Tionscadal Iompar
Cathair na Gaillimhe

N6 Galway City Ring Road

Bat Derogation Licence Application

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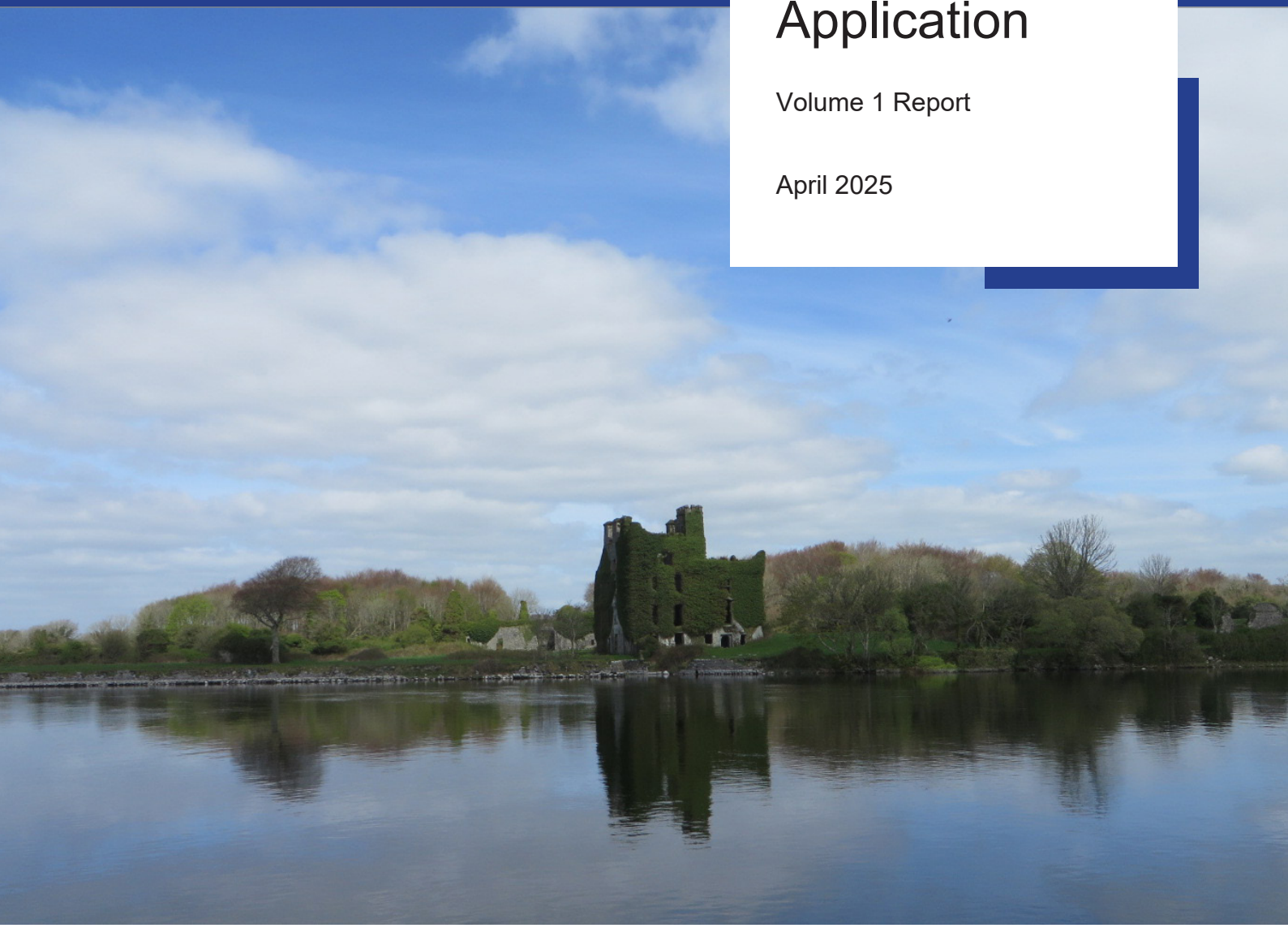

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Contents

Appendices

1. Introduction

Galway County Council are submitting this application under Regulation 54 of the *European Communities (Birds and Habitats) Regulations 2011* (S.I. 477 of 2011) for a derogation licence to comply with the requirements of the provisions of Regulations 51, 52 and 53 of the same Regulations.

The application relates to specific residual impacts on bats arising from the construction and operation of the proposed N6 Galway City Ring Road, hereafter referred to as the proposed N6 GCRR, and its potential impact on bat (*Chirpotera*) species.

The proposed N6 GCRR comprises the construction of approximately 5.6km of a single carriageway from the western side of Bearna Village as far as Ballymoneen Road and approximately 11.9km of dual carriageway from Ballymoneen Road to the eastern tie in with the existing N6 at Coolagh, Briarhill, and associated link roads, side roads, junctions and structures, as shown on Plate 2.1. The section of the proposed N6 GCRR from the tie-in with the R336 Coast Road to the N59 Letteragh Junction will be a protected road[1] and the section from this junction to the tie-in with the existing N6 at Coolagh, Briarhill will be a motorway. A full description of the proposed N6 GCRR is provided in Section 2.

Potential impacts have been mitigated for as far as possible during the design phase of the proposed N6 GCRR and the residual impacts are those that cannot be ruled out, despite applying best practice techniques.

This licence application is being submitted to the National Parks and Wildlife Service of the Department of Housing, Local Government and Heritage for approval.

The guidance that has been referred to during the preparation of the application for the derogation licence has included:

- *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins, 2016)[2]
- Bat mitigation guidelines for Ireland v2. *Irish Wildlife Manuals, No. 134*. (Marnell *et al.*, 2022)
- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* (NRA, 2005)
- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (NRA, 2006)
- *Lesser Horseshoe Bat Species Action Plan 2022-2026* (NPWS & VWT, 2022)
- *Wildlife and Traffic: A European Handbook for Identifying Conflicts and Designing Solutions. COST 341 Habitat Fragmentation due to Transportation Infrastructure.* (Iuell et al, (Eds.), 2003)
- *SafeBatPaths: Fumbling in the dark - effectiveness of bat mitigation measures on roads*: Final report (Elmeros and Dekker, 2016)
- *Bat mitigation measures on roads – a guideline: Fumbling in the dark – effectiveness of bat mitigation measures on roads. CEDR Transnational Road Research Programme*. Conference of European Directors of Roads. (Elmeros et al, 2016)
- UK *Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Version 1.1*. (Reason and Wray, 2023)

[1] A protected road, as defined under Section 45 (1) of the Roads Act, means a public road or proposed public road specified to be a protected road in a protected road scheme approved by An Bord Pleanála. Section 45 (2) of the Roads Act 1993, as amended, states that a protected road scheme approved by the Minister may provide for the prohibition, closure, stopping up, removal, alteration, diversion or restriction of any specified or all means of direct access to the protected road from specified land or from specified land used for a specified purpose or to such land from the protected road.

[2] The 3rd (i.e. 2016) edition of the Bat Conservation Trusts *Bat Surveys for Professional Ecologists: Good Practice Guidelines* was the most recent at the time the bat surveys were undertaken for the proposed road development.

Bat mitigation guidelines for Ireland v2 note that they do not include the planning and development of national roads and refer out to Transport Infrastructure Ireland's documents in that regard: Best Practice *Guidelines for the Conservation of Bats in the Planning of National Road Schemes* (NRA, 2005) and *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (NRA, 2006). Nevertheless, the survey programme undertaken in 2023 to verify the extensive bat baseline data gathered between 2014 and 2018, and the development of the mitigation strategy and monitoring plan, is consistent with the principles and approach set out in *Bat mitigation guidelines for Ireland v2*. Any survey constraints or limitations that applied to the 2023 bat survey programme are discussed in Section 5.4.3 and the interpretation of results and development of the mitigation strategy and monitoring plan is based on a precautionary approach and appropriately qualified by those constraints, as relevant.

On 15 September 2023, the Bat Conservation Trust published a revised and updated 4th edition of the Bat Surveys *for Professional Ecologists: Good Practice Guidelines*. Compared with the 3rd edition, the main changes in survey methodologies relevant to the survey programme undertaken for the proposed N6 GCRR relate to:

- Use of night-vision aides (NVAs) as part of presence/absence roost surveys
- Change in Potential Roost Feature (PRF) classification system for assessing bat roost potential of trees, potential tree survey methods and recommended survey effort
- Walked transect methodology replaced with a night-time bat walkover (NBW) survey methodology
- A greater emphasis placed on use of automated detectors versus NBW surveys
- A reduction in minimum survey effort for in-person walked detector surveys (NBWs), now once per season regardless of habitat suitability
- A reduction in minimum survey effort for automated detectors surveys now to be deployed once per season or once per month over the season, depending on habitat suitability

Given the publication of the 4th edition of *Bat Surveys for Professional Ecologists: Good Practice Guidelines* at the end of the 2023 bat survey season, changes to survey methodologies are not reflected in how the 2023 bat survey data was gathered. Nevertheless, the survey programme and methodologies applied in 2023 are appropriate and sufficient to update the baseline environment used to inform the impact assessment and mitigation strategy presented in this derogation licence application. As an example, although NVAs were not routinely used for presence/absence surveys, infrared camera technology was used to accurately count key lesser horseshoe bat roosts (e.g. Menlo Castle and Cooper's Cave).

A Bat Derogation Licence application for the Project was submitted to the NPWS in March 2024, and granted in April 2024 (see Appendix A.8.25 Part 1 of the EIAR for the 2024 bat derogation licence). As the 2024 bat derogation licence expired on 31 December 2024, a new derogation licence application was submitted to the NPWS on 1 April 2025 (included in Appendix A.8.25 Part 2 of the EIAR).

Further to the collection of the bat survey data in 2023, a review was undertaken in March 2025 to evaluate whether there have been any landscape scale habitat changes since then that might influence the movement or foraging behaviour of bats along, and in the immediate vicinity of, the Project. The review comprised an examination of recent orthophotography, along with a drive through and vantage point validation from the nearest publicly accessible location (generally a roadside), to record any large-scale land-use changes that might materially affect bat movement. The conclusion of the review was that there were no material landscape scale habitat changes since 2023 that would affect bat the movement or foraging behaviour of bats along, and in the immediate vicinity of, the Project. Therefore, it is the professional opinion of the author of this Bat Derogation Licence application that the scientific data presented within the Bat Derogation Licence application remains valid to robustly inform and support the bat impact assessment and conclusions set out in the bat derogation licence application.

It is noted that only activities that may give rise to offences under Regulations 51, 52 and 53 of the 2011 Regulations are within the scope of this application. There may be other potential ecological impacts of the proposed N6 GCRR that are not relevant to this application and therefore are not discussed further.

Regulation 54 of the European Communities (Birds and Habitats) Regulations 2011 (S.I. 477 of 2011) states:

4.(1) Any person may apply to the Minister, or the Minister or Ministers of Government with responsibilities for fish species referred to in Part 2 of the First Schedule, for a derogation licence from complying with the requirements of the provisions of Regulations 51, 52 and 53.

(2) Where there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range, the Minister, or the Minister or Ministers of Government with responsibilities for fish species referred to in the Fourth Schedule, may grant such a derogation licence to one or more persons, where it is-

(a) in the interests of protecting wild fauna and flora and conserving natural habitats,

(b) to prevent serious damage, in particular to crops, livestock, forests, fisheries and water and other types of property,

(c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment,

(d) for the purpose of research and education, of repopulating and re-introducing these species and for the breeding operations necessary for these purposes, including the artificial propagation of plants, or

(e) to allow, under strictly supervised conditions, on a selective basis and to a limited extent, the taking or keeping of certain specimens of the species to the extent specified therein, which are referred to in the First Schedule.

(3) A derogation licence granted under paragraph (2) shall be subject to such conditions, restrictions, limitations or requirements as the Minister considers appropriate.

(4) Any conditions, restrictions, limitations or requirements to which a derogation licence under paragraph (2) is subject shall be specified therein.

(5) Without prejudice to any conditions, restrictions, limitations or requirements specified therein, a derogation licence granted under this Regulation is subject to the provisions of subsections (2) to (5) of section 14 of the Protection of Animals (Amendment) Act 1965.

This application is set out as follows:

- A description of the proposed N6 GCRR (Section 2)
- An explanation as to why a derogation is required in terms of the justification for the proposed N6 GCRR (Section 3)
- Explanation as to why there are no satisfactory alternatives (Section 4)
- Data collected in order to describe the local bat population (Section 5)
- Description of the potential impacts on the local bat population (Section 6)
- Summary of the potential impacts on the local bat population (Section 7)
- Description of the approach proposed toward mitigating the potential impacts and providing compensatory measures for impacts that cannot be fully mitigated (Section 8)
- Description of residual impacts (Section 9)
- Proposed monitoring programme prior to, during and post-construction (Section 10)

2. Description of the Proposed N6 GCRR

The proposed N6 GCRR comprises of the construction of approximately 5.6km of a single carriageway from the western side of Bearna Village as far as the Ballymoneen Road and approximately 11.9km of a dual carriageway from there to the eastern tie in with the existing N6 at Coolagh, Briarhill, along with associated link roads, side roads, junctions and structures and localised works to the existing electricity transmission and distribution networks (specifically comprising of the diversion of 110kV and 38kV services), as shown in Plate 2.1 below.

The total area within the Assessment Boundary is 334ha. The total area within the footprint of the development boundary was 280ha in the 2018 EIAR. This increase of 54ha is due to the additional lands included at Galway Racecourse for the purposes of the application for the Galway Race Committee Trust Planning Permission relating to the proposed development at Galway Racecourse for which planning permission has been granted. Of this total area, an area of 180ha is required for the footprint of the proposed N6 GCRR.

Plate 2.1 Proposed N6 GCRR Overview

The proposed N6 GCRR ties into the existing R336 Coast Road in An Baile Nua with an at-grade roundabout junction approximately 2km to the west of Bearna Village and then proceeds north and east as a single carriageway to the north of Bearna Village and onwards towards Ballymoneen. An at-grade roundabout is proposed at the Bearna to Moycullen Road L1321, and at-grade signalised junctions are proposed at Cappagh Road and Ballymoneen Road.

To the east of the Ballymoneen Road Junction the proposed N6 GCRR is a dual carriageway and continues east to a grade separated N59 Letteragh Junction located in Letteragh. The junction connects to the N59 Moycullen Road via the proposed N59 Link Road North, and to the Letteragh Road and Rahoon Road via the proposed N59 Link Road South. The proposed N6 GCRR continues eastwards to cross the existing N59

Moycullen Road at Dangan and travels on a viaduct over the University of Galway Sporting Campus before crossing the River Corrib and Lough Corrib SAC on a bridge structure.

The University of Galway (UoG) Sports Pavilion will be modified and will continue to function as a sports facility during and post construction. The modifications to the Sports Pavilion at UoG Sporting Campus will be undertaken as enabling works during the summer period prior to commencement of the construction of the proposed N6 GCRR. Welfare facilities at the Sports Pavilion at UoG Sporting Campus will be maintained throughout the construction works.

East of the River Corrib, the proposed N6 GCRR continues east on embankment toward the townland of Menlough. Additional lands to the north of Menlo Castle are included as part of the proposed N6 GCRR to provide lands for the enhancement of the core foraging habitat for the Lesser horseshoe bat known to roost at Menlo Castle and mitigate against potential impacts to this species. These lands will be planted with additional hedgerows and maintained as agricultural lands by the local authority and will remain in their ownership.

Continuing east the proposed N6 GCRR crosses over Bóthar Nua and remains on a viaduct section, the Menlough Viaduct, towards Sean Bóthar before entering a section of cut preceding Lackagh Tunnel, immediately west of Lackagh Quarry, and exits the tunnel in the quarry. There is a tunnel maintenance building located adjacent to Lackagh Tunnel.

The proposed N6 GCRR continues east with a grade separated junction located at the N84 Headford Road Junction at Ballinfoyle and continues east through the townland of Castlegar to the grade separated junction at the N83 Tuam Road. This junction provides access to both the N83 Tuam Road and the proposed Parkmore Link Road between the Ballybrit Business Park and the Parkmore Industrial Estate via the proposed City North Business Park Link Road to provide full connectivity at this location.

The proposed N6 GCRR then continues southeast entering the Galway Racecourse Tunnel (length 230m) at Ballybrit to the north of the racetrack which results in the demolition of the existing stables. Galway Race Committee Trust has subsequently applied for planning permission for replacement temporary and permanent stables, and associated development, to address/mitigate against the loss of stables and ensure the continued operation of the racecourse. That application (Reference 24/60279) was granted approval by Galway City Council on 2 December 2024.

On emerging from the tunnel, the proposed N6 GCRR continues southeast, crossing over the R339 Monivea Road on embankment and continuing south to enter a cutting as it reaches its junction with the existing N6 at Coolagh Junction. The proposed Coolagh Junction will be a fully grade separated junction with partial free flow on the major movements.

The proposed N6 GCR will also include extensive landscape planting and the creation of Annex I habitat areas[3] (e.g. Calcareous grassland habitat within Lough Corrib SAC on the east bank of the River Corrib). Noise barriers will also be installed at locations along the proposed N6 GCRR.

There are four significant structures included in the design of the proposed N6 GCRR, namely the River Corrib Bridge, Menlough Viaduct, Lackagh Tunnel and Galway Racecourse Tunnel. The following is a summary of the main structures to be constructed for the proposed N6 GCRR and a brief overview of how these structures interact with the Lough Corrib SAC is provided. The locations are shown on Figures 2.1 to 2.15.

River Corrib Bridge

The proposed N6 GCRR crosses the River Corrib on a bridge structure (ST09/01) 620m in length between Ch. 8+850 to Ch. 9+500. The proposed structure comprises of an eight-span bridge carrying the proposed N6 GCRR over the River Corrib adjacent to a retained embankment with five culvert openings on the eastern approach. The proposed structure is a variable depth single concrete box without supports in the river with the main span over the river being 153m. There is no encroachment into the Lough Corrib SAC on the west

[3] The Annex I habitat creation relates to addressing residual impacts to Annex I habitats outside of any European sites in the EIA Report. It is not in response to any impacts on Annex I habitats that relate in any way to effects on QIs or the conservation objectives of any European sites and that habitat creation does not constitute "compensatory measures" in the meaning of that term in Article 6(4) of the Habitats Directive.

side of the River Corrib. On the east side, retaining structures are provided on the approach embankment to limit encroachment of the embankment into the Lough Corrib SAC. The structural depth of this main span varies from approximately 7m near the supports on either side of the river and reducing to approximately 3m at mid-span over the river, with no associated cables or trusses protruding above the deck.

Menlough Viaduct

A viaduct structure, Menlough Viaduct (ST10/01) is proposed from Ch. 10+100 to Ch. 10+420. The viaduct has a total length of approximately 320m, and the proposed N6 GCRR is on embankment on both approaches to it. It is located outside but adjacent to the Lough Corrib SAC, between 32m and 130m north of the SAC boundary.

The total length of the viaduct is governed by the area of priority Annex I habitat over which it crosses, namely Limestone pavement and a Turlough. Both of these Annex I habitats are located outside of the Lough Corrib SAC boundary and do not provide a supporting role to, nor form part of the QI for this SAC. The viaduct contains eight spans of a similar 40m span length. The span lengths have been adjusted to reduce the impact of the substructure and foundations on the Limestone pavement and Turlough (both of which fall outside of the Lough Corrib SAC boundary). The position of the substructure and foundations will minimise the potential impact on these Annex I habitats. No substructure supports are proposed within the extents of the Turlough.

Lackagh Tunnel

Lackagh Tunnel (ST11/01) is a 270m long mined (drill and blast) tunnel and is located at Ch. 11+150 to Ch. 11+420. The eastern portal of Lackagh Tunnel is located within the inactive Lackagh Quarry, a limestone quarry. The central section of the tunnel will pass under the Lough Corrib SAC, while the western portal is proposed to be located in agricultural fields outside of Lough Corrib SAC.

The primary function of the Lackagh Tunnel and its Western Approach is to transverse the Lough Corrib SAC between Lackagh Quarry and Menlough without directly impacting on the Limestone pavement and Calcareous grassland habitats within the Lough Corrib SAC. This requires a safe method of excavation and construction of the tunnel such that there will be no impact on the Lough Corrib SAC during the construction or operation of the tunnel.

Galway Racecourse Tunnel

The proposed Galway Racecourse Tunnel (ST14/02) consists of a 240m twin tube reinforced concrete cut and cover tunnel with central wall from Ch. 14+950 to Ch. 15+900. The purpose of the Galway Racecourse Tunnel is to avoid by design, adverse impacts, namely disruption to operations and functioning, on the Galway Racecourse. The proposed mainline passes through the north-western corner of Galway Racecourse property This tunnel does not traverse through or immediately adjacent to any European site.

3. Need for the Licence

3.1 Introduction

This Section addresses the requirement for the derogation to be issued only under specific qualifying circumstances as set out in Regulation 54(2).

The derogation is being sought on the basis that there are no satisfactory alternatives and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range. Furthermore, it is being sought as the project has imperative reasons of overriding public interest[4], including those of a social or economic nature. These reasons are outlined below.

3.2 Development of a Transport Solution for Galway

Galway City and its environs have critical transport issues that require urgent resolution. To address these transport issues, Galway County Council, Galway City Council, Transport Infrastructure Ireland and the National Transport Authority are collaborating in developing a transport vision for Galway where all elements of transport are working together to achieve an integrated sustainable transport solution. The proposed N6 GCRR which is the subject of this derogation licence, forms an essential part of this transport solution.

The total breakdown of the existing transport network in Galway occurs on a frequent basis as there is no resilience in the network e.g. wet afternoon, road maintenance, vehicle collision and/or signal outage. This random unpredictable shutdown of Galway's transport network costs millions and has the real potential to prohibit Galway functioning as a city or economic engine for the Western Region.

The transport issues facing Galway City and its environs as a result of the inadequacy of the existing road network are wide ranging with associated consequential impacts as noted below:

- Congestion throughout the city road network
- Over capacity of existing junctions
- Journey time unreliability due to uncertain quantum of delay
- Journey time variability throughout the day
- Peak hour traffic delays
- By-passable traffic is in conflict with internal traffic
- Strategic traffic is in conflict with local traffic
- Inadequate transport links to access markets within the city
- Inadequate transport connections from Galway onwards to Connemara
- Lack of accessibility to the Western Region as a whole
- Prolonged journey times and delays on the current bus network, due in part to the limited available road space in the city centre for introducing bus priority which both reduces its attractiveness to passengers and increases costs of operating
- Limited road space on most of the principal roads, which reduces opportunities for safe and comfortable cycling

[4]Note that the term "Imperative reasons of overriding public interest" is used in this application in the context of Regulation 54(2)(c) and does not in any way infer the same meaning as used in Article 6(4) of the E.C. Habitats Directive and Regulation 43 of S.I. 477 of 2011.

- Connectivity issues on the National and Regional road network resulting in significant volumes of cross-county and strategic travel demand between east and west Galway being concentrated and funnelled through the city area in order to cross the River Corrib
- The impact of traffic congestion on the city's reputation, particularly with regard to inward development
- Accessibility issues due to traffic congestion for businesses and community facilities in Galway City and its environs and the Business Parks in Parkmore and Ballybrit
- The routing of thousands of vehicles per day through the city centre brings with it associated and unmitigated impacts on businesses, public facilities, homes and non-motorised road users
- The stop/start nature of urban driving and platooning of vehicles behind slow moving vehicles adds to the levels of pollution experienced by locals and visitors
- Severance effects of traffic congestion is experienced in urban areas and traffic speeds are increasing in rural areas as local roads are used to avoid the congested national road network

There is a critical need to address the transport issues in Galway City and its environs. As a Gateway to the Connemara and the West Region, **connectivity and accessibility to and through Galway City** is essential in aiding the region to revitalise, improve and develop into the future. As Galway City and its environs continues to grow, it is crucial to **safeguard the future development** of the city as the principal economic centre in the west of Ireland and to ensure that its development is sustainable. In addition, providing **well developed transport links** via roads, rail and air to the West Region enables enterprises and the local economy of the west to grow and develop as a viable alternative to the east coast corridor which is of significant public interest at a national level. The existing road network was analysed to establish the underlying issues so that the appropriate transport solution is implemented.

The transport solution recognises that the West Region has a significant and valuable resource in its natural heritage environment with a wide variety of species and habitats of local, national and international importance, whilst also being conscious of the need to establish effective communication links to ensure that the region continues to thrive and to offer an alternative to the east coast corridor. To get Galway City and its environs working and functioning in a sustainable manner for the future is key to this solution.

The physical form of the city, together with the limited available space between the lake and the bay, plus the presence of established communities, commercial and educational facilities, Natura 2000 designated sites[5] (hereinafter referred to as European sites), National Heritage Areas and proposed Natural Heritage Areas, and sites of significant architectural, archaeological and cultural heritage significance presents significant constraints for developing new infrastructure for the city and focuses attention on the importance of considering all alternatives in order to minimise the impact on those designated sites.

3.3 Galway Transport Strategy

The Galway Transport Strategy is the transport solution for Galway and provides Galway City and its environs with a clear implementation framework for transportation over the next 20 years. The GTS took into account the existing transport issues as described above and these issues were carefully considered and analysed with the aim of finding a transport solution to create a safer, smarter and sustainable transport system for Galway City and its environs taking into account travel demands, existing infrastructure and environmental constraints.

[5] Natura 2000 sites are defined under the Habitats Directive (Article 3) as a European ecological network of special areas of conservation composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II. The aim of the network is to aid the long-term survival of Europe's most valuable and threatened species and habitats. In Ireland these sites are designed as *European sites* – as defined under the Planning and Development Acts and/or Birds and Habitats Regulations as (a) a candidate site of Community importance, (b) a site of Community importance, (c) a candidate special area of conservation, (d) a special area of conservation, (e) a candidate special protection area, or (f) a special protection area. They are commonly referred to in Ireland as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

The GTS included an evaluation of transport options for all modes, and affirmed the strategic need for an orbital route around the city and a new crossing of the River Corrib, in order to implement the level of service required for each mode of transport, including walking, cycling, public transport and private vehicle. The provision of an additional crossing of the River Corrib would facilitate the reduction of congestion on city centre roads, and allow the reallocation of road space in the city network to non-motorised modes of transport, thereby facilitating the effective implementation of all the elements contained in the GTS, namely the improvement of public transport, cycling and walking measures. A new road link to the north of the city is proposed as part of the GTS to deliver the necessary capacity and support the delivery of sustainable transport measures, particularly within the city centre.

3.4 N6 Galway City Ring Road (GCRR)

The initial studies carried out as part of the proposed N6 GCRR confirmed that a new River Corrib bridge crossing is possible and identified a preferred location for this crossing. Further details on the initial studies (such as constraints and options development) are provided in Chapter 4 of the N6 Galway City Ring Road (GCRR) 2018 EIAR[6].

The proposed N6 GCRR will deliver the additional crossing of the River Corrib and the new link road as proposed by the GTS. Therefore, the proposed N6 GCRR forms an essential part of the GTS, it delivers the road component of the overall transport solution for Galway City and its environs, provides benefit to the local and the larger regional population of Galway and the western region and is cognisant of the sensitive environment into which it is interwoven.

The need for the proposed N6 GCRR , is justified as it will deliver the following:

- By tackling the city's congestion issues, it will provide a better quality of life for the city's inhabitants and provide a much safer environment in which to live
- By reducing the number of cars on the roads within the city centre and improving streetscapes, workers and students are facilitated to commute using multi-modal transport means. This includes travelling on foot, by bicycle and on the public transport system
- Provides connectivity to the national roads via junctions to maximise the transfer of cross-city movements to the new road infrastructure, thus releasing and freeing the existing city centre zone from congestion caused by traffic trying to access a city centre bridge to cross the River Corrib
- Attracts traffic from the city centre zone thus facilitating reallocation of road space to public transport leading to improved journey time reliability for public transport
- Caters for the strong demand between zones on either side of the city
- Provides additional river crossing with connectivity back to the city either side of the bridge crossing
- Facilitates improved city centre environment for all due to reduced congestion, thus encouraging walking and cycling as safe transport modes

3.5 Summary

Galway City and its environs have critical transport issues as identified in Section 3.2 above that require urgent resolution. These are regarded to be imperative reasons of overriding public interest in the context of addressing Regulation 54(2)(c) of S.I. 477 of 2011[7].

There are, however, significant constraints for developing new transport infrastructure for Galway given (i) the physical form of the city, (ii) the limited space available, (iii) the built environment and residential areas on both sides of the River Corrib, and (iv) the presence of designated sites.

[6] https://www.n6galwaycityringroad.ie/

[7] Note that the term "Imperative reasons of overriding public interest" is used in this application in the context of Regulation 54(2)(c) and does not in any way infer the same meaning as used in Article 6(4) of the E.C. Habitats Directive and Regulation 43 of S.I. 477 of 2011.

The physical form of the city in terms of the built and natural environment and residential areas on both sides of the River Corrib, together with the limited available space between the lake and the bay, plus the presence of the designated sites, presents significant constraints for developing new infrastructure for the city. The presence of these constraints focuses attention on the importance of considering all alternatives to minimise the impact on the human environment and the designated sites.

To address the transport issues, an overall transportation solution for Galway was developed by Galway County Council, Galway City Council, and NTA culminating in the GTS, of which the proposed N6 GCRR forms a key element as the road component of this solution.

The GTS included an evaluation of transport options for all modes, and affirmed the strategic need for an orbital route around the city and a new crossing of the River Corrib, in order to implement the level of service required for each mode of transport, including walking, cycling, public transport and private vehicle. The provision of an additional crossing of the River Corrib would facilitate the reduction of congestion on city centre roads, and allow the reallocation of road space in the city network to non-motorised modes of transport, thereby facilitating the effective implementation of all the elements contained in the GTS, namely the improvement of public transport, cycling and walking measures. A new road link to the north of the city is proposed as part of the GTS to deliver the necessary capacity and support the delivery of sustainable transport measures, particularly within the city centre.

The proposed N6 GCRR will deliver the additional crossing of the River Corrib and the new link road as proposed by the GTS. Therefore, the proposed N6 GCRR forms an essential part of the GTS, it delivers the road component of the overall transport solution for Galway City and its environs, provides benefit to the local and the larger regional population of Galway and the West Region and is cognisant of the sensitive environment into which it is interwoven.

The conclusion of all the analysis and work on this project is that the proposed N6 GCRR resolves the transport issues and delivers on the project objectives and represents the optimal solution, both from the perspective of human environment and the natural environment.

The proposed N6 GCRR is the optimum transport solution and is consistent with proper planning and sustainable development and this view is supported /validated by recent inclusion of policy support for both GTS and constituent measures, including the proposed N6 GCRR, in the relevant Galway Development Plans.

The need for the proposed N6 GCRR, is justified as it will deliver the following:

- By tackling the city's congestion issues, it will provide a better quality of life for the city's inhabitants and provide a much safer environment in which to live
- By reducing the number of cars on the roads within the city centre and improving streetscapes, workers and students are facilitated to commute using multi-modal transport means. This includes travelling on foot, by bicycle and on the public transport system
- Provides connectivity to the national roads via junctions to maximise the transfer of cross-city movements to the new road infrastructure, thus releasing and freeing the existing city centre zone from congestion caused by traffic trying to access a city centre bridge to cross the River Corrib
- Attracts traffic from the city centre zone thus facilitating reallocation of road space to public transport leading to improved journey time reliability for public transport
- Caters for the strong demand between zones on either side of the city
- Provides additional river crossing with connectivity back to the city either side of the bridge crossing
- Facilitates improved city centre environment for all due to reduced congestion, thus encouraging walking and cycling as safe transport modes

The route of the proposed N6 GCRR, which is necessary to provide the optimal transport solution, results in the unfortunate but unavoidable impacts on the receiving environment including the removal of bat roosts. However, this must be viewed and considered and balanced with the overall benefits outlined above that this proposed N6 GCRR presents for the future of Galway and its environs and connectivity to the West Region.

4. Absence of satisfactory alternatives

4.1 Introduction

This Section presents the evidence to demonstrate that there are no satisfactory alternatives to the activities covered by the derogation, in order to meet the requirements of Regulation 54(2) of S.I. 477 of 2011. It specifically describes the results of the constraints and option selection studies which resulted in the selection of the preferred corridor for the proposed N6 GCRR. All of the alternative options considered, other than the "Do-nothing" option would have impacts on local bat populations. The impacts on bat populations varied between options, as described below.

4.2 Constraints

As noted in Section 3, there are significant constraints for developing new transport infrastructure for Galway given (i) the physical form of the city, (ii) the limited space available, (iii) the built environment and residential areas on both sides of the River Corrib, and (iv) the presence of designated sites.

These constraints are described in more detail below:

- The low density of the suburbs of Galway has led to reliance on private car usage as a means of travel and makes it difficult to develop an economically efficient public transport solution
- Galway City is divided by the River Corrib as it flows between Lough Corrib and Galway Bay with significant trip attractors, employment centres, education centres and residential areas located on both sides of the river
- Lough Corrib forms a natural division between the east and west of County Galway and the distance between Lough Corrib and Galway Bay is only 4.5km[8] within which lies Galway City, very much at the heart of County Galway
- The city is located in the middle of areas which are rich in natural heritage with a wealth of natural habitats. This has resulted in significant areas around Galway City being designated of international importance

The physical form of the city in terms of the built and natural environment and residential areas on both sides of the River Corrib, together with the limited available space between the lake and the bay, plus the presence of the designated sites presents significant constraints for developing new infrastructure for the city. The presence of these constraints focuses attention on the importance of considering all alternatives in order to minimise the impact on the human environment and the designated sites.

These constraints are depicted on Plate 4.1 below.

[8] Distance measured from south shore of Lough Corrib to Spanish Arch at Galway Docks

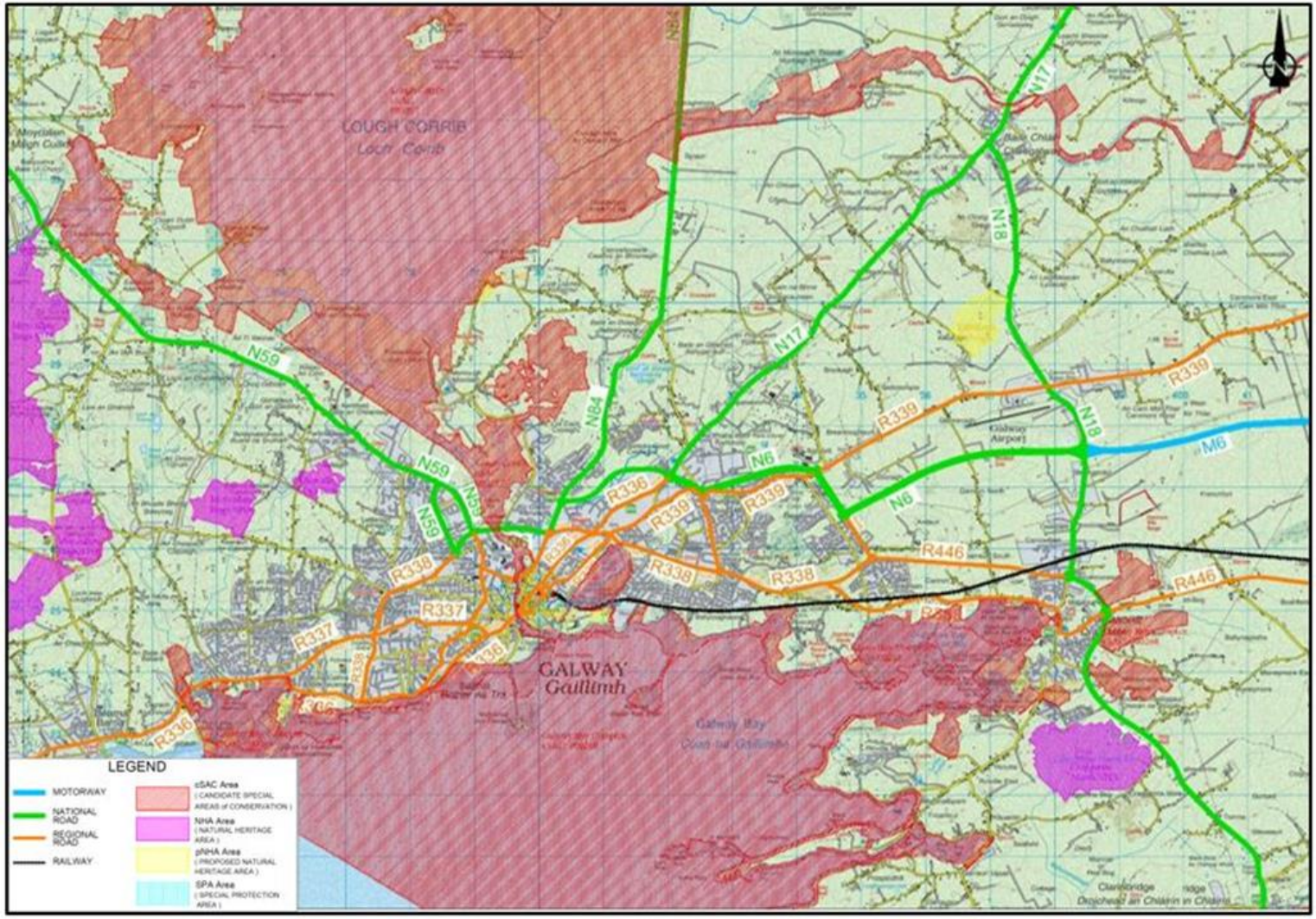

Plate 4.1 Significant Constraints

The design team for the proposed N6 GCRR, carefully considered and analysed the traffic issues in Galway with the aim of finding a transport solution to create a safer, smarter and sustainable transport system for Galway City and its environs taking into account travel demands, existing infrastructure and environmental constraints.

Initial feasibility studies identified the zones of employment, education, retail and residential, i.e. these are known as zones of traffic generators and attractors.

These zones are shown on Plate 4.2. This graphic shows the residential areas interwoven with the key attractors with the resultant travel desire lines also displayed and this plate demonstrates how the River Corrib divides this city.

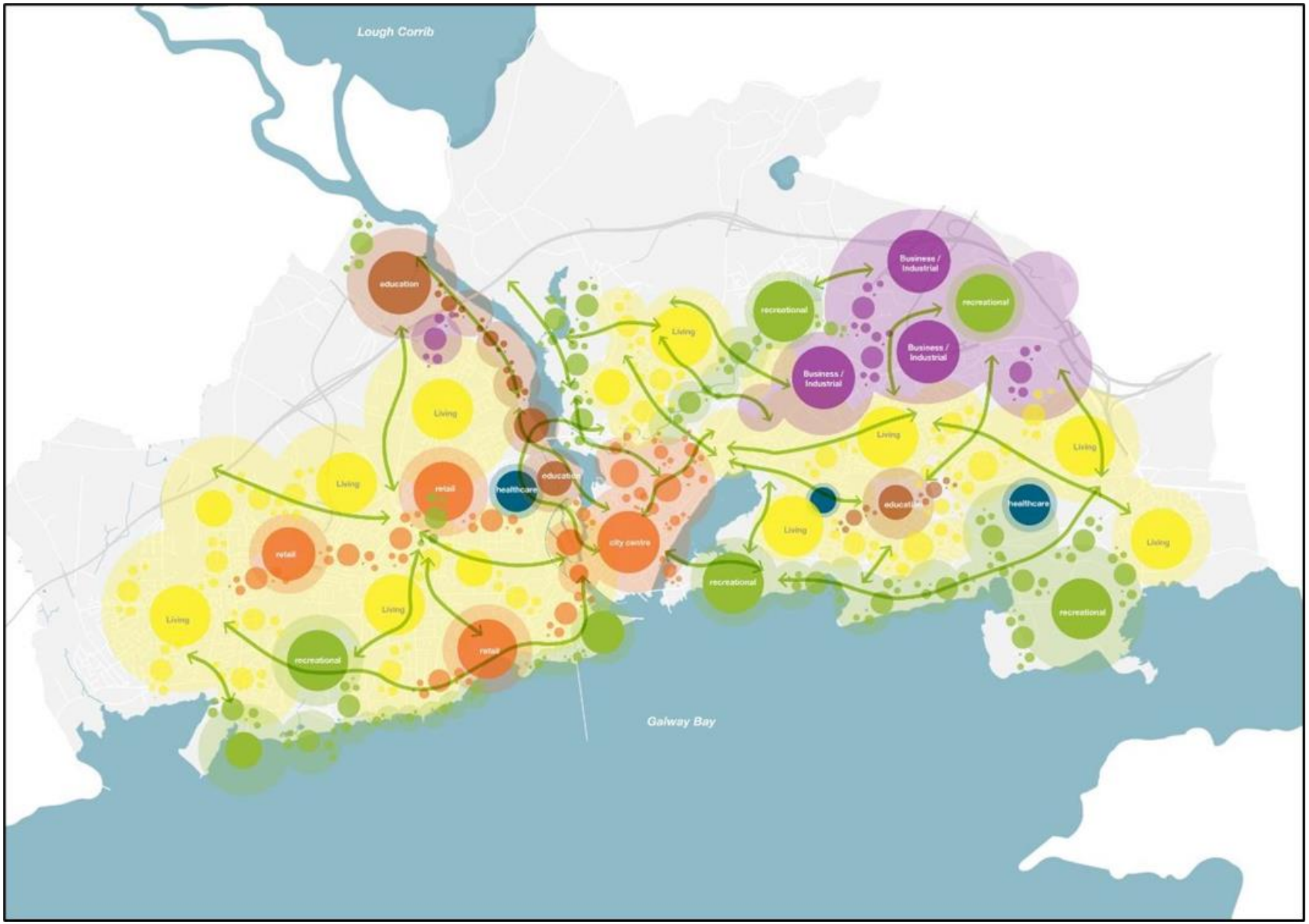

Plate 4.2 Traffic Generators and Attractors

4.3 Optioneering and Appraisal

The early studies identified that Galway has a transport problem, and moreover it had a multifaceted transport problem that needed more extensive analysis to fully understand all the issues. Full details of this analysis are included in Chapter 6 of the N6 Galway City Ring Road (GCCR) 2018 EIAR[9].

Following on from the initial feasibility studies, taking cognisance of the judgement on the 2006 Galway City Outer Bypass scheme and the key constraints of the Lough Corrib Special Area of Conservation (SAC) the options which were considered are outlined below:

- "Do-Nothing": This option is the Base Year model with growth factors applied to the existing population and traffic data up to the year of opening
- "Do-Minimum": This option includes road and non-road schemes, including smart mobility measures, which have been committed or are likely to proceed before the year of opening
- "Do-Something Public Transport": This option was based on measures, options and schemes identified by the existing *Galway Public Transport Feasibility Study* of 2010 for Galway City Council, including smart mobility measures
- Lough Corrib Route Options
- Coastal Route Options
- Upgrade Existing Road Alternative (On-line): The first road option developed was the on-line upgrade of the existing road infrastructure and utilises the existing N6 and the R338
- Build New Road Alternative (Off-line): This option included off-line route options connecting the R336 in the west to the existing N6 in the east, including the 2006 GCOB route option

An assessment of the following options discounted them from further consideration during the option development stage as they were deemed not to meet the project objectives:

- 'Do-Nothing'
- 'Do-Minimum'
- Traffic Management Alternative
- Lough Corrib Route Options
- Coastal Route Options
- Tunnel over project extents

The options considered further during the route selection phase include the Red, Orange, Yellow, Blue, Pink, Green Route Options and the 2006 GCOB Scheme (i.e. acronym for the N6 Galway City Outer Bypass Scheme of 2006) and the Cyan Route Option (i.e. acronym for the N6 Galway City Outer Bypass of 2006 route option from N6 to the N59 linked to an alternative route option from N59 to R336 on the west to avoid the impacts which were the subject of the refusal by ABP of this section previously) as shown in Plate 4.3 below.

At the constraints and option selection stage of the project, a greater proportion of the bat survey effort was focused on describing the Lesser horseshoe bat population, given its status as a qualifying interest species of the Lough Corrib Special Area of Conservation (SAC). The presence of other bat species at the constraints and option selection phase had been established by a series of walked and vehicle-based acoustic surveys, surveys of a selection of properties and use of automated detectors to record bat activity across the site.

A full assessment of the route options including public consultation was undertaken. A summary of the conclusions of this assessment including the comparison of potential impacts on bats is outlined below.

[9] https://www.n6galwaycityringroad.ie/

Further details on the route options are provided in Chapter 4 of the N6 Galway City Ring Road (GCCR) 2018 EIAR.[10]

Red and Orange Route Options

In terms of impacts on bats, the red and orange route options were within the foraging area of the Menlo Castle Lesser horseshoe bat roost; although they were one of three route options that were also in close proximity to the mating/hibernation site at Cooper's Cave in the Terryland River Valley. As such, the red and orange route options were considered to be one of the least damaging route options with regard to this species provided that the integrity of Cooper's Cave could be maintained. Given the scale of impacts on properties it is likely that these options would have also resulted in loss of bat roosts within buildings.

The overall assessment of the Red and Orange Route Options through the section from the city boundary to the existing N6 Coolagh Junction concluded that they are not feasible in so far as they are not deliverable or realisable as they create disproportionate impacts on the sensitive urban environment of Galway City and on its inhabitants, communities and neighbourhoods.

The scale and nature of the infrastructure required for the on-line portion of these route options is of significant magnitude; this is because the route option would be retrofitted into a sensitive urban environment. The design legacy of such significant heavy engineering solutions associated with these route options is likely to radically permanently impact on the experience and image of the city. The scale of this harm is so significant as to deem them to be at significant variance with some of the project objectives. The impacts of the Red and Orange Route Options are considered to be on such a large scale as to be disproportionate to the over-riding need for the proposed N6 GCRR. Equally as further mitigation by avoidance is very unlikely to improve these route options, these route options were not advanced further. The Red and Orange Route Options are not regarded to be satisfactory alternatives.

[10] https://www.n6galwaycityringroad.ie/

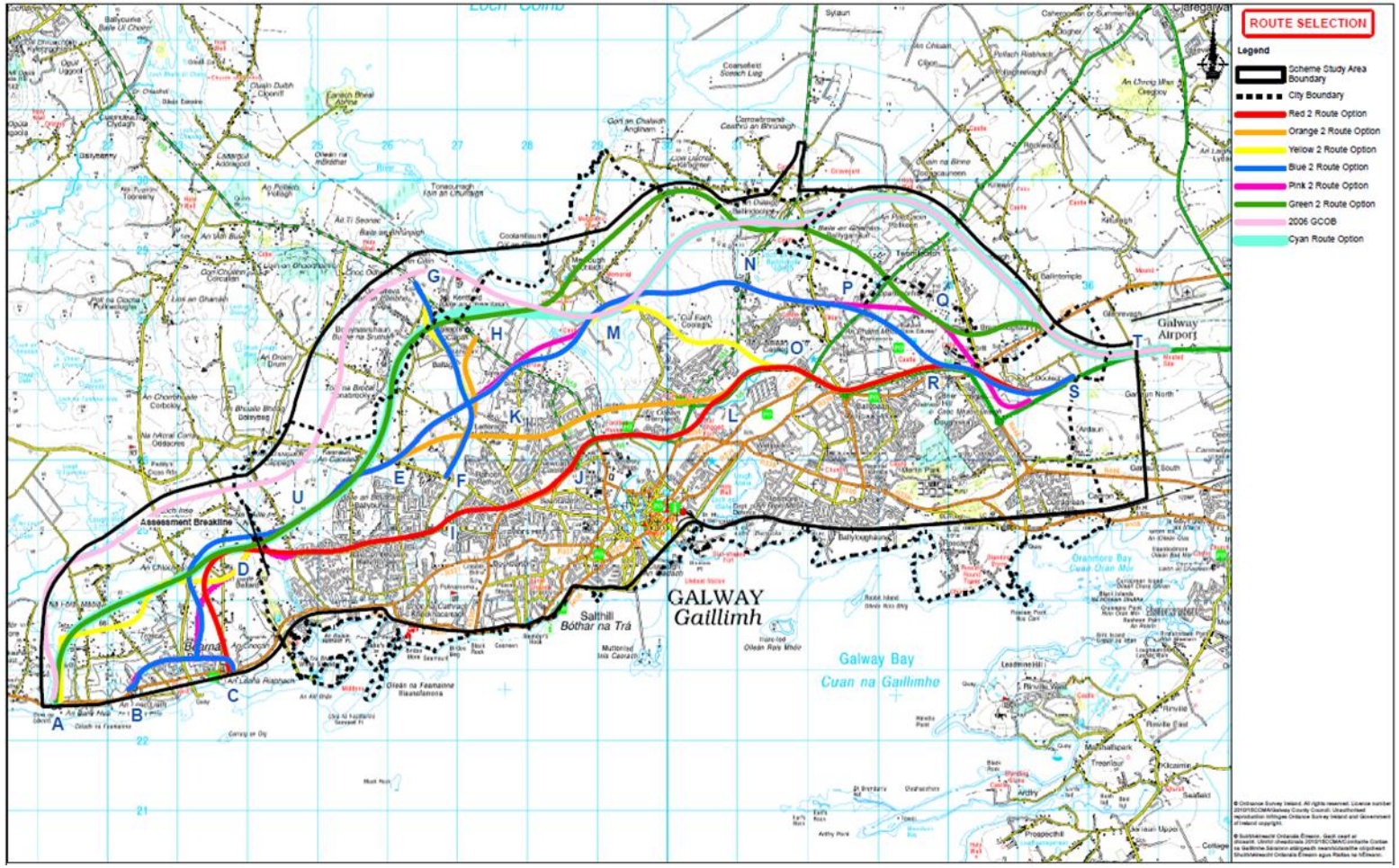

Plate 4.3 Route Options

2006 GCOB

The western section of the 2006 GCOB did not receive planning permission from ABP under the earlier application due to potential environmental impacts in the area of Moycullen Bogs Bog NHA. Further, the 2006 GCOB would not deliver the optimum intermodal transport solution as extensive traffic modelling shows that it would not deliver relief to congestion to the same level as the proposed N6 GCRR.

Further still, in terms of the 2006 GCOB:

- It does not provide connection with the N83 Tuam Road, a national road, thereby providing a lesser level of connectivity
- It does not provide any connection to the key employment centres at Parkmore and Ballybrit and, therefore, minimal relief to the existing congestion at the eastern city extents
- It has an adverse impact on the site integrity of the Lough Corrib SAC per the European Court decision
- It has potential to impact on Lough Inch River which is known to contain Freshwater pearl mussels downstream
- It has a significant impact on the Moycullen Bog Complex NHA from a hydrogeological and hydrological perspective both at Tonabrocky and in the vicinity of Lough Inch
- It has a profound impact on the curtilage of Menlo Castle from a cultural heritage perspective and on the amenity value from Human Beings perspective
- It has less impacts on communities and amenities with an overall improvement in the level of severance experienced, but at the expense of longer journey times and less relevant journey possibilities between east and west

Therefore, the 2006 GCOB route option was not advanced further. In terms of potential impacts on the local bat population, the 2006 GCOB would have been within the foraging area of the Menlo Castle Lesser horseshoe bat roost and close to Menlo Castle itself. The 2006 GCOB is not regarded to be a satisfactory alternative.

Cyan Route Option

The Cyan Route Option is a reconfiguration of the 2006 GCOB to address the issues raised by ABP in its refusal of the western section of the 2006 GCOB. This route option reflects the 2006 GCOB route option to the east of the River Corrib (i.e. approved by ABP in 2008) but with the addition of a grade separated junction on N83 at the crossing point. It follows an alternative route to 2006 GCOB to the west of the River Corrib (i.e. refused by ABP in 2008) in order to address the issues raised by ABP. The Cyan Route Option would not deliver the optimum intermodal transport solution as extensive traffic modelling shows that it would not deliver relief to congestion to the same level as the proposed N6 GCRR.

Further still, in terms of the Cyan Route Option:

- It does not provide a direct connection to the key employment centres at Parkmore and Ballybrit and, therefore, minimal relief to the existing congestion at the eastern city extents
- It has an adverse impact on the site integrity of the Lough Corrib SAC per the European Court opinion
- It has a profound impact on the curtilage of Menlo Castle from a cultural heritage perspective and on the amenity value from Human Beings perspective

Therefore, the Cyan Route Option was not advanced further. In terms of potential impacts on bats, the Cyan Route Option would have been within the foraging area of the Menlo Castle Lesser horseshoe bat roost and close to Menlo Castle itself. The Cyan Route Option is not regarded to be a satisfactory alternative.

Preferred Option

In reviewing all remaining route options (i.e. Yellow, Blue, Pink and Green), in each section, an assessment was undertaken under various criteria which sought to balance the potential impact on the ecological constraints, human beings and other constraints.

In terms of impacts on bats all of these route options have the potential to adversely affect local population of bats. All route options are c.1km from two Lesser horseshoe bat roosts, two known Whiskered bat roosts and two known Brown Long-eared bat roosts at the western end near Bearna. All posed adverse impacts to the local Lesser horseshoe bat population given the scale of habitat loss and severance likely to be associated with habitat loss within their core foraging area, and in the immediate vicinity of the maternity roost at Menlo Castle. The only differences between them related to the length of the proposed option corridor within the core foraging area and the distance from the castle itself. The Yellow and Blue Route Options were within 280m of the castle, the Pink Route Option 170m away and the Green Route Option 330m away.

The outcome of the robust assessment of all constraints for each route option is that the emerging preferred route option selected was a combination of route options which had the least number of residential properties acquired in each section, i.e. Yellow in Section 1 (modified to reduce potential environmental impacts), Pink in Section 2 and Pink in Section 3.

Further, once chosen, the design of the emerging preferred route option has been refined in as much as possible to eliminate and reduce impacts on the receiving environment.

The route of the proposed N6 GCRR, which is necessary to provide the optimal transport solution, results in the unfortunate but unavoidable impacts on the receiving environment including the removal of bat roosts. Due to the location of the core foraging area for the Lesser horseshoe bat population, impacts from the proposed N6 GCRR are unavoidable when the other environmental variables are also taken into account.

However, this must be viewed and considered and balanced with the overall benefits outlined above that this proposed N6 GCRR presents for the future of Galway and its environs and connectivity to the West Region.

The Optimum Transport Solution

The solution proffered in the proposed N6 GCRR is the optimum transport solution while also being the preferred option from an environmental perspective, both from a human environment and natural habitat perspective. This is the fundamental reason that the proposed N6 GCRR is deemed to be a proportionate response, and its justification is that it delivers all of the following:

- Provides a strategic route, forming part of the TEN-T comprehensive network, across the River Corrib without the need to go through the city
- Provides the necessary connectivity to all the national roads and the West Region and for those living within Galway and the rest of the country
- Provides for strategic traffic accessing Galway City and connectivity with zones of traffic generators and attractors
- It meets the functionality of the road component of the overall intermodal transport solution
- Enables the reallocation of existing road space within the city to public transport and smart mobility measures and is part of a sustainable holistic transport solution
- Alleviates congestion within Galway City which would result in reduced air and noise pollution
- Facilitates a more efficient public transport system
- Facilitates the provision of a multi-modal choice of travel
- Improves safety levels for all public road users
- Minimises property demolition and acquisition as far as possible

- Improves the quality of life of those living within Galway City with a reduction in traffic congestion and hence reduced pollution and an increase in opportunities for physical activity

5. Bat Survey Data

5.1 Survey Methodologies

The following sections describe the methodologies employed to carry out the bat surveys undertaken between 2014 and 2018 to inform the various stages of Constraints, Option Selection and EIA for the proposed N6 GCRR and also the bat surveys completed in 2023.

The extent of the survey area in 2023 was reduced relative to the survey area for the 2014-2018 surveys, in that roosts located within the proposed development boundary for the proposed N6 GCRR and its immediate vicinity were resurveyed, while accounting for a larger survey area for Lesser horseshoe bat roosts. The 2023 bat activity data does not supersede the 2018 but adds to it, in its function to verify the baseline predictions that underpin the impact assessment. The following annexes include stand-alone technical reports for discrete elements of surveys (e.g. radio-tracking studies):

- Appendix F: Galway Bat Radio-tracking Project - Bat Radio-tracking surveys. Radio-tracking studies of Lesser horseshoe and vesper bat species, August and September 2014 (Rush & Billington, 2014)
- Appendix G: Galway City Transport Project - Bat Acoustic Surveys: Summer-Autumn 2014 (Geckoella Ltd., 2015a)
- Appendix H: N6 Galway City Transport Project - Bat Radio-tracking and Roost Surveys 19 to 29 August 2014 (Geckoella Ltd., 2015b)
- Appendix I: Galway bat radio-tracking project. Radio tracking studies of Lesser horseshoe bat species, May 2015 (Rush & Billington, 2015)

A summary of all field surveys undertaken between 2014 and 2018, and in 2023, is provided respectively in Sections 5.1.1 and 5.1.2 below.

The methodologies employed are based on the approaches documented in Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition) (Collins, 2016). The methodologies documented in the guidelines are evidence based and are complementary to the Bat Mitigation Guidelines for Ireland – V2 (Marnell, et al., 2022). The methodologies employed for surveys in 2023 are generally a continuation of the methodologies employed for the collection of the baseline for the proposed development between 2014 and 2017. Where divergences have occurred, these divergences are noted and explained in the subsections below.

Three survey methodologies have not been repeated in 2023, based on the professional judgement of the authors of this report and on consultation with the NPWS on 3 March 2023:

- Vehicle transect surveys conducted to inform the baseline in 2014 were not repeated in 2023. While these surveys provided data across the original project study area (including the study area for identification of route options), the data generated was at a coarse landscape scale resolution. The combination of walked transects along the proposed N6 GCRR in 2023, supported by automated detector deployments, provides a more robust survey methodology to inform a new impact assessment and licencing process.
- The crossing point element of the automated/static bat detector surveys undertaken in 2015, did not greatly influence or support the final design of the bat mitigation strategy and therefore has not been repeated.
- Radiotracking surveys conducted in 2014 and 2015 have not been repeated in 2023 given the comprehensive data already collected between 2014 and 2018 and concerns on the part of the NPWS relating to the potential impacts of the surveys on bats relative to the unlikely change in data. It was

agreed that the completion of a revised marking study of the local lesser horseshoe bat population in combination with the completion of a landscape-scale assessment of changes to bat foraging and commuting habitats could be used to infer whether lesser horseshoe bat landscape use has changed since 2014 and 2015.

A Bat Derogation Licence application for the Project was submitted to the NPWS in March 2024, and granted in April 2024 (see Appendix A.8.25 Part 1 of the EIAR for the 2024 bat derogation licence). As the 2024 bat derogation licence expired on 31st December 2024, a new derogation licence application was submitted to the NPWS on 1st April 2025 (included in Appendix A.8.25 Part 2 of the EIAR).

Further to the collection of the bat survey data in 2023, a review was undertaken in March 2025 to evaluate whether there have been any landscape scale habitat changes since then that might influence the movement or foraging behaviour of bats along, and in the immediate vicinity of, the Project. The review comprised an examination of recent orthophotography, along with a drive through and vantage point validation from the nearest publicly accessible location (generally a roadside), to record any large-scale land-use changes that might materially affect bat movement. The conclusion of the review was that there were no material landscape scale habitat changes since 2023 that would affect bat the movement or foraging behaviour of bats along, and in the immediate vicinity of, the Project. Therefore, it is the professional opinion of the author of this Bat Derogation Licence application that the scientific data presented within the Bat Derogation Licence application remains valid to robustly inform and support the bat impact assessment and conclusions set out in the bat derogation licence application.

5.1.1 Survey Dates and NPWS Licences

5.1.1.1 2014 – 2018

A summary of all field surveys undertaken in 2014 to 2018 is provided in Table 5.1 below. For full details on Personnel for 2018 and 2023 surveying, see Appendix A.

Table 5.1 Surveys and Survey Dates between 2014 and 2018

Survey Type	Survey Date(s)	Surveyor(s)
Winter hibernation surveys	1 to 14 March 2014 21 March 2014 6 February 2015 24 February 2016 15 January 2018	Scott Cawley Ltd.
Autumn/Winter static monitoring surveys to detect mating and hibernation (Cooper's Cave, Newry's Cave, Prospect Hill Railway Tunnel and Menlo Castle)	September to October 2014 February to March 2015	Scott Cawley Ltd.
Vehicle-based bat preliminary roost assessments	July and October 2014	Scott Cawley Ltd.
Daytime manual preliminary roost assessments and dusk/dawn roost characterisation surveys	August and September 2015 July and August 2016 June and July 2017	Scott Cawley Ltd.
Counts of Lesser horseshoe bat roosts at Menlo Castle, Aughnacurra and Cooper's cave	August 2017 and August 2018	Scott Cawley Ltd.
Daytime surveys of qualifying roosts within Lough Corrib SAC (Eborhall House)	21 October 2015 23 August 2016 14 July 2017	Scott Cawley Ltd.

Survey Type	Survey Date(s)	Surveyor(s)
Tree preliminary roost assessments and dusk/dawn roost characterisation surveys	April to June 2015 September, October and November 2015	Scott Cawley Ltd.
Vehicle-based bat activity surveys	June and July 2014	Scott Cawley Ltd.
Walked bat activity surveys	June and July 2014	Scott Cawley Ltd.
Static bat detectors surveys	August to November 2014 July to September 2015 September to October 2015 July to August, 2017 May 2018	Geckoella Environmental Consultants Ltd Scott Cawley Ltd Scott Cawley Ltd
Radio-tracking and marking studies	30 July to 7 August 2014 19 to 29 August 2014 2 to 9 September 2014 16 and 23 May 2015	Greena Ecological Consultancy Ltd Geckoella Environmental Consultants Ltd

The bat surveys were carried out under the following licences, issued by the NPWS[11]:

- DER/BAT 2014-17 - Derogation licence to disturb bat roosts throughout the State (valid until 31 December 2018)
- DER/BAT 2014-39 - Derogation licence to disturb bat roosts in Galway County and City
- DER/BAT 2015-02 - Derogation licence to disturb bat roosts in Galway County and City
- DER/BAT 2015-03 - Derogation licence to disturb bat roosts throughout the State
- DER/BAT 2015-24 - Derogation licence to disturb Menlo Castle bat roost and bat roosts north of Galway City and from Oranmore to Furbogh to the west and from the coast to Moycullen to the North
- DER/BAT 2016/09 Derogation licence to disturb bat roosts throughout the State
- DER/BAT 2017/06 Derogation licence to disturb bat roosts throughout the State
- C056/2014 - Licence to capture protected wild animals (bats) for educational and scientific purposes throughout the State
- C098/2014 - Licence to capture protected wild animals (bats) for educational and scientific purposes in an area bounded by Oranmore and Claregalway to the east across to Moycullen and Furbogh to the west, Galway
- C009/2014 - Licence to attach a ban, ring, tag or other marking device to a wild animal bat) in an area bounded by Oranmore and Claregalway to the east across to Moycullen and Furbogh to the west, Galway
- 027/2014 - Licence to use an acoustic lure to capture bats in an area bounded by Oranmore and Claregalway to the east across to Moycullen and Furbogh to the west, Galway, including Menlo Castle roost and night/satellite roosts in Galway

[11] The individual licences that applied to individual survey elements are listed under the relevant survey sections.

- C004/2015 - Licence to attach a ban, ring, tag or other marking device to a wild animal bat) in an area including Menlo Castle, north of Galway City and from Oranmore to Furbogh to the west and from the coast to Moycullen to the north, County Galway
- C033/2015 - Licence to capture protected wild animals (bats) for educational and scientific purposes throughout the State
- C085/2015 - Licence to capture protected wild animals (Lesser horseshoe bats) for educational and scientific purposes in an area including Menlo Castle, north of Galway City and from Oranmore to Furbogh to the west and from the coast to Moycullen top the north, County Galway
- The locations of various surveys conducted between 2014 - 2018 are illustrated on Figures 5.1.1 and 5.1.2.

5.1.1.2 2023

A summary of all field surveys undertaken in 2023 is provided in Table 5.2 below. Bat surveys were conducted across a single calendar year, 2023, covering the seasons winter, spring, summer and autumn. Where different surveys relating to a particular ecological receptor (e.g. habitats) were undertaken over several survey seasons or covered different geographic locations along the route of the proposed N6 GCRR, the surveys are described/presented in chronological order.

Table 5.2 Surveys and Survey Data in 2023

Survey	Survey Date(s)	Surveyor(s)
Bat Surveys		
Marking surveys of lesser horseshoe bats	May and August 2023	Greena Ecological Consultancy – fitting rings on lesser horseshoe bats under licence from the NPWS Scott Cawley Ltd. - follow-up inspections of known and potential lesser horseshoe bat roosts to identify and count bats with and without rings
Winter hibernation and roost inspection surveys	February to March 2023	Scott Cawley Ltd.
Building / tree roost inspection surveys	May to September 2023	Scott Cawley Ltd.
Ground-level tree assessment and inspection of tree PRFs	April 2023 and August 2023	Scott Cawley Ltd.
External / Internal Building inspections	May to September 2023	Scott Cawley Ltd. Ove Arup & Partners Ltd. Caroline Shiel Consulting Ecologist Barbara McInerney Consulting Ecologist
Roost Counts at Menlo Castle	May to September 2023	Scott Cawley Ltd.
Roost presence / likely absence surveys	May to September 2023	Scott Cawley Ltd. Ove Arup & Partners Ltd. Caroline Shiel Consulting Ecologist Barbara McInerney Consulting Ecologist
Bat Activity Surveys		
Walked transect activity surveys	April to September 2023	Scott Cawley Ltd.

Survey	Survey Date(s)	Surveyor(s)
Automated / static bat detector surveys	April to September 2023	Scott Cawley Ltd.

The bat surveys were carried out under licence DER/BAT 2023-02[12] and 21/2023[13], issued by the NPWS[14].

5.1.2 Building surveys

5.1.2.1 Roost Inspection Surveys

2014 - 2018

In 2014, a list of potential bat roost buildings was compiled following a vehicle-based survey in areas within, and adjacent to, the study area. Buildings regarded to have high suitability to support Lesser horseshoe bat roosts were identified as priority early in the Constraints and Option Selection phase with structures that offered roosting opportunities to other bat species identified after that. The physical characteristics (construction material, roofing material, estimated age etc.) and GPS locations were recorded and a photograph of each building was taken. The building inspections were undertaken between July and October 2014.

In 2015, 2016 and 2017, buildings within or immediately adjacent to the proposed N6 GCRR, and specific buildings within 1 km of the proposed N6 GCRR, that were identified as being of high suitability for roosting bats (as guided by Collins, 2016) (i.e. buildings with an obvious, or high, likelihood to support roosting bats, their size, shelter, protection, conditions and surrounding habitat) were also surveyed. Daytime building inspections and dusk/dawn surveys were conducted in August and September 2015, July and August 2016 and May, June and October 2017.

The locations of all buildings surveyed as of 2018 are shown on Figure 5.2.1.

The daytime building inspections involved a full examination of the internal and external areas of the structures to search for the presence of bats and identify potential roost sites. Bat activity is usually detected by the following signs:

- Bat droppings (these will accumulate under an established roost or under access points)
- Insect remains (under feeding perches)
- Oil (from fur) and urine stains
- Scratch marks
- Bat corpses

Surveyors filled out a standardised roost survey form and these were compiled into a Potential Bat Roost (PBR) building database.

In some situations, where a building had a high suitability as a bat roost but no physical evidence was found, a frequency division ultrasound detector (for example an Anabat SD1, Wildlife Acoustic Song Meter 2 or SMZC or similar) was left in-situ for several nights.

Bat droppings were placed in 1.5ml eppendorf tubes with silica and sent to Waterford Institute of Technology for genetic analysis to identify the bat species.

[12] Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011

[13] Granted under Section 9 and 23 (6) (b) of the Wildlife Active 1976 to 2018

[14] The individual licences that applied to individual survey elements are listed under the relevant survey sections.

The roost surveys were carried out under licence from the NPWS (DER/BAT 2014-39, and DER/BAT 2015-03, DER/BAT 2016-09, DER/BAT 2016-28) and DER/BAT 2017-06).

For bat emergence/re-entry surveys conducted in 2015, bat activity around buildings was monitored using a hand-held bat detector (Pettersson 240x, Wildlife Acoustics EM3 or similar) to determine if bats were exiting/entering buildings.

Dusk emergence/re-entry surveys were conducted for up to two hours after sunset, while pre-dawn surveys were generally conducted from 2hrs before sunrise. For buildings inside, and within 1km of, the proposed N6 GCRR at least one internal survey and dusk or dawn survey was conducted. Where internal access was not possible, three emergence/re-entry surveys were conducted on a building, subject to accessibility.

Two additional counts of Lesser horseshoe bats at Menlo Castle, Cooper's Cave and the roost at Aughnacurra (PBR178) were undertaken in August 2018: the first count on the 22 August 2018 and the second count over the 27/28 August 2018.

2023

The scope of building/structure inspection surveys extended to all buildings located within or immediately adjacent to the proposed development boundary. Buildings within the proposed development boundary are likely to be relevant to this derogation licence application to facilitate the construction of the proposed N6 GCRR, whilst any roosts that occur in buildings in the immediate vicinity could theoretically be impacted by the proposed N6 GCRR. One-hundred and sixty five buildings were identified within this zone of influence, with building/structure inspection completed on 129 of the 165 buildings in 2023. A further six buildings were inspected internally or externally in 2023. Access was denied for building/structure inspection by the occupants of 30 of the 165 buildings in 2023. As such, 135 of 165 were subject to surveys in 2023.

Buildings/structure inspections in 2023 were completed by qualified and experienced ecologists from Scott Cawley, Arup, and independent ecologists Barbara McInerney and Caroline Shiel. All surveyors conducting roost inspection surveys are licensed by the NPWS to do so. In this instance, surveys were completed under licences DER/BAT 2023-02[15] and 21/2023[16].

The full list of buildings identified for survey, and those buildings which were appraised and/or inspected for roosting bats in 2023 are illustrated on Figures 5.3.1 and 5.3.2.

The daytime building/structure appraisal and inspection involved a full examination (where accessible) of the internal and external areas of the structures to identify actual or potential bat roosts and access points and to locate any evidence of bats, as per the methodology followed in the 2014 – 2018 surveys.

Where safely accessible voids, crevices or cracks in the buildings were examined using torches or endoscopes. Any bat droppings that were found were placed in 1.5ml eppendorf tubes with silica and sent for genetic analysis to identify the bat species. Of the 135 buildings surveyed in 2023, access was granted and/or possible to the internal parts of 78 of those buildings.

Following completion of building/structure inspections in 2023, the 135 buildings surveyed were assigned to suitability categories ranging between 'Negligible' and 'High' as per the categories documented in Table 4.1 of *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition*) (Collins, 2016, p. 35).

In those cases where access was denied in 2023, the previous confirmed roost status determined from buildings inspections and emergence/re-entry surveys conducted between 2014-2018 has been retained, taking a conservative approach.

The suitability of a building for roosting bats took account of the presence of potential roost features (PRFs), and surrounding landscape characteristics (e.g. whether the building was located adjacent to/connected to areas suitable for foraging bats).

[15] Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011

[16] Granted under Section 9 and 23 (6) (b) of the Wildlife Active 1976 to 2018

5.1.2.2 Dusk emergence surveys

2014 – 2018

In 2014, a list of potential bat roost buildings was compiled following a vehicle-based survey in areas within, and adjacent to, the study area. Buildings regarded to have high suitability to support Lesser horseshoe bat roosts were identified as priority early in the Constraints and Route Selection phase with structures that offered roosting opportunities to other bat species identified after that. The physical characteristics (construction material, roofing material, estimated age etc.) and GPS locations were recorded and a photograph of each building was taken. The building inspections were undertaken between July and October 2014.

In 2015, 2016 and 2017, buildings within or immediately adjacent to the proposed N6 GCRR, and specific buildings within 1km of the proposed N6 GCRR, that were identified as being of high suitability for roosting bats (at the time, as guided by Collins, 2016)) (i.e. buildings with an obvious, or high, likelihood to support roosting bats, their size, shelter, protection, conditions and surrounding habitat) were also surveyed. Daytime building inspections and dusk/dawn surveys were conducted in August and September 2015, July and August 2016 and May, June and October 2017.

The locations of all buildings surveyed are shown on Figures 5.1.11 and 5.1.2.

The daytime building inspections involved a full examination of the internal and external areas of the structures to search for the presence of bats and identify potential roost sites. Bat activity is usually detected by the following signs:

- Bat droppings (these will accumulate under an established roost or under access points)
- Insect remains (under feeding perches)
- Oil (from fur) and urine stains
- Scratch marks
- Bat corpses

Surveyors filled out a standardised roost survey form and these were compiled into a Potential Bat Roost (PBR) building database.

In some situations, where a building had a high suitability as a bat roost but no physical evidence was found, a frequency division ultrasound detector (for example an Anabat SD1, Wildlife Acoustic Song Meter 2 or SMZC or similar) was left in-situ for several nights.

Bat droppings were placed in 1.5ml eppendorf tubes with silica and sent to Waterford Institute of Technology for genetic analysis to identify the bat species.

The roost surveys were carried out under licence from the NPWS (DER/BAT 2014-39, and DER/BAT 2015-03, DER/BAT 2016-09, DER/BAT 2016-28) and DER/BAT 2017-06).

For the emergence/re-entry surveys conducted in 2015, bat activity around buildings was observed with the aid of a hand-held bat detector (Pettersson 240x, Wildlife Acoustics EM3 or similar) to determine if bats were exiting/entering buildings. Dusk emergence/re-entry surveys were conducted for up to two hours after sunset, while pre-dawn surveys were generally conducted from 2hrs before sunrise. For buildings inside, and within 1km of, the proposed N6 GCRR at least one internal survey and dusk or dawn survey was conducted. Where internal access was not possible, three emergence/re-entry surveys were conducted on a building, subject to accessibility.

Two additional counts of Lesser horseshoe bats at Menlo Castle, Cooper's Cave and the roost at Aughnacurra (PBR178) were undertaken in August 2018: the first count on the 22 August 2018 and the second count over the 27/28 August 2018.

2023

Dusk emergence surveys were undertaken to establish if roosting bats are present or likely to be absent from buildings within the proposed development boundary and its immediate vicinity and, if roosting bats are

present, to characterise the roost type and importance. Bat activity was recorded using Elekon BatLogger M2 devices which record full spectrum bat echolocation calls (as .wav files).

Surveys commenced at 15 minutes before sunset and continued for up to two hours. The number of dusk emergence surveys was dependant on several factors, but principally the suitability category assigned to the building on foot of completion of building/structure inspections as documented above.

Emergence surveys were conducted at 100 of the 165 no. buildings across the study area by ecologists from Scott Cawley, Arup and Independent Ecologists Caroline Shiel and Barbara McInerney.

Access for surveys was denied by the owners of 30 buildings, and surveys could not be conducted from outside the site boundary of these properties.

Thirty-two buildings that were subject to initial building/structure inspection survey were determined by surveyors, using their professional judgement, to be:

- Of negligible suitability for roosting bats and therefore no further survey is required (24 buildings)
- Of such low suitability for roosting bats that bats are very unlikely to use the buildings as a roost, and therefore no further surveys are required (eight buildings)

For the three remaining buildings, surveys were not completed in 2023 for other reasons, however as noted above, taking a conservative approach, the roost status from the previous surveys was taken for these roosts.

Dusk emergence surveys were undertaken during the appropriate time of year to detect maternity and day roosts (e.g. between May and September, inclusive).

Weather conditions were considered as part of survey design, however the location of the proposed N6 GCRR on the Atlantic seaboard means that weather conditions are more changeable than in the eastern part of the country. In general surveys proceeded during periods of light to moderate rainfall.

The locations of buildings surveyed for dusk emergence survey in 2023 are illustrated in Figures 5.3.1 and 5.3.2.

5.1.3 Surveys of bats using Eborhall House and Ballymaglancy Cave, Cong SAC

Eborhall House and Ballymaglancy Cave, located to the north of Lough Corrib, are both important roost sites for breeding and hibernating Lesser horseshoe bats respectively. Eborhall House is the "qualifying" roost for the Lough Corrib SAC whilst the nearby Ballymaglancy Cave is a SAC in its own right (No. 000474) and is thought to provide hibernation roosts for the bats from Eborhall House.

As part of the assessment of the potential movement of this bat species across the landscape, it was deemed important to determine if any of the ringed bats[17] that were roosting near the study area were also using these "qualifying" roosts, even though they are located a considerable distance to the north (more than 30km).

5.1.3.1 2014 - 2018

Surveys were undertaken at Eborhall House and Ballymaglancy Cave to determine the presence of Lesser horseshoe bats that were ringed at roosts within the study area were undertaken under licence DER/BAT 2015-03, DER/BAT 2016-09, DER/BAT 2016-28 and DER/BAT 2017-06) on 21 October 2015, 23 August 2016 and 14 July 2017. Surveys in 2015 were undertaken by Paul Scott (Scott Cawley Ltd) with Mr John Higgins (NPWS Local Conservation Ranger) and in 2016 by Dr Daniel Buckley and in 2017 by Paul Scott.

Daytime visual surveys were undertaken to count and identify any marked bats. Only the October 2015 surveys included Ballymaglancy Cave. No ringed bats from the study area were recorded during these visits.

[17] See Section 2.1.9 of this report for details on bats that were ringed.

5.1.3.2 2023

Surveys were undertaken at Eborhall House and Ballymaglancy Cave to determine the presence of Lesser horseshoe bats that were ringed at roosts within the study area were undertaken under licence DER/BAT 2023-02[18] and 21/2023[19].

Eborhall House (4 Summer inspections, 2 Winter Inspections) was surveyed on 7 July 2023, 27 July 2023, 10 August 2023, 7 September 2023, 14 November 2023, and 13 December 2023, as part of the known summer/winter roosts located north of Loch Corrib. Other known roosts associated with Eborhall House were inspected, on the same dates. These are Ballymaglancy Cave (Summer/Winter), Kelly's Cave (Winter), Bunnadober Mill (Summer, Maternity Roost).

Surveys were undertaken by Scott Cawley Ecologists Daniel Connell MCIEEM, Síofra Quigley MCIEEM, Kristie Watkin Bourne and Cathal O'Brien six times (four Summer inspections, two Winter inspections). Daytime visual surveys were undertaken to count and identify any marked bats. No ringed bats from the study area were recorded during these visits.

5.1.4 Surveys of bats using Ross Castle Lake and Woods SAC and Cloonnabinnia Cave

5.1.4.1 2014 - 2018

The 2014 – 2018 surveys were focused on the QI roost for Lough Corrib SAC at Ebor Hall, given the Menlo Lesser horseshoe bat population are heavily reliant on habitat within Lough Corrib SAC.

At the time, Ross Lake SAC and Cloonnabinnia Cave were considered well beyond the normal foraging range for the species we were working with at the time - supported by the Lesser horseshoe SAC Site Specific Conservation Objectives (SSCOs), which defined a 2.5km radius core zone.

Additionally, the Ross Lake roost was in serious decline and had very few bats, based on NPWS counts around that time. NPWS counts from Ross Lake Gatehouse across the combined survey period showed a decline in numbers from 150 bats in 1994 to five bats in 2011 ((Rebecca Teesdale pers. comm., 2014 and p44 in Roche et al, (2015)).

This decline in the Ross Lake roost increased the relative importance of the roost at Menlo Castle as a stepping stone roost, and at the time was believed to be the only significant maternity colony at the southern end of Lough Corrib.

Between 2018 and 2023, the roost experienced a recovery (See Table 5.6 for NPWS Ross Castle Lesser horseshoe bat counts**)**, to the extent that the site was considered as significant for inclusion in 2023.

5.1.4.2 2023

Surveys were undertaken at Ross Castle to determine the presence of Lesser horseshoe bats that were ringed at roosts within the study area were undertaken under licence DER/BAT 2023-02[20] and 21/2023[21].

Ross Castle (4 Summer inspections, 2 Winter Inspections) was surveyed on 6 July 2023, 26 July 2023, 10 August 2023, 6 September 2023, 13 November 2023, and 12 December 2023.

As part of the Ross Castle inspections, known summer/winter roosts located south/east of Loch Corrib and associated with Ross Castle were inspected, on the same dates. These are Cloonnabinnia Cave (Summer/Winter). Cloonnabinnia Hotel is a known Lesser Horseshoe roost, however the building is in a derelict state, unsafe to enter, and permission to access the grounds was denied by the owners.

The surveys were undertaken by Scott Cawley Ecologists Daniel Connell MCIEEM, Síofra Quigley MCIEEM, Kristie Watkin Bourne and Cathal O'Brien 6 times (4 Summer inspections, 2 Winter inspections).

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[18] Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011

[19] Granted under Section 9 and 23 (6) (b) of the Wildlife Active 1976 to 2018

[20] Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011

[21] Granted under Section 9 and 23 (6) (b) of the Wildlife Active 1976 to 2018

Daytime visual surveys were undertaken to count and identify any marked bats. No ringed bats from the study area were recorded during these visits.

5.1.5 Tree Surveys

5.1.5.1 2014 - 2018

Trees within, or immediately adjacent to, the proposed development boundary (see Figures 5.5.1 to 5.5.15) were assessed for their potential as bat roosts as part of multidisciplinary surveys carried out from April to June 2015 and in October/November 2015. The suitability of each tree to support roosting bats was classified using the categories outlined in *Bat Surveys: Good Practice Guidelines* (Hundt, 2012).

- Category 1*: Trees with multiple, highly suitable features capable of supporting larger roosts
- Category 1: Trees with definite bat potential, supporting fewer suitable features than Category 1* trees, or with potential for use by single bats
- Category 2: Trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats
- Category 3: Trees with no potential to support bats

Trees assigned a category of 1*, 1 or 2 were re-inspected from 10 to 25 September 2015. Trees with crevices accessible by ladder were surveyed using an endoscope to determine if bats were roosting in the trees, if there was evidence of bats or simply if the potential roost feature offered good conditions for roosting.

Internal inspection of trees was carried out under licence from the NPWS (DER/BAT 2015-03).

5.1.5.2 2023

An initial desktop review was conducted to identify and target trees for further assessment. The desktop review included appraisal of trees identified as *potential bat roosts* over the period 2014-2018, combined with a review of orthophotography on Google Street maps and Google Street View. Twenty-three tree groups were identified across the study area for ground-level tree appraisal.

Ground-level tree appraisal surveys were conducted Scott Cawley ecologists between 11 and 14 April 2023 and on 29 August 2023.

Additionally, a single tree with a potential roost feature was inspected by Síofra Quigley MCIEEM of Scott Cawley on 22 February 2023 concurrent with completion of winter hibernation surveys.

The ground-level tree appraisal consisted of identification and recording of features which could potentially be used by roosting bats (potential roost features or PRFs).

In trees PRFs typically arise from disease, decay or other physical damage to a tree, or arise from the natural growth form of the tree (association PRFs).

PRFs have been categorised and described as per Bat Roosts in Trees: A Guide to Identification and Assessment for Tree-Care and Ecology Professionals.

Where safely accessible from ground level, PRFs were inspected using a torch and mirror/a handheld endoscope device (RIGID CA 350x or similar). Any signs of roosting bats were recorded. Surveyors are licenced to enter and survey bat roosts and are trained and experienced in the inspection of trees for roosting bats.

See Figures 5.6.1 to 5.6.15 for locations.

5.1.6 Walked transect surveys

5.1.6.1 2014 – 2018

Walked transect surveys took place in June and July 2014. Twenty-one survey sites were selected and a transect route was designed within this to encompass a representative sample of the habitats within the study area. These areas are shown on Figures 5.1.1 and 5.1.2.

Prior to the detector survey commencing, the survey sites were walked during the day to plot a route and identify any health and safety issues. Surveys were conducted on nights with potential for high levels of bat flight activity (i.e. warm, dry, calm conditions).

Surveying commenced 45 minutes after sunset. Bat activity was recorded using EM3 bat detectors (Wildlife Acoustics) with a GPS unit (Garmin) attached to record the location of bat calls and to plot the transect route. Detectors were set to record continuously, saving call files in the compressed WAC format. Each transect was walked once. In addition, an Anabat SD1 or an SM2 detector was placed overnight in suitable bat habitat along the transect routes.

Bat calls recorded using EM3 detectors were analysed using the Kaleidoscope auto-identification software (Wildlife Acoustics) and were all manually verified to ensure the software identified calls correctly. Bat calls recorded on the Anabat detectors were analysed using the software AnalookW (Titley Scientific).

5.1.6.2 2023

The approach to walked transect surveys is based on the methodologies contained in *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition)* (Collins, 2016, pp. 54-58).

It diverges from the guidelines with respect to survey effort in that each transect has been completed three times (once per season) across the period of peak bat activity, rather than once/twice per month as advocated by (Collins, 2016) for moderate or high suitability landscapes for foraging and commuting bats. The landscape in Galway ranged between low to high suitability for foraging and roosting bats, depending on location.

Bats are strongly associated with woodland and riparian habitats in Ireland (Roche, et al., 2014). It is Scott Cawley's professional opinion that this reduced survey effort does not impose any limitations on the ability to complete an impact assessment of the proposed N6 GCRR for the following reasons:

- Walked transect surveys are complemented by the deployment of a suite of automated detectors across the study area. These automated detectors record bat data over a period of a number of days, and therefore offer a longer-term view of bat activity which cannot be captured from walked transects, which represent a shorter snapshot in time.
- While additional walked transect surveys would generate additional data, the additional effort expended is not likely to be commensurate to the value of the data generated, e.g. any additional data generated is not likely to provide any additional insights into how bats are using the landscape.

The proposed N6 GCRR was divided into 15 distinct areas for the completion of 15 no. separate walked transect routes. Walked transect surveys took place across three separate survey seasons between April and September 2023. Inclusive:

- Spring / early-season surveys were conducted between April and May 2023
- Summer / mid-season surveys were conducted between June and July 2023
- Autumn / late-season surveys were conducted between August and September 2023

Prior to the detector survey commencing, the transect routes were walked during the day to plot a route and identify any health and safety issues. Surveying commenced 30 minutes after sunset. Transects were walked at a constant speed and bat activity was recorded using BatLogger M devices which record full spectrum bat echolocation calls (as .wav files) and the GPS location of the recording. Detectors were set to record continuously, and each transect was walked once per survey. The starting point/direction of each transect was varied across the seasons to capture variability in bat activity at different periods after dusk. Qualitative

observations of bat activity were also recorded, as appropriate — i.e. number of bats, flight direction, flight height, behaviour (e.g. commuting or foraging) where this was detectable.

Bat calls were analysed using Elekon BatExplorer software (Version 2.2.6), with data review, validation and verification conducted by Jared Bennett, Shane Brien, and Colm Clarke MCIEEM of Scott Cawley. Recordings were initially assigned to a suggested species using the software's in-built auto-identification function[22].

Calls of all bat species were verified using the professional judgement of the reviewer, with reference to published literature on bat call identification including *Bat Calls of Britain and Europe: A Guide to Species Identification* (Russ & Bat Conservation Trust, 2012) and *Social Calls of the Bats of Britain and Ireland* (Middleton, et al., 2022). Where the auto-identification system correctly identified a recording to the relevant species/category, the call was marked as 'verified' by the reviewer. Calls that were misidentified by the auto-identification system were re-classified/reassigned to another relevant category/species by the reviewer.

The 2023 walked transect extents are illustrated on Figures 5.3.1 and 5.3.2 and survey dates are included in Appendix D.

5.1.7 Automated detector activity surveys

5.1.7.1 2014 – 2018

In 2014, as part of the Constraints and Option Selection studies, automated detector surveys of bat activity in selected locations within the study area were conducted from the 12 August to the 2 November 2014. Twenty-four sites for automated detector deployment were selected across the study area to survey the bat species present at different locations, as well as to collect comparative data on species richness and general levels of bat activity. The locations of the automated detectors are shown on Figure 5.4.1. These locations were selected to cover a range of habitat types and to cover locations that may be crossed by potential route options. The automated detectors used were SM2 or SM2+ bat detectors (Wildlife Acoustics). Detectors were set to record in WAC format from half-an-hour before dusk to half-an-hour after dawn set to automatically trigger in response to potential bat calls.

Static monitoring using SM3BAT bat detectors (Wildlife Acoustics) was also conducted at three underground sites in the study area (Cooper's Cave, Newry's Cave and Prospect Hill Railway Tunnel) in the autumn period from the 29 September to the 31 October 2014 and in winter from 4 February to 26 March 2015, in order to determine their use during the autumn mating and winter hibernation periods. An additional bat detector (Wildlife Acoustics SMZC) was placed in the chimney flue in Menlo Castle in winter, underneath the known maternity roost, to determine if bats were present there during the hibernation period. Whilst Lesser horseshoe bats are generally inactive in winter, they do wake up to move around the roost space, and to feed and drink water, and can be detected doing so by the installed equipment. Licences specifically permitting these winter surveys, under certain conditions to protect the roosts and bats, were acquired from the NPWS (DER/BAT 2014-39 and DER BAT 2015-02).

In order to collect long-term data on the bat species flying in specific locations along the route of the proposed N6 GCRR) in 2015, 42 locations were monitored from the 7 July to the 23 September 2015 using a range of automated detectors: seven SM2, one SM3 and one SMZC detector – for locations see Figure 5.4.1. Detectors were left to record at each location for a five-night survey period and this was repeated twice providing three survey periods. The automated detectors were deployed at locations where the emerging preferred corridor of the proposed N6 GCRR intersected linear features or woodland edges in the proximity of known bat roosts, or in areas where bats had previously been recorded.

[22] The BatExplorer calculates species suggestions according to the selected species library (UK Bats EN – Elekon) and the averaged call parameters of a recording. These species suggestions are assigned a plausibility (%) and a ranking, with the highest ranked species suggestion assigned by the software to the recording

The siting of detectors also targeted areas where less-common species were known to occur such as the Lesser horseshoe bat and also for recording "quieter"[23] Brown long-eared bat and *Myotis* bat species.

Of the 42 locations, 19 were subject to further long-term automated detector surveys (10 September to 9 October 2015) to determine if bats were flying near linear features and woodland severed by the proposed N6 GCRR (see Figure 5.4.1 for locations). Whilst bat flight paths are not restricted to always following linear features, these were regarded to be landscape features that could be severed by the proposed N6 GCRR.

The locations were chosen based on the results of the long-term automated detector monitoring carried out earlier in the year outlined above. Locations that had suggested very high bat activity and those with records of less common and quieter species were prioritised; e.g. Lesser horseshoe bats, Brown long-eared bat and *Myotis* bats.

For these "crossing point surveys" an SM2 with two microphones was deployed for three consecutive nights at each location. One microphone (fixed to the SM2 unit) was placed on one side of the proposed N6 GCRR, a second was placed on the opposite side of the proposed N6 GCRR and connected to the same SM2 unit by a 50m cable. Analysis of bat calls and their temporal relationship were then used to support the identification of bats likely to have crossed the proposed N6 GCRR – i.e. a bat call recorded at one microphone, followed by a call from the same species within a certain recording interval (between 8 and 30 seconds), was a "potential crossing". The choice of time period was based on a variety of sources of data which quotes bat flight speeds of "small species" of 3-8m/s (18-29km/h), Pipistrelle species 4.4m/s, Lesser horseshoe bats 3.5m/s and Natterer's bats 4.5m/s (Baagøe, 1987 and Jones and Rydell, 1994). This method also varies in effectiveness for different species and for different flight characteristics as fast commuting bats with loud echolocation calls (e.g. Leisler's bats) would be detected almost simultaneously by both microphones. Quieter bats (echolocation calls only detected at close range) which may have more weaving flight patterns, such as Lesser horseshoe bats when foraging, could take much longer to pass between the two detector microphones.

In order to ground-truth the results of the crossing point surveys, manual surveys were also conducted on one night when the automated detectors were recording. Surveyors recorded bat flight activity at each location, over a period of 2 hours after sunset, from a vantage point using a hand-held bat detector (Batbox Duet) and recorded the time bats were recorded on the detector and/or visually along with the direction of bat flight. Surveys concluded when bats could no longer be seen.

Bat calls were analysed using the Kaleidoscope auto-identification software (Wildlife Acoustics) and were all manually verified to ensure the software identified calls correctly.

In order to record and assess bat activity within the lands proposed for bat habitat enhancement at Menlough (See Section 8.2 for further details), four SM2BAT+ detectors placed along hedgerows from 28 July - 11 August 2017, and again from 2 – 15 May 2018.

5.1.7.2 2023

Automated/static bat detectors Wildlife Acoustics Song Meter Mini Bat Ultrasonic Recorders were deployed three times across the proposed N6 GCRR between April and August 2023, with the purpose of sampling bat data early in the season, mid-season and late season.

- The following detectors malfunctioned and were redeployed L19 (Autumn) L23 (Spring)
- The following detectors malfunctioned and were not redeployed L18 (Spring) L44(Summer)

It should be noted that these malfunctions do not pose any limitations on the overall dataset collated for the project and/or the ability to complete the impact assessment, as for each location (as for all 50 locations across the survey area) automated detectors were deployed a further two times within the same survey year, at the same position. Additionally, walked transects for bat activity were conducted both through and throughout these particular areas during spring, summer, and autumn periods, co-ordinated with the time of

[23] Presence/absence of Brown long-eared bats and some *Myotis* species of bats can be problematic in manual, roving surveys as their echolocation calls have limited volume and range. Longer-term monitoring increases the chances of encountering them.

the automated detector deployments. Combined with the historical data obtained (as detailed through this report), this approach ensured that a comprehensive and representative dataset was obtained for subsequent analysis.

Fifty locations for automated detector deployment were selected across the proposed N6 GCRR to cover a range of habitat types likely to be of importance to bats and pick up variability in bat activity over time. The locations of automated detectors were selected to complement the walked transects described above.

Each automated detector was deployed for a minimum of five consecutive nights and set to record from 30 minutes before sunset to 30 minutes after sunrise[24]. All automated / static bat detectors were deployed with the same settings:

- Date, time and GPS Location were set for each deployment to facilitate solar calculation of sunrise and sunset by the device
- Gain = 12 dB
- Sample rate = 256 kHz
- Minimum duration = 1.5 ms
- Maximum duration = none
- Minimum trigger frequency = 15 kHz
- Trigger level = 12 dB
- Recording mode = WAV

The locations automated/static bat detectors were deployed in 2023 are illustrated on Figure 3 and deployment dates for each location are provided in Appendix E.

Bat calls were analysed using Elekon BatExplorer software (Version 2.2.6), with data review, validation and verification conducted by Jared Bennett, Shane Brien, and Colm Clarke MCIEEM of Scott Cawley. All are trained and qualified ecologists with experience in bat data analysis.

Recordings were initially assigned to a suggested species using the software's in-built auto-identification function[25]. As the performance of auto-identification systems for bats is dependent on the training data used to train it, and as bat calls often vary by habitat, the performance of auto-identification systems can vary (Collins, 2023).

In particular auto-identification systems can return a high error rate for less common bat species. For this reason, it is necessary to validate and then verify bat calls that have been through auto-identification.

Post-classification validation comprised a review of a subset equating to a minimum of 10% of calls assigned to the following categories by BatExplorer:

- Noise
- Common pipistrelle bat Pipistrellus pipistrellus
- Soprano pipistrelle bat *P. pygmaeus*

Calls of all other species were verified by using the professional judgement of the reviewer, with reference to the literature on bat call identification including *Bat Calls of Britain and Europe: A Guide to Species Identification* (Russ & Bat Conservation Trust, 2012) and *Social Calls of the Bats of Britain and Ireland* (Middleton, et al., 2022).

[24] As per Collins, J. (ed.) (2023) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition)*

[25] The BatExplorer calculates species suggestions according to the selected species library (UK Bats EN – Elekon) and the averaged call parameters of a recording. These species suggestions are assigned a plausibility (%) and a ranking, with the highest ranked species suggestion assigned by the software to the recording

Where the auto-identification system correctly identified a recording to the relevant species/category, the call was marked as 'verified' by the reviewer. Calls that were misidentified by the auto-identification system were re-classified/reassigned to another relevant category/species by the reviewer.

Following verification, an error rate of false positive classifications was calculated for Noise, common pipistrelle bat and soprano pipistrelle bat recordings using the following formula:

$$\frac{SUM\ (VERIFIED\ RECORDINGS)}{SUM\ (AUTO-CLASSIFIED\ RECORDINGS)} - 1$$

All calls assigned to bat species other than those listed above were manually reviewed and verified or reassigned by the reviewers.

The need for verification of all other species arises from the increased risk of classification errors for those species when relying upon auto-identification only (Collins, 2023). This is related to the relatively small number of calls generated from these species.

5.1.8 Marking studies

5.1.8.1 2014 - 2018 - Radio-tracking studies

Radio-tracking of bats allows accurate recording of where bats are flying from their roosts, where they feed and other roost sites. It is an intensive method of data collection but provides very useful and reliable data for impact assessment purposes.

Radio-tracking work undertaken as part of the collection of baseline data for the purposes of impact assessment was undertaken over four sessions, over two seasons in 2014 and 2015:

- Session 1: 30 July - 7 August 2014 and was led by Greena Ecological Consultancy Ltd., with the aim of radio-tracking Lesser horseshoe bats and (to a lesser extent) vespertilionid bats in order to identify the location and extent of foraging areas and the location of day/night/transitional roosts in the study area
- Session 2: 19 - 29 August 2014 and was led by Geckoella Environmental Consultants Ltd., with the aim of locating vespertilionid bat roosts within the study area
- Session 3: 2 - 9 September 2014 and was led by Greena Ecological Consultancy Ltd., with the aim of identifying and mapping vespertilionid and rhinolophid bat movements to mating sites or winter roosts
- Session 4: 16 - 23 May 2015 and was led by Greena Ecological Consultancy Ltd., with the aim of determining movements of the Lesser horseshoe bats in Menlo Castle during the spring period and to locate day roosts for this species in the western part of the study area

Lesser horseshoe bats were captured at two sites in the wider study area during sessions 1 and 3: Menlo Castle and Cooper's Cave. Bats were captured using mist nets and harp traps as they emerged or arrived at roosts after sunset.

Vespertilionid bats were captured at six sites (Bearna Woods, Cooper's Cave, Menlo Woods, Merlin Woods, University of Galway, and the University of Galway Sporting Campus) using mist nets, harp traps and an acoustic lure (Sussex Autobat) that attracts bats by emitting artificial foraging and social calls (Hill and Greenaway, 2005).

Several licences were issued by the NPWS to permit capture of bats using the traps and use of the acoustic lure and the fitting of the radio transmitters - Refs: C098/2014, C009/2014, 027/2014, C004/2015, C033/2015, C085/2015, DER/BAT 2015-24.

Captured bats were identified to species level and weighed to determine if they were suitable for tagging with radio transmitters. Radio transmitters (Biotrack and Holohil) were glued between the fur-clipped shoulder blades of the bats using latex adhesive and usually detached from the tagged bat within two weeks

of being attached. Priority was given to tagging female Lesser horseshoe bats, *Myotis* bats and Common pipistrelles as at that time little was known about where these species were flying, feeding and roosting.

Bats were tracked using Australis 26K and Sika UHF radio receivers with Yaggi rigid aerials. Omni-directional antennas were used to search for bats by vehicle. Both receivers were able to automatically scan through different frequencies, which made it possible to search for a number of tagged bats at any one time.

For sessions 1 and 3, bats were tracked at night while they were foraging to determine home ranges, core foraging areas and identify night roosts; bats were also located using the telemetry signal during the day to identify roosts.

For session 2, bats were only tracked during the day to locate roosts. For sessions 1 and 3, foraging and commuting bats were observed from fixed (often elevated) points where suitable radio reception was available, such as at elevated or other suitable vantage points. Where possible, surveyors made close approaches to bats to ascertain the exact foraging area and behaviour, or to attempt pursuit if the bat was moving away. Accurate bearings of bat locations were simultaneously taken, by two or more surveyors, from hand held sighting Silva Expedition 54 compasses. These bearings were then used to calculate a location, using the Locate software. GPS units (Garmin) were used to increase the speed and accuracy of the surveyors recording their locations. Over survey nights, surveyors built up a picture of bat commuting routes and of bat foraging areas. Foraging areas were estimated using minimum convex polygons (MCP) and multi-lateral polygons (MLP) generated from the outermost locations radio-tracked bats were recorded.

A MCP is defined as an animal's home range size, with the shape, and position represented by joining the outermost fixes (Mohr, 1947). A MLP is defined as the minimal area between all confirmed points of an animal's occurrence during a radio-tracking session.

5.1.8.2 2023 – Marking Studies of Lesser Horseshoe bats (Rings)

Lesser horseshoe bats roosting sites at Aughnacurra (PBR178), Coopers Cave (PBR112), and Menlo Castle (PBR06) were visited to capture bats by hand, using static hand net, mist net, cone trap and harp between 8-10 May 2023 and again on 22 August 2023 by Geoff Billington MCIEEM, Stephen Davison and Alison Johnston MCIEEM of Greena Ecology Ltd. and Simon Brain of Amenity Tree Care Ltd. under licences from the NPWS. For full details, refer to Appendix C.

Surveys were led and directed by Geoff Billington who has over 25 years of experience in bat survey including advanced licence bat survey techniques. A subset of Lesser horseshoe bats from these roosts was captured and marked with anodised aluminium rings stamped with a unique alphanumeric serial number.

The rings were fitted over the forearm of the bats by the surveyors, the sex of the bat was noted and bats were then released by hand. Fitting of rings was restricted to lesser horseshoe bats. Any other bat species that were captured accidentally were immediately released.

Following the fitting of rings to lesser horseshoe bats, roost inspection surveys were conducted under licence[26] [27] by Scott Cawley Ecologists Daniel Connell MCIEEM, Síofra Quigley MCIEEM, Kristie Watkin Bourne and Cathal O'Brien six times (four Summer inspections, two Winter inspections) at the known lesser horseshoe roost sites listed in Table 5.2 below to count lesser horseshoe bats and to record any ringed individuals at these roosts, including the serial number on the ring (See Sections 5.1.2 – 5.1.4).

The use of these invasive survey techniques was undertaken to evidence, support and verify the hypothesis that the Lesser horseshoe bat population local to Menlo do not form part of nor support the qualifying interest lesser horseshoe bat populations of any nearby SAC sites, including the Lough Corrib SAC qualifying interest roost at Ebor Hall House. This type of information gathering is not possible from alternative less-invasive observational/bat activity surveys (for Ringing locations in 2023, See Figure 5.7.1).

[26] European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No 477 of 2011) Regulation 54 derogation licence reference DER/Bat 2023 – 02 for roost disturbance of all bat species and all roost types.

[27] Wildlife Acts 1976 to 2018 - Sections 9 and 23 (6) (b) reference 21/2023 to photograph / film wild animals (all bat species).

Table 5.3 Known Roosts of Lesser Horseshoe Bats in the Vicinity of the Proposed N6 GCRR that were visited as part of the Marking Surveys

Ref. No.	Roost Name	Note	SAC roost	Inspection 1	Inspection 2	Inspection 3	Inspection 4	Inspection 5	Inspection 6
N/A	Ross Castle	Summer Roost (NPWS)	Ross Lake and Woods SAC [001312]	6 July 2023	26 July 2023	10 August 2023	6 September 2023	13 November 2023	12 December 2023
N/A	Cloonabinnia Hotel	Derelict and unsafe – Access denied by new owner (NPWS)		N/A	N/A	N/A	N/A	N/A	N/A
PBR160	Cloonabinnia Cave	Winter Roost (NPWS)		6 July 2023	26 July 2023	10 August 2023	6 September 2023	13 November 2023	12 December 2023
N/A	Eborhall House	Summer Roost (NPWS)	Lough Corrib SAC [000297]	7 July 2023	27 July 2023	10 August 2023	7 September 2023	14 November 2023	13 December 2023
N/A	Ballymaglancy Cave	Winter Roost (NPWS)		7 July 2023	27 July 2023	10 August 2023	7 September 2023	14 November 2023	13 December 2023
N/A	Kelly's Cave	Winter Roost (OPW)		N/A	N/A	N/A	7 September 2023	14 November 2023	13 December 2023
N/A	Bunnadober Mill	Summer Roost (OPW/NPWS)		N/A	N/A	N/A	7 September 2023	14 November 2023	13 December 2023
PBR06	Menlo Castle	Summer Roost & Winter Roost (NPWS)	Roosts not within any European site, and populations not known to form part of any SAC populations	9 March 2023	29 March 2023	13 June 2023	11 July 2023	15 August 2023	N/A
PBR50	Ballybrit Castle	Not a known LHB roost		23 February 2023	9 March 2023	N/A	N/A	N/A	N/A
PBR12	Cooper's Cave	Summer Roost & Winter Roost (NPWS)		22 February 2023	9 March 2023	14 June 2023	12 July 2023	16 August 2023	-

Ref. No.	Roost Name	Note	SAC roost	Inspection 1	Inspection 2	Inspection 3	Inspection 4	Inspection 5	Inspection 6
PBR136	Newry's Cave	Roost		22 February 2023	-	-	-	-	-
PBR114	Dangan Ice House, University of Galway Campus	Not a known LHB roost		22 February 2023	8 March 2023	-	-	-	-
PBR113	Souterrain in the townland of Lydican	Not a known LHB roost		23 February 2023	8 March 2023	-	-	-	-

5.1.9 Collection of data on Lesser Horseshoe bat population and distribution

2014 - 2023

An analysis of the NPWS's Lesser horseshoe bat roost database was conducted to estimate the importance of the maternity colony at Menlo Castle for the Lesser horseshoe bat population at a local, regional and national level. The most recent counts and distribution of all summer roosts in counties Galway, Mayo, Clare and Limerick, which make up the northern sub-population of this species in Ireland according to Harrington (2018) and Dool et al, 2016) were used to determine the proportion that the Menlo Castle roost contributes to the summer population in these counties and therefore its strategic importance for the sub-population at a regional level.

Previous records for Lesser horseshoe bats within the study area were sourced from the Bat Conservation Ireland database and the NPWS's Lesser horseshoe bat database. Mr Conor Kelleher, Mr Brian Keely, Dr Kate McAney, Dr Catriona Carlin (Galway Bat Group) and local NPWS conservation ranger Rebecca Teesdale were also consulted to collate any additional summer and winter roost records that were not in the above databases.

This initial desktop assessment was supplemented by data collected during subsequent field surveys.

5.1.10 Landscape change analysis – Lesser Horseshoe Bat

A landscape scale analysis has been undertaken, as requested by the NPWS at a consultation meeting on the 3 March 2023 to determine whether there have been any landscape scale changes since the original 2014 – 2018 bat surveys that might influence the movement, foraging behaviour or roosting behaviour of lesser horseshoe bats within the study area.

The analysis focused on identifying material changes to habitat extents and distribution to evaluate whether, as a result of any changes, bats are likely to be using the local landscape in a different way to that recorded and predicted as part of the baseline survey data collected between 2014 and 2018 and used to inform the impact assessment and development of the mitigation strategy and monitoring plan set out in this derogation licence application.

For the purposes of this assessment, a material change is one that will or has the potential to affect how bats move, forage and roost within the territory of the Lesser horseshoe bat population centred around the maternity roost at Menlo Castle. Examples of such changes might be the loss of linear habitat features such as stone walls, hedgerows or treelines, the loss of woodland habitat areas, habitat loss due to increased urbanisation, or land use zoning changes that might result in loss of 'green' space in the near future.

In 2018, the core area used by the Menlo Castle Lesser horseshoe bat population extended from the N59 Moycullen Road to the west to the N83 Tuam Road to the east, and from Menlough Village and the shores of Lough Corrib to the north to the Coolagh Lakes and Jordan's Island area to the south (see Figure 5.8.1 for the 2014 - 2018 Lesser horseshoe bat survey results).

The following datasets were reviewed to identify any material landscape scale habitat changes that have occurred since 2019 (i.e. until 2023, 2019 was the most recent date of habitat review and verification work undertaken in relation to the proposed N6 GCRR which included all lands within the proposed development boundary in response to a Request for Further information from An Bord Pleanála):

- 2018 habitat map for the proposed N6 GCRR
- 2019 habitat map for the proposed N6 GCRR
- 2023 habitat map for the proposed N6 GCRR
- Google Earth orthophotography[28]

[28] Image dates range from 20 June 2022 to 9 August 2023

- Bing maps[29]
- Google maps[30]
- The National Landcover Map 2018[31]
- Galway City Development Plan 2017-2023 land use zoning map
- Galway City Development Plan 2023-2029 land use zoning map
- Variation 2(a) to the Galway County Development Plan 2015-2021, Bearna Plan, Land Use Zoning Map for Bearna, July 2018
- Galway County Development Plan 2015-2021 land use zoning map
- Galway County Development Plan 2022-2028 land use zoning map
- Galway County Development Plan 2022-2028, Galway Metropolitan Area, Briarhill, Land Use Zoning Map

Ad-hoc observations on land use change recorded over the course of other ecological survey work carried out in 2023 were also factored into the analysis, where relevant.

Across the study area, but particularly within the core area used by the Menlo Castle Lesser horseshoe bat population, there are relatively few material changes to the habitat baseline information.

Most of the material changes recorded across the wider study area are associated with expanding residential, commercial or industrial development, with the remainder related to vegetation clearance and extensions to existing development such as car parks or graveyards. The subset of those areas that lie within the core area used by the Menlo Castle Lesser horseshoe bat population similarly comprise of small scale development expansion and vegetation clearance.

The locations and notes on observed/recorded land use change are shown on Figure 5.9.1.

The scale and extent of individual change areas are relatively small, they are widely dispersed within the core area used by the Menlo Castle Lesser horseshoe bat population, and few are within or immediately adjacent to the proposed N6 GCRR. There are also no significant changes to land use zonings in the core area used by the Menlo Castle Lesser horseshoe bat population from 2019 onwards. Therefore, landscape scale land use change is not predicted to have influenced how the Menlo Castle Lesser horseshoe bat population move, forage or roost within the study area.

Any changes to bat usage of the study area arising from the 2023 bat surveys are discussed below under the individual species heading in Section 5.2.

5.2 Species-specific survey results

5.2.1 Lesser horseshoe bat *Rhinolophus hipposideros*

5.2.1.1 Historical Records

Prior to the commencement of the 2014 surveys to inform the constraints and option selection studies for the proposed N6 GCRR, there were a small number of records of Lesser horseshoe bats in the study area. They comprised records of the bat roosts at Menlo Castle, suspected night roosts at a barn in Menlough Village and two sheds in Coolagh collected as part of the previous EIA for the Galway City Outer Bypass (RPS, 2006). Menlo Castle has been regarded to be a key maternity colony for the area since it was found in August

[29] Image date 25 May 2023

[30] Image date5 April 2017

[31] Developed using imagery from the OSi aerial photography campaign of 2018 formed the main data source alongside satellite imagery from the European Space Agency (ESA) Sentinel 2 programme and OSi's PRIME 2 vector spatial database

2000 and has since been monitored annually by the NPWS. Ad-hoc observations during other bat surveys (e.g. BATLAS 2010) also noted Lesser horseshoe bat activity on the western side of the River Corrib at Daingean.

Surveys carried out for other EIAs recorded Lesser horseshoe bats at University of Galway (McCarthy, Keville and O'Sullivan. (2014a) and Killarainy near Moycullen (RPS. (2013a).

The general lack of historical roost records and *ad-hoc* observations for this species did not necessarily suggest their low density or absence from specific areas. It is more likely to have been due to both the lack of targeted surveys for this species and the tendency for it to be overlooked due to its very quiet and narrowly-focused echolocation calls which allows it to be detected only at very close range.

5.2.1.2 Identification of locations used for winter hibernation

Unlike other Irish bat species, the Lesser horseshoe bat hibernates in the open, hanging from the ceiling from caves, cellars and other structures kept cool in winter. Therefore, it is much easier to find than other bat species at this time of year.

Following the collation of the historical data at the end of 2014, the examination of historical maps and records of caves and underground structures provided a list of locations that could be potential sites used for hibernation.

These included:

- Menlo Castle
- Merlin Castle
- Ballybrit Castle
- Roscam Round Tower
- Cooper's Cave
- Newry's Cave
- Dangan Ice House
- Souterrain in the townland of Lydican

2014 – 2018 Results

The interior of Ballybrit Castle and Merlin Castle were inaccessible for winter surveys that were undertaken in 2014 and therefore use of them by this species could not be ruled out. Of the others the only evidence of Lesser horseshoe bats was found in Cooper's Cave near Castlegar, where a small number of fresh droppings characteristic of this species were recorded in the rear of the accessible part of the cave, suggesting recent use.

Daytime visual inspections of accessible locations were also undertaken in February and March 2015. Six Lesser horseshoe bats were recorded within Cooper's Cave on the February visit. All bats were in a state of hibernation. It was noted that two of the bats were ringed. The ring numbers (which could be read without disturbing the bats) corresponded to the following bats ringed as part of the bat surveys in summer 2014: one was a male bat ringed and radio-tracked at Menlo Castle on the 30 August 2014; the other, a male bat ringed and radio-tracked at Cooper's Cave on the 1 September 2014. This confirmed that some of the individuals using the Menlo Castle summer roost also used the cave as a hibernation site, and that bats using Cooper's Cave in summer months also used the cave as a hibernation site.

Cooper's Cave was also checked again on 24 February 2016 and four Lesser Horseshoe bats were recorded in a state of hibernation. None of these bats were ringed. Surveys in January 2018 recorded six hibernating Lesser horseshoe bats present on the 8 January and three on the 11 January (including one ringed bat).

No bats were seen or otherwise recorded within Newry's Cave in 2015 and 2016. It became evident in visits in 2015 that this site floods via underground springs up to ceiling level and therefore would be unsuitable for hibernating bats.

Since Lesser horseshoe bats are known to travel outside their summer ranges to reach hibernation sites, it was necessary to examine similar potential hibernation sites outside of the study area. Checks for bats (and particularly ringed bats) using other known underground sites, were carried out in February 2015. Five Lesser horseshoe bats (not ringed) were found hibernating in Cloonnabinnia Cave, outside Moycullen. A large pile of Lesser horseshoe bat droppings was also found in Moycullen Cave suggesting that it is used as a roosting site but this may be used at other times of year.

In 2018, winter surveys at Moycullen Cave and at Cloonnabinnia Cave recorded three Lesser horseshoe bats which were found hibernating at each location.

Attempts were made to gain access to land where the cave curiously named "*Rhinolophus* Retreat" is located; however, entry to lands was not possible. A souterrain near Athenry was also visited in 2018, but is probably unsuitable for use by Lesser horseshoe bats as the entrance was blocked.

The results of the surveys of potential hibernation sites for this species of bat indicated that Cooper's Cave and Menlo Castle provide winter hibernation conditions, for several individuals, in the vicinity of the proposed N6 GCRR. However, both sites are vulnerable to human disturbance or changes within the roosts due to rockfall. There is also the possibility that other concealed voids in limestone features could also host hibernating bats.

2023 Results

It was not possible to access a number of locations during the first visit in February. This was due to either health and safety concerns, or as they were inaccessible during the first visit, and therefore they were not resurveyed during the second visit in March. It was only possible to survey Ballybrit Castle externally during both survey visits as the main entrance is boarded up. It was possible to partially view the inside of the ground floor of the Castle through the open windows, but no evidence of Lesser horseshoe bat was identified. The Castle is very exposed and in the middle of a field, with no connectivity to the surrounding landscape, and therefore unlikely to be used by lesser horseshoe bat for roosting or hibernating.

Cloonnabinnia Cave was surveyed during the February and March visits, with four lesser horseshoe bats identified hibernating on both surveys. Coopers Cave was also surveyed in February and March, nine live bats were recorded in February, and three live bats were recorded in March. During the March survey, temperatures were very low (<4°C). The bats that were seen during the March visit were very far back into the Cave, compared to the February visit. It is likely that more bats were present further into the Cave where it was not possible to see fully inspect. Bat droppings were noted in Cloonnabinnia Cave and Coppers Cave on both occasions.

During the February visit, internal access to Menlo Castle was not possible due to access issues. In March, the internal of the Castle was inspected for lesser horseshoe bat. No bats were identified during this visit, however; the chimney void where bats are known to roost within, is not fully viewable from ground level.

An attempt was made to survey Newry's Cave in Rosshill Park Woods, however a locked gate and health and safety concerns prevented access to the sunken depression area in the woods where the Cave is present. It was not feasible to completely determine species; nevertheless, according to the hibernation characteristics of Lesser horseshoe bats (i.e. caves, cellars, mines, and other vast open spaces), it was concluded that the species hibernating within the tree hollow was not lesser horseshoe bat.

A souterrain near Claregalway was visited during both site visits in February and March. The internal of the structure was inspected as much as was safely possible from the entrance, but it was not possible to fully inspect due to health and safety concerns. No signs or live bats were found during either visit. An icehouse in Galway City, adjacent to the University of Galway in Upper Newcastle was inspected during February and March.

It was deemed unlikely to be a hibernation roost for lesser horseshoe bats due to the exposed and likely frequently disturbed nature of the structure. No evidence of bats was identified.

A small tunnel in Barna Woods that extends slightly under Barna Road was inspected in February 2023, as a single Lesser horseshoe bat had been identified here in 2016. The size of the tunnel did not allow for access.

No bats were present, and due to its size and frequent exposure, this site is unlikely to serve as a hibernation roost for lesser horseshoe bats.

A railway tunnel that was previously a lesser horseshoe bat roost in Galway City Centre, is now beneath the Dean Hotel on Prospect Hill. Access was permitted to inspect the tunnel, which had been sealed in behind the gym in the basement of the Hotel.

The tunnel was flooded, and it was not possible or safe to travel further into the tunnel due to this. However, an effort was made to identify where the other end of the tunnel may exit in Galway City Centre, which was not successful. It is assumed the tunnel is fully sealed on both sides.

Another previously identified lesser horseshoe bat roost consisting of a man-made tunnel (PBR159) beyond Moycullen was searched for, but was not found. Works are ongoing adjacent to this site, and a very high wall and steep slope prevented any further searches of the area for the roost site.

Table 5.4 Structures and Trees Inspected as part of the Winter Hibernation Roost Survey

Ref. No.	Name	Notes on access and automated detector deployment	Known LHB roost	Inspection 1	Inspection 2
PBR50	Ballybrit Castle	External access only	No	23/02/2023	09/03/2023
PBR160	Cloonnabinnia Cave	Internal access to cave	Yes	23/02/2023	08/03/2023
PBR112	Coopers Cave	Internal access to cave	Yes	22/02/2023	09/03/2023
PBR06	Menlo Castle	Accessed internal part of castle on second visit only, albeit no access / visibility inside chimney	Yes	09/03/2023	29/03/2023
N/A	Tree Cavity, Rosshill Park Woods (Tree roost)	No internal access granted	No	22/02/2023	-
PBR136	Newry's Cave	No access due to locked gate and H&S risk to surveyor	Yes	22/02/2023	-
PBR113	Souterrain Lydican	Not accessible due to H&S risk to surveyor. access granted to internal parts of structure	No	23/02/2023	08/03/2023
PBR114	Ice house, University of Galway Campus	Accessed and surveyed	No	22/02/2023	08/03/2023

Ref. No.	Name	Notes on access and automated detector deployment	Known LHB roost	Inspection 1	Inspection 2
PBR124	Tunnel in Barna Woods	Internal access possible but surveyor could not access due to size of space	Yes (summer only)	23/02/2023	-
PBR137	Railway Tunnel	Accessed via Dean Hotel gym in basement.	No	22/02/2023	-
PBR159	Man-made tunnel	Could not find on first survey	Yes	28/02/2023	-

5.2.1.3 Identification of Summer roosts

2014 – 2018 Results

Evidence of Lesser horseshoe bats was recorded at 15 structures, including Menlo Castle (PBR06) during the summer roost surveys in 2014 and 2015. Most roosts were located in the vicinity of Menlough and Castlegar. Outside these two areas, a day roost (PBR178) containing nine bats including five juvenile bats was located in the garage of a house in the Aughnacurra residential estate on the western side of the River Corrib, adjacent to the NUI Galway Recreational Facilities.

In August 2018, two counts were undertaken at this roost: twelve Lesser horseshoe bats were recorded on the first night, and ten on the second. Two of the lesser horseshoe bats present at the Aughnacurra roost on the 28 August 2018 were ringed, confirming the link between the roost sites at Menlo Castle, Cooper's cave and this satellite roost[32].

A night roost was also found in another garage in this estate (PBR210). Figure 5.8.1 shows the location.

Other Lesser horseshoe bat roosts found on the western side of the city and surrounding environs included two-night roosts in vicinity of Bearna Woods (PBR124, PBR115), north of Bearna (PBR217) and a roost in the townland of Aubwee just off the N59 Moycullen Road to the northwest of the city (PBR44). All "night roosts" were confirmed as such, when Lesser horseshoe bat droppings were recorded but the structure was deemed to be unsuitable as a day roost and no bats were seen in-situ.

On the eastern side of the city and surrounding environs, one Lesser horseshoe bat night roost (PBR21) was located adjacent to the Corinthian's Rugby Club off the N83 Tuam Road to the north east of the city, while a day roost with a single bat was found in a disused bungalow adjacent to Ballindooley Lough (PBR25).

Lesser horseshoe bats at Menlo Castle (PBR06) were monitored from 2006-2017 by the NPWS and more recently by surveyors from Scott Cawley Ltd. Lesser horseshoe bats can be very difficult to count on emergence as they tend to fly in and out of the roost entrance. Monitoring of the roost in 2016, 2017 and 2018 used infra-red cameras and reflects the most accurate count for this roost.

2023 Results

Overall, fifteen roosts of Lesser horseshoe bat were identified in 2023: The identification of these roosts arose from a combination of building/structure inspection surveys, roost emergence surveys, and data generated in the period 2014-2018.

[32] To the best of the author's knowledge, at the time of writing, the only Lesser horseshoe bat ringing programme undertaken locally in recent years was that undertaken in 2014 and 2015 as part of the N6 GCRR surveys, where bats captured at Menlo Castle and Cooper's Cave were ringed (see Appendix A.8.1, Section 1.4.9 of the 2018 EIAR for the N6 GCRR). Therefore, the ringed Lesser horseshoe bats observed at Aughnacurra are individuals ringed during the 2014/2015 studies at Menlo Castle and Cooper's Cave

The roosts are overwhelmingly concentrated in the area between Castlegar Village demarcated by the N83 Tuam Road in the east, the River Corrib in the west, and the N6 to the south. Two outliers are located west of the River Corrib, in Aughnacurra housing estate and further west in Ballard West in the vicinity of Barna Woods:

- PBR06, Menlo Castle. This building is a known maternity roost for Lesser horseshoe bat and appears to be the largest and most important roost in the study area, with a peak count of 46 no. bats observed emerging from the structure during an emergence survey in mid-August 2023. Numbers observed emerging from the building varied between 36 early in the season (mid-June) to 40 mid-season (mid-July) and up to 46 in August as mentioned already.
- PBR83, a timber clad building in Menlo, which is a mixed species roost with common pipistrelle bats. No observations of Lesser horseshoe bat were made at this building in 2023, however the evidence supporting its identification as a roost was on foot of radio tracking surveys completed in 2014 and 2015 which were not repeated in 2023. The building continues to be suitable for occupation by roosting Lesser horseshoe bats, and is considered a roost for the species.
- PBR112, Coopers Cave, a limestone cave north of the N6 and west of the Bar Aille housing estate. This was identified as an important satellite roost to Menlo Castle in 2014 and 2015, and continues to be used by Lesser horseshoe bats in small numbers year-round. The cave was visited three times during the summer season and a maximum of 5 no. bats were observed emerging from the cave in mid-June 2023.
- PBR128, a derelict residential building in Castlegar north of an area of commercial development which was previously identified hosting a single Lesser horseshoe bat in 2014-2018. No bats were observed emerging from this building in 2023, however given its ongoing suitability as a Lesser horseshoe bat roost, and the presence of high quality foraging and commuting habitat in the vicinity, for the purposes of this assessment it is considered to be a roost.
- PBR129, a building in Menlo. Emergence surveys were not conducted at this building in 2023, however it is considered to be suitable for roosting Lesser horseshoe bat, is situated within the core sustenance zone of the Menlo Castle roost (PBR06), and was identified as a day/night roost in 2014-2018. For these reasons it still considered to be a roost in 2023.
- PBR153, an old stable/farm outbuilding. This was identified as a day/night roost for Lesser horseshoe bat based on radio-tracking studies conducted in 2014 and 2015. It continues to be suitable for this species and notwithstanding the absence of observations of bats emerging from the building in 2023, it is considered to be a roost.
- PBR156, a castellated gate in Menlo, which is a mixed species roost with common pipistrelle bat. The building continues to be suitable for roosting Lesser horseshoe bat and is considered to be a roost (likely used as a day/night roost) based on information generated from radio-tracking surveys in 2014 and 2015 and notwithstanding the absence of observations of bats in 2023.
- PBR158, a residential dwelling in Coolough which was identified as a Lesser horseshoe bat night/day roost during radio tracking surveys in 2014 and 2015. Access was denied by the owner/occupiers of the building to surveyors in 2023, however it remains suitable for roosting bats based on appraisal of the exterior from the nearest publicly accessible lands. For this reason it is considered to be a roost.
- PBR210, a known Lesser horseshoe bat based on radio-tracking surveys conducted in 2014 and 2015. Internal and external inspection surveys and emergence surveys were undertaken in mid-August and late-September 2023.
- A single unidentified bat was observed returning to roost at the building during the September survey. This bat could not be identified to species based on analysis of call characteristics, but is highly likely to be Lesser horseshoe bat on account of the status of the building as a known roost.
- PBR218, open crevices identified as a day/night roost for Lesser horseshoe bat in 2014 and 2015. This natural structure was surveyed three times in late June, and late September 2023. A single bat was observed emerging on the second survey in late June, and a peak of 10 no. bats were observed emerging

during the last survey in late September 2023. Based on results of the survey this is likely to be an important satellite roost to the roost in Menlo Castle.

- PBR241, a roost identified in 2014-2018 and again based on observations of emergence surveys in 2023. This complex of buildings was visited twice in June 2023, with a single bat emerging from the structure on the second survey visit.

Three roosts, previously identified in 2014 but not re-surveyed in 2023, were retained as 'present', under a conservative approach:

- PBR82, an outbuilding and archway in Menlough. Identified initially as a night roost for Lesser Horseshoe bats (1 bat) in 2014 during radio-tracking, but also present were Brown-long eared bats and Natterer's bats. Remains suitable and notwithstanding absence of any evidence of use in 2023 is conservatively being assigned as a night roost for Brown long-eared bats and the other bat species previously identified as present in the roost.
- PBR85 – Live bat radio-tracked in 2014 to a shed with ridge tiles and loose corrugated iron and open doorway at Coolagh. Identified as a night roost for Lesser Horseshoe bats (1 bat). Remains suitable and notwithstanding absence of any evidence of use in 2023 is conservatively being assigned as a night roost.
- PBR219 - A night roost for Lesser horseshoe bats in a void within a natural limestone structure located within Menlough Woods, identified during the radio-tracking session in 2015. Linked with the maternity roost in Menlo Castle (PBR06).

Additionally, PBR178 on the Aughnacurra Housing Estate, previously a known Lesser horseshoe bat satellite roost to Menlo Castle (PBR06), has been retained as 'present', taking a conservative approach. The roost area is within a sub-optimal building (garage) in terms of the preferred building type for this species, and its occupation by bats may be a reflection of the lack of availability of better roost opportunities in the area.

Historically, there is evidence that this was a Lesser horseshoe maternity roost, however the low to negligible levels of Lesser Horseshoe activity at the property recorded in the 2023 surveys indicates that this has since changed and is perhaps intermittently used by Lesser horseshoe bats as a day roost.

Samples of droppings found were taken (*Analysis result pending*) during the 2023 season, as records show Myotis spps. are also present at the property.

Figure 5.10.1 shows the location of the Lesser horseshoe bat roosts identified in 2023.

Table 5.5 Numbers of Lesser Horseshoe Bats recorded emerging from Menlo Castle

Date	Count	Source	Comments
Unknown	12	NPWS	Date/Year of count absent from NPWS LHB Database
16/06/2006	2	NPWS	-
24/06/2009	26	NPWS	-
07/07/2009	38	NPWS	-
02/03/2011	21	NPWS	-
29/06/2012	23	NPWS	-
02/07/2012	27	NPWS	-
13/06/2013	21	NPWS	-
04/06/2014	18	NPWS	-
18/06/2014	35	NPWS	-
08/07/2014	27	Scott Cawley Ltd.	-

Date	Count	Source	Comments
18/05/2015	5	Scott Cawley Ltd.	Disposable barbeque found in fireplace suggesting disturbance
21/05/2015	12	Scott Cawley Ltd.	-
02/06/2015	22	NPWS	-
29/06/2015	32	Scott Cawley Ltd. / NPWS	-
09/07/2015	29	Scott Cawley Ltd. / NPWS	Inclement weather
20/08/2015	28	Scott Cawley Ltd. / NPWS	Two bats did not emerge
07/06/2016	28	NPWS	-
22/06/2016	41	NPWS	-
29/08/2016	35	Scott Cawley Ltd.	Counted from infra-red video camera footage. 2-3 bats may have remained in the roost
15/06/2017	34	NPWS	-
11/08/2017	43	Scott Cawley Ltd.	Counted from infra-red video camera footage. 1 bat exited from small chimney
06/06/2018	34	NPWS	-
21/06/2018	42	NPWS	-
22/08/2018	20	Scott Cawley Ltd.	Counted from infra-red video camera footage
27/08/2018	15	Scott Cawley Ltd.	Counted from infra-red video camera footage
19/06/2019	34	NPWS	-
08/06/2020	27	NPWS	-
29/06/2020	29	NPWS	-
29/06/2022	37	NPWS	-
31/05/2023	35	NPWS	-
13/06/2023	38	Scott Cawley Ltd.	Counted from infra-red video camera footage
21/06/2023	47	NPWS	-
11/07/2023	40	Scott Cawley Ltd.	Counted from infra-red video camera footage
15/08/2023	46	Scott Cawley Ltd.	Counted from infra-red video camera footage

The roost numbers showed variability in the counts but have averaged 29 bats over the last eighteen years (2006 – 2024).

This variability may be explained by bats using different (unknown) exit points on some nights, difficulties in counting in low light conditions and weather conditions in preceding nights which may have forced some bats to use alternative roosts. Infra-red footage in 2016 and 2023 suggested that bats fly out quickly at very low levels and could have been easily overlooked by conventional emergence monitoring techniques.

Radio-tracking 2014 and 2015

Additional data on the roosts used by this species was collected during the radio-tracking in 2014 and 2015. 13 Lesser horseshoe bats were captured and fitted with radio-transmitters in the first radio-tracking session in August 2014. Ten of these (seven females and three males) were caught at the Menlo Castle roost (PBR06) and three (all males) were caught at Cooper's Cave (PBR).

Five bats were captured and fitted with radio-transmitters in the September session; one (female) was caught in Menlough Woods and four (three males and one female) were captured at Cooper's Cave (PBR112).

The radio-tracking in August 2014 resulted in the identification of six day roosts and 11 night roosts for this species (Figure 5.8.1 shows these locations). Three of the six daytime roosts and seven of the night roosts had already been identified as Lesser horseshoe roosts from the building inspections undertaken in 2014. Nine additional daytime roosts and eight additional night roosts were subsequently identified in the September 2014 session of radio-tracking. Only three roosts (Menlo Castle PBR06, Cooper's cave PBR112 and a shed in Angliham Quarry PBR126) were used by bats during both tracking sessions. All roosts used by radio-tracked bats were located in the vicinity of Menlough Village, Coolagh, Castlegar and Angliham Quarry.

The 2014 surveys found Lesser horseshoe bats using several roosts in the daytime in summer including those consistently used such as Menlo Castle and Cooper's Cave. Inspections of other structures and radio-tracking recorded other day roosts and a network of night roosts.

Eborhall House and Ballymaglancy Cave, located to the north of Lough Corrib, are both important roost sites for breeding and hibernating Lesser horseshoe bats respectively. Eborhall House is the "qualifying" roost for the Lough Corrib SAC whilst the nearby Ballymaglancy Cave is a SAC in its own right (No. 000474) and is thought to provide hibernation roosts for the bats from Eborhall House.

Marking Studies (Rings) 2014 – 2015

No previous ringing study covering Lesser horseshoe bats had been undertaken in the area of interest prior to 2014. Scott Cawley carried out monitoring of bat activity in combination with emergence surveys and roosts inspections prior to the 2014 and 2015 ringing and radio-tracking studies by Greena in order to provide information on bat colonies present in the area of interest.

Monitoring of specific roost sites has been extended beyond the duration of the 2014 and 2015 study to provide additional data on linkage between sites.

A twin session ringing study was carried out by Greena Ecological Consultancy in May 2023 and August 2023.

This session, together with the results from 2014 and 2015, aimed to help understand potential seasonal shift in activity patterns of Lesser horseshoe bats while avoiding interference during the most sensitive period of bat life cycle when females give birth and lactate (suckle their young).

In 2014 and 2015 base silver coloured rings were used.

Marking Studies (Rings) 2023

In 2023, colour anodised rings were prepared and used, green at Menlo Castle (PBR06) and blue at Coopers Cave (PBR112).

A licence to carry out bat trapping (licence to catch with harp/mist net/by hand no. no.C147/2023) plus a licence to disturb roosts (DER/BAT 2023-48) was obtained from the NPWS and authorisation to access the land involved was obtained from landowners in advance of commencing fieldwork by Scott Cawley.

Red rings were going to be used at Aughnacurra garage (PBR178), but no Lesser horseshoe bats were present on either session.

Greena Ecological Consultancy captured 11 Lesser horseshoe bats (*Rhinolophus hipposideros*) during the May 2023 session, eight at Menlo Castle and three at Coopers Cave, seven of them females and four males all 11 were ringed.

19 were captured in August 2023, all at Menlo Castle, 11 were females and eight were males. 17 were ringed, 10 of them females and seven were males. The licence only permitted 30 bats in total to be handled so trapping ended once total was reached.

In August 2023, one male bat had previously been ringed at the castle in 2014 and four females ringed at the castle in May 2023 were recaught. The 2014 male had previously been radio-tracked in August 2014 (bat no. 6). (See Appendix G).

No ringed bats from the study area were recorded during the four Summer inspections and two daytime Winter inspections at Eborhall House (Summer roost), Ballymaglancy cave (Summer/Winter roost), Kelly's Cave (Winter roost), Bunnadober Mill (Summer, Maternity roost), Ross Castle (Summer roost), and Cloonnabinnia Cave (Summer/Winter) by Scott Cawley during the 2023 season (See Table 5.3 above for dates).

See Figure 5.7.1 for 2023 Bat Ringing locations.

5.2.1.4 Evidence of bat activity

2014 – 2018 Results

This section summarises the results of the various surveys that recorded Lesser horseshoe bat activity across the study area. Survey methods include vehicle transects, walked transects and use of automated detectors at fixed locations in 2014 and 2015 covering both summer, autumn and winter seasons. The results of the radio-tracking are also summarised separately in this section.

Lesser horseshoe bats were not recorded during the vehicle transect surveys but would not normally be expected to be easily detected due to their quiet and directional echolocation calls. However, the walked transect surveys recorded this species at Menlo Castle and Cooper's Cave. Static bat detectors deployed during the walked transects recorded this species by a culvert on the existing N6 (where the Terryland River flows under the road), by the Coolagh Lakes and by Ballindooley Lough.

The static bat detectors deployed in 2014 (Figures 5.4.1 and 5.8.1), recorded Lesser horseshoe bats at 14 (out of a total of 24) locations. Automated detectors S5, S6 and S21 recorded the highest amount of activity for this species, which reflects their proximity to Menlo Castle (see summary of radio-tracking studies below).

Beyond the Menlough area, Lesser horseshoe bats were also recorded at a woodland edge in the Ballindooley area (S2), close to a known roost identified during the building surveys, in the hazel scrub-limestone pavement complex east of Menlough (S4 and S22), within the grounds of Glenlo Abbey Hotel (S8), in Castlegar Valley (S10), on three sites on the north western edge of Galway City (S11, S13 and S15), the outskirts of Bearna Village (S19), and two sites on the north eastern edge of Galway City just to the north of Galway Technology Park (S1, S24).

The automated detectors deployed in 2015 along the route of the proposed N6 GCRR recorded Lesser horseshoe bats at 15 locations. Activity was recorded within the known foraging area of the Menlo Castle roost as indicated by the radio-tracking results (see below), including along the woodland edges, south of Menlo Castle, within the limestone pavement area of Lough Corrib SAC, Lackagh quarry and on field boundaries north of Castlegar Village, into the area south of Castlegar Village near Cooper's Cave.

Lesser horseshoe bat activity was also recorded within the grounds of University of Galway, east of Galway Racecourse at Ballybrit and on the Bearna Stream, north of Bearna Woods.

For the crossing point surveys, possible recordings of Lesser horseshoe bats that were made on both microphones, that could suggest bats flying across the proposed N6 GCRR, were recorded at 2 (out of a total

of 21) sites for Lesser horseshoe bat: CP7 and CP9. CP7 had one potential crossing record, while CP9 had 35 potential crossing records.

In order to record and assess bat activity within the lands proposed for habitat enhancement, four SM2BAT+ ultrasound detectors were placed along hedgerows from 28 July - 11 August 2017. Detectors were also placed in hedgerows on the bóithrín at Menlo which is crossed by the proposed N6 GCRR. Lesser horseshoe bats were recorded at both locations with 132 recordings made in the proposed habitat enhancement lands and 81 recording made along the bóithrín.

An SM2BAT+ detector was also deployed from 2 – 15 May 2018 at one of the same locations within the lands proposed for habitat enhancement and two detectors were also deployed in the field to the south toward the River Corrib in order to measure usage of different areas over the same time period. On this second occasion, Lesser horseshoe bats were recorded at all three locations with 102 recordings made by the two detectors in the fields to the south and only 12 recordings in the proposed habitat enhancement lands.

These results demonstrated that the proposed habitat enhancement area was accessible for Lesser horseshoe bats and is a suitable area for increasing the amount of foraging habitat within it.

Monitoring of bat activity at Cooper's Cave, Newry's Cave and the City Centre Railway Tunnel took place in the autumn of 2014 and late winter in 2015. A small number of Lesser horseshoe bat calls were recorded on the 26 and 28 September, 2014 in Newry's Cave. A large number of Lesser horseshoe calls were recorded throughout September 2014 and October 2014 in Cooper's Cave, which would suggest that Cooper's Cave is used in the mating season for this species. Lesser horseshoe bat activity was recorded at Cooper's Cave and Menlo Castle during the late winter activity seasons in 2015.

Therefore, based on these emergence/re-entry surveys undertaken after the radio-tracking studies it was concluded overall that Lesser horseshoe bats use Menlo Castle and Cooper's cave throughout the year – Menlo Castle for breeding and hibernation and Cooper's Cave for mating and hibernation.

The radio-tracking surveys allowed the patterns of foraging and flight paths to be identified for this species. In August 2014, the maximum foraging distance from Menlo Castle ranged from 0.59km up to 5.15km, with the average maximum distance of foraging area from the roost being 2.93km. On average, males foraged slightly further afield, with the average maximum distance from the roost 3.68km, while females averaged a maximum distance of 2.29km. See Figure 57 in Appendix F.

In September 2014, the maximum foraging distance from the roost ranged from 1.11km up to 4.40km with the average maximum distance of foraging from the roost being 3.39km. On average, males foraged a maximum distance from the roost of 2.88km, while females averaged a maximum distance of 4.16km. See Figure 58 in Appendix F.

The overall foraging area in August 2014 comprised 21.75km^2 (MCP) or 13.70km^2 (MLP)[33], whilst it was 56.10km^2 (MCP) or 26.46km^2 (MLP) in September 2014. Foraging areas recorded in both August and September, overlapped in woodland and field boundaries in the Menlo Castle and Menlough Village areas; suggesting that these areas were core foraging areas. The area of overlapping areas from August and September 2014 was 11.96km^2 (MCP) or 8.1km^2 (MLP). Field systems and quarries north-east and east of Menlo Castle and field systems north of Cooper's Cave also served as foraging areas. See Figures 57 and 58 in Appendix F.

The majority of Lesser horseshoe bat foraging areas in August and September 2014 overlapped in the area of the River Corrib, field boundaries and woodland around Menlo Castle and Menlough Village, limestone pavement, woodland, scrub and lake around Coolagh and Menlough Village, field boundaries and scrub around Castlegar and Ballindooley Lough, and a disused quarry in Angliham.

None of the foraging areas recorded in 2014 extended south of the existing N6, towards Galway City.

In May 2015, four Lesser horseshoe bats were captured and tagged. Two of the bats had been captured, tagged and ringed in 2014. Rings were placed on the new bats.

[33] A MCP is defined as an animal's home range size, with the shape, and position represented by joining the outermost fixes (Mohr, 1947). A MLP is defined as the minimal area between all confirmed points of an animal's occurrence during a radio-tracking session.

Three day roosts were identified during the radio-tracking session in 2015. Three out of the four bats consistently used the maternity roost in Menlo Castle (PBR06). One bat utilised a previously-unknown roost in a boulder field located in an abandoned quarry just south of Coolagh Lakes (PBR218) over several days before returning back to Menlo Castle (PBR06). Another bat used a void within a natural limestone structure located within Menlough Woods (PBR219) to roost. All of these daytime roosts were also used in the night for short periods of resting at night.

The overall foraging area of Lesser horseshoe bats tracked in 2015 covered 16 km^2 (MCP) or 10.22km^2 (MLP). The core foraging area of all bats extended over 1.25km^2. The majority of foraging areas overlapped in the area of Menlo Castle, Menlough Woods and Menlough Village in a similar pattern recorded in 2014.

This was considered to be the core foraging area from where bats travelled both north towards Lough Corrib and south following the River Corrib. See Figure 11 in Appendix F.

The overall foraging area in May 2015 was smaller than recorded in the late summer/early autumn tracking periods in 2014. It is possible that the low night-time temperatures in May 2015 resulted in shorter foraging periods and shorter travel distances.

Based on the results of the radio-tracking studies carried out in 2014 and 2015, it was concluded that Lesser horseshoe bats utilised existing woodlands, field boundaries and watercourses for foraging and navigating during this period. Areas of scrub over limestone pavement were often used as foraging areas for prolonged periods of time. Quarries in the local area (including Lackagh Quarry and Angliham Quarry) appeared to be of importance to Lesser horseshoe bats with records of bats spending time both feeding and night roosting there. Areas used both during the late maternity period in summer as well as for foraging in preparation for hibernation in late summer are regarded to be crucial in supporting the local Lesser horseshoe bat population.

The radio-tracking studies confirmed a strong link between the maternity roost present at Menlo Castle (PBR06) and Cooper's Cave (PBR112). Although there is a direct connection between both sites via the River Corrib and Terryland River, the radio-tracked bats tended not to utilise this potential commuting route and instead travelled overland via Lackagh quarry to the Terryland River Valley, via a small area of green space around Castlegar Village. Bats were regularly recorded commuting between these two sites and have been confirmed to be a part of the same Lesser horseshoe bat population.

Radio-tracking data also suggested that Cooper's Cave (PBR112) is an important roosting site for male Lesser horseshoe bats in summer and an important autumn mating site in the area as well as a hibernation site for this species.

In order to record and assess bat activity within the lands proposed for habitat enhancement, four SM2BAT+ ultrasound detectors were placed along hedgerows from 28 July - 11 August 2017. Detectors were also placed in hedgerows on the bóithrín at Menlo which is crossed by the proposed N6 GCRR.

Lesser horseshoe bats were recorded at both locations with 132 recordings made in the proposed habitat enhancement lands and 81 recording made along the bóithrín.

An SM2BAT+ detector was also deployed from 2 – 15 May 2018 at one of the same locations within the lands proposed for habitat enhancement and two detectors were also deployed in the field to the south toward the River Corrib in order to measure usage of different areas over the same time period. On this second occasion, Lesser horseshoe bats were recorded at all three locations with 102 recordings made by the two detectors in the fields to the south and only 12 recordings in the proposed habitat enhancement lands.

These results demonstrated that the proposed habitat enhancement area was accessible for Lesser horseshoe bats and is a suitable area for increasing the amount of foraging habitat within it.

2023 Results

Walked transects in 2023 recorded Lesser horseshoe bats at two (out of a total of 15) transect locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Menlo/River Corrib (T9). Lesser horseshoe bat calls were also recorded at Castlegar (T12).

The automated detectors deployed in 2023 recorded Lesser horseshoe bats at 24 (out of a total of 50) locations along the route of the proposed N6 GCRR.

The highest levels of activity were recorded at Castlegar (L44) Lackagh Quarry (L33 and L34) and Ballinfoyle area (L36).

Lesser horseshoe bats were also recorded during Winter Hibernation statics placed at Menlo Castle PBR06, Cooper's Cave PBR112, and Cloonnabinnia Cave PBR160.

5.2.2 Leisler's bat Nyctalus leisleri

5.2.2.1 Historical records

Leisler's bats have been recorded across the study area as bat detector records and have also been recorded using bat boxes in Rusheen Bay, which are the only previous roost records for this species. Detector records include for University of Galway (A.P. McCarthy Planning Consultants (2007a), McCarthy, Keville & O'Sullivan (2014a) McCarthy, Keville & O'Sullivan (2014b)) Moycullen and Ballycuirke Lough (Galway County Council/Roscommon National Roads Design Office (2011). Since this bat can travel long distances from its roost each night, detector records do not necessarily suggest that bats are roosting nearby.

5.2.2.2 Identification of Roosts

2014 – 2018

No winter roost sites were recorded in any of the surveys for the proposed N6 GCRR. Radio-tracking of three bats captured in 2014 and 2015 provided locations of four day roosts (PTR45, PB134, PBR139, PBR146). See Figure 5.11.1 for locations of these roosts for this species.

In 2014, a single male Leisler's bat was captured and tagged in Menlough Woods. Radio-tracking indicated that the maximum distance that this individual was recorded travelling was 4.85km over a foraging area of 8.96km^2 that encompassed the southern area of Lough Corrib, the River Corrib and the Menlough area. Two roosts used by this individual were also located; a large modern house along the N84 Headford Road near Ballinfoyle (PBR134) and an ash tree at the edge of Menlough Woods (PTR45) (within the footprint of the proposed N6 GCRR). See Figure 44 in Appendix F.

Another two male Leisler's bats were captured, ringed and tagged in Bearna Woods in the second radio-tracking session in 2014. However, data was only collected for one of these bats as the second could not be located. The bat that could be tracked was found to roost during the day at two modern dwelling houses on the Cappagh Road (PBR139, PBR146). Refer to Figure 3l in Appendix H. This bat had a recorded foraging area of 13.62km^2 (MCP) that encompassed the southern area of Lough Corrib, along the River Corrib corridor and Menlough area.

2023

Six Leisler's bat roosts were identified across the study area. The identification of these roosts arose from a combination of building/structure inspection surveys, roost emergence surveys, and data generated in the period 2014-2018.

- PBR196, a bungalow on the N84 Road, was identified as a roost for Leisler's bat based on the completion of emergence surveys in late May, late June and mid-September 2023. Access was denied to the internal part of this building by the owners and therefore survey data generated arose from emergence and external inspections only. A single Leisler's bat was observed returning to roost at the building during the September survey. This building was identified as a mixed roost of common pipistrelle bat, soprano pipistrelle bat and Leisler's bat in the period 2014-2018. Based on results from 2023 it appears that this roost is not currently used by pipistrelle species but continues to be used by Leisler's bat albeit intermittently by small numbers of the species. It is likely to be a transitional roost.
- PBR226, a building/structure in the grounds of University of Galway, was surveyed three times in late June, late July and late September 2023. A single Leisler's bat was observed emerging from and/or returning to roost at this building on each survey visit.
- PBR73, St. James' Church Bushypark. This building was identified as a mixed Leisler's bat and Natterer's bat *Myotis naterreri* roost in 2014-2018, albeit no observations/records of Natterer's bats were logged in 2023. The building was subject to three separate emergence surveys in early June, late July and

mid-September 2023, and the exterior of the building was inspected for signs of roosting bats. Internal access to the building for survey purposes was refused by the owners. Bats were observed emerging from the bell tower of the building on each survey visit, with 1 no. bat emerging in June and July, and 5 no. bats emerging in September. Based on the higher number of emergences in September it is possible that the building is more important as a transitional/autumn roost for this species.

- PBR134 and PBR255 have been described under the subsection Soprano pipistrelle bat *Pipistrellus pygmaeus* above. Both roosts are mixed Soprano pipistrelle and Leisler's bat roosts. No Leisler's bats were observed emerging from PBR134 in 2023, however the building remains suitable for roosting bats, contained signs of roosting bats based on internal inspection, and it is considered prudent to continue to treat this building as a Leisler's bat roost based on information generated between 2014 and 2018. A single Leisler's bat was observed emerging from PBR255 on one emergence survey undertaken in mid-August 2023.
- PBR139 – In 2014, a single bat was radio-tracked to a day roost at a modern residential bungalow on the Cappagh Road.

No confirmed winter roost sites for Leisler's bat were identified during surveys completed during the 2023 survey season, however, Leisler's bats were recorded during Winter Hibernation statics placed at Menlo Castle PBR06 and Ballybrit Castle PBR50.

5.2.2.3 Evidence of bat activity

2014 - 2018

Leisler's bats were recorded widely across the study area during the walked transect surveys. However, few calls were recorded within the urban habitats within the more developed areas in Galway City. During the surveys conducted between 2014 - 2018, the species was recorded at every automated detector location which reflects this widespread and far-ranging species during its foraging activities.

No winter roost sites were recorded in any of the surveys for the proposed N6 GCRR. Radio-tracking of three bats captured in 2014 and 2015 provided locations of four day roosts (PTR45, PB134, PBR139, PBR146). See Figure 5.11.1 for locations of these roosts for this species.

In 2014, a single male Leisler's bat was captured and tagged in Menlough Woods. Radio-tracking indicated that the maximum distance that this individual was recorded travelling was 4.85km over a foraging area of 8.96km^2 that encompassed the southern area of Lough Corrib, the River Corrib and the Menlough area.

Two roosts used by this individual were also located: a large modern house along the N84 Headford Road near Ballinfoyle (PBR134) and an ash tree at the edge of Menlough Woods (PTR45) (within the footprint of the proposed N6 GCRR). See Figure 44 in Appendix F.

Another two male Leisler's bats were captured, ringed and tagged in Bearna Woods in the second radio-tracking session in 2014. However, data was only collected for one of these bats as the second could not be located. The bat that could be tracked was found to roost during the day at two modern dwelling houses on the Cappagh Road (PBR139, PBR146). Refer to Figure 3l in Appendix H. This bat had a recorded foraging area of 13.62km^2 (MCP) that encompassed the southern area of Lough Corrib, along the River Corrib corridor and Menlough area.

The automated detectors deployed in 2015 recorded Leisler's bats at 32 (out of a total of 42) locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded over the River Corrib and Lackagh Quarry (see Figure 5.11.1).

During the crossing point surveys, indications of potential crossings were recorded at 6 (out of a total of 21) sites for Leisler's bat; CP5, CP6, CP8, CP10, CP14, CP15. It is reasonable to assume that the approach taken for detecting bat crossings is not effective for this species. The Leisler's bat loud echolocation calls would be received by both microphones simultaneously and therefore crossings could not be confirmed. However, since this is a fast and high-flying bat it is regarded to be less impeded by severance of features at ground level (an "open airspace species" according to Elmeros *et al.*, 2016).

2023

Walked transects in 2023 recorded Leisler's bats at 13 (out of a total of 15) transect locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Rahoon Road (T5), Lackagh Quarry (T11), and the Menlo/River Corrib areas (T9).

The automated detectors deployed in 2023 recorded Leisler's bats at 50 (out of a total of 50) locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Lackagh Quarry (L33) and Letteragh Road (L14) (see Figure 5.12.1).

5.2.3 Common pipistrelle bat Pipistrellus

5.2.3.1 Historical records

Common pipistrelle bats have been recorded across the study area including the grounds of University of Galway (A.P. McCarthy Planning Consultants (2007a), McCarthy, Keville & O'Sullivan (2014a) McCarthy, Keville & O'Sullivan (2014b)). None of these observations would appear to be records of roost sites and are records from bat detector surveys.

5.2.3.2 Identification of locations used in Summer

2014 – 2018

Building inspections carried out in 2014 and 2015 identified four roosts used by Common pipistrelle bats. One was located in an outbuilding in the Ballindooley area (PBR07), a small roost of 3-4 bats was found in a large shed adjacent to the N83 Tuam Road in Cappanabornia (PBR228) and single bats were observed at the stable block in Galway Racecourse in Ballybrit (PBR205) and an abandoned bungalow to the north of Bearna Village (PBR220). (Refer to Figure 5.13.1).

Six common pipistrelle bats were captured during the radio-tracking session in 2014: two at University of Galway, two at the University of Galway Sporting Campus, and two at Menlough Woods.

The male and female bats captured in University of Galway were tagged, ringed and tracked to their day roosts. The female was found to roost in two modern buildings in a housing estate at Ballymoneen (PBR141, PBR147) on the north-western edge of the city, while the male was found to roost in two modern agricultural barns in Cloonacauneen (PBR148, PBR149), to the north of the Roadstone Quarry. Refer to Figure 3F, 3G in Appendix H.

2023

Three small Common pipistrelle roosts were recorded during roost emergence surveys in 2023. Both buildings are located in Menlo and were previously recorded as Lesser horseshoe bat night roosts in the period 2014-2018.

- The first building, PBR156 is a prominent castellated gate structure where seven Common pipistrelle bats were observed returning to roost in June 2023 during the first of two survey visits. No bats were recorded emerging or returning to roost on the second visit and it is likely that this is a small satellite or transitional roost for this species.
- The second building, PBR83 is a distinctive timber-clad modern dwelling, which was also identified in 2014 as a Lesser horseshoe bat night roost. Three Common pipistrelle bats were counted emerging from this building on a second of two survey visits in late June 2023. This building is also likely to be a small satellite or transitional summer roost for this species.
- The third building is a shed in Lackagh quarry, PBR252. A single Common pipistrelle bat was observed flying into this building and was not later observed emerging from the building. For this reason, the building is assumed to be used as a roost, and is likely to be a night roost/feeding roost for the species.

No confirmed winter roosts for this species have been recorded in 2023, however pipistrelle bats are known to roost in extremely small crevices and non-destructive identification of their winter hibernation roosts is often not possible or extremely difficult. It is considered appropriate to treat summer roosts as potential winter hibernation roosts and mitigate as such.

Common Pipistrelles were recorded during Winter Hibernation statics placed at Menlo Castle PBR06, Ballybrit Castle PBR50, and Cloonnabinnia Cave PBR160.

5.2.3.3 Evidence of bat activity

2014 - 2018

During the surveys conducted between 2014 - 2018, Common pipistrelle bats were recorded widely across the study area during the walked and vehicle transect surveys. However, very few calls were recorded within the more developed areas within Galway City apart from areas adjacent to the River Corrib. The species was recorded at all 24 automated detector locations in 2014. Refer to Figure 5.13.1 for these locations.

The automated detectors deployed in 2015 along the proposed N6 GCRR recorded Common pipistrelle bats at 34 (out of a total of 42) locations. The highest level of activity was recorded in Lackagh Quarry (RS13), a hedgerow in a field adjacent the N83 Tuam Road (RS26), a hedgerow adjacent to the Coolagh Roundabout (RS29) and along a hedgerow bordering the Aille Road, north of Bearna Village (RS40). Refer to Figure 5.13.1 for the locations of these transects.

During the crossing point surveys, possible crossing records were recorded at 16 (out of a total of 21) sites for Common pipistrelle bats. Seven sites recorded more than 10 possible crossings for this species; CP6, CP9, CP10, CP11, CP14, CP15, CP16.

Relatively high number of possible crossings were recorded at CP9 (88 possible crossings) and CP10 (630 possible crossing records). Refer to Figure 13 for the locations of these records.

2023

Walked transects in 2023 recorded Common pipistrelle bats at 15 (out of a total of 15) transect locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Cappagh Road (north of Cappagh Park) (T3), Coolough (to the west of Lackagh Quarry) (T10), and Rahoon Road (T4).

The automated detectors deployed in 2023 recorded Common Pipistrelle at 50 (out of a total of 50) locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Ballybrit (Galway Racecourse) (L48), Cappagh Road (L8), Briarhill (L50), Ballard West (L5), and Forramoyle West (L1).

Refer to Figure 5.14.1 for the locations of these records.

5.2.4 Soprano pipistrelle bat *Pipistrellus pygmaeus*

5.2.4.1 Historical records

This species has been previously recorded across the study area and include records at Daingean, (A.P. McCarthy Planning Consultants, 2007a), Merlin Park (Browne and Fuller, 2009), Bearna Woods (Browne et al, 2009), Ballyquirke (Galway County Council/Roscommon National Roads Design Office, 2011) and University of Galway (McCarthy, Keville and O'Sullivan, 2009a, 2014a, 2014b). A historical record was also provided by the NPWS of a roost from Menlough Village in 2014 (R. Teasdale, pers. comm, 2015) a single bat was known to roost in Menlo Castle in 2000 (RPS, 2006).

5.2.4.2 Identification of locations used in Summer

2014 - 2018

Fourteen soprano pipistrelle roosts were identified across the study area between 2014 and 2018. The identification of these roosts arose from a combination of building/structure inspection surveys, roost emergence surveys, and data generated in the period 2014-2018.

Building inspections carried out in 2014, 2015 and 2016 identified 13 roosts of this species. These were located in Aubwee, Ballybrit, Ballindooley, Letteragh, Gortacleva, Roscam, Bearna Woods, Bearr Aile, Truskey West, Aughnacurra and Coolagh. Seven of these roost sites were at locations with unoccupied farm buildings and houses (PBR196, PBR205, PBR237, PBR241, PBR42, PBR44, PBR49), and roosts were found in occupied buildings in Bearna Woods (PBR222), Aughnacurra residential estate (PBR177, PBR255) and Coolagh (PBR179).

A single soprano pipistrelle bat was observed emerging from an oak tree (PTR40) in a field located to the south of Menlo Castle in the summer of 2015.

Refer to Figure 5.13.1 for locations referred to above.

2023

Fifteen Soprano pipistrelle roosts were identified across the study area in 2023.

Two buildings, PBR225, a mid-twentieth century bungalow surrounded by a grove of conifers in Troscaigh Thiar, Bearna, and PBR222, located adjacent to Bearna Woods in Knocknacarra could not be surveyed in 2023 as the owners of these buildings refused access to surveyors. Both buildings were identified as soprano pipistrelle roosts by Scott Cawley based on surveys conducted between 2014 and 2018: PBR225 was identified as a potential maternity roost; PBR222 as a small transitional roost of 1-2 bats. Based on appraisal of these buildings from the closest publicly accessible lands in 2023, they remain relatively unchanged and remain suitable for roosting bats, and for these reasons have been counted as roosts.

PBR267: A traditional bungalow off the Ballymoneen Road north of Fána Buí estate was identified conservatively as a soprano pipistrelle bat roost in 2023. This building was surveyed twice in early August and mid-September 2023 and although no soprano pipistrelle bats were observed emerging from it, it was recorded as a roost in 2014-2018 and retains its suitability to act as a small roost for this species.

Three buildings were identified as Soprano pipistrelle roosts in 2023 on the basis of external inspections and emergence surveys:

- PBR145: A traditional bungalow in Castlegar Village. Surveyors were denied access by the owners to conduct an internal inspection of this building. Three emergence surveys were conducted at this building, with 10 bats emerging on the first survey in early July, nine bats emerging in mid-July and no bats emerging in mid-September. This building is likely to be a small maternity or summer roost on the basis of these surveys results.
- PBR261: A modern residential dwelling in Na Foraí Maola Thiar. Surveyors were denied access by the owners to conduct an internal inspection of this building. A single soprano pipistrelle bat was observed returning to roost under flashing in the southwest corner of this building on a survey conducted in late June 2023. No bats were observed emerging on the second survey visit in late June, and the building is likely to act as a night/day roost or transitional roost.
- PBR238: An abandoned/derelict traditional farmhouse on the Ballymoneen Road surrounded by a copse of trees. Internal inspection of the interior of this building was not completed for health and safety reasons. A single soprano pipistrelle bat was observed emerging from this building during a single emergence survey conducted in early August 2023.

Nine buildings were identified as Soprano pipistrelle roosts in 2023 on the basis of external and internal inspections of those building as well as the completion of emergence surveys:

- PBR53: A castle building in Castlegar Village. Three separate emergence counts were conducted on this building in mid-June, early July, and early September 2023. Two bats were observed emerging from the structure during the June visit.
- PBR134: A modern residential dwelling on the western side of the N84 near Cairéal Mór. A single bat was observed emerging during the first of two surveys conducted on this building in mid-August and early September 2023. Droppings were also identified in the building, and it was identified as a Leisler's bat roost in the period 2014-2018.
- PBR179: A modern residential dwelling on the Coolough Road in Menlo. Three soprano pipistrelle bats were observed emerging from this building during a single emergence survey conducted in early September 2023. This building was recorded as a bat roost in the period 2014-2018 and is likely to be a maternity roost for soprano pipistrelle bats.
- PBR248: A thatched cottage on a boreen North of Castlegar Village. A small number of bats was observed emerging from this building.

- PBR250: An abandoned bungalow on the N84 Headford Road. There emergence surveys were conducted on this building in late mid-July, late July and mid-September 2023. Three bats were observed emerging from the building in September and on this basis it is likely to be a small day/night or transitional roost.
- PBR255: A modern bungalow west of the University of Galway campus in the Aughnacurra housing estate. This building was subject to one emergence survey, during which five bats (4 no. soprano pipistrelle and 1 no. Leisler's bat *Nyctalus leisleri*) were observed emerging from the building.
- PBR256: A modern bungalow west of the University of Galway campus on the N59 Clifden Road. This building was previously identified as a Brown long-eared bat *Plecotus auritus* roost in 2014-2018. Two emergence surveys were conducted at this building in 2023 in late July and mid-August 2023, respectively. Small numbers of soprano pipistrelle bats were observed emerging from the buildings on each occasion (1 no. bat in July, 2 no. bats in August).
- PBR288: A farm outhouse in the townland of Troscaigh Thiar. A single bat was observed emerging during a single visit in late August 2023.
- PBR177: A residential building on Aughnacurra estate. A single bat was observed emerging during a single visit in September 2023. This building was previously identified as a Soprano pipistrelle roost in 2014-2018 (Emergence and Re-Entry of 12 bats).

No confirmed winter hibernation observations of this species were observed during hibernation surveys, although as per common pipistrelle bat, this species is known to roost in locations that are inaccessible to surveyors by non-destructive methods, e.g. between cavity block walls and under roof tiles.

These roosts can often be in the same building as a summer roost. For this reason, any building that is listed as a soprano pipistrelle roost is being conservatively treated as a potential hibernation roost for the species.

Soprano pipistrelles bats were also recorded during Winter Hibernation statics placed at Menlo Castle PBR06 and Ballybrit Castle.

Refer to Figure 5.15.1 for locations referred to above.

5.2.4.3 Evidence of bat activity

2014 - 2018

During the surveys conducted between 2014 – 2018, Soprano pipistrelle bats were recorded widely across the study area during the walked and vehicle transect surveys. However, very few calls were recorded within the more developed areas within Galway City apart from areas adjacent to the River Corrib.

This species was recorded at all 24 automated detector locations deployed in 2014.

The automated detectors deployed in 2015 recorded soprano pipistrelle bats at 37 (out of a total of 42) locations along the route of the proposed N6 GCRR.

The highest levels of activity were recorded near the River Corrib (RS1 and RS2), in proximity to a confirmed roost in Aughnacurra Housing Estate (RS8) and a hedgerow adjacent to the existing Coolagh Roundabout (RS29). Figure 5.13.1 shows the locations of these surveys.

During the crossing point surveys, bat activity suggesting possible crossings was recorded at all 21 survey locations for soprano pipistrelle bats. Thirteen sites along the route of the proposed N6 GCRR recorded more than 10 possible crossing records for this species.

Refer to Figure 5.13.1 for locations referred to above.

2023

Walked transects in 2023 recorded Soprano pipistrelle bats at 15 (out of a total of 15) transect locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Menlo/River Corrib (T9), Coolough (west of Lackagh Quarry) (T10), and Lackagh Quarry (T11).

The automated detectors deployed in 2023 recorded Soprano pipistrelles at 50 (out of a total of 50) locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Dangan (L21) (near Greenfields Hockey Club), Menlo/River Corrib (L23), and Briarhill L50 (near Coolagh Roundabout).

Significant activity for Soprano pipistrelles was also recorded north of Cappagh Park (L6), Ballinfoyle (L37 & L38), (east of Lackagh Quarry), and Castlegar (L40 in 2023).

Refer to Figure 5.15.1 for locations referred to above.

*5.2.5 Nathusius' pipistrelle bat *Pipistrellus nathusii*

The results of the bat surveys as they relate to Nathusius' pipistrelle bat are shown on Figure 5.16.1 and 5.17.1.

5.2.5.1 Historical records

This is the only bat species that has not been previously recorded in the study area. Only one record exists at a county level for an ad-hoc observation made in Oughterard in 2007 according to the Bat Conservation Ireland database.

5.2.5.2 Evidence of bat activity

2014 - 2018

During the surveys conducted between 2014 – 2018, Nathusius' pipistrelle bats were recorded during the walked and vehicle transect surveys in 2014 but on a much rarer basis than the other two *Pipistrellus* species. They were recorded in an area of farmland east of Galway Technology Park, Bearna Woods, Coolagh Lakes and Letteragh.

The species was recorded at 20 (out of a total of 24) automated detector locations in 2014, although they again were much less frequent than the other *Pipistrellus* species but suggested that the species was more widespread than was shown by the walked and vehicle transects. Sites with highest numbers of calls included S20, S16, S21 and S06, which were located around the River Corrib. See Figure 5.16.1 for the locations of these records.

The automated detectors deployed in 2015 along the route of the proposed N6 GCRR recorded Nathusius' pipistrelle bats at one (out of a total of 42) location, in Lackagh Quarry (RS13), where two calls were recorded.

During the crossing point surveys, evidence for Nathusius' pipistrelle bats crossing the route of the proposed N6 GCRR were recorded at CP14 and CP20 (2 out of a total of 21). Only single "passes" were recorded.

2023

Walked transects in 2023 recorded Nathusius' pipistrelle bats at four (out of a total of 15) transect locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Dangan/University of Galway Sports Ground (T8), and Lackagh Quarry (T10 and T11).

The automated detectors deployed in 2023 recorded Nathusius' pipistrelle bats at 41 (out of a total of 50) locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at during Winter Hibernation at the static placed at Menlo Castle PBR06. All the other 50 statics deployed recorded single-digit figures of Nathusius' pipistrelle bats, the highest levels of activity were recorded at north of Lettereragh Road (L17), Coolough (L28 & 27), and Menlo/Coolough area (L26) near the River Corrib.

See Figure 5.17.1 for the locations of these records.

No roosts for this species have been recorded in 2023, however as noted above, Nathusius' calls were recorded at during Winter Hibernation at the static placed at Menlo Castle PBR06.

5.2.6 Unidentified Pipistrelle Species *Pipistrellus* sp.

The results of the bat surveys as they relate to Pipistrelle bats, not identified to species level, are shown on Figure 5.13.1 and 5.18.1.

Common pipistrelle bats have their peak echolocation call strength at 45kHz and soprano pipistrelle bats at 55kHz. Pipistrelle bat species that echolocate between 48 and 52kHz cannot be accurately identified by their calls and are described as "unidentified" Pipistrelle bat species.

5.2.6.1 Identification of Roosts

2014 - 2018

Two unidentified Pipistrelle bat roosts were recorded during building inspections in 2014 and 2015. A roost of unknown number was found in a farm house to the west of Bearna Village (PBR224) during an internal survey whilst an old unidentified Pipistrelle bat dropping was found in a bungalow within the grounds of Galway Racecourse in Ballybrit (PBR242).

An unidentified Pipistrelle bat was observed with an endoscope in a crevice in an ash tree (PTR54) in hazel scrub on limestone pavement located to the north of Coolagh Lakes in 2015.

Figure 5.13.1 shows the locations of these records.

2023

Five unidentified pipistrelle bat roosts were recorded during roost emergence surveys in 2023.

- PBR229: a traditional bungalow off Ballymoneen Road was identified as a roost for Pipistrelles based on emergence surveys conducted in mid-June, early August and mid-September 2023. A single Pipistrelle bat returned to roost at the bungalow in September. This roost is considered to be a transitional roost for Pipistrelles.
- PBR50: Ballybrit Castle was identified as a roost for Pipistrelle species, based on emergence surveys conducted in June 2023.
- PBR205_ST1, PBR205_ST10, and PBR205_ST9 at Galway Racecourse Stables Block Castle were identified as roosts for Pipistrelle species, based on emergence surveys conducted between June - August 2023.

No confirmed winter roosts for this species were recorded however as mentioned previously, pipistrelle species are known to hide in inaccessible parts of buildings that also act as summer roosts, and therefore all summer roosts are treated as potential hibernation roosts.

Common Pipistrelles were recorded during Winter Hibernation statics placed at Menlo Castle PBR06, Ballybrit Castle PBR50 (no. 8) and Cloonnabinnia Cave PBR160.

Soprano pipistrelles bats were also recorded during Winter Hibernation statics placed at Menlo Castle PBR06 and Ballybrit Castle.

The highest levels of Nathusius' pipistrelle bats activity were recorded at during Winter Hibernation at the static placed at Menlo Castle PBR06.

Figures 5.13.1 and 5.18.1 shows the locations of these records.

5.2.6.2 Evidence of bat activity

2014 - 2018

During the surveys conducted between 2014 – 2018, bat calls that could not be assigned to either common or soprano pipistrelle bats were recorded widely across the study area during the walked and vehicle transects undertaken in 2014. The highest activity was recorded near the River Corrib (RS1), Lackagh Quarry (RS13) and along a hedgerow near Castlegar Village (RS19). See Figure 5.13.1 and 5.18.1 for the locations of these records.

The automated detectors deployed in 2015 recorded unidentified Pipistrelle bats at 32 (out of a total of 42) locations along the route of the proposed N6 GCRR. During the crossing point surveys, bat activity suggesting possible crossings were recorded at 14 (out of a total of 21) sites for unidentified Pipistrelle bat species. Two sites recorded more than 10 possible crossing records for this species group: CP9 and CP10.

2023

Walked transects in 2023 recorded unidentified pipistrelle species at one (out of a total of 15) transect location(s) along the route of the proposed N6 GCRR. The activity was recorded at Coolough, west of Lackagh Quarry (T10).

The automated detectors deployed in 2023 recorded unidentified pipistrelle species at 1 (out of a total of 50) location(s) along the route of the proposed N6 GCRR. The activity was recorded at Dangan/ University of Galway Sports ground (L22) (all in September 2023).

Figure 5.18.1 shows the locations of these records.

5.2.7 Brown long-eared bat *Plecotus auritus*

5.2.7.1 Historical records

Baseline data presented in documentation supporting planning applications in the study area have recorded a Brown-long eared bat roost of more than 20 bats in Menlo Castle (RPS, 2006) although this was not recorded during the current series of surveys.

This commonly-occurring and widespread species is known to occur in Merlin Woods (Browne and Fuller 2009), University of Galway campus (McCarthy, Keville and O'Sullivan. (2014a)), Clydagh Bridge and Ballyquirke (north of the study area) (Galway County Council/Roscommon National Roads Design Office. (2011). Bat Conservation Ireland records for this species show a small number of records in the study area.

5.2.7.2 Identification of roosts

2014 - 2018

27 roosts of this species were recorded during the building inspections in 2014-2017. Seven of the roosts could support maternity colonies; a period house on the Letteragh Road (PBR49), Merlin Castle (PBR51), an abandoned bungalow on the R338 to Oranmore (PBR89), a barn on the R399 east of Ballybrit (PBR100), the attic of two houses in Aughnacurra Housing Estate (PBR178, PBR256) and a modern house in the Heath Housing Estate (PBR173).

Twelve additional roosts were also classified as night roosts, while the remaining were not classified. The night roosts were found in the following locations; an abandoned house adjacent to the Corinthians RFC (PBR21), an abandoned house in Rockmount (PBR15), an abandoned three outbuildings near Ballindooley Lough (PBR17, PBR25, PBR111), an outbuilding and archway in Menlough (PBR82, PBR156), an unfinished modern house in Gortacleva (PBR138), a shed in Barr Aile (PBR217), and a shed in Garraun (PBR194), cottage in Ballintemple (PBR105).

During the radio-tracking in August 2014, four brown long-eared bats were captured; two bats at Bearna Woods, one bat at Menlough Woods, and one bat at Cooper's Cave. The female brown long-eared captured at Cooper's Cave was fitted with a radio transmitter and tracked to its daytime roost; a bungalow in Castlegar (PBR145). An emergence count carried out on this building observed six bats leaving the roost. As this bat was an adult female it is likely that this building was being used as a maternity roost. This bat was also tracked during the September radio-tracking session and was found to repeatedly roost in the same bungalow.

On one night the bat was recorded night roosting in a stone arch between Menlough Village and Menlo Castle (PBR156) during heavy rain.

The maximum commuting distance recorded for this individual in a single night was approximately 4.07km.

The foraging area of 2.18km^2 (MCP) mainly encompassed the valley where Cooper's Cave was located but also around Ballindooley Lough. Refer to Figure 3A in Appendix H and Figure 46 in Appendix F.

Figure 5.16.1 shows the locations of these roost records.

2023

Seven roosts of this species were identified in 2023. The identification of these roosts arose from a combination of building/structure inspection surveys, roost emergence surveys, and data generated in the period 2014-2018:

- PBR173, a modern house in the Heath Housing Estate (PBR173). Brown Long-eared bat droppings (confirmed by DNA sequencing)/large amount suspected maternity roost, were confirmed in surveys conducted 2014 - 2018.
- PBR192, a modern residential building north of the N83 Tuam Road, was identified as a Brown long-eared bat roost based on the discovery of droppings during internal inspections of the building in 2014-2018. The owners of the building refused access to surveyors to conduct emergence, external or internal inspections of the building in 2024, and the building could not be surveyed from adjacent areas of publicly accessible lands due to its large setback from the roadside. Based on review of the property using aerial imagery and google street maps, it appears to remain in similar condition to 2018 and therefore it is assumed that it remains a roost for brown long-eared bats.
- PBR204, a derelict bungalow on the eastern side of the N84 Headford Road was identified as a Brown long-eared bat *Plecotus auritus* roost in 2014-2018 based on the identification of droppings in the interior of the building. Three separate emergence surveys were completed in late May, late June and late September 2023, with a single brown long-eared bat observed emerging during the June survey.
- PBR215, a hayshed south of PBR215 in Troscaigh Thiar which was subject to three surveys in late August 2023 including internal and external building inspection and emergence surveys. The building is surrounded by dense scrub vegetation on its southern side and this limited visibility of all parts of the building. Nonetheless, the building was identified as a mixed brown long-eared bat/*Myotis* species roost based on the emergence of two bats during the first survey visit.
- PBR216, a small outbuilding to the rear of a residential property in Troscaigh Thiar. A single Brown long-eared bat was observed returning to roost on the first of two surveys conducted at this building in late August 2023.
- PBR267, a traditional bungalow is a mixed roost of brown long-eared bat and soprano pipistrelle bat and is described under subsection Soprano pipistrelle bat *Pipistrellus pygmaeus* above. This is a small roost and a single brown-long-eared bat was observed roosting under a barge board at the rear of the building.
- PBR82, an outbuilding and archway in Menlough. Identified initially as a night roost for Lesser Horseshoe bats (1 bat) in 2014 during radio-tracking, but also present were Brown-long eared bats and Natterer's bats. Remains suitable and notwithstanding absence of any evidence of use in 2023 is conservatively being assigned as a night roost for Brown long-eared bats and the other bat species previously identified as present in the roost.

No winter hibernation roosts for this species were observed in 2023, however, Brown long-eared bats were recorded during Winter Hibernation statics placed at Cloonnabinnia Cave PBR160.

Figure 5.19.1 shows the locations of these records.

5.2.7.3 Evidence for bat activity

2014 - 2018

During the surveys conducted between 2014 – 2018, Brown long-eared bats were only recorded at two locations during the walked and vehicle transects but these results are typical for this bat species which echolocates very quietly and is therefore difficult to pick up on a heterodyne bat detector on a moving transect. However, they were recorded at 18 (out of a total of 24) automated detector locations in 2014, indicating that the species is quite widespread in the study area, consistent with the findings of the summer roost surveys.

The automated detectors deployed in 2015 recorded brown long-eared bats at only two (out of a total of 42) sites along the route of the proposed N6 GCRR, adjacent to the River Corrib (RS1 and RS7).

2023

Walked transects in 2023 recorded no Brown long-eared bats across all 15 transect locations along the route of the proposed N6 GCRR.

However, the automated detectors deployed in 2023 recorded Brown long-eared bats at 47 (out of a total of 50) locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Ballinfoyle/Castlegar (L38 and L37) and Lackagh Quarry (L32 and L33).

Figure 5.19.1 shows the locations of these records.

5.2.8 Myotis bat species

The results of the bat surveys, as they relate to bats identified to the *Myotis* genus level, are shown on Figure 5.16.1 and 5.20.1.

The *Myotis* genus includes three bat species resident in Ireland: Daubenton's bat *Myotis daubentonii*, Natterer's bat *M. nattereri* and the Whiskered bat *M. mystacinus.* There can be difficulty in differentiating between the bats using their echolocations calls as there can be similarity between them. Therefore, they have been grouped together for the purposes for reporting these results.

5.2.8.1 Historical records

Previous bat studies have reported in excess of 20 Daubenton's bats recorded roosting in the southern façade of Menlo Castle in 2000. There was no roost recorded in 2005 and 2006 (RPS, 2006), but bats were recorded foraging nearby. Less than 30 Natterer's bats were recorded roosting in outbuildings of Menlo Castle in 2000 but no roost was recorded in 2005 and 2006 ((RPS, 2006). *Myotis* bats were recorded on the University of Galway Sporting Campus (McCarthy, Keville & O'Sullivan (2014). There was also a historical record of a roost of Natterer's bats at St. James's Church, Bushypark. Natterer's bats were also recorded as part of the surveys carried out for the proposed R336 to N59 Road Scheme (RPS, 2013a). Daubenton's bats have been recorded on the River Corrib from the University of Galway lands (McCarthy, Keville and O'Sullivan. (2014a, 2014b)) and also in most watercourses within the city and around its environs.

This species is regularly sighted around the Galway Cathedral during bat walks by Galway Bat Group (C. Carlin, pers comm 2015).

Whiskered bats have rarely been recorded across the study area and only *ad-hoc* records from Bat Conservation Ireland exist.

5.2.8.2 Identification of roosts

2014 - 2018

Four Natterer's bat roosts were recorded during the inspections of buildings in 2015 (PBR17, PBR20, PBR64, PBR82). These roosts were confirmed based on the presence of droppings, which were analysed using DNA sequencing to confirm the species identity.

An emergence survey of Menlo Castle (PBR06) carried out on the 8 July 2014 found Daubenton's bats to be still roosting in the castle. Numbers of bats were estimated to be less than 20 bats.

During the radio-tracking in August 2014, nine Daubenton's bats (one female and eight males) were captured in Menlough Woods and a single male Daubenton's bat was captured at Cooper's Cave. One of the male Daubenton's bats captured in Menlough Woods was tagged and tracked. It was found to roost in a stonewall structure on the eastern bank of the River Corrib (PBR133). An emergence count undertaken shortly after recorded 25 Daubenton's bats to be roosting in the wall, suggesting that this was likely to be a maternity roost for this species.

During the second radio-tracking session in August 2014, ten Daubenton's bats were captured (one from Merlin Wood, three from University of Galway, and six from Menlough Woods) and four were tagged (one female from Merlin Wood, two females and one male from University of Galway). Roosting information

was recorded for three of the Daubenton's bats tracked during the second August session. They were found to roost in three buildings (PBR142, PBR143, PBR144) and two bridges (PBR150, PBR152) in Galway City Centre. Foraging data was recorded in the September tracking session for two Daubenton's bats that were captured during the second August session. One bat travelled a maximum distance of 1.06km and had foraging areas of 0.26km^2 (MCP) encompassing Merlin Woods and the Coolagh lakes. The other had a maximum distance of 2.48km and had a foraging area of 0.55km^2 (MCP) encompassing the River Corrib from Menlo Castle into Galway City Centre. Refer to Figures 48, 49 I Appendix F and Figure 2, 3B, 3D, 3E of Appendix H.

Two male whiskered bats were captured and tagged during the second radio-tracking session in August 2014 (one from University of Galway and one from Merlin Woods). However, the bat caught in Merlin Woods could not be relocated after tagging.

The other Whiskered bat was found to roost in two modern dwelling houses (PBR140, PBR151) in a residential estate by the Sports Centre, near Bearna Woods. Foraging data for this individual was gathered during the September radio-tracking session.

The maximum distance this bat travelled was 3.71km and had a foraging area of 2.02km^2, encompassing areas of scrub and rough grassland in the Bearna area. Refer to Figure 47 in Appendix Fand Figures 2 and 3C in Appendix H.

A Natterer's bat was captured in Menlough Woods in August 2014 but was not prioritised for tracking at that time and hence not fitted with a radio-tag. Another male Natterer's bat was captured, ringed and tagged in Menlough Woods during the September radio-tracking session; however, no data was recorded from this bat, possibly due to the bat leaving the area, or transmitter failure.

Figure 5.11.1 shows the locations of these roost records.

2023

Seven roosts of *Myotis* bat species were identified: The identification of these roosts arose from a combination of building/structure inspection surveys, roost emergence surveys, and data generated in the period 2014-2018 and 2023:

- PBR73, St. James' Church, Bushpark. The building was identified as a roost for *Myotis* species, based on historical record of Myotis bats in St. James' Church (*Myotis naterreri*) and emergence of bats recorded during surveys conducted between June – September 2023.
- PBR199, a building on the eastern side of the N84 in Ballindooly that was subject to external inspection and emergence surveys (access was denied to internal parts of the building by the owners / occupants). The building was identified as a small roost for *Myotis* species bats based on emergence surveys. Three surveys were completed in late May, late June, and mid-September 2023. A single bat was observed returning to roost at the building during the September survey. Based on observations, this is likely to be a night roost or day roost for *Myotis*. The building is adjacent to high quality riparian habitat (Ballindooly Lough) which *Myotis* species are particularly strongly associated with.
- PBR215, a hayshed in Troscaigh Thiar as already described under subsection Brown long-eared bat *Plecotus auratus* above. A single *Myotis* bat was observed roosting at this building in August 2023.
- PBR140, a residential building in the Lios Mór housing estate was identified as a roost for Whiskered bat *Myotis mystacinus* based on data collected in 2014 only (observation of a live bat in the building). Surveys were not conducted at this building in 2023 as the owner refused access to the building by surveyors. As the building remains in a similar condition to 2018, out of an abundance of caution, the building is assumed to continue to provide roosting opportunities to whiskered bat and has been treated as a whiskered bat roost.
- PBR151, another residential building in the Lios Mór housing estate. Again surveyors were denied access for bat surveys in 2023, and therefore the identification of this building as a roost relies solely on data collected between 2014-2018 (observation of a live whiskered bat *Myotis mystacinus* in the building).

- PBR178, a residential building in the Aughnacurra housing estate off the N59 Clifden Road. The garage to this building was previously identified as a Lesser horseshoe bat roost *Rhinolophus hipposideros*. The observations of *Myotis* bats in 2023 relates to the house proper, with a single bat observed emerging from the building on the first two of three survey visits in mid-June, mid-July, and mid-August 2023.
- PBR82, an outbuilding and archway in Menlough. Identified initially as a night roost for Lesser Horseshoe bats (one bat) in 2014 during radio-tracking, but also present were Brown-long eared bats and Natterer's bats. Remains suitable and notwithstanding absence of any evidence of use in 2023 is conservatively being assigned as a night roost for Brown long-eared bats and the other bat species previously identified as present in the roost.

Figure 5.20.1 shows the locations of these roost records.

5.2.8.3 Evidence of bat activity

2014 - 2018

During the surveys conducted between 2014 – 2018, on the walked and vehicle transect surveys and the automated detector surveys in 2014 and 2015, the majority of *Myotis* calls were not identified by species due to the overlap in call characteristics between species when analysed.

However, on a number of occasions, *Myotis* species were confirmed by visual observations coinciding with echolocation calls.

Natterer's bats were recorded at Bearna Woods and Daubenton's bats were seen foraging on the River Corrib and the Terryland River. The majority of *Myotis* bat calls were recorded along the River Corrib and Terryland River during the walked and vehicle transects but were infrequently recorded across the rest of the study area. Figure 5.16.1 shows the locations of these detector records.

Myotis calls were recorded across all 24 automated detector locations in 2014, although at a lower frequency than pipistrelle species. Location S07 recorded the highest amount of *Myotis* activity. This site was close to the River Corrib and the known Daubenton's maternity roost.

The automated detectors deployed in 2015 along the route of the proposed N6 GCRR recorded *Myotis* bats at 25 (out of a total of 42) locations.

Activity levels for this species at static locations along the route of the proposed N6 GCRR was low for this species group but the highest activity was recorded along the River Corrib (RS1), Lackagh Quarry (RS13), an area of woodland adjacent to the N84 Headford Road near Ballindooley and along a stream surrounded by fields and scrub in Ballard East.

During the crossing point surveys, possible crossing records were recorded at 7 (out of a total of 21) sites for *Myotis* bat species, with 1-3 possible crossings recorded at each of these sites.

2023

Walked transects in 2023 recorded *Myotis* species at three (out of a total of 15) transect locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at River Corrib/Menlo (T9). The other transects were north of Bearna Road (T1) at the western-end of the proposed N6 GCRR, and Lackagh Quarry (T11).

The automated detectors deployed in 2023 recorded *Myotis* species at 47 (out of a total of 50) locations along the route of the proposed N6 GCRR. The highest levels of activity were recorded at Dangan/Greenfields Hockey Club (L21), Cappagh Road area (L8), and Menlo/River Corrib area (L25).

Significant activity of *Myotis* species was also recorded at Coolough/Menlo area (L27), Lackagh Quarry (L32); and Dangan University of Galway Sports Ground (L22).

Myotis species were also recorded during Winter Hibernation statics placed at Menlo Castle (PBR06) and Cloonnabinnia Cave (PBR160). Figure 5.20.1 shows the locations of these detector records.

5.3 Interpretation and evaluation

5.3.1 Population size class assessment

The *Bat Mitigation Guidelines for Ireland* v2 (NPWS, 2022) refer to the population size class assessment as being the numbers of bats associated with a site. The guidelines acknowledge that it can be difficult to estimate the size of the bat population in a local context for a variety of factors including variability in sampling and survey efficiency, population dynamics, seasonal occupation of roosts and species/gender-specific preferences at each roost site. There is also a wide range of variability in effectiveness in using bat activity data as an indication of density of individuals.

The data on local bat populations is mostly available for Lesser horseshoe bats as the populations of this species has been monitored for several years in Ireland. Other species have varying ranges of data available and subsequently it was not deemed possible to apply the same level of analysis to the other bat species. In the context of the limited distribution of Lesser horseshoe bats in Ireland this species has been given a more detailed level of analysis than other species.

5.3.1.1 Lesser horseshoe bat

Counts of Lesser horseshoe bats made at Menlo Castle were compared to other roost counts in County Galway and beyond to determine the level of importance of Menlo Castle.

Based on counts from 2006 - 2023, the maternity roost at Menlo Castle makes up approximately 0.65% (min 0.1% - max 0.65%) of the summer population of Lesser horseshoe bats for the national population of this species and 6% (min 2% - max 6%) of the County Galway summer population. Therefore, while the roost at Menlo Castle does not meet the threshold of representing 1% of the national population to make it of National Importance (National Roads Authority, 2009)[34], it does exceed this threshold at the county level and therefore is regarded to be of County Importance.

Based on the distribution of maternity roosts in the range of this species in Ireland, the Menlo Castle maternity roost and the local population it supports meets the criteria of being of National Importance, whereby "a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle." (National Roads Authority, 2009)[34]

According to the NPWS Lesser horseshoe Database (November 2023), there are only six known maternity roosts in and around Lough Corrib, with the majority of roosts concentrated on the northern shores near Cong. Only two roosts are located on the southern end: Ross Lake Gatehouse and Menlo Castle. These southern roosts may be an important stepping-stone for long-term movements and gene flow between bat populations in North Galway and Mayo and populations in South Galway and Clare.

Previous counts from Ross Lake Gate House had shown that this roost has undergone significant deterioration resulting in decline in numbers from 150 bats in 1994 to five bats in 2011 (Rebecca Teesdale pers. comm., 2014 and p44 in Roche et al, (2015)).

However, more recent counts bats for 2020 - 2023 season indicate that the colony is showing signs of recovery, with 31 bats recorded in July 2023 (NPWS).

Table 5.6 Ross Castle Counts 1994 - 2023

Date	Count	Source
1994	150	NPWS
1998	15	NPWS
25/08/1988	54	NPWS
13/07/1989	30	NPWS

[34] https://www.tii.ie/technical-services/environment/planning/Best_Practice_Guidelines_for_the_Conservation_of_Bats_in_the_Planning_of_National_Road_Schemes.pdf

Date	Count	Source
23/07/1992	34	NPWS
05/07/1993	70	NPWS
02/07/2002	49	NPWS
20/05/2006	37	NPWS
22/06/2009	36	NPWS
01/07/2009	44	NPWS
13/06/2011	5	NPWS
05/07/2012	41	NPWS
11/07/2012	31	NPWS
27/05/2014	10	NPWS
17/06/2014	43	NPWS
03/06/2015	3	NPWS
17/06/2015	25	NPWS
31/05/2016	19	NPWS
15/06/2016	28	NPWS
08/06/2017	25	NPWS
23/06/2017	22	NPWS
27/06/2017	25	NPWS
29/05/2018	22	NPWS
12/06/2018	39	NPWS
11/06/2019	4	NPWS
27/06/2019	12	NPWS
10/06/2020	20	NPWS
30/06/2020	22	NPWS
09/06/2022	22	NPWS
07/07/2022	33	NPWS
08/06/2023	19	NPWS
06/07/2023	22	Scott Cawley
03/07/2023	31	NPWS
26/07/2023	27	Scott Cawley
10/08/2023	25	Scott Cawley

Date	Count	Source
06/09/2023	25	Scott Cawley

A decline in the Ross Lake roost could potentially increase the relative importance of the roost at Menlo Castle as a stepping stone roost as it would be the only significant maternity colony at the southern end of Lough Corrib.

There is no evidence to suggest that Menlo Castle Lesser horseshoe bat population is connected to the Eborhall Lesser horseshoe bat population, which is the qualifying interest (QI) population for Lough Corrib SAC.

Any predicted impacts on Lesser horseshoe bats associated with the proposed N6 GCRR will not affect the conservation objectives of the Lough Corrib SACs QI Lesser horseshoe bat population, nor the QI Lesser horseshoe bat populations of any other European sites.

The numbers of bats using Cooper's Cave (PBR112) is hard to quantify due to the lack of access to roosting areas underground and the seasonal and gender specific variability in its use. It clearly is used by males and females some of which roost there in summer and also use it for mating. The cave system also supported a small population of hibernating Lesser horseshoe bats (averaging 5 - 9 bats in 2023) although the cave system could not be accessed in its entirety, so more bats could have been present further underground.

The 2014 – 2023 surveys have indicated that Menlo Castle and Cooper's Cave provide hibernation conditions for the local population although since both locations cannot be fully accessed to count individuals, the population size cannot be fully determined. Given the lack of other maternity roosts in the locality which could otherwise be a source of additional bats to occupy hibernacula, it is very unlikely that the winter roost population differs from the summer roost population in the Menlo Castle-Cooper's Cave complex.

Populations of all other bat species are regarded to be important at a local geographic scale since they are regarded to be widespread across the study area, County Galway and at a national scale.

Less common bat species, particularly Natterer's and Whiskered bat, were represented within the study area and at a low encounter rate that would suggest a population density comparable to the rest of the country.

Nathusius' pipistrelle was recorded flying through the study area but, much like available data on the species for the rest of the country, no confirmed roosts were encountered.

However, the highest levels of activity were recorded at during Winter Hibernation at the static placed at Menlo Castle PBR06 (no. 152).

5.3.1.2 Numbers of bats

Table 5.7 presents the nature of each bat roost and the numbers of bats recorded at the roosts identified during the baseline surveys which are the subject of this derogation licence application. This may be as a result of the direct loss of roosts, risk of disturbance caused by construction, the effects of fragmentation of flight paths during construction and operation (residual effects) and loss of foraging habitats closest to these roosts.

The respective species' roost locations are shown in Figures 5.8.1 to 5.20.1.

Table 5.7 Confirmed Bat Roosts of Relevance to the Derogation Licence Application

Roost Code	Species	Evidence for bats	2014 - 2018 -Number of bats recorded (or likely population)	2023 -Number of bats recorded (or likely population)
Roosts within the Proposed Development Boundary				
PBR177	*Pipistrellus pygmaeus*	Emergence of bats	14	1
PBR178	*Myotis species, Rhinolophus hipposideros*	Emergence of bats (Myotis Spps.) and 9 Lesser horseshoe bats seen in 2015, 10 Lesser horseshoe bats recorded emerging in 2016	9 Lesser horseshoe bats seen in 2015, 10 Lesser horseshoe bats recorded emerging in 2016. Unknown number of Brown Long-eared bats	1
PBR179	*Pipistrellus pygmaeus*	Live bats	4 Soprano Pipistrelle bats emerged in 2015, none in 2016. Possible former maternity roost	3
PBR196	*Nyctalus leisleri*	Re-entry of bats	Single or small numbers. Single Soprano pipistrelle bat emerged	1
PBR199	*Myotis species*	Re-entry of bats	Unknown	1
PBR204	*Plecotus auritus*	Emergence of bats	RhHi :1, PlAu : 1	1
PBR205_ ST1	*Pipistrellus species*	Emergence of bats	2015_1PiPi_2016_1PiPy_3_Pi Pi	Unknown
PBR205_ ST10	*Pipistrellus species*	Emergence of bats		Unknown
PBR205_ ST9	*Pipistrellus species*	Emergence of bats		Unknown
PBR210	*Rhinolophus hipposideros*	Re-entry of bats	Unknown	1
PBR215	*Plecotus auritus, Myotis species*	Live bats	Unknown	2
PBR250	*Pipistrellus pygmaeus*	Emergence of bats	Unknown	3
PBR255	*Pipistrellus pygmaeus, Nyctalus leisleri*	Emergence of bats	3	5
PBR241	*Rhinolophus hipposideros*	Re-entry of bats	2	1
PBR248	*Pipistrellus pygmaeus*	Emergence of bats, multiple droppings	Unknown	Unknown
PBR252	*Pipistrellus pipistrellus*	Entry of bats	Unknown	1
PBR256	*Pipistrellus pygmaeus*	Emergence of bats	14	2
PBR261	*Pipistrellus pygmaeus*	Emergence of bats	Unknown	1

Roost Code	Species	Evidence for bats	2014 - 2018 -Number of bats recorded (or likely population)	2023 -Number of bats recorded (or likely population)
PBR267	*Plecotus auritus*, *Pipistrellus pygmaeus*	Live bats	1 Plau, 1 Py	1
Roosts Adjacent to the Assessment Boundary (<100M)				
PBR73	*Nyctalus leisleri*, *Myotis naterreri*	Emergence of bats	Unknown	5
PBR139	*Nyctalus leisleri*	Single bat tracked using radio telemetry	1	1
PBR145	*Pipistrellus pygmaeus*	Emergence and re-entry of bats, droppings	1	10
PBR173	*Plecotus auritus*	Emergence of bats	Unknown	Unknown
PBR192	*Plecotus auritus*	Droppings recorded in 2014 by Brian Keeley. No access in 2023	Unknown	Unknown
PBR216	*Plecotus auritus*	Live bats	Unknown	1
PBR219	*Rhinolophus hipposideros*	Live bat radio tracked to building in 2014	1	1
PBR225	*Pipistrellus pygmaeus*	None	Unknown	Unknown
PBR226	*Nyctalus leisleri*	Re-entry of bats	Unknown	1
PBR229	*Pipistrellus species*	Re-entry of bats	Unknown	1
PBR238	*Pipistrellus pygmaeus*	Live bats	Unknown	1
PBR288	*Pipistrellus pygmaeus*	Feeding Signs, Emergence of bats	Unknown	1
Roosts away from the Assessment Boundary (>100M)				
PBR06	*Rhinolophus hipposideros*	Emergence and re-entry of bats	RhHi: 27 in 2014 and 32 in 2015, MyDa: 20-30	46
PBR112	*Rhinolophus hipposideros*	Emergence and re-entry of bats. Winter Hib 2022-23	3	5-9
PBR128	*Rhinolophus hipposideros*	None in 2023. 1 no. LHB encountered in 2014	1	1

Roost Code	Species	Evidence for bats	2014 - 2018 -Number of bats recorded (or likely population)	2023 -Number of bats recorded (or likely population)
PBR129	*Rhinolophus hipposideros*	None from 2023 (not surveyed). 1 live LHB recorded in 2014	1	1
PBR134	*Pipistrellus pygmaeus, Nyctalus leisleri*	Emergence of bats, droppings	Unknown	1
PBR140	*Myotis mystacinus*	Live bat in building (2014)	1	1
PBR151	*Myotis mystacinus*	Live bat in building (2014)	14	14
PBR153	*Rhinolophus hipposideros*	Bat droppings on internal walls	1	1
PBR156	*Pipistrellus pipistrellus, Rhinolophus hipposideros*	Re-entry of bats	1	7
PBR158	*Rhinolophus hipposideros*	Live bat radio tracked to building in 2014	1	1
PBR218	*Rhinolophus hipposideros*	Emergence of bats	1	10
PBR222	*Pipistrellus pygmaeus*	Live Bats	1	1
PBR50	*Pipistrellus species*	Winter Hibernation Statics recording 2023. Arup (MM 21.06.23 Pip re-entry)	Unknown	1
PBR53	*Pipistrellus pygmaeus*	Emergence of bats, droppings	Unknown	2
PBR82	*Rhinolophus hipposideros, Plecotus auritus, Myotis naterreri*	None in 2023. Rhip radio tracked to this building in 2014. The building remains suitable for these species	1	1
PBR83	*Pipistrellus pipistrellus, Rhinolophus hipposideros*	Live bats (Ppyg only) in 2023. Previously identified as a Rhip roost in 2024 with tagged bat returning to roost at this building at night. Remains suitable	1	3
PBR85	*Rhinolophus hipposideros*	Not surveyed in 2023. 1 no. LHB recorded in 2014	1	1

Table 5.8 presents total numbers of bats of each species in structures that may be removed or not removed as a result of the proposed N6 GCRR.

Table 5.8 Estimated[35] Numbers of Bats affected by Removal of Roosts

Bat Species	2023 Approximate population size of bats in properties to be removed	2023 Approximate population size of bat in properties not removed		2014-18 Approximate population size of bats in properties to be removed	2014-18 Approximate population size of bat in properties not removed
Lesser horseshoe bat	2 (Minimum)	82		10	49
Common pipistrelle bat	1 (Minimum)	7 (Minimum)		8	9
Soprano pipistrelle bat	13 (Minimum)	22 (Minimum)		25	6
Brown long-eared bat	4	Unknown		16	63
Daubenton's bat	0	0		0	30
Leisler's bat	1	12 (Minimum)		1	3
Whiskered	Unknown	16 (Minimum)		0	2
Natterer's bat	0	5		0	5
Unidentified bat	Unknown	Unknown		2	0

As can be inferred from Table 5.8 above, the species that is potentially incurring the greatest potential loss of roosting is the Soprano pipistrelle bat population, which also happens to be the most commonly occurring bat in the country and recorded at almost all recording locations in the study area.

The population of Lesser horseshoe bats lost as a result of demolitions comes from the loss of two properties at Aughnacurra PBR178 (a satellite roost to Menlo Castle (PBR06) (which itself will not be affected by the demolition works)), and PBR210.

The main residential building at PBR241 complex is to be retained for Lesser horseshoe bats and protected from adverse impacts. A rocket box will also be installed near the roost at PBR 241, rather than a bat box fixed to the building itself, so as not to detract from its cultural heritage value, this is discussed further in this derogation licence application as a compensation measure[36].

5.3.2 Assessment of the status of the overall study area

The overall study area includes 8 of the 9 species that are known to breed on the island of Ireland. The only species for which a roost was not confirmed is Nathusius' pipistrelle bat, but this species was recorded flying in the study area by the automated detectors in several locations.

The status of the population of Lesser horseshoe bats as discussed in Section 5.4.1 is deemed to be of important at a national geographic scale. As discussed in Section 5.4.1 populations of all other bat species are regarded to be important at a local geographic scale.

5.3.3 Survey Limitations

Between 2014 and 2023, a total of 230 structures and 62 trees were assessed as part of the collection of baseline data on the bat population in the area of the proposed N6 GCRR.

[35] "Estimated", since the numbers may be based on a small number of counts or estimates of bat numbers by bat workers based on volumes of droppings recorded. Actual numbers are not likely to deviate significantly from those quoted above.

[36] Note that the term "compensation" is used in this application refers to addressing impacts which cannot be mitigated. These impacts will have no impact on any European Site and the term "compensation" as used in this application does not in any way infer the same meaning as used in Article 6(4) of the E.C. Habitats Directive.

This unprecedented level of surveying allowed a detailed picture of the species assemblage present in the study area and informed the constraints and option selection studies, and the design of the proposed N6 GCRR.

All structures within the proposed development boundary which may be affected either directly or indirectly were surveyed to record potential usage by bats. In most cases it was possible to carry out internal and external checks for signs of bats in daytime as well as dusk and/or dawn surveys. Inevitably in a few cases, access to inside the structure was not possible. In such cases, surveys at night were undertaken to record any bats emerging from or returning to the structure.

Some surveys (e.g. radio-tracking surveys in 2015) may have been affected by cool night time temperatures and may have forced bats to reduce foraging time. Overall, the repeated surveys carried out since 2014 have allowed bats to be surveyed over multiple seasons which reduce the bias caused by suboptimal weather conditions.

As noted in *Bat mitigation guidelines for Ireland v2* (Marnell *et al.*, 2022), 'it is extremely difficult to survey trees and be certain that any bat roosts have been detected'. This has been accounted for in developing the mitigation strategy whereby all trees with potential to support roosting bats will be subject to pre-felling checks, including emergence (Section 8.1), to ensure the protection of any bats that may be present at that time.

In 2023, one-hundred and sixty five buildings were identified within this zone of influence, with building/structure inspection completed on 129 of the 165 buildings. Access was denied for building/structure inspection by the occupants of 30 of the 165 buildings (See Section 5.1):

Table 5.9 Properties with Access Denied 2023

PBR129	PBR175	PBR185	PBR195	PBR213	PBR244	PBR257	PBR266	PBR296	PBR63
PBR166	PBR176	PBR191	PBR200	PBR234	PBR245	PBR259	PBR273	PBR298	PBR84
PBR174	PBR184	PBR193	PBR208	PBR243	PBR247	PBR263	PBR280	PBR299	PBR85

5.4 Changes in Roost Locations and Species across the Study Area between 2018 and 2023

A summary of the overall changes in locations of bat roosts within the overall project area are detailed below in Table 5.10 (For full details refer to Appendix B).

Table 5.10 Changes in Roost Locations and Species across the Study Area between 2018 and 2023

Label	Change between 2023 and 2018 (Y/N)	Details of change(s) between 2023 and 2018 - 2014
PBR06	Y	Species Change - just Lesser Horseshoe bats, not Daubenton's bats
PBR112	N	N/A
PBR114	N	N/A
PBR115	Y	No longer a roost
PBR124	Y	No longer a roost
PBR128	Y	Change in PRF from Medium to Low
PBR129	Y	Change in PRF from Low to High
PBR130	Y	No longer a roost
PBR133	Y	No longer a roost

Label	Change between 2023 and 2018 (Y/N)	Details of change(s) between 2023 and 2018 - 2014
PBR134	Y	Species Change - now Soprano Pipistrelles and Leisler's bats. Change in PRF from Low to High
PBR139	Y	Confirmed in 2023 as Transitional roost
PBR140	N	N/A
PBR145	Y	Species Change - now Soprano Pipistrelles, not Brown Long-eared bats. Confirmation of PRF as Low
PBR146	Y	No longer a roost
PBR151	N	N/A
PBR153	Y	Confirmation of PRF as High
PBR154	Y	No longer a roost
PBR156	Y	Species Change - now Soprano Pipistrelles and Lesser horseshoe bats, not Brown Long-eared bats and Lesser horseshoe bats. Confirmation of PRF as Moderate
PBR157	Y	No longer a roost
PBR158	N	N/A
PBR166	N	N/A
PBR167	N	N/A
PBR168	N	N/A
PBR169	N	N/A
fPBR170	N	N/A
PBR171	N	N/A
PBR172	N	N/A
PBR173	N	N/A
PBR174	N	N/A
PBR175	N	N/A
PBR176	N	N/A
PBR177	N	N/A
PBR178	Y	Species Change - now Myotis Species and Lesser horseshoe bats, not Brown long-eared and Lesser horseshoe bats
PBR179	Y	Species Change - now just Soprano Pipistrelle, not Brown long-eared and Soprano Pipistrelle. Change of PRF from High to Moderate
PBR180	N	N/A
PBR181	Y	N/A
PBR182	N	N/A

Label	Change between 2023 and 2018 (Y/N)	Details of change(s) between 2023 and 2018 - 2014
PBR183	Y	No longer a roost
PBR184	N	N/A
PBR185	N	N/A
PBR186	N	N/A
PBR187	N	N/A
PBR188	N	N/A
PBR189	N	N/A
PBR190	N	N/A
PBR191	N	N/A
PBR192	N	N/A
PBR193	N	N/A
PBR194	N	N/A
PBR195	N	N/A
PBR196	Y	Species Change - now just Liesler's bats, not Brown long-eared and Soprano Pipistrelle
PBR197	Y	Change in PRF from Low to Negligible
PBR198	N	N/A
PBR199	Y	Now a Myotis species roost
PBR200	N	N/A
PBR201	N	N/A
PBR202	N	N/A
PBR203	Y	Change in PRF from High to Medium
PBR204	Y	Species Change - now just Brown long-eared, not Brown Long-eared and Lesser horseshoe bats
PBR205	Y	Change in PRF from Medium to High. Pipistrelle Species recorded in wider stable block area (sub-divided as below - PBR205_ST)
PBR205_ST1	N/A	N/A
PBR205_ST10	N/A	N/A
PBR205_ST11	N/A	N/A
PBR205_ST12	N/A	N/A
PBR205_ST2	N/A	N/A
PBR205_ST3	N/A	N/A

Label	Change between 2023 and 2018 (Y/N)	Details of change(s) between 2023 and 2018 - 2014
PBR205_ST4	N/A	N/A
PBR205_ST5	N/A	N/A
PBR205_ST6	N/A	N/A
PBR205_ST7	N/A	N/A
PBR205_ST8	N/A	N/A
PBR205_ST9	N/A	N/A
PBR206	Y	Change in PRF from Low to Negligible
PBR207	Y	Change in PRF from Medium to Low
PBR208	N	N/A
PBR209	N	N/A
PBR210	N	N/A
PBR211	N	N/A
PBR212	N	N/A
PBR213	N	N/A
PBR214	N	N/A
PBR215	Y	Now a Brown long-eared bat and Myotis species roost
PBR216	Y	Now a Brown long-eared bat roost
PBR218	N	N/A
PBR219	N	N/A
PBR222	N	N/A
PBR225	Y	Species change - now just Soprano Pipistrelle
PBR226	Y	Now a Leisler's bat roost
PBR228	Y	No longer a roost. PRF change from Medium to High
PBR229	Y	Now a Pipistrelle species roost
PBR230	Y	Change of PRF from High to Low
PBR234	N	N/A
PBR235	N	N/A
PBR236	N	N/A
PBR237	Y	No longer a roost
PBR238	Y	Now a Soprano Pipistrelle bat roost

Label	Change between 2023 and 2018 (Y/N)	Details of change(s) between 2023 and 2018 - 2014
PBR241	Y	Species change - now Lesser horseshoe bat roost not a Soprano Pipistrelle bat roost
PBR242	Y	No longer a roost.
PBR243	N	N/A
PBR244	N/A	N/A
PBR245	N/A	N/A
PBR246	N/A	N/A
PBR247	N/A	N/A
PBR248	Y	Change of PRF from Medium to High
PBR249	Y	Change of PRF from Low to High
PBR250	Y	Change of PRF from Medium to High
PBR251	Y	Change of PRF from Low to Medium
PBR252	Y	Now a Common Pipistrelle bat roost
PBR253	Y	Change of PRF from Low to Negligible
PBR254	N	N/A
PBR255	Y	Species change - now Leisler's bats and Soprano pipistrelle root, not just Soprano pipistrelle
PBR256	Y	Species change - now Soprano pipistrelle root, not Brown long-eared bat
PBR257	N	N/A
PBR259	N	N/A
PBR260	N	N/A
PBR261	Y	Now a Soprano Pipistrelle bat roost
PBR262	N	N/A
PBR263	N	N/A
PBR264	N	N/A
PBR265	N	N/A
PBR266	N	N/A
PBR267	N	N/A
PBR268	N	N/A
PBR269	N	N/A
PBR270	Y	No longer a roost
PBR271	N	N/A

Label	Change between 2023 and 2018 (Y/N)	Details of change(s) between 2023 and 2018 - 2014
PBR272	N	N/A
PBR273	N	N/A
PBR274	Y	PRF change from Medium to High
PBR275	Y	PRF change from Low to Negligible.
PBR276	Y	PRF change from Low to Negligible
PBR277	Y	PRF change from Low to Negligible
PBR278	Y	PRF change from Low to Negligible
PBR279	Y	PRF change from Low to Negligible
PBR280	N	N/A
PBR281	N	N/A
PBR283	N/A	N/A
PBR284	N/A	N/A
PBR285	N/A	N/A
PBR286	N/A	N/A
PBR287	N/A	N/A
PBR288	N/A	N/A
PBR289	N/A	N/A
PBR290	N/A	N/A
PBR291	N/A	N/A
PBR292	N/A	N/A
PBR293	N/A	N/A
PBR294	N/A	N/A
PBR295	N/A	N/A
PBR296	N/A	N/A
PBR298	N/A	N/A
PBR299/PBR116	Y	Building has been demolished between 2018 - 2023
PBR49	Y	No longer a roost
PBR50	Yes	Now a Pipistrelle species roost
PBR53	Y	Now a Soprano Pipistrelle bat roost
PBR54	Y	No longer a roost. PRF change from High to Negligible
PBR62	N	N/A

Label	Change between 2023 and 2018 (Y/N)	Details of change(s) between 2023 and 2018 - 2014
PBR63	N	N/A
PBR67	N	N/A
PBR73	Y	Species change - now Leisler's bat and Natterer's bat roost not just Natterer's bat
PBR81	Y	PRF change from Medium to Negligible
PBR82	N	N/A
PBR83	Y	Species change - now Common Pipistrelle and Lesser horseshoe bat roost not just Lesser horseshoe bat
PBR84	N	N/A
PBR85	N	N/A

5.4.1 2018 Roosts within the proposed development boundary compared with 2023 Roosts within the proposed development boundary

As of 2018, 15 buildings supporting 20 bat roosts were within the proposed development boundary (six Soprano pipistrelle roosts (PBR177, 179, 196, 205, 255, 267), one Common pipistrelle roost (PBR205), one unidentified pipistrelle bat roost (PBR182), seven Brown long-eared bats roosts (PBR 183, 178, 179, 196, 204, 256, 267), three Lesser horseshoe bat roosts (PBR178, 204, 210) and two unidentified species bat roosts (253, 270). Six of these are structures used by more than one bat species. Figures 5.8.1, 5.11.1, 5.13.1 and 5.16.1) show the locations of these roosts.

Following the 2023 surveys, this status has subsequently changed to 19 buildings supporting 23 bat roosts are within the proposed development boundary (eight Soprano pipistrelle roosts (PBR177, 179, 250, 255, 248, 256, 261, 267), 1 Common pipistrelle roost (PBR252), three unidentified pipistrelle bat roosts (PBR205_ST1, 205_ST9, and 205ST_10), three Brown long-eared bat roosts (PBR204, 215, 267), three Lesser horseshoe bat roosts (PBR178, 210, 241), two Leisler's bat roosts (PBR196, PBR255), and three unidentified Myotis species bat roosts (PBR178, 199, 215).

Figures 5.10.1, 5.12.1, 5.14.1, 5.15.1, 5.17.1, 5.18.1, 5.19.1 and 5.20.1 show the locations of these roosts.

6. Impact assessment

6.1 Overview of activities to be covered by this derogation licence

As noted in Section 1, this application relates to specific residual impacts on bats arising from the construction and operation of the proposed N6 GCRR, and its potential impact on bat (*Chirpotera*) species. Potential impacts have been mitigated as far as possible during the design phase and the residual impacts are those that cannot be ruled out despite applying best practice techniques.

Only activities that may give rise to offences under Regulations 51, 52 and 53 of the 2011 Regulations are within the scope of this application. There may be other potential ecological impacts of the proposed N6 GCRR that are not relevant to this application and therefore are not discussed further.

The works that are relevant to this derogation licence application are outlined below.

Construction phase

- Removal of structures and trees which may cause direct loss of roosting sites
- Removal of vegetation, which may cause:
  - Direct loss of bat foraging habitat
  - Fragmentation of foraging habitat and commuting routes and areas used by bats for other non-roosting activities[37]
- Installation of temporary lighting during construction and at site compounds which may cause indirect disturbance of flight patterns

Operational phase

- Use of the proposed N6 GCRR by vehicular traffic which may cause:
  - Mortality of bats due to vehicular collision
  - Loss of foraging resources either by residual impact of severance of /barriers across features assisting bats in reaching them during the operation of the proposed N6 GCRR
  - Indirect disturbance of flight patterns due to operational lighting proposed development and proposed lighting at University of Galway sports pitches and periods of construction works at night

This derogation licence application applies to those aspects of the proposed N6 GCRR whereby there is a residual risk of adverse impacts e.g. removal of roosts within a structure, residual risk of bat mortality because of vehicular collision and the unavoidable fragmentation of foraging habitats.

A significant amount of data collection and analysis has been carried out in respect of potential impacts to bat species from the proposed N6 GCRR.

This analysis has enabled the project team to conclusively rule out potential impacts on bat species from certain aspects of the proposed N6 GCRR, such as proposed lighting design and the provision of passage under and over the proposed N6 GCRR.

These aspects, therefore, are not included in this application for a derogation under Article 54 as there will be no potential impact on bat species from these aspects.

[37] as fragmentation of feeding habitat has the potential to disturb normal bat behavioural patterns, and thus adversely affect the ability of local bat populations to persist and reproduce, impacting on their local distribution and/or abundance and thereby conflicting with Regulation 51(b) of S.I. 477.

6.2 Construction Phase

As noted above, the following impacts are relevant to this derogation licence application (i.e. those that could constitute an offence under the European Communities (Bird and Natural Habitats) Regulations, 2011):

- Removal of structures and tree which may cause direct loss of roosting sites
- Removal of vegetation, which may cause:
  - Direct loss of bat foraging habitat
  - Fragmentation of foraging habitat and commuting routes and areas used by bats for other non-roosting activities[38]
- Installation of temporary working and site compound lighting which may cause indirect disturbance of flight patterns

The nature of each of these impacts is described below.

6.2.1 Removal of structures and trees which may cause direct loss of roosting sites

19 buildings supporting 23 bat roosts are within the proposed development boundary (8 Soprano pipistrelle roosts (PBR177, 179, 250, 255, 248, 256, 261, 267), 1 Common pipistrelle roost (PBR252), 3 unidentified pipistrelle bat roosts (PBR205_ST1, 205_ST9, and 205ST_10), 3 Brown long-eared bat roosts (PBR204, 215, 267), 3 Lesser horseshoe bat roosts (PBR178, 210, 241), 2 Leisler's bat roosts (PBR196, PBR255), and three unidentified Myotis species bat roosts (PBR178, 199, 215).

Four of these are structures used by more than one bat species. Figures 5.8.1 and 5.10.1 to 5.20.1 show the locations of these respective roosts.

Eighteen of these structures are proposed for demolition, with one of the structures (PBR241) to be retained. The main residential building at PBR241 complex is to be retained for Lesser horseshoe bats and protected from adverse impacts. A rocket box will also be installed near the roost at PBR241, rather than a bat box fixed to the building itself, so as not to detract from its cultural heritage value, this is discussed further in this derogation licence application as a compensation measure[39].

PBR183 was confirmed as no longer being a roost in the 2023 surveys, However, while the main structure will be demolished, an outbuilding on the property will be retained for the purposes of compensation for loss of other roosts.

Three trees will be felled (PTR48, PTR45, PTR43) that have been confirmed as supporting bats (Leisler's bat (PTR48) and Pipistrelle bats, respectively (PTR45 and PTR43) and an additional 13 trees have high (or category 1 as per 2014 – 2018 classification) potential to support bats and will also be felled. Figures 5.5.1 and 5.6.1 show the locations of these trees.

The potential impacts of the permanent loss of these 19 roost structures, apart from the Lesser horseshoe bat roosts, and the three trees are deemed to be significant at a local level as they are valued as important at the local geographic level, almost all had a low number of bats using them and were recorded using other roost sites across the study area which will not be impacted by the proposed N6 GCRR.

The impacts of the loss of the Lesser horseshoe bat roosts are potentially significant at a national level in the absence of mitigation measures. The 2014 - 2018 surveys confirmed that the roost at Aughnacurra (PBR178) was a satellite roost linked to Menlo Castle.

[38] as fragmentation of feeding habitat has the potential to disturb normal bat behavioural patterns, and thus adversely affect the ability of local bat populations to persist and reproduce, impacting on their local distribution and/or abundance and thereby conflicting with Regulation 51(b) of S.I. 477.

[39] Note that the term "compensation" is used in this application refers to addressing impacts which cannot be mitigated. These impacts will have no impact on any European Site and the term "compensation" as used in this application does not in any way infer the same meaning as used in Article 6(4) of the E.C. Habitats Directive.

Given that prior to 2020, the physical structure of the Menlo Castle roost was subject to deterioration, the Aughnacurra roost could be a relatively new addition to their network of roosts. As of 2020, a series of restoration works have commenced at Menlo Castle. These were ongoing in 2023.

The Aughnacurra satellite roost (PBR178) is within a sub-optimal building (garage) in terms of the preferred building type for this species, and its occupation by bats may be a reflection of the lack of availability of better roost opportunities in the area.

While there is historic evidence that PBR178 was a Lesser horseshoe maternity roost, the low- to negligible levels of Lesser horseshoe activity at the property recorded in 2023 surveys indicates that this has since changed and is perhaps intermittently used by Lesser horseshoe bats as a day roost. Samples of droppings found were taken (*Analysis result pending*) during the 2023 season, as records show Myotis species are also present at the property.

It cannot be wholly-discounted that Lesser horseshoes will return to this roost in larger numbers over subsequent years, therefore, taken a conservative and precautionary approach, it should be considered that the loss of the satellite Lesser horseshoe bat roost at Aughnacurra (PBR178) and the loss of another Lesser horseshoe bat night roosts (PBR210) within their foraging area could result in an impact on the Lesser horseshoe bat at a national geographic scale, in the absence of any measures to address this impact.

In the context of the potential impact on the Lough Corrib SAC, of which Lesser horseshoe bats are a QI, although this species is present within the study area, the roost that forms the QI population for this European site (Eborhall House) is more than 30km away from the proposed N6 GCRR, on the northern shore of Lough Corrib. This distance would be regarded to be beyond the normal core foraging range of the Eborhall House population and beyond the normal commuting range of this species except on exceptional occasions or over long periods of time – for example, bats dispersing and moving between areas in the wider landscape over a period of many years/generations.

Furthermore, radio-tracking surveys of the Menlough population of bats (which were identified within the study area) undertaken for this project in 2014 and 2015 (*N6 Galway City Transport Project Route Selection Report*, Arup, 2016) did not suggest any evidence of movement between that population and the Eborhall House roost. Given the lack of any linkage between the study area and the roosts that are the reason for designation of this European site, likely significant effects on the Lough Corrib SAC's Lesser horseshoe bat population have been ruled out.

Twelve other bat roosts were deemed to be in proximity to the proposed N6 GCRR (within 100m of the proposed development boundary). Potential direct impacts are predicted on these roosts as a result of disturbance during the construction phase, although it is acknowledged that in some areas this impact may be of a lower magnitude than others as the boundary is set back from the actual construction footprint.

These roosts include night roosts for Lesser horseshoe bats, day roosts for Soprano and Common pipistrelle bats, Leisler's bats and a possible maternity roost for Brown long-eared bats. This is predicted to result in impacts regarded to be significant at a local level in the absence of mitigation for all of these species.

Only PBR173 is suspected to be vulnerable to a significant level of construction impacts. PBR173 is a suspected maternity roost for Brown long-eared bats. All other roosts are set back from the proposed development boundary or are in locations where the construction works for the proposed N6 GCRR are less likely to be as intrusive.

The species that is potentially incurring the greatest potential loss of roosting is the Soprano pipistrelle bat population, which also happens to be the most commonly occurring bat in the country and recorded at almost all recording locations in the study area.

The impact on population of Lesser horseshoe bats lost as a result of demolition comes from the loss of one property at Aughnacurra (PBR178), a satellite roost to Menlo Castle (PBR06) (which itself will not be affected by the demolition works).

6.2.2 Removal of vegetation, including tree felling

6.2.2.1 Direct loss of bat foraging habitat

The proposed N6 GCRR will result in loss of foraging habitat for all bat species recorded. There are few areas that are deemed unsuitable for bats or where the baseline data collection has not recorded bat activity.

For Lesser horseshoe bats, the radio-tracking studies have revealed areas proved to be used for feeding but for other bat species, their foraging areas have been inferred from predicted theoretical "core sustenance zones" (CSZ) taken from best practice guidance (UK Bat Conservation Trust, 2020). A CSZ refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the "resilience and conservation status" of the colony using the roost.

Due to the large number of bat roosts recorded in the study area, all parts of the proposed N6 GCRR overlap with at least one CSZ for a bat roost.

The level of significance of the loss of these foraging habitats can be described in terms of impacts on individual roosts in terms of the proportion of loss of the CSZ as a result of the proposed N6 GCRR. It is important to note that the percentage loss of area within the CSZ does not account for any additional barrier effects provided by the proposed N6 GCRR which could prevent bats reaching foraging areas on the other side of the proposed N6 GCRR.

There is also evidence (Berthinussen and Altringham, 2012[40]) that there is displacement of bats from the margins of the road corridor which extends the impact zone well outside of the construction area.

However, it should be noted that these displacement effects have only been investigated and detected in relatively open landscapes away from woodland and large water bodies. Certain sections of the proposed N6 GCRR where woodland is being retained close to the edge of the proposed N6 GCRR, may exhibit less of an adverse effect.

Theoretical core sustenance zones (CSZs) for the Irish bat species are listed below with an indication of the level of confidence attached to the CSZ size. Unidentified bats have been given a CSZ radius of 3km which represents the average of the above CSZ radii.

Table 6.1 Theoretical Core Sustenance Zones for each Bat Species (based on UK Bat Conservation Trust, 2016)

Species	CSZ radius (km)	Confidence in CSZ size (text taken from Bat Conservation Trust, 2016)
Lesser horseshoe bat	2	Good. The CSZ in the context of the roost at Menlo Castle and at Cooper's Cave is regarded to be 2km, based on the results of radio tracking surveys as documented in Section 5.1.8 of this report. This has been calculated using the same approaches as outlined in the BCT guidance (2020). In the context of other day roosts, the CSZ of 2km has also been applied.
Brown long-eared bat	3	Poor. No data on mean-maximum distance between roost and foraging areas available from the literature. In addition, the calculated weighted (based on the number of bats used to calculate the CSZ) average (3.45km) lies just below the threshold where it was rounded down to give a CSZ size of 3km. The CSZ of the Brown Long-eared bat that was studied during radio-tracking in 2014 is regarded to be approximately less than 4km radius (maximum foraging distance was 4.07km but data collection only took place over 2 days). Since only one bat was tracked, the BCT recommended CSZ distance of 3km has been used.
Daubenton's bat	2	Poor. No data on mean-maximum distance between roost and foraging areas available from the literature. The maximum foraging distances of the Daubenton's bats that were studied has shown a limited feeding area within the River Corrib corridor up to 2.5km from the roost. Due to the low numbers of bats that were analysed the BCT recommended CSZ distance of 2km has been used.

[40] Berthinussen A. and Altringham J. (2012) *The effect of a major road on bat activity and diversity*. Journal of Applied Ecology 2012, 49, 82–89.

Species	CSZ radius (km)	Confidence in CSZ size (text taken from Bat Conservation Trust, 2016)
Natterer's bat	4	Good. Calculation based on a reasonable sample size from multiple colonies and studies. The BCT recommended CSZ distance of 4km has been used.
Whiskered bat	1	Poor. Data available from multiple colonies but only for a single study for this species. The BCT recommended CSZ distance of 1km has been used.
Common pipistrelle bat	2	Moderate. Data available from multiple colonies but only from a single study. The BCT recommended CSZ distance of 2km has been used.
Soprano pipistrelle bat	3	Good. Calculation based on a reasonable sample size from multiple colonies and studies. The BCT recommended CSZ distance of 3km has been used.
Nathusius' Pipistrelle bat	3	Poor. Calculation based on small sample size. The BCT recommended CSZ distance of 3km has been used.
Leisler's bat	3	Poor. Calculation based on small sample size. The BCT recommended CSZ distance of 3km has been used.

For all confirmed roosts that were identified during the field surveys, the proportion of the CSZ that will be lost as a result of the proposed N6 GCRR was calculated (refer to Appendix J for details). Whilst the CSZ is a generic radial distance from the roost, in some cases not all of this habitat would be regarded to be suitable foraging habitat for bats as it included built land with little suitable habitat to provide foraging resources. Bats will therefore not use all of the CSZ; they will selectively feed in the most resource rich areas. However, such potentially unsuitable areas within the footprint of the proposed N6 GCRR were not deducted from the CSZs for each roost, thereby giving a worst-case scenario for the assessment of impacts. CSZs around night roosts have not been included in this analysis as theoretically these roosts occur within the CSZ of the associated day roost.

The proportion of habitat loss relating to each roost being lost is less than 7% of the CSZ in all cases except for PBR205 (existing stable yard at Galway Racecourse) and less than 5% of the CSZ in the majority of cases. In the case of PBR205 the majority of the "real" CSZ is likely to extend to the quarry to the northwest and agricultural land as foraging opportunities are more limited in the urban landscapes to the south. Much of the "real" CSZ is not affected by the proposed N6 GCRR.

For Pipistrelle bat species which are adapted to feeding in a wide variety of landscape types[41], the impact of habitat loss during construction is not predicted to be significant since these bats will be able to utilise the majority of suitable habitat in their CSZ that is currently available to them and are not reliant on having to cross the construction area to reach foraging areas. This applies particularly to roosts to the north of the proposed N6 GCRR as the majority of optimal feeding areas are outside of the urban city core which lies to the south.

For Lesser horseshoe bats which show a greater preference for following linear landscape features between roosts and foraging areas[42], the potential impact of habitat loss is compounded by the barrier effect which may prevent bats using suitable habitats on the other side of the proposed N6 GCRR or moving between day and night roosts or between different roosts used at other times of year. Impacts are regarded to be potentially significant at a county level if the foraging range is affected (e.g. by not being able to reach night roosts) or national-scale where the fecundity or mortality rates are affected due to lack of feeding resources as a result of loss of feeding habitat and barrier effects. Significant efforts have been made to provide

[41] In the CEDR guidelines they are in Group C: Bats with medium manoeuvrability. They often hunt and commute along vegetation or structures at variable heights, but rarely close to or within the vegetation. May also hunt in open areas. Commuting over open stretches generally takes place at low to medium heights (typically 2 – 10 m) with no clear tendency to lower flight.

[42] In the CEDR guidelines they are in Group A: Extremely manoeuvrable bats, which often fly within foliage, or close to vegetation, surfaces and structures at variable flight heights. When commuting, they often follow linear and longitudinal landscape elements. Low-flying (typically < 2 m) when commuting over open gaps.

effective methods to getting bats across the construction areas and underneath or over the proposed N6 GCRR so that they can avail of habitats on both sides of the proposed N6 GCRR.

The magnitude of habitat loss for Lesser horseshoe bats has been measured in terms of the physical loss of the most important habitat as a result of the proposed N6 GCRR. The area deemed to be of highest importance for Lesser horseshoe bats is regarded to be the core foraging area used by Menlo Castle (PBR06) radio-tracked bats in summer 2015 and still present in 2023.

Prior to the birthing period in mid-June, female bats will utilise the best foraging habitats closest to the roost and research in at least one study (Bontadina et al, 2002[43]) has highlighted the importance of habitat within 600m of the roost.

Approximately 7ha of woodland, scrub, hedgerows and grassland will be lost in the area from the River Corrib to the Bothár Nua which spans the core foraging area for the Menlo Castle roost (PBR06).

The loss of this 7ha equates to 5.6% of the core foraging area (125ha) recorded in 2015 which is regarded to be the area of highest importance for the roost[44], although not all of the core foraging area is used equally by bats.

The loss of habitat within the core foraging area for the Menlo Castle Lesser horseshoe roost (PBR06) is deemed to be a potentially significant factor threatening the viability of the roost there. If bats cannot feed close to the roost, especially close to the birthing period, then fecundity may be reduced. When compounded by other potential effects of the proposed N6 GCRR (collision, barrier effects) this relatively small loss of habitat might have a significant impact on the population.

Other bat roosts in proximity along the proposed N6 GCRR are unlikely to be associated with such optimum bat habitats. The loss of woodland in the Menlough area is unavoidable as the belt of woody vegetation on the northeast bank of the river stretches from the Quincentenary Bridge in the city all the way to Menlough Village and therefore the proposed N6 GCRR will inevitably cross it at some location.

In order to prevent the loss of foraging habitats resulting in an adverse impact on bat species at either a local, county or national geographic scale, design measures have been incorporated into the design of the proposed N6 GCRR. This derogation licence application therefore only addresses those impacts which cannot be fully mitigated by design.

6.2.2.2 Fragmentation of foraging habitat and commuting routes and areas used by bats for other non-roosting activities[45]

Given that there is evidence of bats crossing the proposed N6 GCRR in multiple locations and that all parts of the proposed N6 GCRR are within the theoretical or proven CSZ of at least one bat roost, there is the potential for the proposed N6 GCRR to act as a barrier to flight paths for all species (except Leisler's bats which have been shown to fly at greater altitudes so as not to be affected by ground level features) and in all locations.

The barrier effect can manifest itself as soon as the site clearance phase commences and the barrier itself is in the form of the cleared lands.

Removal of hedgerows, treelines, woodland and scrub will take place across the length of the proposed N6 GCRR.

[43] Bontadina, F., Schofield H. and Naef-Daenzer B. (2002) *Radio-tracking reveals that Lesser horseshoe bats (Rhinolophus hipposideros) forage in woodland*. J. Zool., Lond. 258, 281-290.

[44] This differs from the 98ha of land within the proposed development boundary which is within the 2925ha of CSZ for the roost at Menlo Castle as per the table in Appendix K.

[45] as fragmentation of feeding habitat has the potential to disturb normal bat behavioural patterns, and thus adversely affect the ability of local bat populations to persist and reproduce, impacting on their local distribution and/or abundance and thereby conflicting with Regulation 51(b) of S.I. 477.

Whilst it is not proposed to remove all the vegetation within the proposed development boundary, it has been assumed that intervention of some kind in the landscape may occur within the boundary to the extent that it could affect bat behaviour, thereby assessing the worst-case scenario.

Interpretation of the patterns of bat activity records has indicated that potential barrier effects would be most significant at the following locations:

1. Bats flying to/from Bearna Woods – The woods were one of the few sites where Natterer's bats were recorded and also support a small/dispersed population of Lesser horseshoe bats and transitional Pipistrelle species. The relatively open, heathy landscape to the north of the woods would be regarded to offer less suitable opportunities for bat foraging so the woods are likely to be important for local populations of several bat species.
2. Aughnacurra (including Chestnut Avenue and Upper Dangan) – the potential barrier effect posed by the proposed N6 GCRR here is somewhat reduced by the proximity of the River Corrib which bats use as a flight corridor. The barrier effect would be likely to supress movements at a very localised scale.
3. Barrier effects in the area spanned by Menlo Castle-Coolagh-Castlegar are potentially the most significant as it is the known core foraging area/CSZ for the nationally-important Menlo Castle population of Lesser horseshoe bats as well as for roosts of other bat species close to the proposed development boundary. Severance of Lesser horseshoe flight paths between Menlo Castle and Cooper's Cave in particular could have significant adverse effects on the ability of the breeding population to mate and hibernate in suitable roosts. Severance of flight paths between day and night roosts also could affect the ability of bats to reach suitable foraging areas further away by using the night roosts as stepping-stones.
4. The location of the Menlo Castle roost is regarded to be at a key location in the national distribution of Lesser horseshoe bats. The main strongholds for this species are in south Mayo, mid-Clare/south Galway, Kerry and West Cork but the species is present all along the west coast counties from Cork to Leitrim. Analysis of the genetic and echolocation differences has revealed that the Irish population is made up of differentiated north and south populations (Dool et al, 2016[46]). Factors such as habitat connectivity were identified as being one of the reasons why this species is subject to population fragmentation at a national scale. Dool et al (2016) describe the "Limerick gap" as an area where there has been a separation of Lesser horseshoe bat populations, leading to genetic isolation in these areas. As can be seen in Plate 6.1, the Menlo Castle roost is in an area of similarly low densities of roost records and the loss of the population could create a new gap in in the natural range of the species in Ireland.

[46] Dool S.E., Puechmaille S.J., Kelleher C., McAney K., and Teeling E. (2016) *The effects of human-mediated habitat fragmentation on a sedentary woodland-associated species (Rhinolophus hipposideros) at its range margin.* Acta Chiropterologica, 18(2): 377–393, 2016.

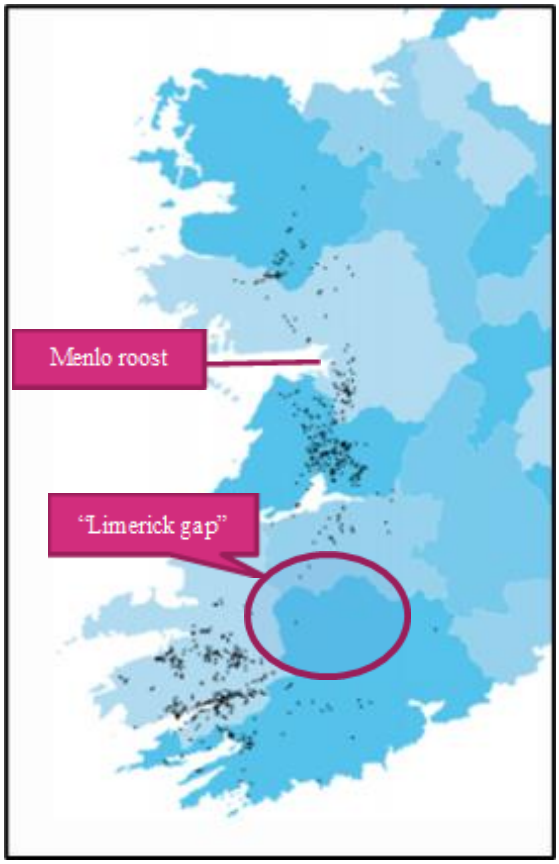

Plate 6.1 Lesser Horseshoe Bat Population Distribution (taken from Bat Conservation ireland Distribution Maps)

5. Based on the distribution of maternity roosts in the range of this species in Ireland, the Menlo Castle maternity roost and the local population it supports are of national importance, as defined in NRA (2009) "a smaller population may qualify as nationally-important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle". However, the roost size falls well below the threshold for designation as a Special Area of Conservation (100 bats in maternity roost) and it has been confirmed by the NPWS as not being part of the Lough Corrib SAC's qualifying interest population.

6. There are only six known maternity roosts in and around Lough Corrib, with the majority of roosts concentrated on the northern shores near Cong. Only two roosts are located on the southern end: Ross Lake Gatehouse and Menlo Castle. These southern roosts may be stepping-stones for long-term movements and gene flow between bats at the northern shore of Lough Corrib, Lough Mask and Lough Carra and populations in South Galway and Clare. Recent counts from Ross Lake Gatehouse have shown that this roost is showing signs of recovery, after having previously undergone significant deterioration resulting in decline in numbers from 150 bats in 1994 to five bats in 2011 (Rebecca Teesdale pers. Comm., 2014 and p44 in Roche et al, (2015)). 2023 NPWS count was 31 Lesser horseshoe bats. Any repeat decline in the Ross Lake roost could potentially increase the relative importance of the roost at Menlo Castle as a stepping stone roost, as it would be the only significant maternity colony at the southern end of Lough Corrib.

7. Prior to 2020, Menlo Castle itself was in a structurally-unstable condition and the bat roost was vulnerable to rock fall, vandalism and blockage within the chimney flue. Since 2020, a series of restorative works has been conducted at Menlo Castle. As of 2023, these were still ongoing. If bats were not able to reach the foraging areas and Cooper's Cave due to a barrier effect, then it would add another impact which might put the viability of this population at risk. There is no evidence to suggest that Menlo Castle Lesser horseshoe bat population is connected to the Eborhall Lesser horseshoe bat population, which is the qualifying interest (QI) population for Lough Corrib SAC. Any predicted impacts on Lesser horseshoe bats associated with the proposed N6 GCRR will not affect the conservation

objectives of the Lough Corrib SACs QI Lesser horseshoe bat population, nor the QI Lesser horseshoe bat populations of any other European sites.

The numbers of Lesser horseshoe bats recorded using Cooper's Cave for hibernation has been relatively small (around 10% of the estimated roost size at Menlo Castle) but much of the cave is not accessible and there may be higher numbers present. The only other hibernation site known for this population is Menlo Castle and the roost site is not accessible for counting. A wildlife overpass has been included as part of the design of the proposed N6 GCRR to allow bats to reach the cave for hibernation and to avoid them being forced to use less suitable locations. While Cooper's Cave is under ongoing pressures from fly tipping and disturbance, it is likely that bats will continue to use it unless the entrance is blocked altogether.

The western portion of the proposed N6 GCRR (from Bearna to Upper Dangan) has a lower distribution density of bats and has less-suitable habitats for foraging but a barrier effect is still predicted in the absence of any effective mitigation. Such potential impacts are regarded to be significant at a local geographic scale as the bat populations have been valued as being important at a local geographic scale, there are few roosts known in this area, and no important landscape features (such as major watercourses, areas of woodland or hedgerow networks) are predicted to be severed.

The potential impacts of the barrier effect have been addressed through the design measures described in Section 8 of this derogation licence application.

6.2.3 Installation of temporary working and site compound lighting which may cause indirect disturbance of flight patterns

As construction works will typically be undertaken during normal daylight working hours, the requirement for lighting for construction works during night time will be limited.

Over the expected 36-month construction phase there will be up to a total of 10 weeks of night time working. Temporary night-time closure of existing local roads may be required where overbridges are to be constructed at locations such as the Rahoon Road, Letteragh Road, N59 Moycullen Road, Menlo Castle Bóthrín, Bóthar Nua, Sean Bóthar, N84 Headford Road, N83 Tuam Road, Briarhill Business Park Road and R339 Monivea Road.

Night-time working requiring the use of floodlighting to permit safe working have the potential to displace bats from the illuminated area. This will be particularly sensitive at the following locations:

- N59 Moycullen Road near the Aughnacurra satellite roost (PBR178) and a proposed replacement roost structure
- Menlo Castle Bóthrín which is an important flight path for Lesser horseshoe bats and other bat species
- Bóthar Nua which is an important flight path for Lesser horseshoe bats and other bat species
- Sean Bóthar which is an important flight path for Lesser horseshoe bats and other bat species
- N84 Headford Road which is an important crossing point for Lesser horseshoe bats and close to known night/occasional day roosts for this species and is also close to a proposed replacement roost structure

In all cases where lighting may cause disturbance, it will be temporary in nature but may last over several consecutive nights and this could result in temporarily lower bat diversity in these areas. Such displacement (which would be a matter of metres) could prevent bats from accessing foraging areas or roosts, or result in bats taking more circuitous routes to get to foraging areas and hence potentially depleting energy reserves.

It cannot be predicted precisely when these works will take place during the year but it could be a significant disturbance if affecting bats pre-parturition (birth) or pre-hibernation when energy reserves are essential for survival. However, the potential impact only arises during months when bats are most active (April to September) and during these months the need for night lighting is likely to be limited as daylight hours are longer.

The potential impacts of the compound lighting effects have been addressed through the design measures described in Section 8 of this derogation licence application.

6.3 Operational Phase

The following potential impacts are relevant to this derogation licence application (i.e. those that could constitute an offence under the European Communities (Bird and Natural Habitats) Regulations, 2011):

- Mortality of bats due to vehicular collision
- Loss of foraging resources either by residual impact of severance or barriers across features assisting bats in reaching foraging areas during the operation of the proposed N6 GCRR
- Indirect disturbance of flight patterns due to noise and operational lighting and periods of working at night

The nature of each of these impacts is described below.

6.3.1 Mortality of bats due to vehicular collision

Research (Sparks and Choate, 2000; Butchkowski and Hassinger, 2002; Dodd et al., 2004; Capo et al., 2006; Choquene, 2006; Glista and DeVault, 2008; Russell et al., 2008; Hein et al.,2009; Whitaker and Mumford, 2009)) has provided evidence that mortality of bats due to road collisions can reach an annual mortality of 5% of the bats in local roosts. Altringham (2008) arrived at a similar estimate, based on conservative calculations for a road in the UK crossed by Lesser horseshoe bats from a large roost (data from Billington 2001 - 2006).

Theoretical studies (e.g. Lande 1987, With and King 1999, Carr and Fahrig 2001) "show that populations of animal species with low reproductive rates and high intrinsic mobility, such as bats, are more susceptible to decline and ultimately extinction by the additional mortality caused by road" (taken from Appendix F, WC1060 main report).

Lesiński (2007) recorded mortality highest where roads approached tree stands (up to 6.8 per km/year) or crossed a forest (2.7 per km/year) and lowest within densely built-up areas (0.3 ind./km/year). If the highest rates were applied to the Lesser horseshoe bat roost at Menlo Castle (PBR06) then this could equate to 34 deaths per year based on the maximum roost foraging area being bisected by c.5km of the proposed N6 GCRR (based on radio-tracking in 2014). The lower rate for mortality near forests would result in 13 deaths per year. Whilst the long-term population fluctuations are not known for this population, in a worst-case scenario such mortality rates could cause the entire roost to become extinct in less than two years, assuming that all of the bats in the roost are exposed to the same level of mortality risk and that all of the bats killed per km were of this species. The loss of this roost would be regarded to be a significant potential impact at a national geographic scale, assuming a worst-case scenario and in the absence of any mitigation.

Similar mortality rates could be applied to similar low-flying gleaning species of bats such as Brown long-eared bats and some *Myotis* species such as Daubenton's bats. Since this would have an adverse effect on these species, a complex mitigation strategy has been developed and is presented in this application.

Measures that have been incorporated into the design of the proposed N6 GCRR including underpasses, culverts and a wildlife overpass at Castlegar, will reduce the percentage of the local bat population flying over the proposed N6 GCRR (and) being at risk of collision. The risk cannot be removed entirely as not all measures are 100% effective at a population level, so this derogation application is seeking to permit the residual mortality incidents which may occur.

6.3.2 Loss of foraging resources either by residual impact of severance or barriers across features assisting bats in reaching them during the operation of the proposed N6 GCRR

In a similar manner to the barrier effect resulting from clearance of the footprint of the proposed N6 GCRR, the completed road will act as a potential barrier to bats moving across the landscape. This will affect bats roosting close to the proposed N6 GCRR as potentially a larger area of their CSZs will be on the opposite side of the proposed N6 GCRR. However, each roost may react differently to the barrier posed by the proposed N6 GCRR and the topography and surrounding habitats may result in a range of impacts occurring, not all of which will be significant.

6.3.3 Indirect disturbance of flight patterns due to operational lighting

The barrier effect can be compounded by light spill associated with the illumination of the corridor of the proposed N6 GCRR. Lighting will also be provided for the proposed University of Galway Sporting Pitches. Whilst there is planning permission to light the existing pitches adjacent to the river, they are currently unlit.

Examination of light spill modelling has identified potential light spill impacts on bats (where light levels exceed 1 lux) at the following locations:

- Ch. 2+850: Lighting at the Bearna East Roundabout may impact on the movement of bats in the locality and prevent them using the proposed culvert CO2/01b. However, proposed landscape planting and retained woody vegetation near the mouth of the culvert entrances will help in shading the flight paths approaching the culvert at this location to allow bats to fly through.
- Ch. 4+300 - Ch. 4+550: Lighting at the Cappagh Road junction is close to PBR139 (Leisler's bat roost) and both Common and Soprano pipistrelle activity has been recorded nearby. Localised displacement may occur in this area although the presence of roadside scrub and garden shrubs and trees will provide shaded area which may be used by bats to avoid lit areas.
- N59 Link Road North and South: This will be illuminated over a length of 2.4km across open agricultural and heath landscape. Light spill may cause a localised barrier to movements in an east-west direction.
- Ch. 9+150 – Ch. 9+250: Additional lighting will be provided as part of the proposed University of Galway Sporting Pitches, with several pitches already lit as of 2023. There are a number of roosts in this general area (for Lesser horseshoe bat, Daubenton's bat, Soprano pipistrelle bat and Brown long-eared bats) however none of them are located within the area of light spill from the proposed lighting design. The closest roost is Menlo Castle PRB06 which is approximately 375m from the proposed sporting pitches at their closest point. No roosts will be directly impacted. The light spill will not impede bats from using the River Corrib for feeding or commuting. There may be a displacement effect locally from the sports pitches themselves due to light spill, however the bat survey results did not record significant levels of usage of these fields by any species.
- Ch. 11+050 – Ch. 11+150: Lighting at western entrance to Lackagh Tunnel. This will be localised and will not affect roosts but is likely to have a displacement effect on bats over an area of circa 150m x 50m where light levels exceed 1 lux.
- Ch. 11+380 – Ch. 11+500: Lighting at eastern entrance to Lackagh Tunnel. This will be localised and will not affect roosts but is likely to have a displacement effect on bats over an area of circa 150m x 50m where light levels exceed 1 lux. There is bat activity data collected for this location including feeding and resting Lesser horseshoe bats, is used by several other species of bats for feeding and commuting.
- Ch. 11+975 – Ch. 14+500: The N84 Headford Road at this location is currently unlit and the proposed new lighting will introduce approximately 8ha of illuminated area. This area is used by several species including Lesser horseshoe bats and will result in a displacement from this area. Light spill from lighting columns in the area of Ballindooley-Castlegar (Ch. 12+600 to Ch. 13+600) will generally be contained within the immediate vicinity of the proposed N6 GCRR which, at this location, is sunken below the level of the surrounding landscape. Light spill here will help to deter bats from crossing the road and reduce the risk of vehicle collision, whilst the Castlegar Wildlife Overpass will be in darkness and provide a safe crossing point.
- Lighting in the area around the N83 Tuam Road Junction, the City North Business Park Link and the Parkmore Link Road will increase from the current levels and may have localised impacts on the flight paths of bat species recorded nearby.
- Ch. 14+850 – Ch. 15+000: Eastern end of Galway Racecourse Tunnel entrance. This will be localised and will not affect roosts but is likely to have a displacement effect on bats over an area of circa 150m x 50m where light levels exceed 1 lux. This may lead to localised impacts on the flight paths of bat species recorded nearby.

- Ch. 15+150 – Ch. 15+300: Western end of Galway Racecourse Tunnel entrance. This will be localised and will not affect roosts but is likely to have a displacement effect on bats over an area of circa 150m x 50m where light levels exceed 1 lux. This may lead to localised impacts on the flight paths of Pipistrelle species recorded nearby.
- Ch. 15+500 – Ch. 17+483 (end of proposed N6 GCRR): Scattered records of Pipistrelle species and Leisler's bats in this location suggest that the widened illuminated corridor in this location will result in localised displacement. This impact is not regarded to be significant as most of the bat records suggest activity is focused to the north east away from the proposed N6 GCRR.

The potential impact of vehicle lighting has been assessed in the context of the potential illumination of Menlo Castle (PBR06) from the proposed N6 GCRR. This would have particularly high sensitivity due to the absence of any notable lighting at present and the presence of both a maternity roost and hibernacula for Lesser horseshoe bats, a possible winter roost for Pipitrelle species (including Nathusius' pipistrelle), a former maternity roost for Daubenton's bat and a former Brown long-eared roost; all species which would be susceptible to lighting impacts. In a worst-case scenario, the cumulative impact of many vehicles on the River Corrib Bridge on Menlo Castle is less than 0.01 lux and this would only result on the top section of the castle.

Given that the Lesser horseshoe bats generally flew at heights of 1-3m above the ground at and near the roost location this is not predicted to affect their flight paths. This level of illumination is also well within the tolerance range for this species.[47]

There are no roosts that will be directly illuminated by the proposed operational lighting to the extent that any adverse impacts are predicted.

The potential impacts of the operational phase have been addressed through the measures described in Section 8 of this derogation licence application.

[47] Average light levels recorded along preferred commuting routes of *Rhinolophus hipposideros* under natural unlit conditions were 0.04 lux across eight sites. Stone E.L. (2011) *Bats and development: with a particular focus on the impacts of artificial lighting.* (Ph.D. Thesis) University of Bristol, UK (2011).

7. Summary of Potential Impacts

The potential impacts of the proposed N6 GCRR (prior to the implementation of the mitigation measures included in the design and roost compensation measures[48]) are summarised as follows:

- Demolition of 19 buildings within the proposed development boundary which will affect local populations of Soprano pipistrelle bats, Common pipistrelle bats, Brown long-eared bats and Lesser horseshoe bats including:
  - One satellite roost for Lesser horseshoe bats which will be demolished at Aughnacurra (PBR178) (a satellite roost for the Menlo Castle (PBR06) Lesser horseshoe maternity roost)
- Loss of foraging habitat is less than 7% of the theoretical CSZ for all roosts impacted by the proposed N6 GCRR. Most of the roosts are losing less than 5% of the theoretical CSZ. Loss of foraging habitat is regarded to be most significant in the Menlough area where approximately 7ha of woodland-pasture-hedgerow habitat is being lost and is within the CSZ for the nationally-important population of Lesser horseshoe bats
- Inevitable elevated mortality rates due to vehicle collisions
- Barrier and severance effects are predicted to occur (in the absence of mitigation) along most of the proposed N6 GCRR but is particularly significant in the Bearna Woods, Aughnacurra, Menlough and Castlegar areas
- Construction and operational light spill impacts are likely to compound the barrier effect to landscape-scale movements (as opposed to directly affecting any specific roosts). No roosts are predicted to be directly illuminated to the extent that any adverse impacts are predicted. Night time construction works are predicted to cause localised temporary displacement of bats of various species including Lesser horseshoe bats. No mitigation measures are required in terms of alteration of the lighting design.

[48] Note that the term "compensation" is used in this application refers to addressing impacts which cannot be mitigated. These impacts will have no impact on any European Site and the term "compensation" as used in this application does not in any way infer the same meaning as used in Article 6(4) of the E.C. Habitats Directive.

8. Mitigation and Compensation[49] Strategy

8.1 Protection of bats within roosts proposed for removal

The following mitigation measures (refer to Figures 5.21.1) are proposed in relation to structures either confirmed as supporting bat roosts or considered to have the potential to support roosting bats:

- Prior to demolition of the 19 structures containing confirmed bat roosts, replacement artificial roosts (as set out in Section 8.2 below) will be in place to ensure that bats are able to access alternative resting places at the earliest opportunity.
- Where possible, buildings with the confirmed bat roosts will not be demolished during the breeding period or hibernation period (April to mid-August and November-March) as the risk of accidental death or injury is higher at this time. Bats may use roosts in smaller numbers in winter but may nevertheless be present. Outside of these periods, the approach to demolition of bat roosts will be determined on a case-by-case basis and subject to relevant licence conditions.
- Buildings confirmed as bat roosts proposed for demolition will be marked on the ground with agreed paint marking to permit identification by Contractors.
- Prior to demolitions, all structures that were confirmed as either having bats or having high suitability for bats will be re-examined immediately prior to demolition to assess whether bats are present at the time of demolition. This will be an all-night examination to determine if bats enter the building during the night or early morning. This will provide adequate information to proceed with demolitions unless weather conditions were unsuitable for feeding bats. If bats are present, they will require exclusion from the property over several nights or if possible physical removal by hand by a licenced bat specialist to be placed in a bat box or similar for release in the evening after capture. For structures which have not been confirmed as bat roosts but regarded to have high suitability for bats and due for demolition, a bat detector assessment of the property to be demolished will be carried out, (note demolitions will not be permitted during the period May to August (the breeding period) in the case of the confirmed bat roosts, as the risk of accidental death or injury to bats is too great at this time). This will be an all-night examination to determine if bats enter the building during the night or early morning. This will provide adequate information to proceed with demolition unless weather conditions were unsuitable for feeding bats. If bats are present, then they will require exclusion from the property over several nights or if possible physical removal by hand by a licenced bat specialist to be placed in a bat box or similar for release in the evening after capture.
- Once structures containing roosts are deemed to be clear of bats, the bat specialist will be on site to supervise the demolition procedure until the structure is no longer deemed able to support a bat roost. Bats may re-enter a partially demolished structure overnight so the bat specialist may be required to be present during demolition works until they are completed.

The following mitigation measures are proposed in relation to those trees identified as having high suitability to support roosting bats. These include the three trees confirmed to have had bats present (PTR43, PTR48, and PTR45) and the 13 other trees to have high suitability, where either obvious potential roosting features are present, or where obscured by dense ivy cover, the tree is of an age and condition that there is a high chance that roosting features are present.

Figures 5.5.1 and 5.6.1 show the locations of these trees but a more detailed drawing will be provided to the contractor prior to any felling works. Bats could occupy suitable roosting features at any time prior to the commencement of works. Therefore, there is an inherent risk that bats could be affected by the proposed felling works. The proposed mitigation measures for this potential impact are as follows:

[49] Note that the term "compensation" is used in this application refers to addressing impacts which cannot be mitigated. These impacts will have no impact on any European site and the term "compensation" as used in this application does not in any way infer the same meaning as used in Article 6(4) of the E.C. Habitats Directive.

- Felling of confirmed and potential tree roosts will be undertaken during the period September – October as during this period bats are capable of flight and may avoid the risks from tree felling if proper measures are undertaken, but also are neither breeding or in hibernation.
- Use of detectors alone may not be sufficient to record bat emergence and re-entry in darkness. Therefore, prior to felling of confirmed and potential tree roosts, an emergence survey using night vision aids such as infrared or thermal imaging cameras and bat detectors will be carried out on the night immediately preceding the felling operation to determine if bats are present.
- Where it is safe and appropriate to do so for both bats and humans, such trees may be felled using heavy plant to push over the tree. In order to ensure the optimum warning for any roosting bats that may still be present, the tree will be pushed lightly two to three times, with a pause of approximately 30 seconds between each nudge to allow bats to become active. The tree should then be pushed to the ground slowly and should remain in place until it is inspected by a bat specialist.
- Trees should only be felled "in section" or "soft felled" where the sections can be rigged to avoid sudden movements or jarring of the sections.
- Where remedial works (e.g. pruning of limbs) are to be undertaken to trees deemed to be suitable for bats, the affected sections of the tree will be checked by a bat specialist (using endoscope, where applicable and necessary) for potential roost features before removal. For limbs containing potential roost features high in the tree canopy, this will necessitate the rigging and lowering of the limb to the ground (with the potential roost feature intact) for inspection by the bat specialist before it is cut up or mulched. If bats are found to be present, they will be removed by a bat specialist licenced to handle bats and released in the area in the evening following capture.
- Prior to felling the three confirmed tree roosts (PTR43, PTR48, PTR45) replacement bat boxes (as set out in Section 8.2.6 below) will be in place to ensure that bats are able to access alternative resting places at the earliest opportunity. The location of the bat boxes in these instances will be within the proposed development boundary but will be decided by the bat specialist. If any additional bat tree roosts are confirmed, and will be removed by the proposed felling works, then appropriate alternative roosting sites will be provided in the form of replacement bat boxes as set out in Section 8.2.6 below.

8.2 Compensation for loss of roosts

Loss of the more "significant" roosts (e.g. maternity roosts or roosts used by Lesser horseshoe bats) will be mitigated by the erection of replacement structures (artificial roosts) in locations close to the original roost.

There is a dual purpose to the artificial roosts. Firstly, to ensure that there is no net loss of roosting opportunities for the bats confirmed to be roosting within the proposed development boundary. Secondly, it has been recognised that there will be an inevitable increase in mortality rates due to road collisions as suggested by scientific evidence as described in Section 6.3.1 of this application. The second function of the replacement roosts is to create improved conditions for bats to breed and to offset the increase in mortality.

Four artificial roost structures are proposed as set out below. The detailed specifications of these artificial roosts will follow the recommendations of an experienced bat ecologist and further consultation with the Vincent Wildlife Trust will take place to ensure that their experiences in these techniques are taken into account.

There will be a need to screen structures from the effects of construction phase disturbance by means of solid hoarding or brushwood screens with an appropriate buffer zone around the roost. The dimensions of the planting will depend on the local topography and surrounding landscape and will be decided on a case-by-case basis by the bat ecologist.

It should be noted that the mitigation strategy has included ensuring that passage underneath the proposed N6 GCRR in the vicinity of the roosts has been facilitated by including culverts underneath the proposed N6 GCRR in locations as close to the roosts as possible.

8.2.1 Proposed Aughnacurra maternity/hibernation roost for Lesser horseshoe bats and Brown long-eared bats

The proposed replacement roost will be located close to the existing Aughnacurra roost (PBR178) structure.

Whilst this roost was not confirmed during the 2023 surveys, this replacement roost has been retained in the mitigation strategy, taking a conservative approach, due both to the high levels of localised Lesser horseshoe bat foraging and commuting activity recorded in area and that - although 2023 surveys returned low to negligible evidence of confirmed entry/exit of Lesser horseshoe bats at the property - PBR178 was previously a known Lesser horseshoe bat satellite roost to Menlo Castle (PBR06), and while it cannot be wholly-ruled out that Lesser horseshoe bats would return to the property, the roost area is within a sub-optimal building (garage) in terms of the preferred building type for this species, and its occupation by bats may be a reflection of the lack of availability of better roost opportunities in the area.

The proposed roost within the proposed development boundary will be temporarily screened with brushwood fencing or similar semi-solid screens c. 2m high for the construction stage and will also be planted up around it as soon as the roost is constructed to provide long-term screening during the operation of the proposed N6 GCRR. Non-native ornamental species may be used to provide screening in this case as it is in keeping with the suburban setting.

The design of the roost will take account of the Vincent Wildlife Trust (VWT) guidance[50] and will follow the following design parameters (as shown in drawing GCOB-3000-D-001 in Appendix K).

- The template for the design has been taken from the roost at Garryland, Co. Galway constructed for the N18 Oranmore to Gort road development which has been shown to have worked successfully since its completion in 2011
- Single storey structure with southwest orientation for maximum solar gain on the pitched roof
- Location as set out in Plate 8.1 in corner of garden to be acquired
- Rendered block wall structure with natural slate roof. The exterior walls can be clad with rough stone or a material designed to have no adverse visual impact
- The building will have a footprint of c.10m x 8m with a steep pitched slate roof, partitions in the ground floor and roof space and an attic floor laid down with an open hatch for access for bats
- Plywood partitions will be installed within the roof voids to create bat “hotboxes” and separate roosting spaces for different species so that the brown long-eared bat roost can also be accommodated in the same building
- The interior of the roof will be lined with BS747 bituminous felt. All ceilings on the ground floor will be fitted with rough wood
- The entry point for bats shall be on the western side away from the proposed N6 GCRR and close to the vegetation on the eastern perimeter which will be retained and enhanced. The entry point will be c. 500mm x 300mm with bars set 125mm apart and lead flashing to be placed over the window sill under the hatch to prevent predator entry
- The northern corner will include a hibernation room at ground level which will be lined with concrete blocks and insulated to provide suitable conditions for hibernation. Plywood partitions will hang down from the ceiling to provide sheltered pockets at ceiling level. An earth floor will maintain humidity and some of the guttering will be piped inside to create an optional water-filled trough along one wall so that humidity levels can be adjusted if needed
- No water or electricity services are required
- Access for surveyors will be via a door on the southern side. Bats will be allowed to fly around the ground floor via an open hatch in the attic floor near the entry point

[50] Vincent Wildlife Trust (2015) *Lesser Horseshoe Bat: Conservation Handbook.*

- The proposed location (within the proposed development boundary) is close to vegetation which is important cover for bats entering and leaving. Additional planting is proposed to link the roost to the perimeter and to connecting features in the wider landscape

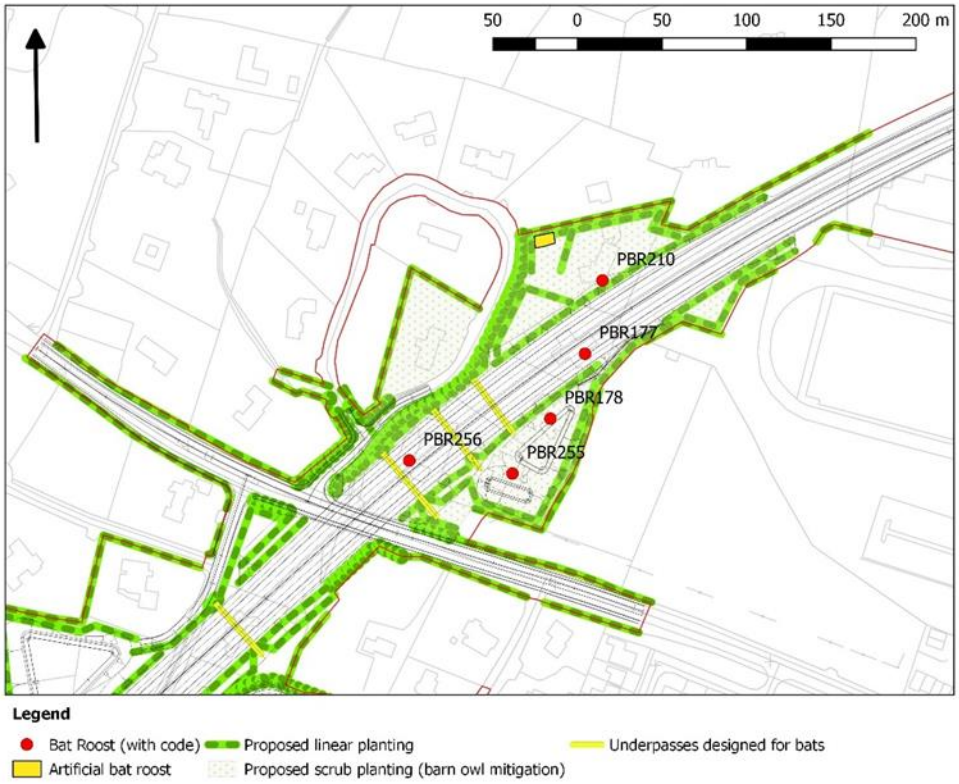

Plate 8.1 Proposed Location of Aughnacurra Artificial Roost Structure (not to scale)

8.2.2 Menlo Castle alternative roost - Lesser Horseshoe maternity/hibernation roost

This roost is not replacing any specific loss of roost but is a critical part of the bat mitigation strategy. It will assist to increase the recruitment in the local Lesser horseshoe bat population so as to offset any increases in mortality as a result of the potential impacts of the proposed N6 GCRR. Prior to 2020, the current roost in the chimney of the castle (PBR06) was unstable, inadequate and vulnerable to being lost if the castle fell into further disrepair. A series of renovation works has been conducted at Menlo Castle since that time, with works still ongoing in 2023. The new Menlo Castle roost would be better in design and aim to increase natural birth rates and thereby neutralise or overturn any negative impacts of the proposed N6 GCRR. The preferred location is in a field to the east of the castle. The key design parameters will include in the following.

The design of the roost has taken account of the Vincent Wildlife Trust (VWT) guidance and following consultation with Dr Kate McAney and Ruth Hanniffy (VWT) and will follow the following design parameters (and as shown in drawing GCOB-3000-D-001 in Appendix K):

- The template for the design will be taken from the roost at Garryland, Co. Galway constructed for the N18 Oranmore to Gort road development which has been shown to have worked successfully since its completion in 2011
- Single storey structure with southern orientation for maximum solar gain on the pitched roof
- Location as set out in Plate 8.2 below in the northwest corner of the field close to Menlo Castle (PBR06)
- Rendered block wall structure with natural slate roof. The exterior walls can be clad with rough stone or a material designed to have no adverse visual impact. Additional planting around the perimeter of the building will also screen it from view

- The building will have a footprint of c.10m x 8m with a steep pitched slate roof, partitions in the ground floor and roof space and an attic floor laid down with an open hatch for access for bats. All ceilings on the ground floor will be fitted with rough wood
- Plywood partitions will be installed within the roof voids to create bat "hotboxes" and separate roosting spaces for different species so that other bat species roost can also be accommodated in the same building
- 4 no. wooden Kent bat boxes will be erected on the gable end of the structure to provide roosting opportunities for Daubenton's and Pipistrelle bat species. See: https://cdn.bats.org.uk/pdf/Bat-Box-Information-Pack.pdf?mtime=20181101151309
- The interior of the roof will be lined with BS747 bituminous felt or equivalent bituminous felt
- The entry point for bats shall be on the west gable end sides away from the proposed N6 GCRR and close to the vegetation on the eastern perimeter which will be retained and enhanced. The entry point will be c.500mm x 300mm with bars set 125mm apart and lead flashing to be placed over the window sill under the hatch to prevent predator entry
- The northern corner will include a hibernation room at ground level. This will be lined with concrete blocks and insulated to provide suitable conditions for hibernation. Plywood partitions will hang down from the ceiling to provide sheltered pockets at ceiling level. An earth floor will maintain humidity and some of the guttering be piped inside to create an optional water-filled trough along one wall so that humidity levels can be adjusted if needed
- No water or electricity services are required
- Access for surveyors will be via a door on the southern side. Bats will be allowed to fly around the ground floor via an open hatch in the attic floor near the entry point
- The proposed location within the proposed development boundary is close to vegetation which is important cover for bats entering and leaving. Additional planting is proposed to link the roost to the perimeter and to connecting features in the wider landscape

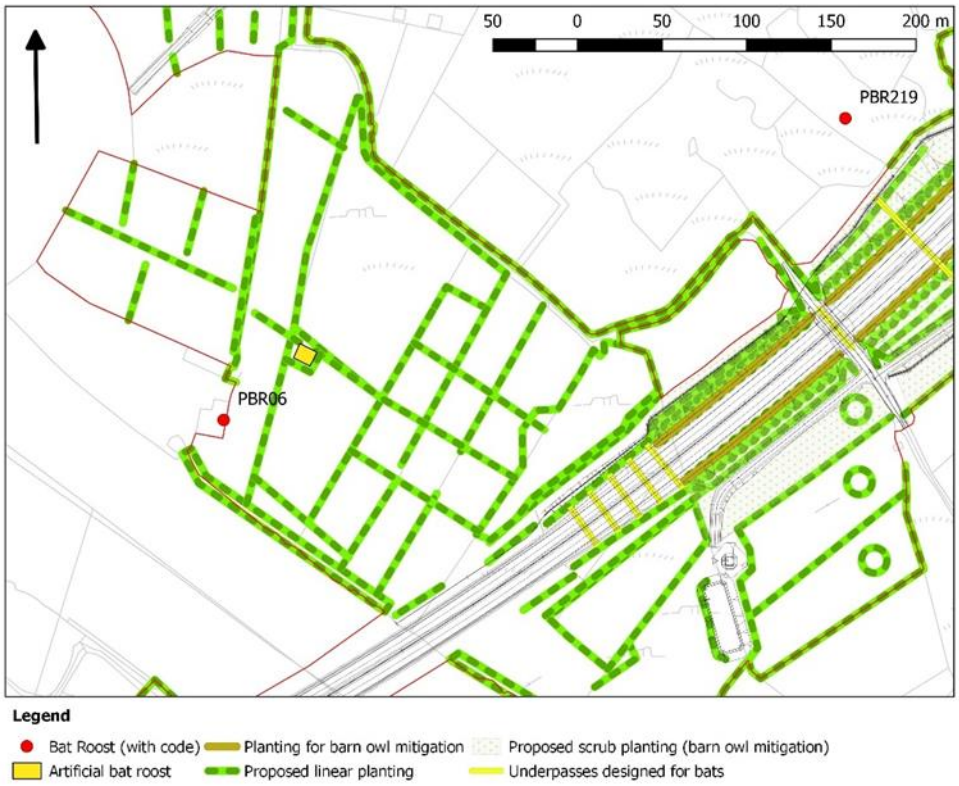

Plate 8.2 Proposed Location of Menlo Castle Artificial Roost Structure

8.2.3 Menlough Woods Replacement Night roost for Lesser horseshoe bats and Soprano pipistrelle and Brown long-eared bats roosts

This is to replace a night roost for Lesser horseshoe bats (PBR219) and Soprano Pipistrelle bats (PBR179). It will be located near the edge of the proposed development boundary west of Bothár Nua and will be a simple wooden shed type structure (1m wide, 2.5m high, 2m deep) modelled on the Vincent Wildlife Trust design[51] and is shown in drawing GCOB-3000-D-002 in Appendix K. The footprint will be much smaller than the area symbol indicated in Plate 8.3 below. The design parameters include:

- Steep pitched slate roof facing southeast
- Plywood "ceiling" with access open hatch 300mm x 300mm for bats
- Access for bats via gap over access door 500mm x 500mm
- Access for birds prevented by installing plywood baffle 1m behind access gap
- Roof lined with BS747 bituminous felt

[51] http://www.vwt.org.uk/wp-content/uploads/2015/04/lesser-horseshoe-night-roost-design.pdf

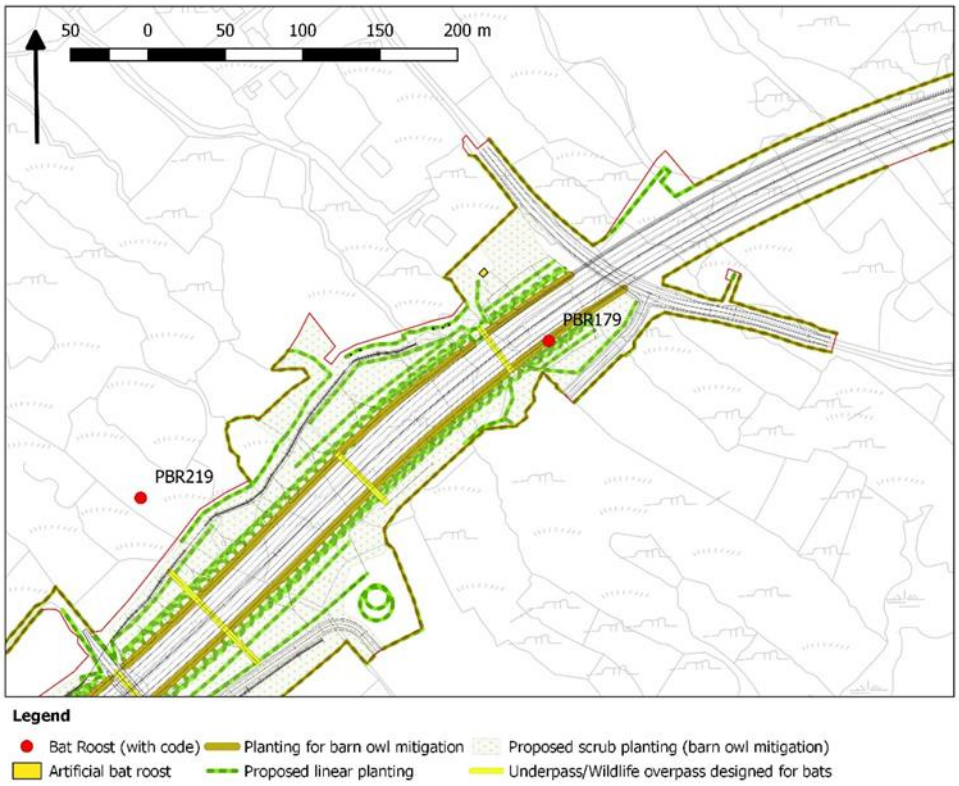

Plate 8.3 Proposed Location of Menlough Woods Artificial Night Roost Structure

8.2.4 Ballindooley Night/Day roost for Brown long-eared and Pipistrelle bat and night/day/hibernation roost for Lesser horseshoe bats

This roost is to replace a Soprano Pipistrelle day/night roost on the N84 Headford Road (PBR179), to replace roosts for Brown long-eared bats (PBR204) and Leisler's bats PBR196), and Lesser horseshoe bat roost at PBR219).

The structure will be a small block building (e.g. 6m x 8m footprint) with natural slate roof and some external features e.g. Kent bat boxes for use by other bats species. Drawing ref GCOB-3000-D-002 in Appendix K shows the design of this roost.

The design parameters include:

- Single storey structure with southwest orientation for maximum solar gain
- Location as set out in Plate 8.4 below abutting the vegetation for good connections to foraging and shelter
- Rendered block wall structure with natural slate roof and can be clad and designed so as to have no adverse visual impact
- The building would have a footprint in the region of 6m x 8m with a steep pitched slate roof, partition wall in the ground floor and roof space and an attic floor laid down with an open hatch for access for bats[52]
- Plywood partitions may be installed within the roof voids to create bat "hotboxes" and separate roosting spaces for different species
- The interior of the roof should be lined with BS747 bituminous felt

[52] Vincent Wildlife Trust (2015) *Lesser Horseshoe Bat: Conservation Handbook*.

- Entry points for bats shall be on the northeast facing sides away from the proposed N6 GCRR and close to vegetation which will be retained and enhanced
- The northern corner will include a hibernation room at ground level which will be lined with concrete blocks and insulated to provide suitable conditions for hibernation. Plywood partitions will hang down from the ceiling to provide sheltered pockets at ceiling level. An earth floor will maintain humidity and some of the guttering will be piped inside to create an optional water-filled trough along one wall so that humidity levels can be adjusted if needed
- No water or electricity services are required
- Access for surveyors will be via a door on the southern side

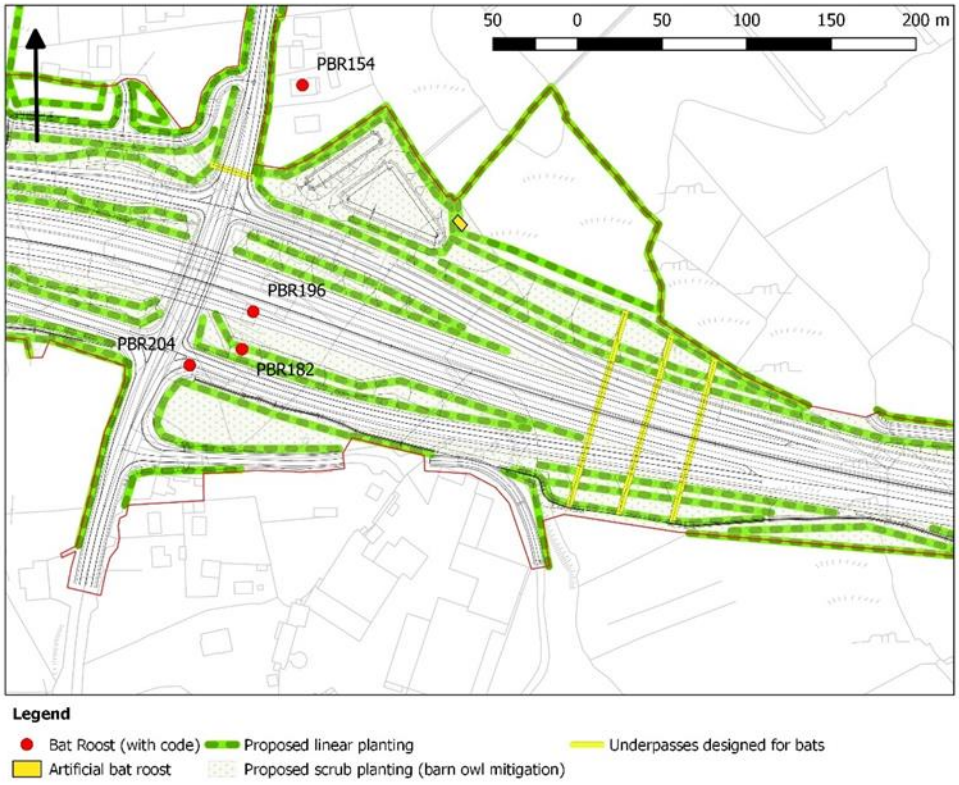

Plate 8.4 Proposed Location of Ballindooley Artificial Night Roost Structure Options

8.2.5 Retrofitting Retained Buildings for Bats

At Ch. 12+960, the detached converted garage to the south of the proposed N6 GCRR is to be retained and converted for use by several species including Brown long-eared bats and Lesser horseshoe bats. This building is in a strategically-important location as it will connect to the linear planting on the south side of the proposed N6 GCRR and is just c.250m from the proposed wildlife overpass in Castlegar and within a local ecological corridor leading to Cooper's Cave, a proven hibernation and mating site for Lesser horseshoe bats. This structure will undergo minor interior and exterior modifications to create warm areas in the roof space for summer roosting and breeding and also cold conditions for hibernation. These modifications are shown in drawing GCOB-3000-D-003 in Appendix K.

Plate 8.5 shows this location below.

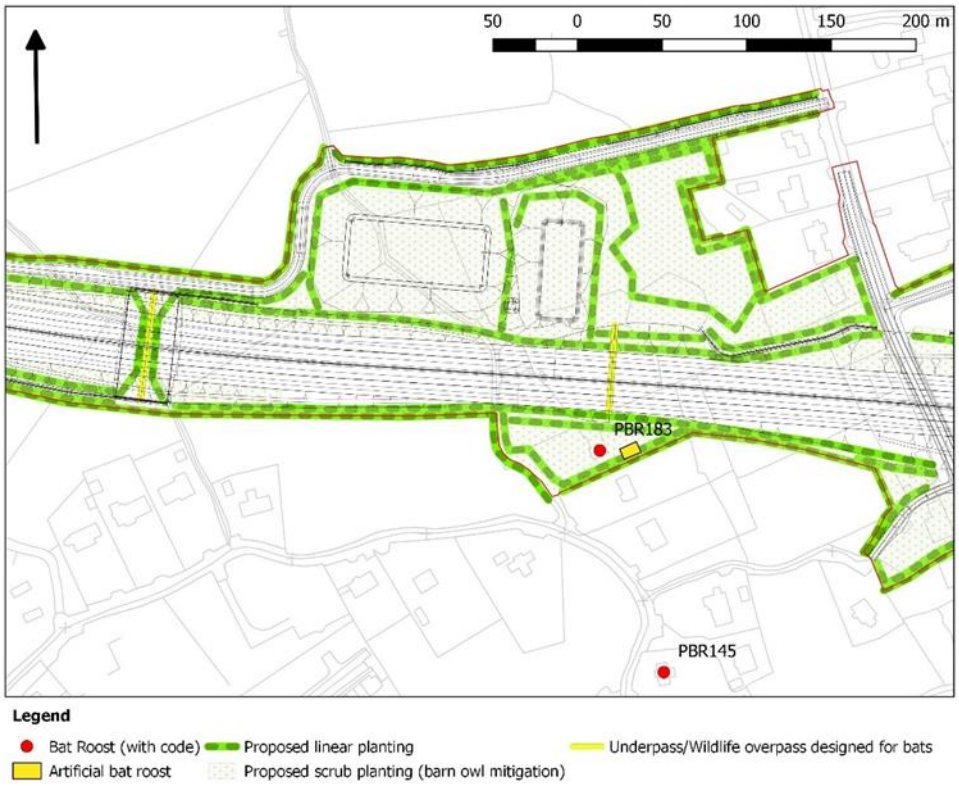

Plate 8.5 Retrofitted Roost near PBR183, Castlegar

8.2.6 Bat Boxes

Bat boxes will be located near the roosts to be lost but not immediately adjacent to the proposed N6 GCRR where risk of collision with vehicles is highest.

Bat boxes will be erected by, or under the supervision of, a bat specialist.

These bat boxes will target Common and Soprano pipistrelle bats and Brown long-eared bats and will consist of Schwegler Type 1FF and 2FN bat boxes (or equivalent) mounted on wooden poles set into concrete bases adjacent to treelines and hedgerows as these have been demonstrated as being successful for these species in Ireland[53]. Mounting boxes on poles close to the edge of tree canopies will also allow the long-term retention of the boxes, as opposed to mounting boxes on small trees which have limited longevity.

A rocket box (as shown on Drawing GCOB-3000-D-002 in Appendix K) will be installed at Ch. 3+320 near the roost at PBR241, rather than a bat box fixed to the building itself, so as not to detract from its cultural heritage value.

Box locations, as shown on Plate 8.6 to Plate 8.9 will include the following:

- A rocket box (as shown on Drawing GCOB-3000-D-002 in Appendix K) will be installed at Ch. 3+320 near the roost at PBR241, rather than a bat box fixed to the building itself, so as not to detract from its cultural heritage value. The main residential building at PBR241 complex is to be retained for Lesser horseshoe bats and protected from adverse impacts
- Ch. 10+050: 5 boxes to be erected along the edge of the tree canopy near the underpass
- Ch. 11+400: 5 boxes to be erected on the entrance road into Lackagh Quarry
- Ch. 15+100: 5 bat boxes to be erected south of Galway Racecourse

[53] McAney K. and Hanniffy, R. (2015) *The Vincent Wildlife Trust's Irish Bat Box Schemes* http://www.mammals-in-ireland.ie/wp-content/uploads/2015/11/Ireland-Bat-Box-Project-Report-WEB.pdf

Plate 8.6 Rocket Box Location at Ch. 3+320 near PBR241

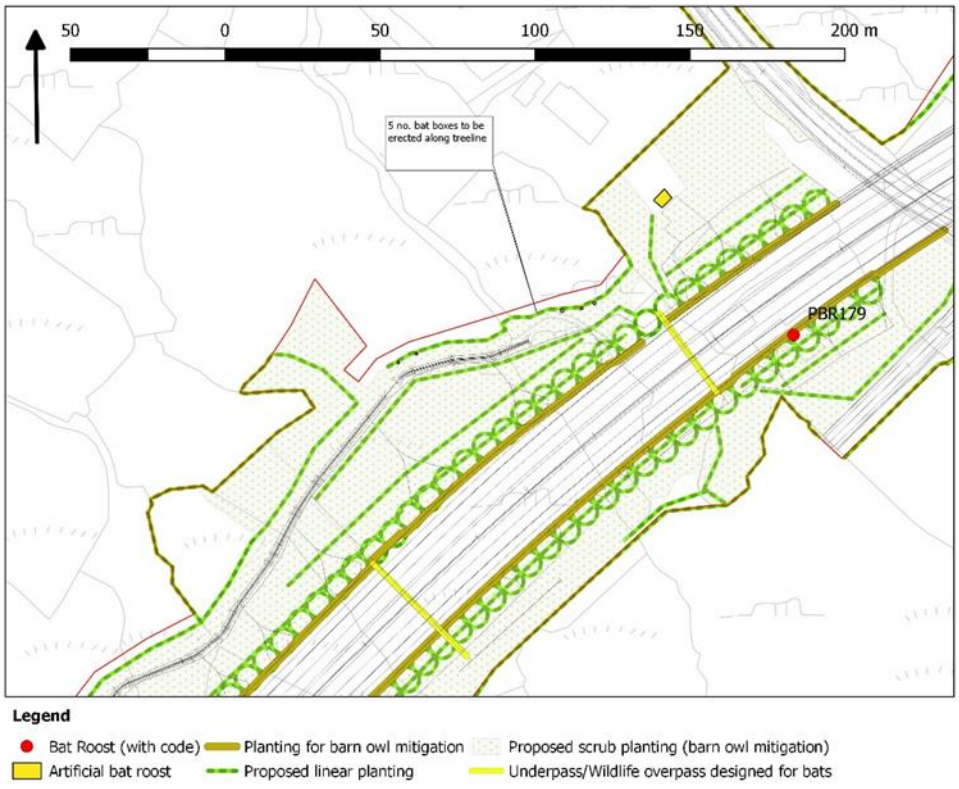

Plate 8.7 Bat Box Locations near Ch. 10+050

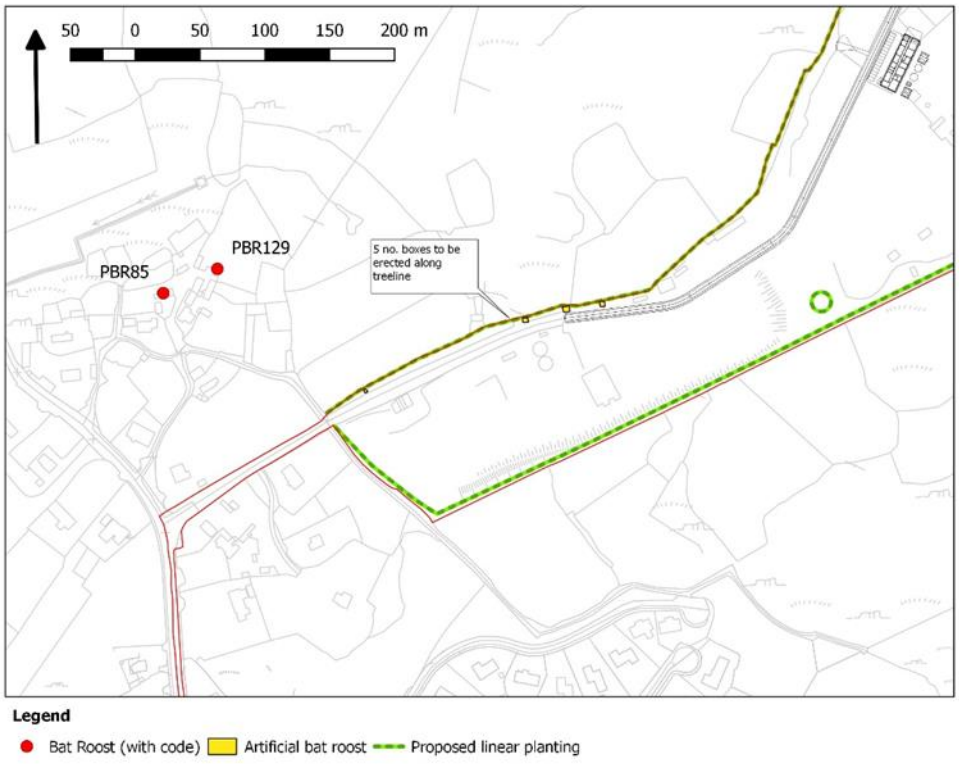

Plate 8.8 Bat Boxes Locations near Ch. 11+400

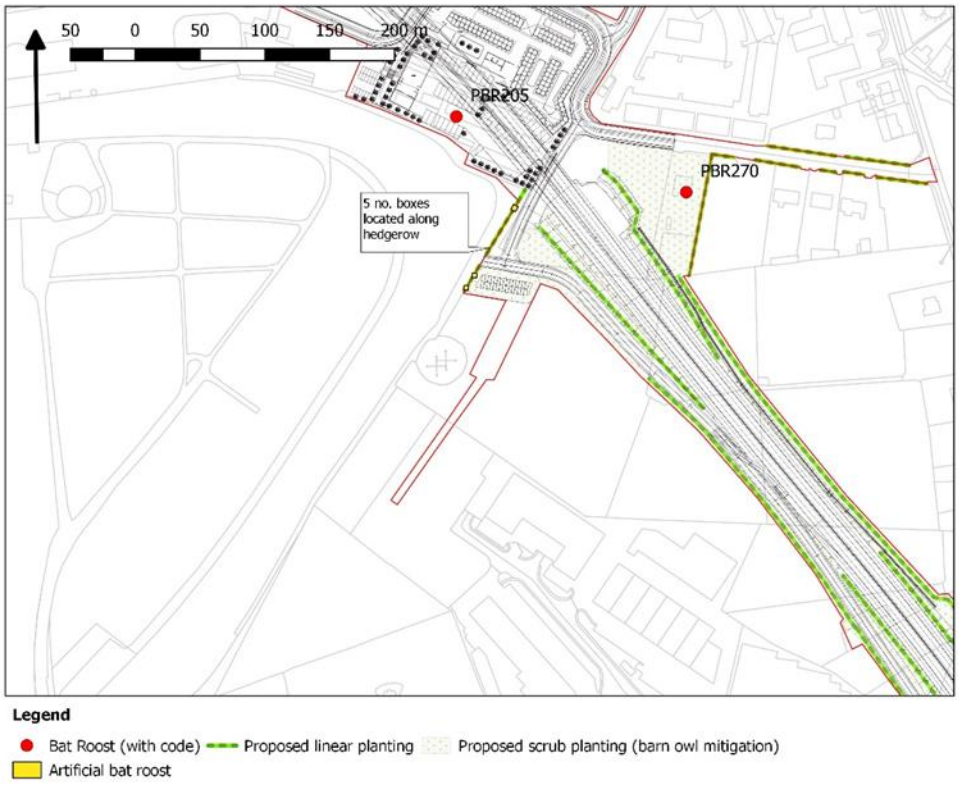

Plate 8.9 Bat Boxes Locations near Ch. 15+100

In the case of bat boxes provided as replacements for bat tree roosts to be felled, boxes will be Schwegler Type 1F bat boxes (or equivalent) erected on suitable trees or structures retained within the proposed development boundary in the vicinity of the tree to be lost where possible. The type and siting of any bat boxes required will be determined by the bat specialist at that time but preliminary areas for bat boxes have been identified in the areas of woodland around Menlough, Coolagh, on retained structures and the quarry walls at Lackagh Quarry and in areas near attenuation ponds.

All new roosts, retrofitted structures and bat boxes will be erected in advance of the commencement of site clearance so that replacement roosts are available to bats and that there is reasonable chance that they will have discovered them prior to loss of the existing roost. Boxes can be erected at any time of year and preferably as soon as the necessary consents are in place for the proposed N6 GCRR.

8.3 Protection of proposed artificial roosts during construction works

- Newly-created roosts and bat boxes within the proposed development boundary will require protection from the adverse effects of noise and lighting during the construction phase. It is an essential element of the mitigation strategy that they are accessible and usable by bats during this time
- All existing and proposed artificial roosts retained within the proposed development boundary will be surrounded with wooden panels to a height that allows shading and shelter of key roost access features
- Planting around the existing and proposed artificial roosts retained within the proposed N6 GCRR will include fast growing shrub species or fast-growing willow if the ground conditions permit. Planting will aim to guide bats away from the open construction zone toward linear features. Use of non-native species may be appropriate in some locations where it is important to get vegetation established
- All structures will be locked and not used for other purposes such as storage of materials or shelter without agreement from the Ecological Clerk of Works
- The maintenance of the existing and proposed artificial roosts retained within the proposed development boundary, in a state that they are accessible and usable by bats, will be carried out by the Contractor until the completion of the proposed N6 GCRR whereby it will be taken in charge by the local authority. Maintenance will include standard building repairs over time and responding to the results of the roost monitoring (e.g. increasing or reducing humidity)

8.4 Reducing barrier effects after site clearance during the construction phase

The construction of the proposed N6 GCRR will require removal of treelines, hedgerows, areas of woodland and other landscape features that bats use to provide shelter, foraging and visual cues for their movements between roosts and feeding areas. The approach to mitigation will include reconnecting some of these important features across the landscape.

The installation of temporary fencing across sites to replace connecting features and provide temporary flightlines (TFLs) is a methodology proposed in CIEEM's UK bat mitigation guidelines (Reason & Wray, 2023). TFLs should be at least 2m high, without gaps, and left in-situ and maintained until permanent flightlines have become established. It is proposed to apply similar measures in key locations to ensure that there are linear features to connect habitats across the construction footprint of the proposed N6 GCRR.

In order to inform siting of mitigation measures, including the TFLs described above during the construction phase, a series of infra-red/thermal camera surveys using a series of cameras and bat detectors along linear features in the following locations will be carried out in the optimum activity season. This will help to identify the preferred crossing points, immediately prior to construction, at the following sections:

- Area 1: North of Bearna Woods
- Area 2: Aughnacurra
- Area 3: River Corrib to Bothár Nua
- Area 4: West of N84 Headford Road
- Area 5: Ballindooley to Castlegar

Each area will be surveyed three times to record bats in flight in these locations with the precise vantage points for cameras to be determined during daytime surveys.

Any existing features that are identified as preferred crossing points and are scheduled for removal at the construction stage will be retained until the last moment and a portable TFL structure put alongside it prior to its removal, so at no stage there is a gap across the construction site at night. The use of TFLs as artificial crossing structures will be monitored three times over two weeks following installation. If the TFL is not at the same location as a proposed permanent crossing point (e.g. the wildlife overpass at Castlegar) then it shall be moved gradually over several nights to realign it with the permanent crossing point.

TFLs may comprise a line of potted shrubs/trees, screening, and/or temporary fencing that can be easily moved at morning and evening to ensure that the crossing is in place each night. Potential design options are outlined in Reason & Wray (2023).

Plate 8.10 Example of Portable Crossing Structure, Switzerland (from Britschgi et al, 2004)

8.5 Reducing mortality risk and barrier effects within the design and operation of the proposed N6 GCRR

The mitigation to address significant barrier effects has been designed to reflect current best practice. The last 10 years has seen an improvement in the monitoring of the effectiveness of bat mitigation measures for roads and there is considerable evidence that whilst bats may “use” measures designed to get them over or under a road, in the context of the overall population these measures may not be “effective” as they are often in the wrong place or simply not attractive to bats to use. Measuring bat mortality as a result of collisions has also been studied in greater detail in recent years.

The two main approaches employed for the proposed N6 GCRR include underpasses of a suitable size where the road design is on embankment and a wildlife overpass where it is in cut. These two measures are the only options that have been demonstrated to be effective at a population level (CEDR, 2016, (Elmeros and Dekker, 2016, Abbot et al 2012a, 2012b).

Underpasses are proposed in important crossing point areas and are aligned with existing landscape features that are known to be used by bats as a result of the surveys. Underpasses in the Menlough - Bothár Nua area and N84 Headford Road areas are regarded to be of critical importance for Lesser horseshoe bat and other bat movements across this landscape.

The section from the N84 Headford Road to N83 Tuam Road is almost entirely in cut and installing underpasses is not possible, therefore the only effective option is a wildlife overpass (referred to throughout this report as the Castlegar Wildlife Overpass).

The Castlegar Wildlife Overpass is a critical component of the strategy. It will allow bats to fly across the proposed N6 GCRR between the roosts and foraging habitats on the north side and Coopers Cave and foraging areas to the south at this location.

From 2013-2015, and in 2023, bats were recorded using hedgerows at many locations in places between the N84 Headford Road and the N83 Tuam Road – a distance of 1,750m. The western section of the proposed N6 GCRR in the vicinity of the N84 Headford Road includes for underpasses which would be used by Lesser horseshoe bats and other bat species in areas where they have been recorded, (approximately 400m in length) whilst the remainder of the proposed N6 GCRR is in a cutting or it is not possible to include such underpasses.

In the absence of the Castlegar Wildlife Overpass, it is possible that bats would attempt to cross the proposed N6 GCRR at the location of the existing crossing points[54]. This would increase the risk of collisions with vehicles at this key location and for Lesser horseshoe bats this could have an adverse impact that could deplete the population to an unsustainably low level.

In the absence of the Castlegar Wildlife Overpass the Lesser horseshoe bats would not be able to use Cooper's Cave for mating in late summer and as a result they could be forced to use less suitable locations (no other mating roosts were recorded). Mating sites that are accessible to a geographically wide population and mixes of males and females from different roosts is an essential attribute to ensure genetic heterogeneity in the local bat population. At present, bats are able to get to Cooper's Cave from a variety of directions.

A potential worst-case scenario barrier effect, isolating the Menlo Castle roost, would lead to reduced genetic diversity and possible reduced reproductive rates in that population. Similarly, the bats using Cooper's Cave would be confined to sub-optimal habitats and it is not unreasonable to conclude that, in a worst-case-scenario, the cave would cease to be used by Lesser horseshoe bats.

The location of the Castlegar Wildlife Overpass is crucial to its success. Research published since 2008 by Berthinussen & Altringham (2015[55]) and evidence presented in the CEDR Safe Bat Paths reports (2016[56]) and Natural England (2015[57]) reports have identified that bats will cross a road along existing known flight paths in preference to new artificial crossings at alternative locations. Whilst this may be truer of species that are known to fly across open spaces such as Pipistrelle species, it is not known if Lesser horseshoe bats would also act in the same way.

In the absence of data to the contrary, the precautionary principle has been applied and the wildlife overpass has been located at known Lesser horseshoe bat crossing points. The proposed location at Ch. 12+690 – Ch. 12+720 ties in with records of Lesser horseshoe bats, Leisler's, *Myotis* species, Common and Soprano pipistrelle bats recorded by static bat detectors in 2015 and in 2023. It will be essential to quantify the number of bats using each crossing point (especially the Castlegar Wildlife Overpass) immediately prior to construction in order to provide data against which post-construction surveys can be compared (see Section 10 for details on monitoring).

The width and design of the Castlegar Wildlife Overpass has followed simple assumptions that are based on the target species ecology and has followed best available knowledge and information as outlined below.

[54] Lighting of the proposed road development at this location may create a barrier effect, making crossing the proposed road development even more problematic for bats.

[55] *WC1060 Development of a Cost-Effective Method for Monitoring the Effectiveness of Mitigation for Bats crossing Linear Transport Infrastructure*. Final Report 2015. Anna Berthinussen & John Altringham. School of Biology, University of Leeds, Leeds LS2 9JT/

[56] http://bios.au.dk/om-instituttet/organisation/faunaoekologi/projekter/safe-bat-paths/documents/

[57] http://publications.naturalengland.org.uk/publication/6312886965108736

Guidance from Natural England (2015) can be summarised as follows:

- The COST 341 handbook (2003) identifies four types of 'over structure' to provide faunal passage; landscape bridges, wildlife bridges, modified bridges/ multi use bridges and tree top overpasses. A clear distinction between landscape bridges and wildlife bridges is not given, but in terms of design this appears to be based on scale aspects, with landscape bridges being larger structures over 80m wide and wildlife bridges being small in width with a recommendation of between 40 and 50m. The handbook does not use the term 'green bridge' to describe these structures.
- A width below 20m is not recommended as although evidence shows that species will still use these bridges, the frequency of use is reduced. The proposed wildlife overpass bridge at Castlegar is 30m wide.

Findings of the WC1060 Report (Berthinussen & Altringham, 2015) can be summarised as follows:

- Although green bridges have the potential to be effective crossing structures for bats over infrastructure, there are other issues that also need to be considered such as the cost, the land take required for construction of the bridge and the detrimental effects there may be on bats while it is being constructed. However, one expensive yet effective structure will always make more sense than cheaper structures that do not work: mitigation structures must be cost effective and functional. Green bridges may also provide mitigation for other wildlife. Eight mammal species have been found to use Scotney Castle landscape bridge, including deer, badger and breeding dormice (National Trust, 2012), and similar structures are commonly built throughout Europe and North America for large mammals. Combining mitigation for a range of wildlife may be a cost-effective solution, but would require careful planning, project management and monitoring.
- The two most widespread forms of wire bat bridge do not provide effective mitigation and should not be built, particularly since there is evidence that bats do not adapt to them with time. Our results suggest that green bridges and underpasses have the greatest potential but they must be designed correctly and many factors are important such as size, position, connectivity, topography, and the density and maturity of vegetation. Green bridges should be of sufficient width.
- Best practice principles for bat mitigation along linear transport infrastructure include that in addition to being vegetated, green bridges should be as wide as possible, to provide a large area for bats to commute across. Further research is needed to determine exact dimensions. A 30m wide green bridge was found to be effective in this study.

The planting design comprises of a double hedgerow in the middle section of the overpass (to mimic a 4m wide bóithrín).

Each of the hedgerows will then diverge out to create a "mouth" at the entrance to the overpass on both sides of the proposed N6 GCRR to funnel bats in to the centre of the overpass. Plate 8.11 shows the schematic design and location of the proposed overpass.

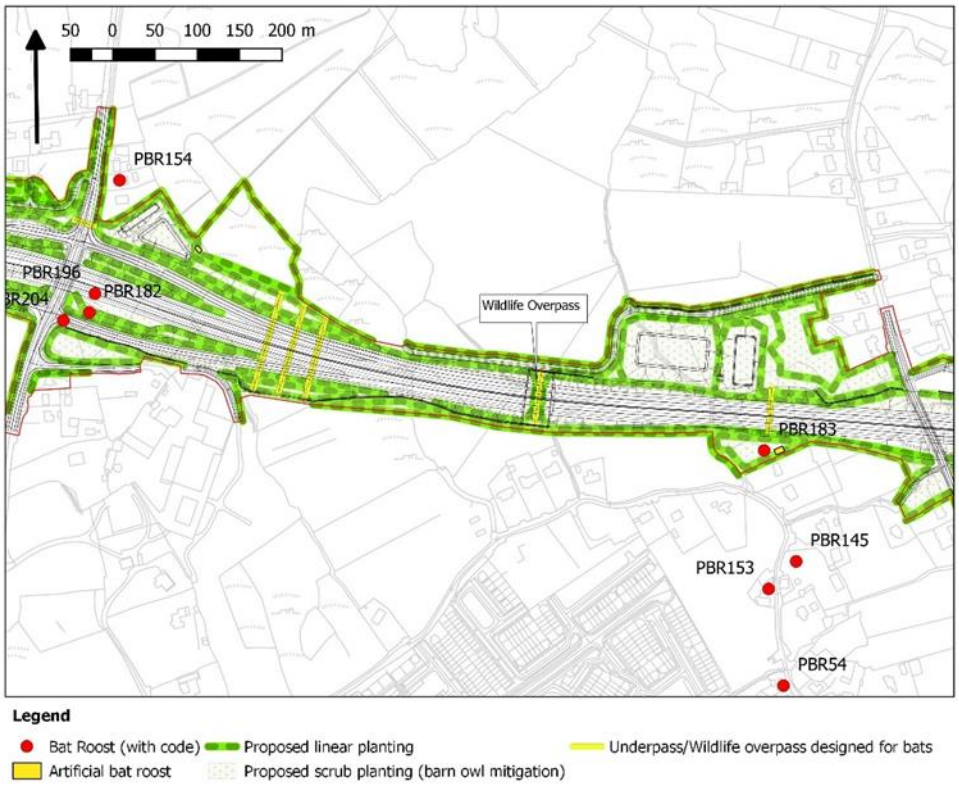

Plate 8.11 Wildlife Overpass at Castlegar

No lighting will be provided at or on any of the structures which have been designed to provide bat passage, with the exception of S06/01 where lighting will be provided to allow for safe use by pedestrians. All of the bat underpasses (as well as artificial roosts) that are designed for Lesser horseshoe bats will have connecting woody vegetation features. Other bats species are not as reliant[58] on hedgerows and woodland edges. Whilst there are many existing landscape features outside of the proposed development boundary, the bat mitigation strategy cannot rely on these in the long term as they may be subject to interventions by third parties. In effect, what will be created is a hedgerow corridor leading up to underpasses in the section of the proposed N6 GCRR between Aughnacurra and Castlegar. This planting provides a guaranteed green corridor connecting up the underpasses/overpasses and will allow bats to adapt more easily to any future landscape scale losses of connecting habitat features that may occur.

Table 8.1 below sets out the schedule of structures which provide bat passage and states the function that they serve in terms of mitigating the potential barrier effect. The size and location of the underpasses and culverts took into account the research carried out by Abbott (2012a, b) and the advice provided in the CEDR, COST341 and WC1060 reports.

Design parameters included:

- Identifying where roosts are close to the proposed N6 GCRR or where bat activity has been identified close to the proposed N6 GCRR
- Identifying where the proposed vertical profile of the proposed N6 GCRR (i.e. in cut, on fill or at grade) can permit bat passage underneath the proposed N6 GCRR
- Where river culverts and minor roads pass under the proposed N6 GCRR, it was considered if these can fulfil a role in conveying bats underneath the proposed N6 GCRR

[58] Although it is noted that Lesser horseshoe bats cross the River Corrib over 120m of open water at Menlo Castle.

- New underpasses provided should be a minimum of 2.5m high to permit the passage of bats. Research by Abbott showed that an underpass 2.5m to 3.1m high would allow 90% of the bats to pass through, as seen in the except from her research below

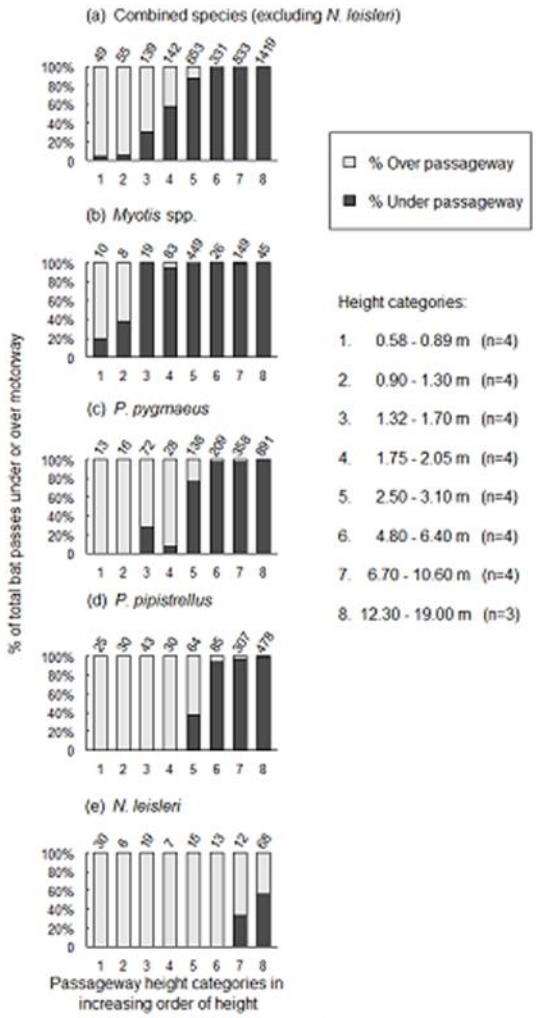

Fig. 4.17 Percentage of bat passes for **(a)** combined species (excluding *N. leisleri*), **(b)** *Myotis* spp., **(c)** *P. pygmaeus*, **(d)** *P. pipistrellus* and **(e)** *N. leisleri* (**b - e** in order of decreasing degree of clutter-adaptation) detected flying through underpasses (% Under) compared to flying over the traffic lanes of the motorway directly above underpasses (% Over) during simultaneously paired recordings. Bat pass counts (Over + Under) per height category (see legend) are shown above each bar for each species

Plate 8.12 Results of Surveys carried out by Abbott (2012c)

Table 8.1 Schedule of Structures Designed to serve Bat Passage

Structure	Description	Mitigation Function
Culvert C00/01	A 2.5m wide by 1.35m high culvert designed to provide bat passage beneath the proposed N6 GCRR	Six species of bats recorded near this location. A combined hydraulic and wildlife culvert which will cater for Lesser horseshoe and Myotis species of bats which have been recorded here.
Culvert C02/01b	A 2.5m wide by 2.5m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	A combined hydraulic and wildlife culvert which will cater for Pipistrelle species which were recorded nearby.
Culvert C03/01	A 2.5m wide by 1.2m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	A combined hydraulic and wildlife culvert which will cater for Pipistrelle species which were recorded nearby.
Culvert C03/03	A 2.5m wide by 2.5m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	Records of Pipistrelle, Lesser horseshoe and Myotis species of bats species nearby. A combined hydraulic and wildlife culvert which will cater for bats and will also cater for the commuting route for Lesser horseshoe bats to Bearna Woods.
Culvert C03/04	A 2.5m wide by 2.5m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	Records of Pipistrelle, Lesser horseshoe and Myotis species of bats nearby. A combined hydraulic and wildlife culvert which will cater for bats and will also cater for the commuting route for Lesser horseshoe bats to Bearna Woods.
Culvert C04/01	A 5m wide by 2.5m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	Records of Pipistrelle, Lesser horseshoe and Myotis species of bats nearby. A combined hydraulic and wildlife culvert which will cater for bats and will also cater for the commuting route for Lesser horseshoe bats to Bearna Woods.
Culvert C04/02	A 3.1m wide by 2.5m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	Records of Pipistrelle, Brown-long eared and Myotis species of bats nearby. A combined hydraulic and wildlife culvert which will cater for bats.
Underbridge S06/01	Proposed road underbridge	The existing Rahoon Road will allow continued bat passage underneath the proposed N6 GCRR. Records of Pipistrelle species of bat nearby. There will be lighting to allow safe pedestrian access.
Culvert C06/00	A 2.5m wide by 2.5m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	Culvert will convey bats underneath proposed N6 GCRR as the proposed N6 GCRR severs the existing road which is used by Pipistrelle species. Records of Pipistrelle species of bat nearby, culvert connects linear feature each side of the proposed N6 GCRR.
Culvert C06/01	A 2.5m wide by 2.5m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	Culvert allows passage across proposed N6 GCRR in area of fill whereas there are no areas for underpasses to the west for c.500m. Connects to attenuation ponds which may be used for foraging.
Culvert C07/00	A 2.5m wide by 2m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	Culvert will connect across landscape used by Pipistrelle and Brown long-eared bats. Roosts to the east which will be surrounded by the proposed N6 GCRR will be reconnected via this culvert and also culverts to the north.
Culvert C07/02A	A 2.5m wide by 2.5m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	Culvert will connect across landscape used by Pipistrelle and Brown long-eared bats. Roosts to the east which will be surrounded by the proposed N6 GCRR will be reconnected via this culvert and also culverts to the north. The culvert carries a small stream and ties into a ditch and hedgerow on the eastern side and will join a proposed landscaped strip on the western side, to connect it to the existing Rahoon Road.

Structure	Description	Mitigation Function
Culvert C08/01A	A 2.5m wide by 2.5m high culvert designed to provide for bat passage beneath the proposed N6 GCRR	This culvert is in an area of fill west of the N59 Moycullen Road and offers an opportunity for bats to cross under the proposed N6 GCRR in this section. Pipistrelle and Lesser horseshoe bats have been recorded in the surrounding area.
Culvert C08/05	2.5m wide by 2.5m high culverts will provide for bat passage beneath the proposed N6 GCRR	These culverts are close to the artificial roost proposed to address the loss of the bat roosts at Aughnacurra (PBR178, 256, 255, 177, 210). As such it is essential to maximise permeability of the proposed N6 GCRR in this section. Brown long-eared and Lesser horseshoe bats will be facilitated by this culvert. Proposed landscape planting strips will connect the culvert to retained vegetation at the perimeter.
Culvert C08/04		
Culvert C08/02		
Culvert C09/01	A 5m wide by 4m high culvert will provide for bat passage beneath the proposed N6 GCRR	Series of five culverts providing permeability underneath the proposed N6 GCRR for Lesser horseshoe, Pipistrelle, Brown long-eared and other bat species. The culverts will open into the retained edges of Menlough woods with additional planting provided.
Culvert C09/02	A 5m wide by 4m high culvert will provide for bat passage beneath the proposed N6 GCRR	
Culvert C09/03	A 5m wide by 4m high culvert will provide for bat passage beneath the proposed N6 GCRR	
Culvert C09/04	A 5m wide by 4m high culvert will provide for bat passage beneath the proposed N6 GCRR	
Culvert C09/05	A 5m wide by 4m high culvert will provide for bat passage beneath the proposed N6 GCRR	
Road Underbridge S09/01	Proposed road underbridge (9.6m wide 5.3m high) Menlo Castle Bóithrín will provide for bat passage beneath the proposed N6 GCRR	Key crossing point in the landscape for Lesser horseshoe bats permitting flights between Menlo Castle roost (and future new roost) and foraging areas near the Coolagh Lakes. Proven by radio-tracking data. The unlit existing road will allow continued bat passage underneath the proposed N6 GCRR. Records of several species of bat nearby including being within the recorded foraging area for Lesser horseshoe bats and being in an important area for crossings.
Culvert C09/06	A 2.5m wide by 2.5m high culvert will provide for bat passage beneath the proposed N6 GCRR	This culvert connects woodland edges that will be retained at the edge of the culvert. Records of several species of bat nearby including being within the recorded foraging area for Lesser horseshoe bats and being in an important area for crossings.
Culvert C09/07	A 2.5m wide by 2.5m high culvert will provide for bat passage beneath the proposed N6 GCRR	In low area in local topography within the recorded foraging area for Lesser horseshoe bats and being in an important area for crossings.
Underpass C10/01	A 18m wide by 4.5m high underpass will provide for bat passage beneath the proposed N6 GCRR	This underpass connects woodland edges that will be retained at the edge of the culvert. Records of several species of bat nearby including being within the recorded foraging area for Lesser horseshoe bats and being in an important area for crossings as proven by radio-tracking data.
Road Underbridge	Proposed road underbridge (9.6m wide by 5.3m high)	The proposed underbridge will allow continued bat passage beneath the proposed N6 GCRR. Records of several species of bat nearby

Structure	Description	Mitigation Function
S10/02		including Lesser horseshoe bats and being in an important area for crossings as proven by radio-tracking data.
Culvert C12/02	A 2.5m wide by 2.5m high culvert will provide for bat passage beneath the proposed N6 GCRR	Series of 3 culverts, each 25m apart, connects lands north and south and allows bats to cross. A key crossing point for Lesser horseshoe bats, Brown long-eared bats and roosts for both species are nearby.
Culvert C12/03	A 2.5m wide by 2.5m high culvert will provide for bat passage beneath the road	
Culvert C12/04	A 2.5m wide by 2.5m high culvert will provide for bat passage beneath the road	
Castlegar Wildlife Overbridge S12/02	The Castlegar Wildlife Overbridge (60m long x 30m wide) will provide for bat passage over the proposed N6 GCRR	Key crossing point in the landscape for Lesser horseshoe bats permitting flights between Castlegar and Ballindooley/Menlough areas. See text above this table for rationale for wildlife overpass location and design.
Structure S08/04	River Corrib bridge will provide for bat passage under the proposed N6 GCRR	An important crossing point for all bat species especially Lesser horseshoe and Daubenton's bats as proven by radio-tracking data. Roosts for both species are nearby.

In addition to the structures specifically designed for bat passage, there are other structures such as where minor roads pass underneath the proposed N6 GCRR which will be used by bats as safe crossing points.

8.6 Compensation[59] for loss of foraging habitat

Approximately 7ha of woodland-pasture-hedgerow-scrub habitat will be removed from the area between the River Corrib and Bothár Nua in Menlough. This habitat is used by the Lesser horseshoe bat population and therefore there is a risk that there may be reduced breeding success if replacement planting is not made available.

Lands within the known core foraging area of the Menlo Castle roost (PBR06), but not optimal feeding habitat, will be used to provide compensation for loss of foraging habitat. Hedgerows in this area will be augmented and thickets of hazel, hawthorn, holly and oak will be provided in several of the fields to create pockets of wood and grassland habitat. Grazing will continue on the lands as it has been shown that foraging over grazed land is preferred to ungrazed lands (Downes et al, 2016). Connectivity to foraging areas will also be secured through tying the proposed planting strips to hedgerows and woodland edges.

Planting of new hedgerows in fields between the proposed N6 GCRR and Menlo Castle will improve the foraging resources of this core foraging area Plate 8.11 and provide connectivity underneath the proposed N6 GCRR. Such planting will include additional native hedgerows planted across the existing fields to increase the lengths of hedgerows close to the proposed new roost for Lesser horseshoe bats near Menlo Castle. The fields will still be grazed and the hedgerows can be fitted with field gates as required provided gaps are kept to a minimum.

The area of habitat enhancement for the purposes of offsetting the loss of suitable bat foraging habitat and landscape connectivity due to the proposed N6 GCRR amounts to approximately 8ha.

[59] Note that the term "compensation" is used in this application refers to addressing impacts which cannot be mitigated. These impacts will have no impact on any European Site and the term "compensation" as used in this application does not in any way infer the same meaning as used in Article 6(4) of the E.C. Habitats Directive.

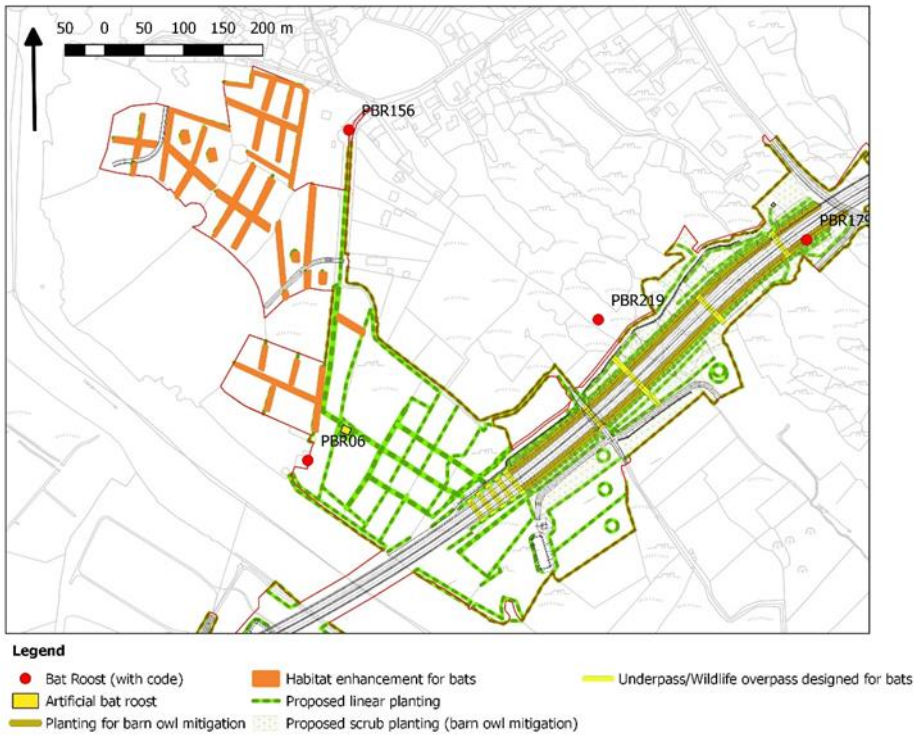

Plate 8.13 Proposed Habitat Enhancement at Menlo Castle (not to scale)

9. Residual Impacts

9.1 Residual Impacts on bat species and effect on conservation status

Potential impacts are predicted to occur to all bat species that were recorded in the study area although the magnitude and significance of the impact will vary between species and locations.

This section summarises the potential impact of the proposed N6 GCRR on the local bat population, the approach to addressing these impacts and the resultant predicted impact on the conservation status of each species. The activities that require derogation are also summarised.

9.1.1 Lesser horseshoe bat

The construction of the proposed N6 GCRR will result in the loss of one satellite roost (PBR178) and one night roost (PBR201) used by this species. The maternity roost at Menlo Castle will not be affected by the construction or operation of the proposed N6 GCRR. Due to the isolated nature of the location of the roosts within the natural range of the species in Ireland and the lack of other maternity roosts known to occur nearby the impact would be of national-scale importance and threaten the conservation status of this species. In order to address this impact, four artificial bat roosts will be constructed and an existing building retrofitted to provide roosting opportunities for Lesser horseshoe bats during all stages of their life cycle. Procedures following best practice to ensure bats are protected during roost demolition will be adhered to, but a derogation is still required to permit the removal of these roosts.

The construction phase will also lead to loss of foraging habitat within the proposed development boundary and fragmentation of flight paths between roosts and between roosts and foraging areas. It is proposed to enhance 8ha of agricultural lands to compensate for loss of 7ha of woodland, scrub and pasture in the area of Menlough, close to the maternity roost.

The impact on bat flight paths and the connectivity across the landscape has been addressed by underpass design in terms of locations, size and associated proposed landscape planting. The wildlife overpass has been located and designed in accordance with good practice. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

Following the implementation of these mitigation measures, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR. The combined effect of providing new roosting with better conditions for breeding and habitats managed to maximise foraging resources will aim to consolidate and increase the existing population.

Promoting an increase in the resident population as a result of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale. The residual impact of the proposed N6 GCRR on Lesser horseshoe bat is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.2 Soprano pipistrelle bat

The construction of the proposed N6 GCRR will result in the loss of eight Soprano pipistrelle roosts, none of which are deemed to be maternity roosts. All contained small numbers of bats. While PBR179 was suspected to be a possible maternity roost in 2014 – 2018 surveys, the emergence survey conducted in 2023 recorded only three Soprano pipistrelle bats. Internal access to the property was denied by the landowner, so the possibility of PBR179 still being used as a maternity roost cannot be wholly-discounted, but the low numbers recorded would indicate that this is now a transitional roost.

There will also be loss of foraging habitat within proposed development boundary and fragmentation of flight paths between alternative roosts and between roosts and foraging areas.

Due to the high frequency of occurrence of this species in the study area and the widespread natural range of the species in Ireland, the impact would be of local-scale importance and the loss of these small roosts is not expected to threaten the conservation status of this species. Nevertheless, procedures following best practice

to ensure bats are protected during roost demolition will be adhered to and a derogation is still required to permit the removal of these roosts.

Bat boxes and installation of bat-roost features in the artificial roost structures will provide replacement roosting opportunities.

8ha of agricultural lands to be planted and managed to compensate for loss of 7ha of woodland, scrub and pasture in Menlough which, although designed for Lesser horseshoe bats, will also benefit this species.

The impact on bat flight paths and the connectivity across the landscape has been addressed by underpass design in terms of locations, size and associated proposed landscape planting. The wildlife overpass has been located and designed in accordance with good practice and this is likely to be used by this species. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

However, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR. The proposed measures aim to protect the existing population using tested methods and approaches. The combined effect of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale. The residual impact of the proposed N6 GCRR on Soprano pipistrelle bats is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.3 Common pipistrelle bat

The construction of the proposed N6 GCRR will result in the loss of one roost (PBR252) of this species. There will also be loss of foraging habitat within proposed development boundary and fragmentation of flight paths between alternative roosts and between roosts and foraging areas.

Due to the high frequency of occurrence of this species in the study area and the widespread natural range of the species in Ireland, the impact would be of local-scale importance and the loss of these small roosts is not expected to threaten the conservation status of this species. Nevertheless, procedures following best practice to ensure bats are protected during roost demolition will be adhered to and a derogation is still required to permit the removal of these roosts.

Bat boxes and installation of bat-roost features in the artificial roost structures will provide replacement roosting opportunities.

The impact on bat flight paths and the connectivity across the landscape has been addressed by underpass design in terms of locations, size and associated proposed landscape planting. The wildlife overpass has been located and designed in accordance with good practice and this is likely to be used by this species. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

However, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR. The proposed measures aim to protect the existing population using tested methods and approaches. The combined effect of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale.

The residual impact of the proposed N6 GCRR on Common pipistrelle bats is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.4 Unidentified Pipistrelle Species

The construction of the proposed N6 GCRR will result in the loss of three roosts at the site of the current Galway Racecourse stables (PBR205_ST1, PBR205_ST10, and PBR205_ST9) of either/both Soprano Pipistrelle and Common Pipistrelle species. There will also be loss of foraging habitat within proposed development boundary and fragmentation of flight paths between alternative roosts and between roosts and foraging areas.

Due to the high frequency of occurrence of this species in the study area and the widespread natural range of the species in Ireland, the impact would be of local-scale importance and the loss of these small roosts is not expected to threaten the conservation status of this species. Nevertheless, procedures following best practice to ensure bats are protected during roost demolition will be adhered to and a derogation is still required to permit the removal of these roosts.

Bat boxes and installation of bat-roost features in the artificial roost structures will provide replacement roosting opportunities.

The impact on bat flight paths and the connectivity across the landscape has been addressed by underpass design in terms of locations, size and associated proposed landscape planting. The wildlife overpass has been located and designed in accordance with good practice and this is likely to be used by this species. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

However, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR. The proposed measures aim to protect the existing population using tested methods and approaches. The combined effect of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale.

The residual impact of the proposed N6 GCRR on Common pipistrelle bats is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.5 Natterer's bat

No known Natterer's bat roosts are to be demolished or directly impacted upon as a result of the proposed N6 GCRR. However, there will be loss of foraging habitat within proposed development boundary. 8ha of agricultural lands to be planted and managed to compensate for loss of 7ha of woodland, scrub and pasture in Menlough which, although designed for Lesser horseshoe bats, will also benefit this species.

Due to the low frequency of occurrence of this species in the study area but the widespread natural range of the species in Ireland, the impact would be of local-scale importance and not threaten the conservation status of this species.

The impact on bat flight paths and the connectivity across the landscape has been addressed by underpass design in terms of locations, size and associated proposed landscape planting. The wildlife overpass has been located and designed in accordance with good practice and this is likely to be used by this species. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

However, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR. The proposed measures aim to protect the existing population using tested methods and approaches. The combined effect of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale.

The residual impact of the proposed N6 GCRR on Natterer's bats is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.6 Daubenton's bat

No Daubenton's bat roosts are to be demolished or directly impacted upon as a result of the proposed N6 GCRR. However, there will be loss of foraging habitat within proposed development boundary. 8ha of agricultural lands to be planted and managed to compensate for loss of 7ha of woodland, scrub and pasture in Menlough which, although designed for Lesser horseshoe bats, will also benefit this species. The maintenance of a dark corridor along the River Corrib underneath the proposed N6 GCRR will also permit foraging and connectivity between landscapes used by this species.

Due to the low frequency of occurrence of this species in the study area but the widespread natural range of the species in Ireland, the impact would be of local-scale importance and not threaten the conservation status of this species.

The impact on bat flight paths and the connectivity across the landscape has been addressed by underpass design in terms of locations, size and associated proposed landscape planting. The wildlife overpass has been located and designed in accordance with good practice and this is likely to be used by this species. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

However, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR. The proposed measures aim to protect the existing population using tested methods and approaches.

The combined effect of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale.

The residual impact of the proposed N6 GCRR on Daubenton's bats is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.7 Whiskered bat

No Whiskered bat roosts are to be demolished or directly impacted upon as a result of the proposed N6 GCRR. However, there will be loss of foraging habitat within proposed development boundary. 8ha of agricultural lands to be planted and managed to compensate for loss of 7ha of woodland, scrub and pasture in Menlough which, although designed for Lesser horseshoe bats, will also benefit this species.

Due to the low frequency of occurrence of this species in the study area but the widespread natural range of the species in Ireland, the impact would be of local-scale importance and not threaten the conservation status of this species.

The impact on bat flight paths and the connectivity across the landscape has been addressed by underpass design in terms of locations, size and associated proposed landscape planting. The wildlife overpass has been located and designed in accordance with good practice and this is likely to be used by this species. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

However, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR. The proposed measures aim to protect the existing population using tested methods and approaches. The combined effect of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale.

The residual impact of the proposed N6 GCRR on Whiskered bats is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.8 Nathusius' pipistrelle bat

No confirmed Nathusius' pipistrelle bat roosts were found during the surveys but it was recorded across the study area at a low density and Winter Hibernation static recorders placed at Menlo Castle PBR06 recorded Nathusius' calls.

There will be loss of foraging habitat within proposed development boundary. 8ha of agricultural lands to be planted and managed to compensate for loss of 7ha of woodland, scrub and pasture in Menlough which, although designed for Lesser horseshoe bats, will also benefit this species.

Due to the low frequency of occurrence of this species in the study area but the widespread natural range of the species in Ireland, the impact would be of local-scale importance and not threaten the conservation status of this species.

The impact on bat flight paths and the connectivity across the landscape has been addressed by underpass design in terms of locations, size and associated proposed landscape planting.

The wildlife overpass has been located and designed in accordance with good practice and this is likely to be used by this species. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

However, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR. The proposed measures aim to protect the existing population using tested methods and approaches. The combined effect of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale.

The residual impact of the proposed N6 GCRR on Nathusius' pipistrelle bats is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.9 Brown Long-eared bat

Three Brown long-eared bat roosts are to be demolished (PBR204, PBR215, and PBR267), none of which are regarded as a maternity roost. Bat boxes and installation of bat-roost features in the artificial roost structures will provide replacement roosting opportunities. All the artificial roost structures will be designed to accommodate this species. Nevertheless, procedures following best practice to ensure bats are protected during roost demolition will be adhered to and a derogation is still required to permit the removal of these roosts. Bat boxes and installation of bat-roost features in the artificial roost structures will provide replacement roosting opportunities.

There will be loss of foraging habitat within proposed development boundary. 8ha of agricultural lands to be planted and managed to compensate for loss of 7ha of woodland, scrub and pasture in Menlough which, although designed for Lesser horseshoe bats, will also benefit this species.

Due to the widespread occurrence of this species in the study area and the widespread natural range of the species in Ireland, the impact would be of local-scale importance and not threaten the conservation status of this species. There are also several other roosts known to occur nearby.

The impact on bat flight paths and the connectivity across the landscape has been addressed by underpass design in terms of locations, size and associated proposed landscape planting. The wildlife overpass has been located and designed in accordance with good practice and this is likely to be used by this species. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

However, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR. The proposed measures aim to protect the existing population using tested methods and approaches. The combined effect of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale.

The residual impact of the proposed N6 GCRR on Brown long-eared bats is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.10 Leisler's bat

One tree (PTR48) used by one individual of this species for roosting will be removed. Bat boxes provide replacement roosting opportunities. All the artificial roost structures will be designed to accommodate this species. Nevertheless, procedures following best practice to ensure bats are protected during roost demolition will be adhered to and a derogation is still required to permit the removal of the roost site in the tree. Bat boxes and installation of bat-roost features in the artificial roost structures will provide replacement roosting opportunities.

There will be loss of foraging habitat within proposed development boundary. 8ha of agricultural lands to be planted and managed to compensate for loss of 7ha of woodland, scrub and pasture in Menlough which, although designed for Lesser horseshoe bats, will also benefit this species.

Due to the widespread occurrence of this species in the study area and the widespread natural range of the species in Ireland, the impact would be of local-scale importance and not threaten the conservation status of this species. There are also several other roosts known to occur nearby.

The proposed N6 GCRR is less likely to pose an adverse impact on this species compared to the other Irish bat species. The impact on bat flight paths and the connectivity across the landscape has been addressed by

underpass design in terms of locations, size and associated proposed landscape planting. These measures will minimise the effect of fragmentation and barrier to movements across the landscape.

However, there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the road although since Leisler's bats often fly at height above the zone of potential collision, this risk is deemed to be extremely low. The proposed measures aim to protect the existing population using tested methods and approaches. The combined effect of these measures will ensure that there will be no reduction in the natural range or population of the species and hence there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status in their natural range, even at the local geographic scale.

The residual impact of the proposed N6 GCRR on Leisler's bats is predicted to be imperceptible above the scale of impacts on individual bats due to vehicle collision.

9.1.11 Overall Residual Impact

For all bat species there is a residual risk of mortality due to collisions with vehicles as a small proportion of the population will potentially still fly over the proposed N6 GCRR.

The combined effect of these measures will ensure that there will be no detrimental effect to the maintenance of the populations of the species at a favourable conservation status – i.e. the natural range of affected bat species is not reduced, there will be a sufficiently large habitat to maintain local bat populations on a long-term basis and, although there will likely be measurable effects on bat distribution and abundance in the vicinity of the proposed N6 GCRR, the local bat populations will be able to maintain themselves on a long-term basis.

10. Proposed monitoring programme

10.1 Pre- construction monitoring

Pre-construction monitoring is required to provide data against which the post-construction monitoring can be compared. Parameters will include:

- Occupancy levels in roosts (Menlo Castle, proposed artificial roost buildings including retrofitted retained buildings, bat boxes)
- Bat passage structures (culverts, underpasses and the Castlegar Wildlife Overpass)
- Diversity of bat species and abundance of bat activity adjacent to the proposed N6 GCRR

Occupancy levels in Menlo Castle will be measured by monthly emergence surveys using infra-red video camera recording, from mid-April to September in the year of or immediately prior to construction commencing (whichever of the two is closer to the construction commencement).

The pre-construction baseline monitoring for bat usage of proposed bat passage structures will focus on recording bats using existing flight paths at proposed underpasses near Menlo Castle, the N59 Letteragh Junction and the proposed Castlegar Wildlife Overpass. Pre-construction baseline data is required on numbers of bats and flight height so that this can be compared to a post-construction scenario. Such data will be collected using focused infra-red camera and detector surveys carried out on at least three separate occasions at each location in the optimum survey period. In accordance with CEDR (2016) guidance it is proposed that this pre-construction monitoring involves a minimum of two separate surveys in the breeding season and two separate (in time) surveys in mid-August to late-September, to reflect periods of landscape-scale movements, and that these surveys take place for two bat activity seasons (May-August) following completion of the construction of the proposed N6 GCRR.

The risk of adverse effects on bat diversity and abundance adjacent to the proposed N6 GCRR can never be ruled out completely; but not all populations will be affected in the same location in the same way and therefore ongoing monitoring is regarded to be good practice to enhance our understanding of the effects of road developments and the effectiveness of mitigation measures. Diversity of bat species and abundance of bat activity adjacent to the proposed N6 GCRR will be monitored using standardised survey transects from the edge of the proposed N6 GCRR outwards as described by Berthinussen & Altringham (2015). These transects will be used to record bat activity across the lands flanking the corridor of the proposed N6 GCRR. It is proposed that six transects are surveyed pre-construction in locations of high bat activity where underpasses or an overpass are proposed.

10.2 During and post-construction monitoring

10.2.1 Roost monitoring

Monitoring of occupancy of the artificial roost buildings (including retrofitted retained buildings) and bat boxes will commence immediately after their installation to determine how soon they are used. They will be installed prior to the main site clearance phase; therefore, all monitoring can be by visual inspection according to the following schedule:

- Emergence counts at Menlo Castle roost: emergence counts will be undertaken during the construction works and in 5 years following construction in May, July and August. These counts will be made using infra-red video camera recording at the same time as visual inspections of bats using the proposed new roost site adjacent to Menlo Castle in order to get an overall count of bats at this location.
- Artificial roost buildings: Occupancy of the proposed artificial roost buildings (including retrofitted structures) during the works and post-construction will be undertaken in the 5 years following completion of construction. Surveys will be undertaken in mid-winter to assess hibernation use and in May and July to assess use during breeding season. Surveys will include checks for individuals and also for droppings (using DNA analysis, where necessary, to identify species). Droppings will be removed after each check to ensure that the subsequent survey only records usage in the interim period. The roosts

will be monitored annually for Lesser horseshoe bats and counts sent to the NPWS as part of the national Lesser horseshoe bat monitoring programme. This monitoring may be undertaken by NPWS staff, Galway bat group or others to be decided by the local authority. Remote modes of monitoring using new technology may mean that visits to the roosts are not always required and that infra-red images inside the roost can be sent wirelessly. Should the monitoring of the roosts suggest that bats are not using them, additional focused surveys will be undertaken to try to understand bat movements in the locality and aim to address any issues. Any changes that may be deemed necessary will be coordinated and communicated to ensure that they do not conflict with any of the impact predictions or mitigation measures prescribed in this report. Temperature and humidity probes coupled with data loggers will be installed in the roosts for two years post construction of the roost and measures taken (e.g. fitting vents, increasing period of water tanks in the hibernation roost area) to address any issues arising.

- Bat boxes: The authors are not aware of any minimum or recommended standard for bat box monitoring. After installation, boxes will be visually inspected quarterly per year for the first two years. Research into the effectiveness of mitigation measures has indicated that occupancy of bat boxes averages 50%[60] since bats may prefer existing alternative roost sites in the locality. Any boxes not showing signs of occupancy after that time may be relocated to alternative locations within the proposed development boundary nearby where they may be of benefit to the local bat population. In years 3-5 after installation the boxes will be checked in late March and September to record usage in winter and summer and to avoid disturbance during the sensitive hibernation times.
- Bat boxes will be checked for a minimum of 5 years after erection.

10.2.2 Monitoring crossing points

Monitoring will comprise acoustic detector and infra-red camera recording at the culverts at the locations previously surveyed pre-construction, referred to in Table 8.1, namely:

- Area 1: North of Bearna Woods
- Area 2: Aughnacurra
- Area 3: River Corrib to Bothár Nua
- Area 4: West of N84 Headford Road
- Area 5: Ballindooley to Castlegar, including the Castlegar Wildlife Overpass

This will quantify the usage by bats compared to non-usage (e.g. using other flight paths). This will allow a determination as to whether the bat passage structures are being effective at a population level (where it is assumed that 90% of the bats are able to pass underneath the proposed N6 GCRR).

Monitoring will be repeated at all locations to provide a robust dataset. In the event that the proposed bat passage structures including the Castlegar Wildlife Overpass are not deemed to be effective, then further focused surveys will be required to determine the causes and address them in a reasonable manner where possible (for example, controlling lighting, addressing local landscape changes). Any changes that may be deemed necessary will need to be coordinated and communicated to ensure that they do not conflict with any of the impact predictions or mitigation measures prescribed in the Environmental Impact Assessment or Appropriate Assessment documentation.

In accordance with CEDR (2016) guidance it is proposed that this post-construction monitoring involves a minimum of two separate surveys in the breeding season and two separate (in time) surveys in mid-August to late-September, to reflect periods of landscape-scale movements, and that these surveys take place for two bat activity seasons (May-August) following completion of the construction of the proposed N6 GCRR.

10.2.3 Diversity and abundance adjacent to the proposed N6 GCRR corridor

Transects of bat activity will be taken across the same locations as the pre-construction transects in order to identify any displacement effects caused by disturbance impacts during construction and operation. Whilst

[60] Paul Lynott, pers. comm 2017.

the application of the Berthinussen & Altringham (2015) methodology is not without its limitations as it has only been applied to open agricultural landscapes, it is nevertheless a foundation for a reproducible survey method that is appropriate to the proposed N6 GCRR.

If a displacement effect is detected (decreased abundance and diversity close to the proposed N6 GCRR) then further focused surveys will be required to determine the causes and address them where possible (for example, controlling lighting, addressing local landscape changes through additional planting).

Any changes that may be deemed necessary will need to be coordinated and communicated to ensure that they do not conflict with any of the impact predictions or mitigation measures prescribed in any subsequent EIAR or Natura Impact Statement. It is proposed that monitoring takes place during construction and two bat activity seasons following completion of the construction of the proposed N6 GCRR.

11. Duties, Responsibilities and Oversight/Compliance Commitments

All biodiversity related measures, including those relating to bats, will be implemented by the Contractor under the supervision of the Project Ecologist (employed by the Employer) and/or the Ecological Clerk of Works (employed by the Contractor).

Contract documents will include a requirement for the Contractor to update and finalise the Construction Environmental Management Plan (CEMP) what will be included with an EIAR for the proposed N6 GCRR prior to construction once appointed and to implement and maintain it during the construction phase.

The final Schedule of Environmental Commitments for an EIAR will be included in the CEMP. The CEMP will detail implementation methodologies for all environmental commitments, including those relating to bats.

There will be a contract management team appointed by the client on site for the duration of the construction phase. The team will supervise the construction of the works including monitoring the Contractor's performance to ensure that the proposed construction phase environmental commitments are implemented and that construction impacts and nuisance are minimised.

The Contractor's team will include a Senior Environmental Manager (SEM) who will be responsible for implementation of the Construction Environmental Management Plan (CEMP) during construction. The SEM will draw up a schedule of monitoring required, listing the type of report expected and detailing to who the reports should be sent, etc. It is the responsibility of the SEM to ensure that all monitoring is carried out by competent persons.

Where the monitoring results fall outside the range contractually required, the SEM is responsible for initiating and reporting on corrective action. This may require the alteration of relevant Environmental Control Measures. The SEM will provide a briefing for all of the Contractor's senior management including the Project Manager, Programme Manager, Construction Manager, Design Engineers, Structures Agents and Site Agents on the CEMP and the Environmental Commitments/Requirements that must be met during the construction phase. The Employer's Site Monitoring Team will be monitoring compliance with the CEMP.

Galway County Council (GCoC) will ensure that the results of monitoring will be used to inform the long-term ecological mitigation programme and any necessary timely corrective action. During construction, monitoring and any required corrective action, will be Galway County Council's (GCoC) responsibility as will be outlined in the Schedule of Environmental Commitments. During operation, GCoC will engage the services of a suitable contractor to monitor the ecological mitigation measures for the lifetime of the project.

All the relevant requirements that will be set out in the Schedule of Environmental Commitments, in relation to monitoring and maintenance of the ecological mitigation measures over the lifetime of the project, will be included as conditions in the contract(s) entered into with the appointed contractor. GCoC shall ensure that provision is made, in the contract(s) entered into with the appointed contractor, for corrective action to be undertaken if any aspects of the implementation of the ecological mitigation measures and monitoring commitments proposals are not effective.

These provisions shall include a requirement for a suitably qualified ecologist/biodiversity expert to review the efficacy of any corrective actions required.

A GIS mapping system will be developed, to allow the Project Ecologist to track the progress, completion and monitoring of the ecological mitigation measures.

At the end of each month, any mapping relating to ecological mitigation measures, including results of pre-construction surveys (e.g. locations of badger setts) or design changes for mitigation measures (e.g. change in location of artificial Badger sett), will be uploaded to the dedicated project website. In addition, at the end of each month any ecological monitoring reports will be uploaded to a dedicated project website.

Notwithstanding the point above ecological monitoring reports will be submitted to the Planning Authority and copied to the NPWS.

The Project Ecologist in conjunction with 'permits to work' will sign off the correct completion and functioning of the measures, where works are in ecologically sensitive locations and/or are ecologically sensitive activities, which are likely to include, but may not be limited to, the following:

- works involving vegetation removal/site clearance of works involving installation of site fencing
- works in or adjacent to the Lough Corrib SAC
- works in or adjacent to any watercourses
- works in or adjacent to any known breeding, resting or hibernating locations of any species protected under either the Birds and Habitats Regulations 2011 or Wildlife Act, in particular bats and otter
- works in areas where mitigation measures (including either habitat creation/mitigation or provision of nest and bat boxes) are proposed
- works in or adjacent to donor and receptor sites identified for the creation of habitats, until such time as any donor material required for the receptor sites has been transported

Once ecological mitigation measures have been implemented and installed, GIS mapping files of their final as-built locations will be sent to the Project Ecologist to be uploaded into the Local Authority's GIS and planning systems.

Interactive or real-time/live mapping systems would be onerous to provide and manage. It is not deemed either necessary or appropriate to provide such systems given the above proposals which together will achieve the same function, purpose and results as a real-time/live mapping system.

12. Conclusions

Galway County Council are submitting this application under Regulation 54 of the European Communities (Birds and Habitats) Regulations 2011 (S.I. 477 of 2011) for a derogation licence from complying with the requirements of the provisions of Regulations 51, 52 and 53 of the same Regulations.

The application relates to specific residual impacts on bats that will arise from the construction and operation of the proposed N6 GCRR, and its potential impact on bat (*Chirpotera*) species. Potential impacts have been mitigated as far as possible during the design phase and the residual impacts are those that cannot be ruled out despite applying best practice techniques.

In the context of assessing effects on the bat species' conservation status, the predicted residual impacts will not reduce the natural range of affected bat species, there will be a sufficiently large habitat to maintain local bat populations on a long-term basis and, although there will likely be measurable effects on bat distribution and abundance in the vicinity of the proposed N6 GCRR, the local bat populations will be able to maintain themselves on a long-term basis.

Each of the following conditions as set out in the requirements of Articles 51, 52 and 53 have been addressed in this application in detail:

- there is no satisfactory alternative
- the proposed derogation will not be detrimental to the maintenance of the species at a favourable conservation status in their natural range
- one of the requirements set out in Article 54(2)(a) to (e) applies. In this case the requirement that applies is "(c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment."
- It has been concluded by the applicant that the proposed design-based mitigation measures, compensatory roosting and foraging habitat and adopting best practice to protect bats during construction activities demonstrates full compliance with the Regulations

Note on the national Lesser horseshoe bat species action plan:

Every six years, Member States of the European Union are required under Article 17 of the EU Habitats Directive to report on the conservation status of all habitats and species listed on the annexes of the Habitats Directive, which includes all resident Irish bat species.

In 2018, when the N6 GCRR EIAR and associated draft derogation licence application was submitted to an Bord Pleanála, the national conservation status of the Lesser horseshoe bat was assessed as 'favourable' (NPWS, 2013).

However, in 2019, the species' conservation status was reported by the NPWS as having declined to 'inadequate and declining' as a result of a reduction in habitat quality and range contraction – the only Irish bat species to report a decline in conservation status over the 2013 to 2019 reporting period (NPWS, 2019).

In 2022, the NPWS published a Lesser horseshoe bat species action plan (NPWS & VWT, 2022) to guide, inform and provide structure for the conservation management of this species. The plan sets out a suite of practical conservation measures to meet this aim focussed on roosting sites, supporting habitat, landscape connectivity and outreach.

The residual effects of the proposed N6 GCRR on the Lesser horseshoe bat will not negatively affect the species' conservation status and will not inhibit the delivery or success of any of the conservation measures set out by the NPWS in the species action plan to retore the Lesser horseshoe bat to favourable conservation status.

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