horseshoe Bat and less light tolerant species, such as the Daubenton's bat will avoid lighting. Some bats such as Leisler's Bat and Pipistrelle species can be attracted to lights and will forage on the swarming insects that gather there. This can disturb existing patterns of foraging activity and may provide a competitive advantage over less light tolerant species. Strong ultra-violet (UV) component and white and blue (cool) lighting attracts more insects than low UV and warmer colour temperature lighting (Bat Conservation Trust, 2018). The installation of public lighting is proposed along various sections of this scheme, parts of which are not currently illuminated. There is a high potential impact of illumination from public lighting to disrupt bat activity, deter and displace bats from the area. In order to maintain the quality of this habitat for both foraging and commuting bats, it is recommended that the public lighting is limited and designed in such a way as to minimise the impact on bats.

Noise and Vibration:

Noise and vibration as a result generators that may be left running at night during construction can impact bat species and their echolocation. This will impact upon their foraging, commuting and communication.

Damage to trees:

Machinery used during construction, particularly in the root zone, can result in damage to trees and increased tree mortality. It may also cause damage to the trunk and branches of trees.

Disturbance to roosting sites:

No buildings or structures will be impacted by the proposed works. Surveys carried out by O'Donnell Environmental in 2021 revealed that one tree of above "negligible" suitability to support roosting bats is located in an area marked for clearance (T-05 in O'Donnell 2021 report). The latest design drawings for the project as of July 2024 indicate this tree is not marked for felling because the route has moved

and thus the tree will not be directly impacted by the proposed works. Works will take place in close proximity to other trees with some suitability to host roosting bats.

The GLTA carried out in January 2024 detected no unoccupied roosts which contained signs of bat occupation (droppings, staining). It determined the trees assessed on site have some minor potential to function as a hibernating roost for bats and have some potential to function as roosting sites for bats during the bat activity season. Trees earmarked in the area to be felled do not support viable PRFs and offer no potential roosting habitat for bat species. The felling of these trees is not predicted to result in the loss of any moderate to high potential roosting features. One tree (Ash (*Fraxinus excelsior*) near a footbridge at the start of the proposed cycleway route was found to have a number of features namely splits in limbs, lifted bark, and fissures as well as smaller cracks that increase the potential for roosting bats. This tree is not located in an area marked for tree felling and so will not be directly impacted by the proposed works. Mitigation measures outlined in the later sections in this report with regards to lighting, noise and root exclusion zones will ensure that there is no significant impact on this tree during the proposed works. Machinery operating in the root zone of trees may result in damage to trees and increased tree mortality if measures are not taken to protect trees which are being retained during the proposed works.

Loss of foraging habitat:

The large variety of species detected during the surveys is reflective of the wide variety of foraging habitats present throughout the scheme area. There are areas of urban parks, open pasture, woodland and riparian habitats that can be utilised by a variety of bat species with different foraging tactics. Eight species of bat were detected during the 2024 surveys and an additional ninth species (Annex II Lesser Horseshoe Bat) was detected during the 2021 surveys with NBDC and BCI records confirming its presence in the area. Loss of vegetation will likely reduce the quality of local foraging habitat, but this is unlikely to be significant given the route will largely be along existing pathways and there will be relatively small amount of habitat loss in the context of the wider landscape.

Impaired ability to commute:

Linear landscape features such as rivers, hedgerows and treelines are used by bat species to commute and navigate through the wider landscape. They can also serve as protection for bat species from predators. The removal or severing of such landscape features may reduce the ability of bat species to commute through the landscape which may reduce available foraging habitat and isolate bats from alternative roosts. The impairment of flightlines in proximity to roost sites can be particularly impactful. A number of trees are required to be removed during this project, but they are largely located to adjoining existing infrastructure or in woodland where it will not significantly impact upon the ability of

bats to commute. No removal or severing of existing linear features is expected to occur as a result of the proposed works and thus there is no expected impact on the commuting ability of bats.

In agreement with the findings of O'Donnell Environmental in 2021, the GLTA carried out by Ryan Haney in January 2024 and the activity surveys carried out in June and July 2024, in the absence of mitigation measures, the above impacts would be expected to result in a **"slight" negative impact** on bat ecology at a local scale.

6 MITIGATION & ENHANCEMENT

The following mitigation measures should be implemented as part of the proposed project.

Lighting:

Construction works should take place during daylight hours only with no lighting on the site during the hours of darkness. Any lighting required for health or safety reasons should be installed at a minimum of 10 metres from existing treelines and woodland habitats and directed away from such sensitive habitats. The proposed public lighting should be designed to minimise light spill on to habitat features, such as the River Shannon or the bat boxes present along the pathway, and concentrate artificial light only where required.

Where public lighting is to be installed along the proposed scheme, the following recommendations are proposed:

- Lighting should be minimised wherever possible in terms of number of lights, the power of the lights (lux level), as well as the UV content. Using powerful lighting on wildlife corridors can, for some species, effectively sever connectivity.
- Directional lighting, facing and located away from the surrounding vegetation should be used, e.g., the use of hoods, cowls.

Table 6.1 Criteria for Suggested Lighting Plan (BCT, 2023).

Criteria	Guidelines	Project Recommendations
Appropriate luminaire specifications	No UV component/ Preferentially cool LED (<3000 Kelvin (K))	A cool white light source to be adopted to reduce blue light component.
Height of light	<5m.	
Directionality	Downwards focused to reduce spill, Minimise light spills using shields, masking & louvres. Light can be restricted and directed to below the horizontal plane, preferably at an angle of less than 70°.	
Timing of lights	Restrict lights to ensure that there are dark hours in place.	

Criteria	Guidelines	Project Recommendations
Avoidance of key areas	Buffer zones of 50m maintained for key features (treelines, hedgerows, woodland). No light around roosts.	
Brightness	No specific guideline available – not as relevant for bats given the spectral sensitives. Lux values under 0.5 in the vertical plane are considered ideal for corridors for bats.	

Noise and vibration:

Generators or other sources of noise, vibration and emissions should not be located with 50m of the existing woodland habitat throughout the site. There should be avoidance of noise and vibration in so far as possible.

Tree protection and impact on bat roosts:

Consultation with an arboriculturist should be sought to protect the trees to be retained during the proposed works. Root protection zones should be established prior to commencement of any works and there should be an appropriate barrier to prevent access by machinery. Trees should not be felled within the bird nesting season from 1st March to 31st August under the Wildlife Act, unless under licence granted from NPWS or with a felling licence. The most appropriate time for felling of trees for bats is September to late October when bats are capable of flight (young bats) and have not yet commenced hibernation.

In line with Bat Conservation Trust Guidance, (2023), at least one bat survey should be undertaken during the appropriate bat survey season to assess potential use of the tree by bats in advance of any felling, and to assess the need for mitigation, if required. This survey will be inclusive of:

- General bat species and quantity within the site ZoI;
- Use of tree as roosting sites; and
- Use of trees as potential roosting sites.

In the event bat(s) are present, the tree may only be removed with a roost derogation license issued by NPWS. Following this inspection and the suitable confirmation of the absence of roosting bats, the trees should be felled according to the following procedure:

Where a large machine such as an excavator is to be used to fell trees, pre-emptive warning should be given to alert any unrecorded roosting bats that may be present by pushing the tree gently 3 to 4 times with the excavator bucket. A pause of 30 seconds should be implemented between each push. The tree should then be pushed to the ground slowly and should remain in place until it has been inspected by the on-site Ecologist.

Where a chainsaw is to be used, limbs free of Ivy will be first cut and allowed to fall to the ground. For the felling of the main Ivy-covered trunks ropes or winches will be put in place so that once the trunk is cut at the base it can be lowered slowly to the ground to thus avoiding any high impact a potential fatality to any unidentified bats present in the Ivy cover.

The Ecologist should be present for the felling of the tree and the tree should be left on the ground for 48 hours to allow for exit. In the event that no bats are identified during the activity survey, the tree should be inspected immediately prior to felling with the month of September an appropriate time for this activity.

In addition to measures to avoid impacts, there is opportunity for ecological enhancement for bats as part of the proposed development. To augment roosting opportunities available to local bat populations at present, additional of bat boxes in a variety of designs suitable for bats with differing roosting habits could be installed on mature trees within the final design to supplement those already present. Bat boxes should be installed on mature trees, positioned to face south, southeast, or southwest and at heights no less than 4m above ground level to avoid predations and allow appropriate access and exit (Bat boxes are available from a variety of commercial outlets). Bat boxes can be positioned at any time of year, but they are more likely to be used during their first Summer if they are put up before the bats emerge from hibernation in late Spring. A suitably experienced Ecologist must oversee the installation of the boxes. All personnel should wear gloves to reduce transmission of human pheromones, which may reduce or delay uptake of boxes by bats.

Reduced foraging habitat & impaired ability to commute:

Prior to construction, vegetation to be retained will be demarcated in consultation with an ecologist and fenced off. This exclusion area should be maintained throughout the entire construction process. Loss of trees or tree cover should be mitigated for by replanting throughout the scheme boundary as close as possible to where the original trees will be removed.

Following implementation of the avoidance and mitigation measures outlined above, the potential for temporary disturbance due to the proposed works is minimised. The loss of commuting and foraging habitat will be minor and temporary in nature throughout most of the scheme. Some loss of trees will occur as part of the proposed works which will result in a loss of potential roosting sites and reduced protection from predators from tree cover. The provision of bat boxes in suitable locations will partially mitigate in the short to medium term for the potential loss of any potential roosting features. Replanting

of trees throughout the scheme boundary will provide potential roosting features in the long term. Overall, in conclusion with the findings of O'Donnell Environmental in 2021 and the Ground Level Tree Assessment carried out by Ryan Hanley in January 2024, the results of this activity survey determine the proposed scheme is likely to result in a permanent, **"non-significant" negative effect** on bat ecology at a local scale.

7 CONCLUSION

As a result of the surveys by O'Donnell Environmental in 2021, the Ground Level Tree Assessment carried out by Ryan Hanley in January 2024 and the activity and passive surveys carried out in June and July 2024, a comprehensive study has been conducted to understand the importance of the study area in Castletroy & Annacotty in Limerick for bat species. No bat roosts were identified however there are a number of suitable bat roosting opportunities throughout the area, particularly for crevice dwelling species such as pipistrelles. The early detection of large numbers of soprano pipistrelles indicate a roost in proximity to the study site. High levels of bat activity and 8 (2024) – 9 (2021) species were detected during the activity surveys. The findings from the separate assessments indicate the study area to be of **"Local importance, (Higher value)**" to bats.

Works during the construction of the proposed cycleway will require felling of a number of trees and some vegetation clearance. The loss of foraging habitat or impact upon commuting ability is not expected to be significant following the mitigation measures outlined above. No roosting bats were encountered on any of the surveys conducted to date and following the implementation of the mitigation measures specified above, no bat roosts are likely to be disturbed as a result of the proposed works. Lighting should be designed as outlined in the mitigation section above to take into consideration wildlife and bats.

Overall, in conclusion with the findings of O'Donnell Environmental in 2021 and the Ground Level Tree Assessment carried out by Ryan Hanley in January 2024 and the activity and passive surveys carried out in 2024, it can be concluded that the proposed scheme is likely to result in a permanent, **"non-significant" negative effect** on bat ecology at a local scale.

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9 APPENDIX

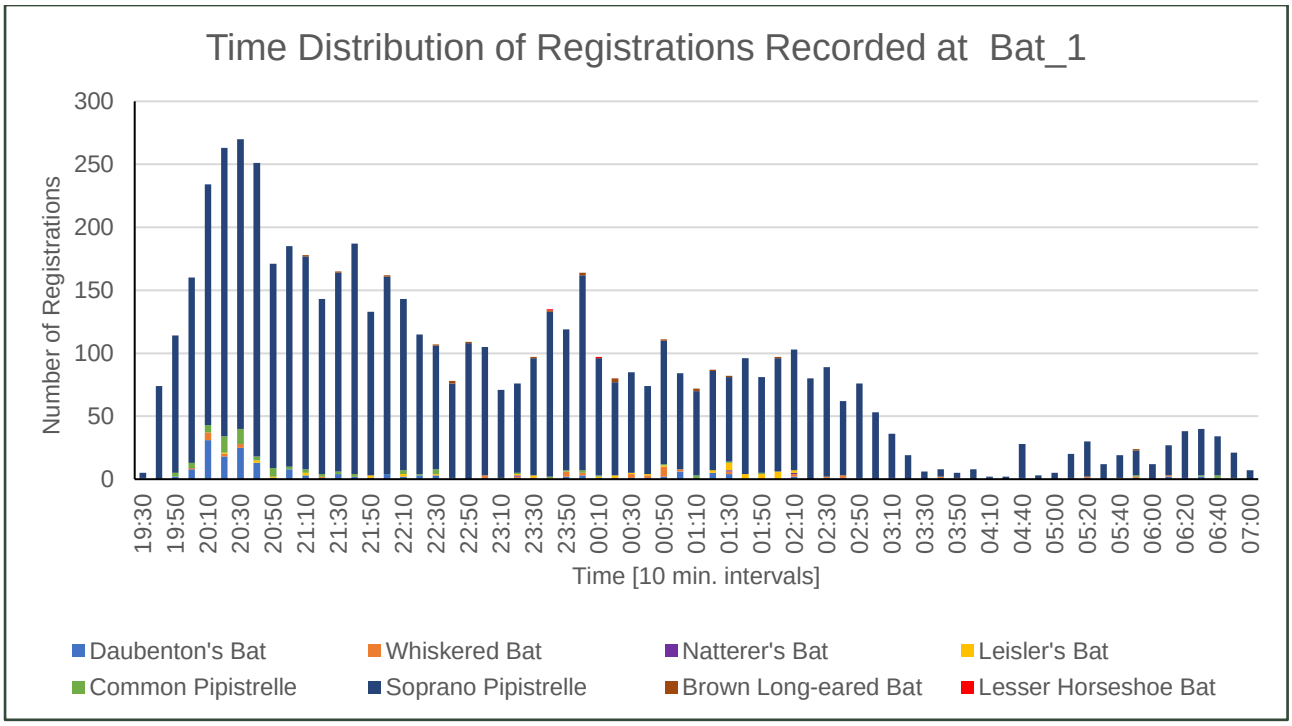
A: DETAILS OF PASSIVE MONITORING SURVEY PERIOD (O'DONNELL, 2021)

Date [night of]	Sunrise	Sunset	Temp. °C	Wind km/h	Precipitation
09/09/2021	06:58	20:03	18	15	Dry
10/09/2021	07:00	20:01	16	17	Dry
11/09/2021	07:02	19:58	15	11	Dry
12/09/2021	07:03	19:56	15	9	Dry
13/09/2021	07:05	19:54	17	9	Dry
14/09/2021	07:07	19:51	16	11	Dry
15/09/2021	07:08	19:49	14	9	Dry
16/09/2021	07:10	19:46	18	30	Dry
17/09/2021	07:12	19:44	14	9	Dry
18/09/2021	07:13	19:42	14	7	Dry
19/09/2021	07:15	19:39	15	11	Dry
20/09/2021	07:17	19:37	15	9	Dry
21/09/2021	07:18	19:34	16	15	Dry

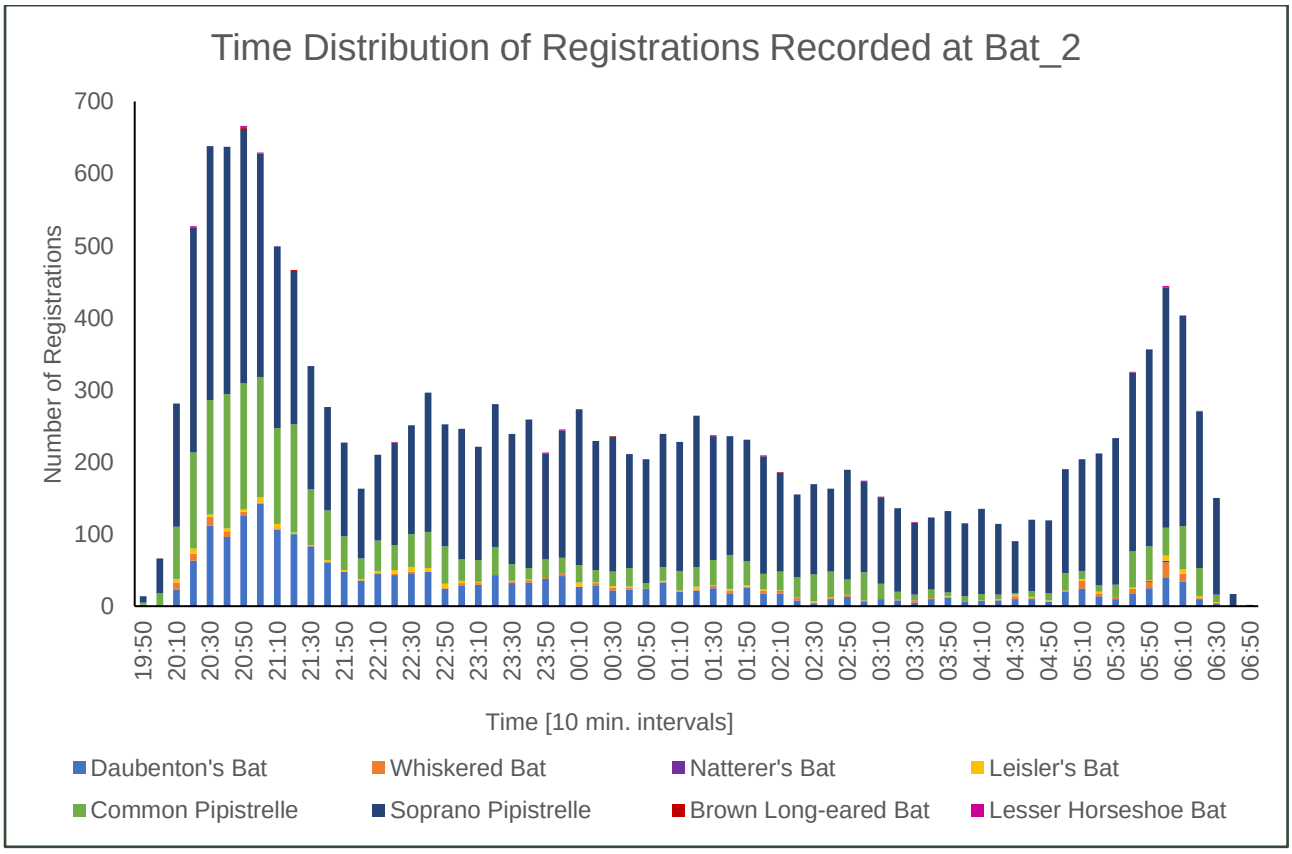
B: REGISTRATIONS FOR EACH SPECIES RECORDED DURING PASSIVE SURVEYS (O'DONNELL, 2021)

Detector	Bat_1	Bat_2
Daubenton's Bat	178	2080
Whiskered Bat	49	193
Natterer's Bat	3	8
Leisler's Bat	46	140
Common Pipistrelle	84	2723
Soprano Pipistrelle	5545	11187
Brown Long-eared Bat	21	7
Lesser Horseshoe Bat	2	16
Total	5928	16360

C: RESULTS OF PASSIVE BAT MONITORING AT MONITORING POINT BAT_1 (O'DONNELL, 2021)



D: RESULTS OF PASSIVE BAT MONITORING AT MONITORING POINT BAT_2 (O'DONNELL, 2021)



E: Deployment Location of Passive (Automated/Static) Detector Bat_1

F: Deployment Location of Passive (Automated/Static) Detector Bat_2