

Limerick WWTP Upgrade and Regional Bioresource Centre

ElAR Chapter 13 – Biodiversity Terrestrial

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Formerly JB Barry Partners who became part of Egis in 2023

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GLOSSARY AND DEFINED TERMS

Acronym	Description
AA	Appropriate Assessment
AASR	Appropriate Assessment Screening Report
ACP	An Coimisiún Pleanála
AD	Anaerobic Digestion
AGS	Aerobic Granular Sludge
AER	Annual Environmental Report
BOD	Biochemical Oxygen Demand
BC	Bioresource Centre
C	Carbon
CAFÉ	Clean Air for Europe Directive
CHP	Combined Heat and Power
DIN	Dissolved Inorganic Nitrogen
ECJ	European Court of Justice
EIAR	Environmental Impact Assessment Report
ELV	Emission Limit Value
EPA	Environmental Protection Agency
ESB	Electrical Supply Board
EU	European Union
FOG	Fats Oils and Grease
FST	Final Settling Tank
GHG	Greenhouse Gas
HGV	Heavy Goods Vehicle
MLPS	Main Lift Pumping Station
MCA	Multi-Criteria Analysis
MRP	Molybdate Reactive Phosphate
IDA	Industrial Development Agency
IFAS	Integrated Fixed-Film Activated Sludge
N	Nitrogen
NDP	National Development Plan
NHA	Natural Heritage Area
NIS	Natura Impact Statement
NPF	National Planning Framework
NSO	National Strategic Outcomes
NSS	National Spatial Strategy
NWSMP	National Wastewater Sludge Management Plan
P	Phosphorous
PE	Population Equivalent - The amount of wastewater received at a treatment plant (and its design capacity) is measured in units known as population equivalent (or PE). The wastewater received from all sources, e.g. industrial, tourism, commercial, residential, etc., is converted into these units, with one unit of PE representing the wastewater treatment load typically generated by a single person.
PFF	Pass Forward Flow
PFT	Picket Fence Thickener

Acronym	Description
PRF	Potential Roost Feature (Bats)
pNHA	Proposed Natural Heritage Area
PS	Pump Station
SEA	Strategic Environmental Assessment
SBR	Sequencing Batch Reactor
SHC	Sludge Hub Centre
SIA	Stable Isotope Analysis
SID	Strategic Infrastructure Development
Sludge	Solid by-products of wastewater
SPA	Special Protection Area
SS	Suspended Solids
UWWTD	Urban Wastewater Treatment Directive
WFD	Water Framework Directive
WWDA	Wastewater Discharge Authorisation
WWTP	Wastewater Treatment Plant
WSPS	Water Services Policy Statement
ZTV	Zone of Theoretical Visibility
PS	Pumping Station
QI	Qualifying Interest
RAS	Return Activated Sludge
RBC	Regional Bioresource Centre
RSES	Regional Spatial and Economic Strategy
SAC	Special Area of Conservation
TDS	Total Dry Solids
THP	Thermal Hydrolysis Process

DEPARTMENTS AND STAKEHOLDERS

Departments & Stakeholders	Acronym (where applicable)
An Coimisiún Pleanála	ACP
Department of Public Expenditure and Reform	DPER
Department of Climate Action, Communication Networks and Transport	CACNaT
Department of Communications, Climate Action and Environment – Changed in 2020	DCCAE
Department of Culture, Heritage and the Gaeltacht – Changed in 2020	DCHG
Department of Finance	DoF
Department of Housing, Planning and Local Government – Changed in 2020	DHPLG
Department of Housing, Local Government and Heritage	HLGaH
Environmental Protection Agency	EPA
Geological Survey Ireland	GSI
Group Water Schemes	GWS
Inland Fisheries Ireland	IFI
Irish Rail (Iarnród Éireann)	IR
Uisce Éireann	UÉ
Limerick City & County Council	LCCC
Local Authority	LA
National Monuments Service	NMS
National Parks & Wildlife Service	NPWS
National Roads Authority	NRA
National Transport Authority	NTA
Office of Public Works	OPW
Ordnance Survey Ireland	OSi
Southern Regional Assembly	SRA

13 BIODIVERSITY TERRESTRIAL

13.1 Introduction

13.1.1 Purpose of this Report

This chapter of the EIAR assesses the potential impacts (and resulting effects) likely to occur as a result of the Proposed Limerick Wastewater Treatment Plant (WWTP) Upgrade and Regional Bioresource Centre Project on the receiving environment, in terms of biodiversity. Furthermore, it outlines the measures required to prevent significant impacts and considers achievement of Biodiversity Net Gain, in line with Uisce Éireann biodiversity policy IW-AMT-POL-013 and guidance – Biodiversity Guidance for Irish Water Developments.

The impact assessment includes an accurate description of all aspects of the Proposed Development during construction, operation and decommissioning (where relevant). It then provides a comprehensive description of the baseline ecological environment, which is based on an appropriate level of survey work that was carried out in accordance with the most appropriate guidelines and methodologies. The chapter then completes a thorough assessment of the impacts of the Proposed Development on biodiversity. Where likely ecologically significant effects are identified, measures are prescribed to avoid or minimise or compensate for such effects.

13.1.2 Outline Project Description

A detailed description of the Proposed Development and its construction activities are provided in Chapter 3 (The Proposed Development), and Chapter 4 (Construction Strategy) of this EIAR.

13.2 Methodology

13.2.1 Study Area

The study area comprises the EIAR site boundary which is shown in Map Figure 1-1 in Volume 3 Figures. The study area also includes waterbodies outside of the EIAR site boundary including Bunlicky Lake and associated watercourse, and the Shannon Estuary, in order to assess potential impacts on otter using adjacent habitats. In addition, the study area comprised Bunlicky Lake, Ballinacurra Creek, and the habitats of the Shannon Estuary in the wider area around both Limerick WWTP and Corcanree PS in order to study the usage of these areas by waterbirds.

13.2.2 Relevant Legislation, Policy and Guidelines

The guidelines listed below were consulted in the preparation of this document to provide the scope, structure and content of the assessment:

- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.3. Chartered Institute of Ecology and Environmental Management, Winchester.
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022).
- Environmental Impact Assessment of National Road Schemes –A Practical Guide (NRA, 2009).
- Guidelines for assessment of Ecological Impacts of National Road Schemes, (NRA, 2009).
- Environmental Assessment and Construction Guidelines (NRA, 2006).
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations 2003 which give further effect to EU Water Framework Directive (2000/60/EC).

- The International Convention on Wetlands of International Importance especially Waterfowl Habitat (Concluded at Ramsar, Iran on 2 February 1971)

In addition to above the UÉ document *Biodiversity Guidance for Uisce Éireann Developments* was considered during this assessment (UE-AMT-GL-021).

The following legislation applies with respect to non-native species:

- Regulation 49 and 50 of European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011).
- European Union (Invasive Alien Species) Regulations 2024 (S.I. No. 374/2024)

13.2.2.1 National Legislation

The Wildlife Act, 1976 (as amended) (hereafter referred to as the Wildlife Act), is the principal piece of legislation governing protection of wildlife in Ireland. The Wildlife Act provides strict protection for species of conservation value. The Wildlife Act conserves wildlife (including game) and protects certain wild animals and flora. These species are therefore considered in this report as ecological receptors.

Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs) are heritage sites that are designated for the protection of flora, fauna, habitats and geological sites. Only NHAs are designated under the Wildlife Act. NHAs are legally protected from damage from the date that they are formally proposed for designation. A list of pNHAs was published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. However, these sites are considered to be of significance for wildlife and habitats as they may form statutory designated sites in the future.

The Flora (Protection) Order 2022 (S.I. No. 235) lists the species, hybrids and/or subspecies of flora protected under Section 21 of the Wildlife Act. It provides protection to a wide variety of protected plant species in Ireland including vascular plants, mosses, liverworts, lichens and stoneworts. Under the Flora (Protection) Order it is illegal to cut, pick, collect, uproot or damage, injure or destroy species listed or their flowers, fruits, seeds or spores or wilfully damage, alter, destroy or interfere with their habitat (unless under licence).

13.2.2.2 National Policy

Ireland's 4th National Biodiversity Action Plan 2023-2030 (Department of Housing, Local Government and Heritage, 2024) (the "NBAP") strives for a "whole of government, whole of society" approach to the governance and conservation of biodiversity. It demonstrates Ireland's continuing commitment to meeting and acting on its obligations to protect Ireland's biodiversity for the benefit of future generations and will implement this through a number of key targets, actions and objectives.

The Wildlife (Amendment) Act 2023 (hereafter referred to as the Wildlife 2023 Act) introduced a new public sector duty on biodiversity. The legislation provides that every public body, as listed in the Wildlife 2023 Act, is obliged to have regard to the objectives and targets in the NBAP. The NBAP sets out five key objectives as follows:

- Objective 1: Adopt a Whole-of Government, Whole of-Society Approach to Biodiversity. Proposed actions include capacity and resource reviews across Government; determining responsibilities for the expanding biodiversity agenda providing support for communities, citizen scientists and business; and mechanisms for the governance and review of this National Biodiversity Action Plan.
- Objective 2: Meet Urgent Conservation and Restoration Needs. Supporting actions will build on existing conservation measures. Efforts to tackle Invasive Alien Species will be elevated. The protected area network will be expanded to include the Marine Protected Areas. The ambition of the EU Biodiversity Strategy will be considered as part of an evolving work programme across Government.
- Objective 3: Secure Nature's Contribution to People. Actions highlight the relationship between nature and people in Ireland. These include recognising the tangible and intangible values of biodiversity,

promoting nature's importance to our culture and heritage and recognising how biodiversity supports our society and our economy.

- Objective 4: Enhance the Evidence Base for Action on Biodiversity. This objective focuses on biodiversity research needs, as well as the development and strengthening of long-term monitoring programmes that will underpin and strengthen future decision-making. Action will also focus on collaboration to advance ecosystem accounting that will contribute towards natural capital accounts.
- Objective 5: Strengthen Ireland's Contribution to International Biodiversity Initiatives. Collaboration with other countries and across the island of Ireland will play a key role in the realisation of this Objective. Ireland will strengthen its contribution to international biodiversity initiatives and international governance processes, such as the United Nations Convention on Biological Diversity.

Such policies have informed the evaluation of ecological receptors recorded within the Site and the ecological assessment process.

13.2.2.3 European Legislation

Habitats and species of European importance are provided legal protection under the EU Habitats Directive 92/43/EEC (the Habitats Directive) and the EU Birds Directive 2009/147/EC (the Birds Directive) this legislation forms the cornerstone of Europe's nature conservation within the EU. It is built around two pillars: the Natura 2000 network of protected sites (hereafter referred to as European sites) and the strict system of species protection. Both the Habitats and Bird Directives have been transposed into Irish law by Part XAB of the Planning and Development Acts 2000 (as amended) (from a land use planning perspective) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011).

Annex I of the Habitats Directive lists habitat types whose conservation requires the designation of Special Areas of Conservation (SAC). Priority habitats, such as Turloughs, which are in danger of disappearing within the EU territory are also listed in Annex I. Annex II of the Habitats Directive lists animal and plant species (e.g. marsh fritillary, Atlantic salmon, and Killarney fern) whose conservation also requires the designation of SAC. Annex IV lists animal and plant species in need of strict protection such as lesser horseshoe bat and otter, and Annex V lists animal and plant species whose taking in the wild and exploitation may be subject to management measures. In Ireland, species listed under Annex V include Irish hare, common frog and pine marten. Species can be listed in more than one Annex, as is the case with otter and lesser horseshoe bat which are listed on both Annex II and Annex IV. The disturbance of species under Article 12 of the Habitats Directive (and in particular avoidance of deliberate disturbance of Annex IV species, particularly during the period of breeding, rearing, hibernation and migration and avoidance of deterioration or destruction of breeding sites or resting places) has been specifically assessed in this EIAR.

The Birds Directive instructs Member States to take measures to maintain populations of all bird species naturally occurring in the wild state in the EU (Article 2). According to Recital 1 of the Birds Directive, Council Directive 79/409/EEC on the conservation of wild birds was substantially amended several times and in the interests of clarity and rationality, the Birds Directive codifies Council Directive 79/409/EEC into Irish Law. Such measures may include the maintenance and/or re-establishment of habitats in order to sustain these bird populations (Article 3). A subset of bird species has been identified in the Birds Directive and are listed in Annex I as requiring special conservation measures in relation to their habitats. These species have been listed on account of inter alia: their risk of extinction; vulnerability to specific changes in their habitat; and/or due to their relatively small population size or restricted distribution. Special Protection Areas (SPAs) are to be identified and classified for these Annex I listed species and for regularly occurring migratory species, paying particular attention to the protection of wetlands (Article 4).

In summary, the species and habitats provided National and International protection under these legislative and policy documents have been considered in this Ecological Impact Assessment. A detailed assessment of the likelihood of the Proposed Development having either a significant effect or an adverse impact on any relevant European Sites (i.e. SACs, cSACs, SPAs or cSPAs) has been carried out in the Appropriate Assessment (AA) Screening Report and Natura Impact Statement (NIS). A separate assessment has not been

carried out in this chapter, to avoid duplication of assessments. However, the relevant conclusions have been cross-referenced and incorporated.

13.2.3 Appraisal Method for the Assessment of Impacts

13.2.3.1 Identification of Target Receptors and Key Ecological Receptors (KERs)

The methodology for assessment followed a precautionary screening approach with regard to the identification of KERs. Following a comprehensive desk study, initial site visits and stakeholder consultation; “Target Receptors” likely to occur in the ZOI of the Proposed Development were identified. The Target Receptors included habitats and species that were protected under the following legislation:

- Annexes of the EU Habitats Directive;
- Qualifying Interests (QI) of SACs within the likely ZOI;
- Species protected under the Wildlife Act as amended; and
- Flora (Protection) Order 2022 S.I. No. 235.

13.2.3.2 Determining Importance of Ecological Receptors

The importance of the ecological features identified within the Site was determined with reference to a defined geographical context. This was undertaken following a methodology that is set out in Chapter 3 of the NRA Ecological Impact Assessment Guidelines (NRA 2009). These guidelines set out the context for the determination of value on a geographic basis with a hierarchy assigned in relation to the importance of any particular receptor. These guidelines provide a basis for determination of whether any particular receptor is of importance on the following scales:

- International
- National
- County
- Local Importance (Higher Value)
- Local Importance (Lower Value)

The guidelines clearly set out the criteria by which each geographic level of importance can be assigned. Locally Important (lower value) receptors contain habitats and species that are widespread and of low ecological significance and of any importance only in the local area. Internationally Important sites are either designated for conservation as part of the Natura 2000 Network (SAC or SPA) or provide the best examples of habitats or internationally important populations of protected flora and fauna. Specific criteria for assigning each of the other levels of importance are set out in the guidelines and have been followed in this assessment. Where appropriate, the geographic frame of reference set out above was adapted to suit local circumstances. In addition, and where appropriate, the conservation status of habitats and species is considered when determining the significance of ecological receptors.

Any ecological receptors that are determined to be of National or International, County or Local importance (Higher Value) following the criteria set out in the guidelines are considered to be KERs for the purposes of ecological impact assessment if there is a pathway for effects thereon. Any receptors that are determined to be of Local Importance (Lower Value) are not considered to be KERs. This is not to say that they are of no biodiversity value, but that impacts on these habitat types in their local context are not likely to result in a significant effect on biodiversity. It should be noted that this relates to the impact on the habitat itself as distinct from considering the role these habitat types play in supporting KER fauna species.

13.2.3.3 Characterisation of Impacts and Effects

The ecological effects of impacts arising from the Proposed Development are characterised as per the CIEEM ‘Guidelines for Ecological Impact Assessment in the UK and Ireland’ (2018, updated 2024) (hereafter referred to as CIEEM 2018 Guidelines). The CIEEM 2018 Guidelines are the industry standard for the completion of Ecological Impact Assessment (EclA) in the UK and Ireland. This chapter has also been

prepared in accordance with the corresponding EPA Guidelines (EPA 2022) as detailed in Section 1.2.1 of Chapter 1. The headings under which the impacts are characterised follow those listed in the guidance document and are applied where relevant. A summary of the impact characteristics considered in the assessment is provided below:

Positive or Negative. Assessment of whether the Proposed Development results in a positive or negative effect on the ecological receptor.

Extent. Description of the spatial area over which the effect has the potential to occur.

Magnitude Refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.

Duration is defined in relation to ecological characteristics (such as the lifecycle of a species) as well as human timeframes. For example, five years, which might seem short-term in the human context or that of other long-lived species, would span at least five generations of some invertebrate species.

Frequency and Timing. This relates to the number of times that an impact occurs and its frequency. A small-scale impact can have a significant effect if it is repeated on numerous occasions over a long period.

Reversibility. This is a consideration of whether an effect is reversible within a 'reasonable' timescale. What is considered to be a reasonable timescale can vary between receptors and is justified where appropriate in the impact assessment section of this report.

13.2.3.4 Determining the Significance of Effects

The ecological significance of the effects of the Proposed Development are determined following the precautionary principle and in accordance with the methodology set out in Section 5 of the CIEEM 2018 Guidelines.

For the purpose of EclA, 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local (CIEEM, 2018).

When determining significance, consideration is given to whether:

- Any processes or key characteristics of KERs will be removed or changed.
- There will be an effect on the nature, extent, structure and function of important ecological features.
- There is an effect on the average population size and viability of ecologically important species.
- There is an effect on the conservation status of important ecological habitats and species.

Integrity

In the context of EclA, 'integrity' refers to the coherence of the ecological structure and function, across the entirety of a site, that enables it to sustain all of the ecological resources for which it has been valued (NRA, 2009). Impacts resulting in adverse changes to the nature, extent, structure and function of component habitats and effects on the average population size and viability of component species, would affect the integrity of a site, if it changes the condition of the ecosystem to unfavourable.

Conservation status

An impact on the conservation status of a habitat or species is considered to be significant if it will result in a change in conservation status. According to CIEEM (2018) guidelines the definition for conservation status in relation to habitats and species are as follows:

- Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.
- Species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

As defined in the EU Habitats Directive 92/43/EEC, the conservation of a habitat is favourable when:

- Its natural range, and areas it covers within that range, are stable or increasing.
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future.
- The conservation status of its typical species is favourable.

The conservation of a species is favourable when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats.
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future.
- There is and will probably continue to be, a sufficiently large habitat to maintain its population on a long-term basis.

According to the NRA Ecological Impact Assessment Guidelines and CIEEM 2018 Guidelines, if it is determined that the integrity and/or conservation status of an ecological feature will be impacted on, then the level of significance of that impact is related to the geographical scale at which the impact will occur (i.e. local, county, national, international).

13.2.4 Desk Study Methodology

A comprehensive desk study was undertaken to inform this ecological impact assessment. This study includes a thorough review of available information that is relevant to the ecology of the site of the Proposed Development. This information provides valuable existing data and also helps in assessing the requirement for additional ecological surveys.

The following list describes the sources of data consulted:

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), Environmental Protection Agency (EPA)
- Review of the publicly available National Biodiversity Data Centre web-mapper
- Review of specially requested records from the NPWS Rare and Protected Species Database for the hectad in which the Proposed Development is located.
- Review of NPWS Article 17 Metadata and GIS Database Files
- NPWS Lesser horseshoe bat national dataset
- Limerick County Development Plan 2022 – 2028 (policies and objectives relating to biodiversity and green infrastructure.
- Limerick Biodiversity Action Plan 2025-2030
- Geological Survey Ireland (GSI) online mapping tool
- University of Bristol Speleological Society (UBSS) Cave Database for the Republic of Ireland
- The Archaeological Database of National Monument
- Review of other available ecological reports of the area (planning reference 221280¹).

¹ <https://eplanning.ie/LimerickCCC/AppFileRefDetails/221280/0>

13.2.5 Field Survey Methodology

13.2.5.1 Habitat and Invasive Species Surveys

Multidisciplinary walkover surveys, including invasive species surveys, were conducted on the 15th of August 2023, 24th of April 2024, and the 23rd of July 2025 in line with NRA (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes) by MKO. The ecological surveys were undertaken within the optimal time of year to undertake a habitat and flora survey (Smith et al. 2011). No works are proposed at the existing discharge point from the Plant within the Shannon Estuary. The multi-disciplinary surveys covered the extent of the Red Line Boundary and included both Limerick WWTP and Corcanree PS. The multi-disciplinary surveys also covered habitats adjacent to the Limerick WWTP and Corcanree PS which were deemed potentially suitable to host protected species with potential to be impacted by the works.

All habitats within and adjacent to the works area were readily identifiable during the site visit. A dedicated invasive species survey was also undertaken during the site visit. During the survey, the site was searched for species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations (S.I. 477 of 2011).

Habitats were identified in accordance with the Heritage Council's 'Guide to Habitats in Ireland' (Fossitt, 2000). Habitat mapping was undertaken with regard to guidance set out in 'Best Practice Guidance for Habitat Survey and Mapping' (Smith et al., 2011). Plant nomenclature for vascular plants follows 'New Flora of the British Isles' (Stace, 2019), while mosses and liverworts nomenclature follows 'Mosses and Liverworts of Britain and Ireland - a field guide' (British Bryological Society, 2010).

The walkover survey was designed to detect the presence, or likely presence, of a range of protected species, as further detailed in the sections below.

13.2.5.2 Otter Surveys

Dedicated otter surveys were undertaken on the 15th of August 2023, 24th of April 2024, and 23rd of July 2025. The surveys were carried out in accordance with NRA (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes) and NRA (2009) Guidelines for the Treatment of Otter During Construction of National Road Schemes. A search was carried out along drain ditches within and adjacent to the Limerick WWTP and Corcanree PS, as well as along the shores of Bunlicky Lake and associated inflowing watercourse to the north Limerick WWTP. The shore of the Shannon Estuary in the vicinity of Corcanree PS was also surveyed. The survey included a search for holts, couches, slides, spraints, prints and feeding remains.

13.2.5.3 Badger Surveys

Badger surveys were undertaken on the 15th of August 2023, 24th of April 2024, and 23rd of July 2025.

The surveys adhered to the guidance as set out in Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Roads Schemes (NRA 2009) and Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes (NRA 2006).

The survey included a search of the Limerick WWTP site and Corcanree PS site, including perimeter habitats, and the stormtank footprint area adjacent to Corcanree PS. The surveys focused on signs of badger activity, including identification of potential habitat areas likely to be of significance to badger.

The badger survey involved a search for all potential badger signs as per NRA 2009 (latrines, badger paths and setts) and Scottish Natural Heritage (SNH) (2003):

- Faeces: Badgers usually deposit faeces in characteristic excavated pits, concentrations of which (latrine sites) are typically found at home range boundaries.

- Setts, comprising either single isolated holes or a series of holes, likely to be interconnected underground.
- Paths between setts or leading to feeding areas.
- Scratching posts at the base of tree trunks.
- Snuffle holes (small scrapes where Badgers have searched for insects, earthworms and plant tubers).
- Day nests (bundles of grass and other vegetation where Badgers may sleep above ground).
- Hair traces.
- Prints.

13.2.5.4 Bat Surveys

13.2.5.4.1 Bat Habitat Appraisal and Preliminary Roost Assessment

Landscape features within the Limerick WWTP and Corcanree PS were visually assessed for their potential to support roosting, commuting and foraging bats, following the methodology set out in *Bat Conservation Trust's Bat Surveys for Professional Ecologists: Good Practice Guidelines* (4th Edn.) (Collins, 2023). The purpose of this appraisal was to identify habitats of relevance to bats and to inform the requirement for, and scope of, further survey work.

Table 4.1 of the BCT Guidelines provides a grading protocol for assessing bat roosting suitability in structures, as well as commuting and foraging habitat quality. This classification system is summarised in Table 13-1 and assigns features to one of five Suitability Categories: *High*, *Moderate*, *Low*, *Negligible* or *None*. Table 4.2 of the Guidelines outlines a parallel tree-assessment protocol using three categories: No Suitability (NONE), Further Assessment Required (FAR), and Potential Roosting Feature present (PRF). The identification of PRFs further distinguishes between features likely to support a small number of bats (PRF-I) and those capable of supporting larger or maternity roosts (PRF-M). This tree-level suitability assessment provides the basis for a Preliminary Roost Assessment (PRA).

TABLE 13-1 BCT PROTOCOL FOR BAT HABITAT APPRAISALS (COLLINS, 2023)

Assessment	Rationale
High	Structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions, and surrounding habitat. Continuous, high-quality, well-connected habitats, connected to known roosts.
Moderate	A structure used by bats due to their size, shelter, protection, conditions and surrounding habitat, but are unlikely to support a roost of high conservation status, and suitable, connected habitats.
Low	Structures with one or more potential roost sites that could be used by an individual bat opportunistically, and suitable but isolated habitats that could be used by a small number of bats.
Negligible	No obvious features present, but a level of uncertainty remains.
None	No habitat features likely to be used by roosting, foraging or commuting bats.

A Preliminary Roost Assessment (PRA) of the site was undertaken to identify the presence of any potential roosting features (PRFs). The survey aimed to determine whether roosting bats or potential access points were present, to locate any suitable roosting structures or trees, and to establish the potential requirement for further survey effort or mitigation.

Buildings and structures within the Proposed Development were assessed for their potential bat roosting suitability. All trees within the boundary were examined from ground level for features indicative of potential roosting opportunities, including rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches, and other PRFs as described by Andrews (2018).

13.2.5.4.2 Manual Surveys

Manual activity surveys consisted of night-time bat walkovers (NBW). The aim of these surveys was to observe bat species using the site and visually assess bat behaviour and important features used by bats within the site. For each of the surveys, surveyors were equipped with active full spectrum bat detectors, Batlogger M (Elekon AG, Lucerne, Switzerland). Where possible, species identification was made in the field and any other relevant information was also noted, e.g., numbers, behaviour, features used, etc. All bat echolocation was recorded for subsequent analysis to confirm species identifications, as detailed in Section 13.2.5.4.5.

The transects were walked by two surveyors, recording bats in real time. They were completed within 2 hours after sunset. The transect routes were prepared with reference to the desktop and walkover survey results, as well as any health and safety considerations and access limitations. The survey effort is summarised in Table 13-2. In addition, an emergence survey of Spillane's Tower and an adjacent subterranean concrete structure was carried out on the 23rd of July 2025. Please note that whilst an additional night-time bat walkover was not carried out at Limerick WWTP more recently than 2023, that static detectors were placed on the site for monitoring for over 3 weeks in 2025 as detailed in Section 13.2.5.4.4. This survey effort is considered sufficient to inform the assessment of bat usage of the site.

TABLE 13-2 BAT ACTIVITY SURVEY EFFORT

Date	Surveyors	Type/Location	Transect start/end	Weather
15/08/2023	Laura Granicz and Emily Fair	Night-time bat walkover at Limerick WWTP	Start time: 21:01 End time: 23:01	17 - 19°C, Dry, Calm, 0 - 50% cloud cover
24/08/2023	David Culleton and Emily Fair	Night-time bat walkover at Corcanree PS	Start 20:25 End 22:25	19°C, Dry-Light drizzle, Calm
23/07/2025	Rachel Walsh and Aoife Joyce	Night-time bat walkover at Corcanree PS and emergence surveys	Start 9.40 End 22.55	18°C, Dry, Calm, 90% cloud cover

13.2.5.4.3 Static Detector Surveys 2023

Two full spectrum SM4 bat detectors (Wildlife Acoustics, Maynard, MA, USA), were deployed during static surveys to record bat activity for a 9-night period. The detectors were deployed on 15th August 2023 and collected on 24th August 2023. The two locations of static detectors were selected to provide coverage of both sites.

Settings used were those recommended by the manufacturer for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates. Static detector locations are shown in Map Figure 13-6 in Volume 3 Figures and presented in Table 13-3.

TABLE 13-3 STATIC DETECTOR LOCATIONS 2023

Detector ID	IG Reference	Habitat	Deployment	Collection
D01 (Corcanree PS)	R 55390 56222	WL1	15 th August 2023	24 th August 2023

Detector ID	IG Reference	Habitat	Deployment	Collection
D02 (Limerick WWTP)	R 54577 55799	WL1	15 th August 2023	24 th August 2023

13.2.5.4.4 Static Detector Surveys 2025

Two full spectrum SM4 bat detectors (Wildlife Acoustics, Maynard, MA, USA), were deployed during static surveys to record bat activity for approximately 3 weeks. The detectors were deployed on the 23rd of July 2025 and collected on 14th August 2025. The two locations of static detectors were selected to provide cover of potential favourable bat habitats and provide coverage of both sites.

Settings used were those recommended by the manufacturer for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates. Static detector locations are shown in Map Figure 13-7 in Volume 3 Figures and presented in Table 13-4.

TABLE 13-4 STATIC DETECTOR LOCATIONS 2025

Detector ID	IG Reference	Habitat	Deployment	Collection
D01 (Limerick WWTP)	R 54539 55606	WD1	23 rd of July 2025	14 th August 2025
D02 (Corcanree PS)	R 55445 56206	WD1	23 rd of July 2025	14 th August 2025

13.2.5.4.5 Bat Call Analysis

All acoustic recordings were analysed using Kaleidoscope Pro v.5.7.0 (Wildlife Acoustics, MA, USA) to determine the bat species or species groups present at the Proposed Development site. Initial species identification was carried out using Kaleidoscope's automated classifier, after which all identifications were manually verified.

Manual verification involved comparing echolocation call characteristics—such as signal shape, peak frequency of maximum energy, slope, pulse duration, start and end frequencies, bandwidth, inter-pulse interval, and power spectrum—to published reference data for Irish bat species (Russ, 2012). Due to the similarity in their echolocation calls, *Myotis* species (e.g., Daubenton's bat (*Myotis daubentonii*), Whiskered bat (*Myotis mystacinus*), and Natterer's bat (*Myotis nattereri*)) were grouped together and reported as *Myotis* spp.

Common pipistrelle (*Pipistrellus pipistrellus*) and Soprano pipistrelle (*Pipistrellus pygmaeus*) were distinguished primarily by their peak frequencies in search-phase calls (~46 kHz and ~55 kHz respectively; Jones & van Parijs, 1993). In instances where species-level identification was not confidently possible due to call overlap or low quality, calls were assigned at the genus level.

Brown long-eared bat (*Plecotus auritus*) produces very quiet echolocation calls that are often not detected by static detectors. As such, all recordings, including those labelled as 'noise' by the software, were manually checked to ensure potential *Plecotus* calls were not overlooked.

Individual bats cannot be distinguished by echolocation alone; therefore, bat activity was measured using the number of 'bat passes.' A bat pass was defined as a recording containing at least two echolocation pulses of a single species or species group, within a maximum 15-second window (Collins, 2023).

To ensure consistency and allow for valid comparisons across datasets, each registration (i.e., continuous audio file) was treated as a single bat pass event. Where more than one species was detected within the same registration, the rarer or more conservation-significant species was assigned. This approach reduces the risk of overestimating bat activity while ensuring that important records of less common species are captured, particularly in periods of high activity where call overlap is common.

13.2.5.5 Wintering Bird Surveys

Full details of Wintering Bird Survey Methodologies are provided in Appendix 13-1 in Volume 4 of this EIAR.

Wintering Bird Surveys were undertaken within the Limerick WWTP and Corcanree PS, as well as suitable surrounding habitats, during the 2020/2021, 2022/2023 and 2024/2025 wintering seasons. The survey area covered the development site at Limerick WWTP and Corcanree PS, and areas of potentially suitable supporting habitat in proximity to the Proposed Development site including areas of agricultural grassland adjacent to Limerick WWTP, Bunlicky Lake, the estuarine habitat adjacent to the outfall at Bunlicky and the estuarine habitat adjacent to Corcanree Pumping station.

The surveys were undertaken monthly between October and March. Surveys were undertaken at alternate high/low tides, within two hours of high/low tide. A combination of low and high tide counts has been used due to the differences in behaviour and site use between tidal states, with different species likely to be foraging and roosting in different areas of River Shannon and River Fergus Estuaries SPA and the surrounding terrestrial habitats, depending on the stage of the tidal cycle.

The surveys were undertaken by an appropriately qualified Ecologist (surveyor details provided in the Appendix). All observations were recorded, and detailed point data was gathered for each species observation, with all bird species denoted using standard British Trust for Ornithology (BTO) codes and with the number of each species recorded next to each registration. The target species recorded in the surveys were those covered by Irish Wetlands Bird Survey (I-WeBS) counts, i.e., all divers, grebes, cormorant, shag, herons, swans, geese, ducks, rails, crakes, waders, gulls, and kingfisher. However, in addition to this, all other bird species, including raptors and all common and widespread passerines, were also recorded from within the proposed development sites.

The winter bird surveys at the nearby SPA followed the Irish Wetland Bird Survey (I-WeBS) methodology; the simple 'look-see' method, whereby all birds present within a predefined area are counted (Gilbert et al., 1998; Bibby, C.J., 2000; Birdwatch Ireland, 2018). The surveys were carried out at suitable vantage points within the sites, additional vantage points located overlooking the section of the River Shannon and River Fergus Estuaries SPA in close proximity to the Proposed Development sites. Vantage points were chosen to have as large as possible a view of the Proposed Development sites, adjacent wetland habitats and potential adjacent daytime foraging habitat in the vicinity of the Proposed Development sites. The chosen vantage points were stopped at for 15-minute intervals each, along the transect walk on each survey day. Vantage points focused on areas which were deemed to be of likely significance to wintering waterbirds of River Shannon and River Fergus Estuaries SPA. Walked transects were undertaken within the site boundaries in conjunction with vantage point surveys.

13.2.5.6 Survey Limitations

All ecological surveys were undertaken within the appropriate time of year for ecological surveys, including habitat and flora surveys (Smith et al. 2011), bat surveys, mammal surveys and wintering bird surveys. No significant access issues which hindered the assessment were encountered. A full and comprehensive survey was achieved.

13.3 Baseline Environment

13.3.1 Desk Study Results

13.3.1.1 Designated Sites

Special Areas of Conservation (SACs) and Special Protection Areas for Birds (SPAs) are sites preserved for nature conservation as designated under the European Habitats Directive and are collectively known as 'Natura 2000 or European Sites'. The potential for effects on European Sites is fully considered in the AA Screening Report and Natura Impact Statement that accompanies this application. The European Sites that are within the Zone of Likely Impact are considered under the Appropriate Assessment process and are listed in the AASR and NIS which accompany this application. The Article 6(3) Appropriate Assessment Screening report identified the potential for the proposed development to result in significant effects on the following European Sites:

- Lower River Shannon SAC [002165]
- Lower River Shannon and River Fergus Estuaries SPA [00407]

The EPA Guidance (2022) states *"A biodiversity section of an EIAR, for example, should not repeat the detailed assessment of potential effects on European sites contained in documentation prepared as part of the Appropriate Assessment process, but it should refer to the findings of that separate assessment in the context of likely significant effects on the environment, as required by the EIA Directive."*

Therefore, the assessment of impacts on European Sites is not repeated here. However, Section 13.4.4 provides a summary of the key assessment findings with regard to European Designated Sites.

The potential for impacts on Nationally Designated Sites is considered in this chapter. Natural Heritage Areas (NHAs) are designated under the Wildlife (Amendment) Act 2000 and their management and protection is provided for by this legislation and planning policy. The potential for effects on these designated sites is fully considered in this EIAR.

Proposed Natural Heritage Areas (pNHAs) were designated on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. However, the potential for effects on these designated sites is fully considered in this EIAR.

The following methodology was used to establish which Nationally Designated Sites have the potential to be impacted by the proposed development:

- Initially the most up to date GIS spatial datasets for all Nationally Designated Sites and water catchments were downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie). The datasets were utilized to identify Designated Sites which could feasibly be affected by the proposed development.
- All European Designated Sites that could potentially be affected were identified using a source-pathway - receptor model and a map of all the European Designated Sites around the Development Site is provided in Figure 13-1. Similarly, a map of the Nationally Designated Sites is provided in Figure 13-2.
- Catchment mapping was used to establish or discount potential hydrological connectivity between the site of the Proposed Development and any Nationally Designated Sites. The hydrological catchments are also shown in Map Figure 13-1 and Map Figure 13-2 in Volume 3 Figures.
- Table 13-5 provides details of all relevant Nationally Designated Sites as identified in the preceding steps and assesses which, if any, are within the likely Zone of Influence.
- The site synopses for these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report.

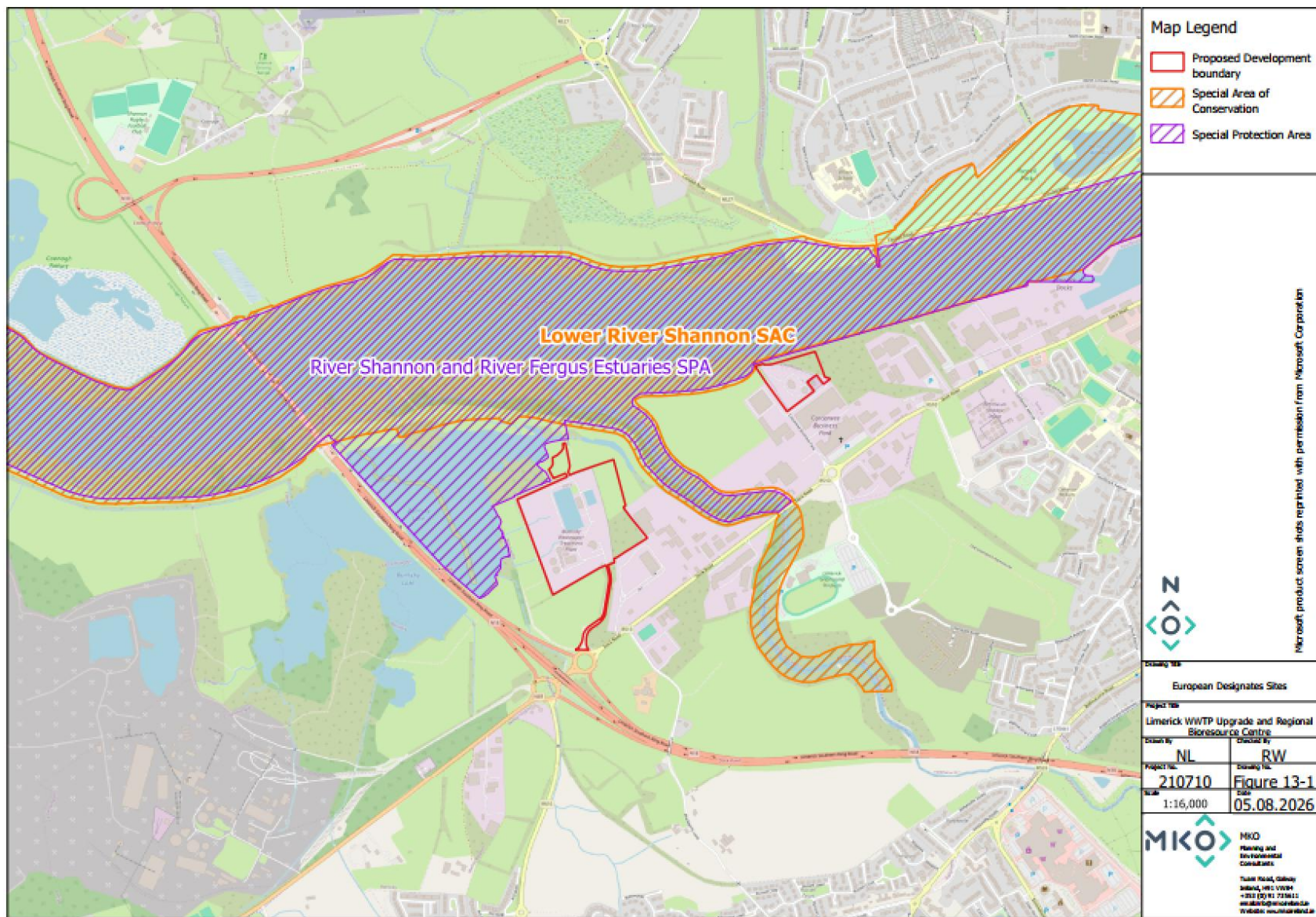


FIGURE 13-1 EUROPEAN DESIGNATED SITES

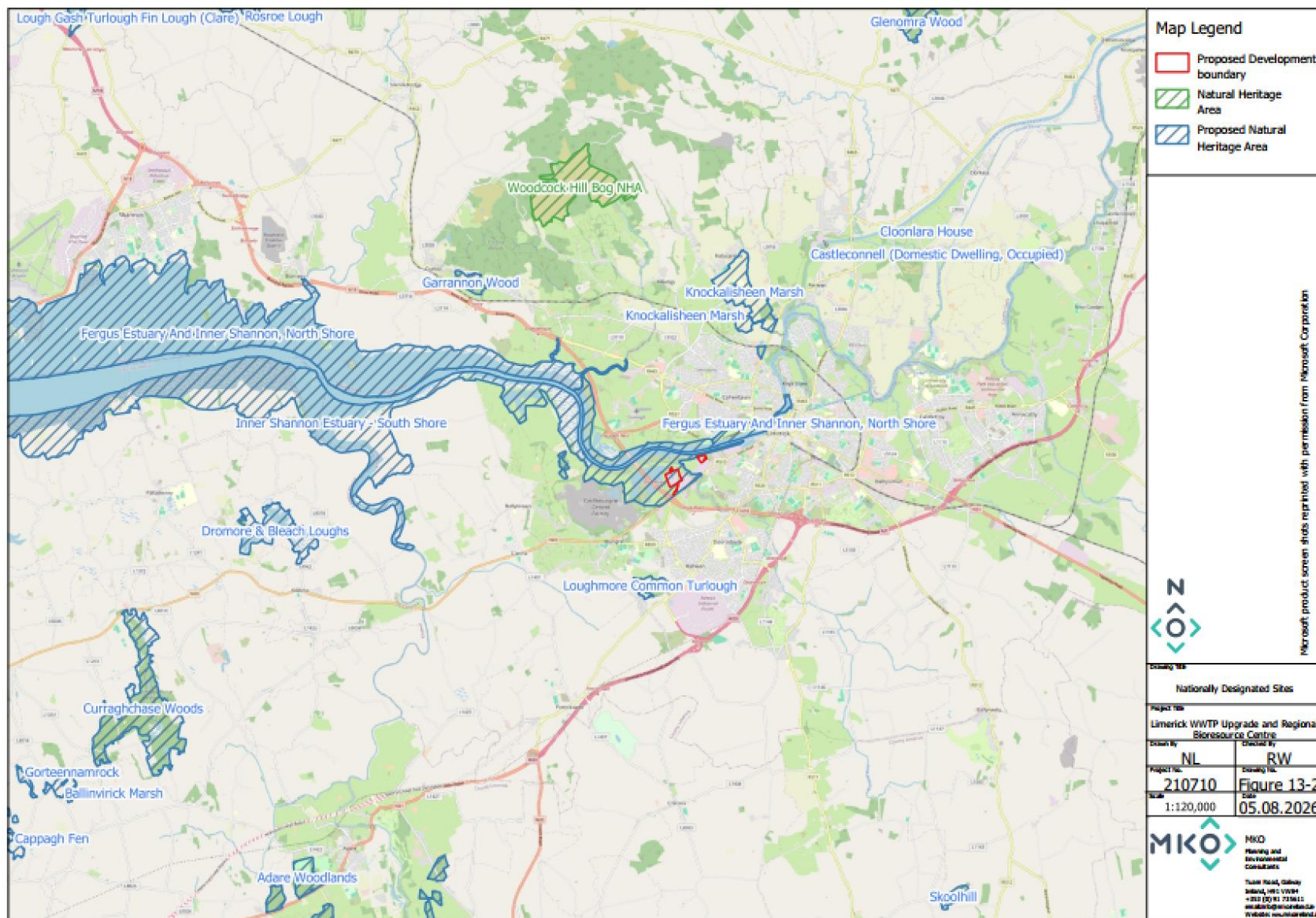


FIGURE 13-2 NATIONALLY DESIGNATED SITES

TABLE 13-5 DESIGNATED SITES IN THE LIKELY ZONE OF INFLUENCE

Designated Sites and distance from proposed development	Likely Zone of Influence Determination
Natural Heritage Areas (NHA)	
Woodcock Hill Bog NHA [002402] Distance: 7.1km	There will be no direct effects as the Proposed Development is located entirely outside of this designated site. There is no source-pathway-receptor chain for effect as the designated site is within a separate hydrological catchment to the Proposed Development site. There is no potential for indirect effect. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.
Gortacullin Bog NHA [002401] Distance: 13.8km	There will be no direct effects as the Proposed Development is located entirely outside of this designated site. There is no source-pathway-receptor chain for effect as the designated site is located upgradient of the Proposed Development site and is designated for terrestrial habitats. There is no potential for indirect effect. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.
Proposed Natural Heritage Areas (pNHA)	
Fergus Estuary and Inner Shannon, South Shore [000435] Distance: 0km	The Limerick WWTP is located within the boundary of this pNHA. The Proposed Development works have the potential to cause deterioration of water quality within the designated site as a result of construction and operation. The pNHA is considered to be within the Likely Zone of Influence and further assessment is required.
Fergus Estuary and Inner Shannon- North Shore [002048] Distance: 140m	There is no potential for direct effect on this designated site as the proposed development is located entirely outside of this designated site. Taking a precautionary approach, the Proposed Development works have the potential to cause deterioration of water quality within the designated site. The pNHA is located on the opposite bank of the Shannon Estuary relative to the Proposed Development. The pNHA is considered to be within the Likely Zone of Influence and further assessment is required.
Loughmore Common Turlough [000438] Distance: 2.3km	There will be no direct effect as the proposed development is located entirely outside this designated site. This pNHA is located to the south and upgradient of the Proposed Development site. There is no source-pathway-receptor chain for effect, therefore there is no potential for indirect effect on the designated site. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.

Designated Sites and distance from proposed development	Likely Zone of Influence Determination
Knockalisheen Marsh [002001] Distance: 2.8km	There will be no direct effect as the proposed development is located entirely outside the designated site. There is no downstream hydrological connectivity from the development site to the pNHA. There is no source-pathway-receptor chain for effect, therefore there is no potential for indirect effect on the designated site. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.
Garrannon Wood [001012] Distance: 6.6km	There will be no direct effect as the proposed development is located entirely outside the designated sites. Due to the terrestrial nature of the pNHA, the intervening distance between the pNHA and the Proposed Development site, and a lack of a source-pathway-receptor chain for effect, there is no potential for indirect effect on this site. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.
Cloonlara House [000028] Distance: 8.1km	There will be no direct effect as the Proposed Development is located entirely outside the designated site. This roost for which the site is designated is located in a three-storey domestic dwelling house and contains over 100 Leisler's Bats (<i>Nyctalus leisleri</i>) during the summer months. According to Bat Conservation Trust – <i>Bat Surveys for Professional Ecologists</i> (Collins 2023), Leisler's bats have a Core Sustenance Zone (CSZ) of 3km from the roost. Due to the intervening distance of 8.1km between the development site and the pNHA, the bat roost is unlikely to be affected by the proposed development. Due to the intervening distance between the pNHA and the Proposed Development site, there is no potential for indirect effect. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.
Dromore & Bleach Loughs Distance: 9.1km	There will be no direct effect as the proposed development is located entirely outside the designated site. There is no hydrological connectivity between the pNHA site and the Proposed Development. There is no source-pathway-receptor chain for effect, therefore, there is no potential for indirect effect. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.
Castleconnell (Domestic Dwelling, Occupied) [000433]	There will be no direct effect as the proposed development is located entirely outside the designated site.

Designated Sites and distance from proposed development	Likely Zone of Influence Determination
Distance: 9.8km	According to Bat Conservation Trust – <i>Bat Surveys for Professional Ecologists</i> (Collins 2023), Irish bat species Core Sustenance Zone ranges between 1 and 4km from roost sites. Due to the intervening distance between the development site and the pNHA, the bat roost is unlikely to be affected by the Proposed Development. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.
Adare Woods [000429] Distance: 11.1km	There will be no direct effect as the Proposed Development is located entirely outside the designated sites. Due to the terrestrial nature of the pNHAs, the intervening distance between the pNHAs and the development site, and a lack of a source-pathway-receptor chain for effect, there is no potential for indirect effects on these sites. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.
Tory Hill [000439] Distance: 11.3km	
Glenomra Wood [001013] Distance: 11.9km	
Skoolhill [001996] Distance: 12.7km	
Curraghchase Woods [000174] Distance: 13.8km	
Castle Lake [000239] Distance: 13.8km	There will be no direct effect as the proposed development is located entirely outside the designated site. Due to the lack of hydrological connectivity between the Proposed Development and the pNHA as well as the intervening distance, there is no potential for indirect effects on this site. No pathway for significant effect was identified, and the site is not within the Likely Zone of Influence.

13.3.1.2 New Flora Atlas

A search was made in the New Atlas of the British & Irish Flora (Preston et al., 2002) to investigate whether any rare or unusual plant species listed in Annex II of the Habitats Directive, which are listed as rare on the Red Data List (Curtis and McGough 1988), or protected under the Flora (Protection) Order 2022, had been recorded in the relevant 10km square in which the study site is situated (R55) (shown in Plate 13.1), during the 1987-1999 atlas survey. The results of the search are included in the Table 13-6 below.

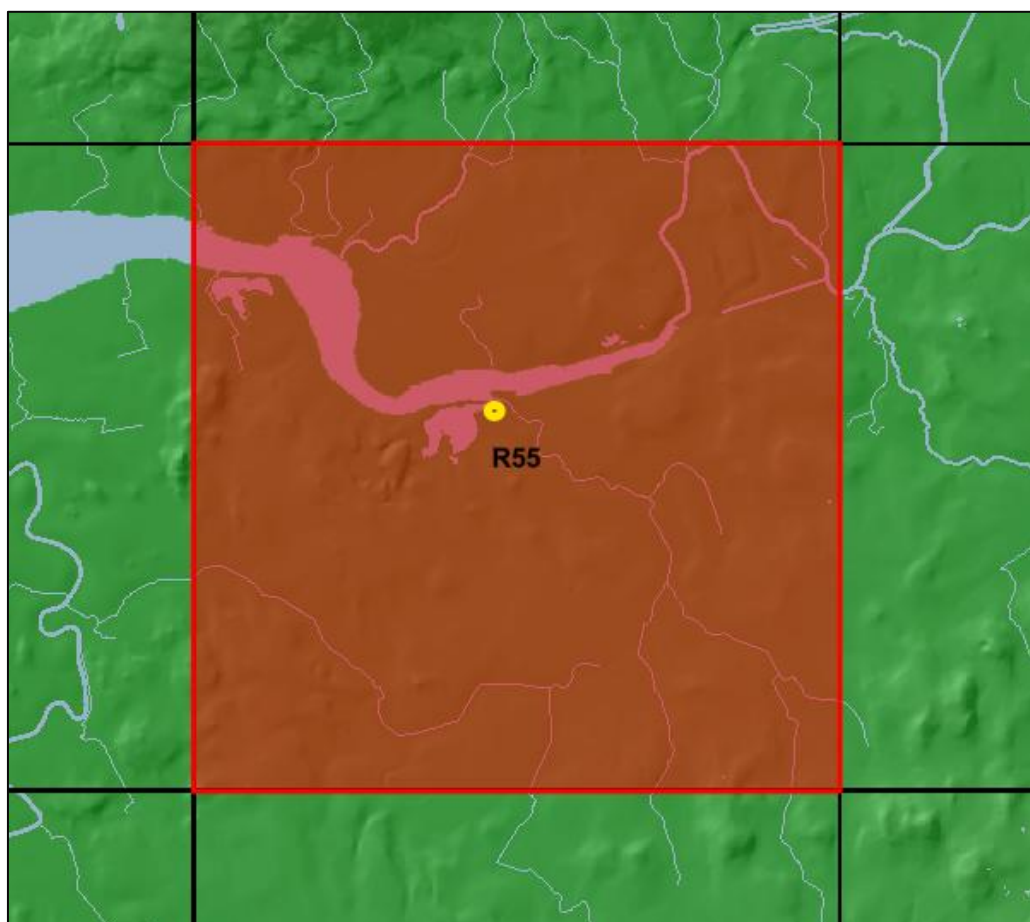


PLATE 13-1 GRID SQUARE R55 IN RELATION TO LIMERICK WWTP (YELLOW DOT). SOURCE: ([HTTPS://MAPS.BIODIVERSITYIRELAND.IE/MAP](https://maps.biodiversityireland.ie/map))

TABLE 13-6 RECORDS OF SPECIES LISTED UNDER THE FLORA (PROTECTION) ORDER 2022 OR THE IRISH RED DATA BOOK FOR VASCULAR PLANTS RECORDED IN THE GRID SQUARE R55

Common Name	Scientific Name	Status RL – Red Listed NT – Near Threatened VU – Vulnerable FPO – Flora Protection Order
Autumn crocus	<i>Colchium autumnale</i>	EN, FPO
Dittander	<i>Lepidium latifolium</i>	VU
Green Figwort	<i>Scrophularia umbrosa</i>	NT
Green-winged Orchid	<i>Orchis morio</i>	VU
Large-flowered Hemp-nettle	<i>Galesopsis speciosa</i>	NT

Common Name	Scientific Name	Status RL – Red Listed NT – Near Threatened VU – Vulnerable FPO – Flora Protection Order
Marsh Mallow	<i>Althaea officinalis</i>	NT
Meadow Barley	<i>Hordeum secalinum</i>	VU, FPO
Meadow Brome	<i>Bromus commutatus</i>	NT
Northern Dead nettle	<i>Lamium confertum</i>	NT
Opposite-leaved Pondweed	<i>Groenlandia densa</i>	NT, FPO
Pale Flax	<i>Linum bienne</i>	NT
Pennyroyal	<i>Mentha pulegium</i>	EN, FPO
Slender Naiad	<i>Najas flexilis</i>	RL (NT)
Slender Thistle	<i>Carduus tenuifloris</i>	NT
Slender Tufted sedge	<i>Carex acuta</i>	NT
Smooth Brome	<i>Bromus racemosus</i>	NT
Spiked sedge	<i>Carex spicata</i>	NT
Triangular Club rush	<i>Schoenoplectus triquetus</i>	NT, FPO
Tubular water dropwort	<i>Oenathe fistulosa</i>	NT, FPO

13.3.1.3 National Biodiversity Data Centre Records

The National Biodiversity Data Centre database was accessed on 22/08/2025 and the following information was obtained. Table 13-7 lists the protected faunal species (excluding birds) recorded within the hectad which pertains to the current study area (R55). The database was also searched for records of Third Schedule non-native invasive species within the hectad. Table 13-8 lists the non-native invasive species recorded within the hectad. Table 13-9 lists all the protected bird species recorded within the hectad which pertains to the current study area.

TABLE 13-7 NBDC RECORDS FOR PROTECTED FAUNA (EXCL. BIRDS) FOR HECTAD R55

Common Name	Scientific Name	Status
Badger	<i>Meles meles</i>	WA
Bottle-nosed Dolphin	<i>Tursiops truncatus</i>	Annex II, IV, WA
Brown Long-eared Bat	<i>Plecotus auritus</i>	Annex IV, WA
Common Frog	<i>Rana temporaria</i>	Annex V, WA
Daubenton's Bat	<i>Myotis daubentonii</i>	Annex IV, WA
Hedgehog	<i>Erinaceus europaeus</i>	WA
Leisler's Bat	<i>Nyctalus leisleri</i>	Annex IV, WA
Nathusius' Pipistrelle	<i>Pipistrellus nathusii</i>	Annex IV, WA
Otter	<i>Lutra lutra</i>	Annex II, IV, WA

Common Name	Scientific Name	Status
Pine Marten	<i>Martes martes</i>	Annex V, WA
Pipistrelle	<i>Pipistrellus pipistrellus sensu lato</i>	Annex IV, WA
Pygmy Shrew	<i>Sorex minutus</i>	WA
Red Squirrel	<i>Sciurus vulgaris</i>	WA
Smooth Newt	<i>Lissotriton vulgaris</i>	WA
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	Annex IV, WA

Annex II, Annex IV, Annex V – Of EU Habitats Directive, WA – Irish Wildlife Acts (as amended) FPO= Flora Protection Order.

TABLE 13-8 NBDC RECORDS FOR INVASIVE SPECIES FOR HECTAD R55.

Common Name	Scientific Name
American mink	<i>Neovision vison</i>
Greater White-toothed Shrew	<i>Crocidura russula</i>
Giant Hogweed	<i>Heracleum mantegazzianum</i>
Himalayan Balsam	<i>Impatiens glandulifera</i>
Japanese Knotweed	<i>Reynoutria japonica</i>
Greylag Goose	<i>Anser anser</i>
Ring-necked parakeet	<i>Psittacula krameri</i>

TABLE 13-9 NBDC RECORDS FOR BIRDS FOR HECTAD R55

Common Name	Scientific Name	Status
Peregrine	<i>Falco peregrinus</i>	Annex I EU Birds Directive
Red-throated Diver	<i>Gavia stellata</i>	
Kingfisher	<i>Alcedo atthis</i>	Annex I, EU Birds Directive,
Whooper Swan	<i>Cygnus cygnus</i>	
Gadwall	<i>Mareca strepara</i>	Annex II EU Birds Directive
Rock Dove	<i>Columba livia</i>	
Coot	<i>Fulica atra</i>	Annex II, III EU Birds Directive
Mallard	<i>Anas platyrhynchos</i>	
Pheasant	<i>Phasianus colchius</i>	
Snipe	<i>Gallinago gallinago</i>	
Teal	<i>Anas crecca</i>	
Tufted Duck	<i>Aythya fuligula</i>	
Wigeon	<i>Mareca penelope</i>	
Woodpigeon	<i>Columba palumbus</i>	
Goldeneye	<i>Bucephala clangula</i>	Annex II EU Birds Directive

Common Name	Scientific Name	Status
Lapwing	<i>Vanellus vanellus</i>	Red List
Pochard	<i>Aythya ferina</i>	Annex II, III EU Birds Directive
Shoveler	<i>Spatula clypeata</i>	Red List
Snipe	<i>Gallinago gallinago</i>	Red List
Shoveler	<i>Spatula clypeata</i>	
Pochard	<i>Aythya ferina</i>	
Grey Wagtail	<i>Motacilla cinerea</i>	
Lapwing	<i>Vanellus vanellus</i>	
Barn Owl	<i>Tyto alba</i>	

Annex I, II, III – Of EU Birds Directive, Red List – Birds of Conservation Concern in Ireland.

13.3.1.4 NPWS Data

A data request was sent to the NPWS and data received in relation to the hectad R55 on the 25.08.2025. The table below lists the rare and protected species records obtained from the NPWS during this study. According to NPWS records, here are no records of Lesser Horseshoe bat roosts within 3km of the development site.

TABLE 13-10 RECORDS FOR RARE AND PROTECTED SPECIES, NPWS.

Common Name	Scientific Name	Status
Common Lizard	<i>Zootoca vivipara</i>	Wildlife Act,
Common Frog	<i>Rana temporaria</i>	Wildlife Act, Annex V
Eurasian Badger	<i>Meles meles</i>	Wildlife Act
Eurasian Otter	<i>Lutra lutra</i>	Wildlife Act, Annex II, Annex IV
Eurasian pygmy shrew	<i>Sorex minutus</i>	Wildlife Act
Green figwort	<i>Scrophularia umbrosa</i>	NT
Green-winged orchid	<i>Orchis morio</i>	VU
Irish hare	<i>Lepus timidus subsp. hibernicus</i>	Wildlife Act, Annex V
Lesser Horseshoe bat	<i>Rhinolophus hipposideros</i>	Wildlife Act, Annex II, Annex IV
Meadow Barley	<i>Hordeum secalinum</i>	FPO
Meadow saffron	<i>Colchicum autumnale</i>	FPO
Northern dead-nettle	<i>Lamium confertum</i>	NT
Opposite-leaved pondweed	<i>Groenlandia densa</i>	FPO, NT

Common Name	Scientific Name	Status
Pennyroyal	<i>Mentha pulegium</i>	FPO, EN
River lamprey	<i>Lampetra fluviatilis</i>	Annex II, Annex V
Sea lamprey	<i>Petromyzon marinus</i>	Annex II
Smooth brome	<i>Bromus racemosus</i>	NT
Smooth newt	<i>Lissotriton vulgaris</i>	WA
Spiked sedge	<i>Carex spicata</i>	NT
Triangular club-rush	<i>Schoenoplectus triqueter</i>	FPO, NT
West European hedgehog	<i>Erinaceus europaeus</i>	Wildlife Act

Annex II, Annex IV, Annex V – Of EU Habitats Directive, WA – Irish Wildlife Acts (1976-2021), Red Data List (Curtis and McGough 1988), BoCCI Red List – Birds of Conservation Concern in Ireland (Population for which the species is red listed in brackets), AEWA -Agreement on the Conservation of African-Eurasian Migratory Waterbirds [1999].

13.3.1.5 Other Ecological Reports

The reported ecological surveys undertaken for a development proposed adjacent to the Corcanree PS were reviewed as part of the desk study for further baseline data in the area (planning reference 221280²). The Flora Protection Order species, opposite-leaved pondweed (*Groenlandia densa*), was found within a drainage channel which is maintained by OPW and associated with a flood embankment along the Estuary. This plant is protected under the Wildlife Act (1976), as amended and the Flora (Protection) Order. The drainage channel is located to the northeast of the proposed stormtank footprint area at Corcanree PS. The channel is located completely outside of the Proposed Development site. There are no other waterbodies or suitable habitat for the species within the Proposed Development site.

13.3.1.6 Water Quality

The Limerick Sewage outfall is located in the upper section of the Shannon Estuary with specific licenced details as follows:

- Primary Discharge Point Code: DP1
- Location: 153944E 156252N
- WFD Code: IE-SH-060-0900

The treated effluent travels 1.1 km from the main plant to the outfall point via a 1,200 mm diameter HDPE pipe. It is transported by gravity flow during low tide and pumped during high tide. The discharge is released via a submerged diffuser chamber located at the headwall of the outfall structure. It then flows along a gabion mattress that extends a further 20 meters into the main river channel. Details of the diffuser chamber and outlet structure can be seen in Chapter 16 (Water Environment). The 2024 Annual Environmental Report (AER) reports a peak week organic collected load of 141,439 PE, and an annual max hydraulic loading rate of 85,606m³/day. The both the organic and hydraulic loading are within the design capacity. Existing water quality has been assessed as part of Chapter 16 (Water). A summary of baseline findings is provided below.

WFD Waterbody Status

The Limerick WWTP discharges into the transitional waterbody Limerick Dock. The main contribution of river water from upstream comes from the Shannon River, which is the WFD Shannon lower river.

² <https://eplanning.ie/LimerickCCC/AppFileRefDetails/221280/0>

Downstream of Limerick WWTP are the Upper Shannon Estuary (approx. 1km downstream) and the Maigue Estuary (approx. 10km downstream).

Limerick Dock and the Upper Shannon Estuary are of 'Poor Status.' The WFD assessment looks at a wide range of conditions (fish, phytoplankton, invertebrates, chemical conditions, etc.) to assess the current status. For the Upper Shannon estuary, the aquatic flora is insufficiently present (angiosperms).

TABLE 13-11 LOWER RIVER SHANNON WFD WATERBODY STATUS ATTRIBUTES

WFD Waterbody Status Limerick Dock	
Transitional Waterbody Code	IE_SH_060_0900
Protected Area	Yes
WFD Risk (3rd cycle)	At Risk
WFD Status (2019-2024)	Poor
Sub catchment	Ballynaclogh_SC_010
Pressures	Hydromorphology pressures
WFD Waterbody Status Upper Shannon Estuary	
Transitional Waterbody Code	IE_SH_060_0800
Protected Area	Yes
WFD Risk (3rd cycle)	At Risk
WFD Status (2019-2024)	Poor
Sub catchment	Ballynaclogh_SC_010
Pressures	Agriculture

13.3.1.7 Flood Risk

As described in Chapter 14 'Water', a review of the CFRAM Study, Limerick Strategic Flood Risk Assessment, Irish Coastal Wave and Water Level Study and national flood mapping indicates that both Limerick WWTP and Corcanree Pumping Station are located within Flood Zone A, representing a high risk of flooding. Both sites are also located within an area benefitting from existing arterial drainage and embankment defences.

The lands within Corcanree PS are partially impacted during a 0.1% coastal flood extent. In the absence of defences, flood waters would encroach on the northwest corner of the site. This area is only required for temporary works during the construction period, and flood waters do not reach the area of the site where the proposed storm tank will be situated.

13.3.1.8 Inland Fisheries Ireland Data

Inland Fisheries Ireland carried out fish stock surveys of the Shannon Estuary, Fergus Estuary and Limerick Docks in 2014 (Kelly et al. 2014). The Limerick Docks sampling site is approx. 7.5km downstream of Castletroy WWTP. A total of six beach seines, six fyke nets and six beam trawls were deployed in Limerick Docks water body in October 2014.

Limerick Docks

A total of 13 fish species were recorded in Limerick Docks. Flounder was the most abundant species, followed by smelt. In a similar trend to many of the other transitional water surveys, flounder was widespread, being recorded using all three netting methods.

A number of species were newly recorded in the 2014 survey, including lamprey sp., plaice, sand goby, smelt, sprat and thick-lipped grey mullet. Dace, an invasive species to this country, was also newly recorded in 2014. Common goby, pike and salmon were previously caught in 2008 but not captured in the 2014 survey of the Limerick Docks. European eel was also recorded during this survey.

Fish were recorded in the following order of decreasing frequency: Flounder (*Platichthys flesus*), Smelt (*Osmerus eperlanus*), Three-spined stickleback (*Gasterosteus aculeatus*), Roach (*Rutilus rutilus*), European eel (*Anguilla Anguilla*), Sprat (*Sprattus sprattus*), Dace (*Leuciscus leuciscus*), Perch (*Perca fluviatilis*), Sand goby (*Pomatoschistus minutus*), Brown trout (*Salmo trutta*), Lamprey sp., Plaice (*Pleuronectes platessa*), Thick-lipped grey mullet (*Chelon labrosus*).

Upper Shannon Estuary

A total of 22 fish species were recorded in the Upper Shannon Estuary in October 2014. Flounder was the most abundant species, followed by sprat and sand goby. Flounder was widely distributed throughout the water body, being captured using all three netting methods, while other species such as sand goby were more localised, only recorded in the shallow marginal areas using beach seines. A number of species were newly recorded in 2014, including Atlantic horse mackerel/scad, bib, brill, coalfish/saithe, fifteen-spined stickleback, pogge and grey gurnard. Long-spined sea scorpion, perch, poor cod and short-spined sea scorpion were previously caught in 2008 but not captured in the 2014 survey. European eel was also recorded during this survey.

Lower Shannon Estuary

A total of 29 fish species were recorded in the Lower Shannon Estuary in October 2014. Sprat was the most abundant fish species, followed by sand goby, thick-lipped mullet and sand smelt. Flounder was well distributed throughout this water body, being captured using all three netting methods. A number of species were newly recorded in 2014, including bib, coalfish/saithe, grey gurnard, mackerel and sand sole. A number of species were previously caught in 2008 but not captured in the 2014 survey, including black goby, cod, European sea bass and European eel. This was the only water body surveyed during 2014 in which thornback ray was recorded.

The report concludes that plaice, smelt, flounder, sand goby, and sprat were among the most abundant and widespread species recorded between Limerick Docks and the Lower Shannon Estuary.

13.3.1.9 Bat Species Range – Article 17 Report

Range maps from the Article 17 Reports (NPWS, 2019) were reviewed in relation to the proposed development locations. The sites lie within the current known range of seven resident Irish bat species:

- *Pipistrellus pipistrellus* (Common pipistrelle)
- *Pipistrellus pygmaeus* (Soprano pipistrelle)
- *Nyctalus leisleri* (Leisler's bat)
- *Plecotus auritus* (Brown long-eared bat)
- *Myotis daubentonii* (Daubenton's bat)
- *Myotis mystacinus* (Whiskered bat)
- *Rhinolophus hipposideros* (Lesser horseshoe bat)

The site lies outside the current known range for:

- *Pipistrellus nathusii* (Nathusius' pipistrelle)

- *Myotis nattereri* (Natterer's bat)

13.3.1.10 Bat Habitat and Landscape

A review of available mapping and site photographs provided an overview of the habitats and landscape features within the Proposed Development areas. The landscape is predominantly characterised by agricultural land with hedgerows, along with the Shannon Estuary, Bunlicky Lake and areas of scrub and woodland. Limerick City Centre is located east of Corcanree PS. According to the National Biodiversity Data Centre's Bat Landscape Suitability Map, the sites have a habitat suitability index score of 43.67 (red zone), indicating high suitability for bat activity.

The Geological Survey of Ireland (GSI) online karst mapping tool did not identify any subterranean geological features within the site boundaries or within 10km of the sites. A review of the UBSS Cave Database for the Republic of Ireland similarly confirmed that no caves occur within the sites or within 10km of the sites.

The archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats within the sites. No records of underground structures occur within the sites.

13.3.2 Field Study Results

13.3.2.1 Terrestrial Habitats

Limerick Wastewater Treatment Plant

A habitat map of the Limerick WWTP is provided in Figure 13-3. The majority of the site within the boundary of the WWTP comprises industrial buildings, WWTP infrastructure, areas of hardstanding, carparks and footpaths which are classified as buildings and artificial surfaces (BL3). Ornamental planting is also present categorised as flower beds and borders (BC4). Ornamentally planted trees within the site include 14 no. ash (*Fraxinus excelsior*), and 4 no. beech (*Fagus sylvatica*) planted to the south of the site. To the southwest of the site there are 4 no. beech, 1 no. ash and 4 no. Norway maple (*Acer platanoides*).

A thick treeline which is best classified as a linear woodland (WD1) surrounds the site and comprises ash, alder (*Alnus glutinosa*), hawthorn (*Crataegus monogyna*), goat willow (*Salix caprea*), grey willow (*Salix cinerea*) and basket willow (*Salix viminalis*) (Plate 13-3). Construction access is proposed through this narrow strip of woodland in two locations depicted on Figure 13-5.

Maintained and regularly mowed lawns within the site are classified as amenity grassland (GA2). These occur along the edges of footpaths and around infrastructure. Species include perennial rye grass (*Lolium perenne*), with common daisy (*Bellis perennis*), creeping buttercup (*Ranunculus repens*), white clover (*Trifolium repens*) and mouse ear chickweed (*Cerastium fontanum*).

Dry meadow/grassy verge habitat (GS2) occurs to the southwest of the site, adjacent to the anaerobic digestors. This comprises false oat grass (*Arrhenatherum elatius*), creeping thistle (*Cirsium arvense*), nettles (*Urtica dioica*), cocks foot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*) and great willowherb (*Epilobium hirsutum*). This grassland is of a high sward and is encroached with hedge bindweed (*Calystegia sepium*). This grassland slopes downwards towards the western trees.

Wet grassland (GS4) occurs to the south of the site and comprises cocks foot, Yorkshire fog, red fescue (*Festuca rubra*), birds foot trefoil (*Lotus corniculatus*), hard rush (*Juncus inflexus*), great willowherb, couch grass (*Elymus repens*), purple loosestrife (*Lythrum salicaria*), creeping buttercup, marsh thistle (*Cirsium palustre*). Meadowsweet (*Filipendula ulmaria*), soft rush (*Juncus effusus*) and knapweed (*Centaurea nigra*) are occasional. Alder saplings (*Alnus glutinosa*) are also present (Plate 13-4).

Within the west of the site, the grasslands are within a depressed area relative to adjacent surfaced areas. The southern extent of this area is classified as reed and large sedge swamp (FS1) interspersed with species

more typical of grassy verge (GS2). The area is species poor and dominated by false oat grass, reed canary grass (*Phalaris arundinaceae*), creeping thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*) and lesser pond sedge (*Carex acutiformis*). The northern area of the grassland is dominated by hard rush (*Juncus inflexus*) with soft rush (*Juncus effusus*) and is classified as wet grassland (GS4). Also present are patches of common reed (*Phragmites australis*) and birds foot trefoil (*Lotus corniculatus*).

Narrow, short strips of wet woodland (WN6) run along the southern boundary and bisect the centre of the above-described grassland habitats. These woodlands are within wet depressions and comprise basket willow, grey willow, and alder. These habitats do not conform to the Annex I habitat type given their small size, context and lack of understory indicators. As outlined in Irish Wildlife Manual (IWM) 146- *The Monitoring and Assessment of four EU Habitats Directive Annex I Woodland Habitats*³:

'Strips which are short, narrow and discontinuous and surrounded by open habitat should not be assigned to 91E0, if they cannot be considered to be functioning woodlands.'

Within the northeast of the site is a high sward grassland classified as dry meadow/grassy verge (GS2), dominated by perennial rye grass, broad leaved dock (*Rumex obtusifolius*), spear thistle (*Cirsium vulgare*) and ragwort (*Senecio jacobaea*). Also frequent are birds foot (*Lotus corniculatus*), meadow vetchling (*Lathyrus pratensis*), creeping buttercup (*Ranunculus repens*) and occasional purple loosestrife. To the east of the site is a wet grassland (GS4) comprising hard rush (*Juncus inflexus*), sedges (*Carex sp.*), birds foot and creeping thistle.

Some small areas of broadleaved woodland (WD1) are present within the southeast of the site and consist of birch (*Betula pubescens*), ash, alder, elm (*Ulmus sp.*) and sycamore (*Acer pseudoplatanus*).

Outside of the boundary of the WWTP to the north is an existing compound area used for storage of materials, categorised as recolonising bare ground (ED3). East of this area is an agricultural grassland (GA1) located adjacent to an unmapped watercourse, categorised as a lowland depositing river (FW2), which is connected to Bunlicky Lake.

To the northeast, outside of the WWTP site boundary, is a riparian woodland (WN5) which is approx. 20 years old (Plate 13-5). The woodland is dominated by willows (*Salix cinerea*, *Salix viminalis*, *Salix caprea*) and occasional hawthorn, with an understorey of reed canary grass (*Phalaris arundinaceae*), nettle, and occasional purple loosestrife (*Lythrum salicaria*), remote sedge (*Carex remota*), cleavers (*Galium aparine*), creeping thistle, meadowsweet, wood avens (*Geum urbanum*), creeping buttercup, pendulous sedge (*Carex pendula*) and rarely, hemlock water dropwort (*Oenanthe crocata*). *Kindbergia praelonga* is found growing on some trees. This habitat is a young, establishing riparian woodland and conforms with the Annex I habitat type Alluvial Woodland (91E0). As outlined in Irish Wildlife Manual (IWM) 146-*The Monitoring and Assessment of four EU Habitats Directive Annex I Woodland Habitats*³:

'... gallery forests of tall willows (Salicion albae) occur alongside river channels and occasionally on river islands, where the tree roots are almost continuously submerged, and are also referable to 91E0. These very distinctive woodlands are dominated by Salix triandra, S. x fragilis, S. alba and S. viminalis, sometimes with S. cinerea, but Alnus glutinosa is relatively rare. There is a luxuriant herb layer of species such as Phalaris arundinacea, Urtica dioica and Filipendula ulmaria.'

A dense, inaccessible woodland is located south of this area. A wide drainage ditch (FW4) separates the wet woodland from the southernmost woodland which is located on higher ground.

The potential temporary construction compound to the south of the WWTP site is located within improved agricultural grassland (GA1). The proposed internal construction compound to the north of the WWTP is within an existing hardstand area evidently used for past storage and compound facilities, categorised as recolonising bare ground (ED3) (Plate 13-6).

³ <https://www.npws.ie/sites/default/files/publications/pdf/IWM146.pdf>

To the west of the WWTP boundary are agricultural fields (GA1) and access road. To the west of this again is Bunlicky Lake, which is within the boundary of River Shannon and River Fergus Estuaries SPA. The Lower River Shannon SAC boundary is located approx. 120m to the north of the WWTP.



PLATE 13-2 AMENITY GRASSLAND AND ROADS WITHIN LIMERICK WWTP



PLATE 13-3 LINEAR WOODLAND ALONG THE WESTERN BOUNDARY OF LIMERICK WWTP



PLATE 13-4 SCRUB, WET GRASSLAND AND WET WOODLAND IN THE WEST OF LIMERICK WWTP



PLATE 13-5 RIPARIAN WOODLAND (WN5) LOCATED NORTHEAST OF LIMERICK WWTP



PLATE 13-6 LEFT: IMPROVED AGRICULTURAL GRASSLAND (GA1) TO THE SOUTH OF LIMERICK WWTP, THE FOOTPRINT OF THE POTENTIAL TEMPORARY CONSTRUCTION COMPOUND. RIGHT: PROPOSED INTERNAL CONSTRUCTION COMPOUND TO THE NORTH OF THE WWTP.



FIGURE 13-3 HABITAT MAP OF LIMERICK WWTP

Corcanree Pump Station

A habitat map of Corcanree Pump Station is shown in Figure 13-4. Corcanree Pump Station (Plate 13-7) consists of the pump building, generator building and associated hard standings and access road, categorised as buildings and artificial surfaces (BL3). Ornamental planting within the site comprises beech hedging (*Fagus sylvatica*), bramble and *Escalonia*.

The site is surrounded by linear woodland, approx. 20 years old, consisting of pedunculate oak (*Quercus robur*), ash, silver birch (*Betula pendula*), hawthorn, hazel (*Coryllus avellana*), willows (*Salix spp.*) and field maple (*Acer campestre*).

Highly managed and regularly mown grasslands are categorised as amenity grassland (GA2). A grassland area in the northwest of the site has been managed for biodiversity and consists of a higher sward and richer biodiversity with species including false oat, knapweed (*Centaurea nigra*), Yorkshire fog (*Holcus lanatus*), creeping bent (*Agrostis stolonifera*), meadow vetchling (*Lathyrus pratensis*), creeping buttercup, bush vetch (*Vicia sepium*), field horsetail (*Equisetum arvense*), tufted vetch (*Vicia cracca*), purple loosestrife, birds foot trefoil, ox-eye daisy (*Leucanthemum vulgare*), and common fleabane (*Pulicaria dysenterica*). A cluster of trees and scrub are present within this area and include pedunculate oak, silver birch and dogwood (*Cornus sanguinea*). A number of standalone immature to semi-mature trees are present within the north of the site including lime (*Tilia cordata*), sycamore, and hornbeam (*Carpinus betulus*).

The footprint of the proposed new storm tank is located to the north of the existing pump station (Plate 13-8). The area comprises a wet grassland (GS4) with abundant yorkshire fog, field horsetail, frequent meadow buttercup, willowherb (*Epilobium sp.*), occasional creeping thistle, brown sedge (*Carex disticha*), meadowsweet, hard rush, meadow foxtail (*Alopecurus pratensis*), and *Calliergonella cuspidata*. Also rarely present are knapweed, dandelion, cowslip (*Primula veris*), glaucous sedge (*Carex flacca*), daisy and small willow shrubs (*Salix cinerea*).

To the north of the grassland an earth embankment with treeline separates the site from the Shannon Estuary (Plate 13-9). Trees include sycamore, horse chestnut (*Aesculus hippocastanum*), basket willow, ash and hawthorn.

A drainage ditch (FW4) is present along the northern boundary of the land to the east of the Proposed Development boundary. This is an OPW maintained channel and is completely outside of the Proposed Development boundary.

The existing access track to the footprint area, which will be used as construction access, runs along the western boundary of Corcanree Pump Station and comprises a track categorised as recolonising bare ground (ED3) which is lined by the linear woodland boundary of the pump station site and a treeline (WL2) (Plate 13-10).



PLATE 13-7 AMENITY GRASSLAND (GA2) AND LINEAR WOODLAND (WD1) WITHIN CORCANREE PS



PLATE 13-8 WET GRASSLAND TO THE NORTH OF CORCANREE PS, WITHIN THE FOOTPRINT OF THE PROPOSED STORM TANK



PLATE 13-9 EMBANKMENT TO THE NORTH OF CORCANREE PS ALONG THE SHORE OF THE SHANNON ESTUARY



PLATE 13-10 ACCESS TRACK TO THE STORM TANK FOOTPRINT WHICH WILL BE USED DURING CONSTRUCTION



FIGURE 13-4 HABITAT MAP OF CORCANREE PS

13.3.2.2 Protected Flora

- The FPO species, opposite leaved pondweed, is present within an OPW drain to the northeast of the proposed footprint of the storm tank (Section 13.3.1.5). This is completely outside of the Proposed Development boundary, however the potential for water quality impacts on this waterbody must be considered.
- There are records of the FPO species, triangular club rush, within the hectad within which Limerick WWTP and Corcanree PS are present (NPWS records).

There is no suitable habitat for either of these species within the boundary of the Proposed Development at Limerick WWTP or Corcanree PS. These species were not recorded in adjacent habitats during the dedicated surveys undertaken. No other FPO species or Red-Listed plant species were recorded within the Proposed Development boundary.

13.3.2.3 Protected Habitats

As outlined in Section 13.3.2.3 above, an example of the Annex I habitat type, Alluvial Woodland (91E0), is present within the Proposed Development boundary. The habitat is classified as a riparian woodland (WN5) which is approx. 20 years old (Plate 13-5). The woodland is dominated by willows (*Salix cinerea*, *Salix viminalis*, *Salix caprea*) and occasional hawthorn, with an understorey of reed canary grass (*Phalaris arundinaceae*), nettle, and occasional purple loosestrife (*Lythrum salicaria*), remote sedge (*Carex remota*), cleavers (*Galium aparine*), creeping thistle, meadowsweet, wood avens (*Geum urbanum*), creeping buttercup, pendulous sedge (*Carex pendula*) and rarely, hemlock water dropwort (*Oenanthe crocata*). *Kindbergia praelonga* is found growing on some trees. As outlined in Irish Wildlife Manual (IWM) 146-*The Monitoring and Assessment of four EU Habitats Directive Annex I Woodland Habitats*³:

'... gallery forests of tall willows (Salicion albae) occur alongside river channels and occasionally on river islands, where the tree roots are almost continuously submerged, and are also referable to 91E0. These very distinctive woodlands are dominated by Salix triandra, S. x fragilis, S. alba and S. viminalis, sometimes with S. cinerea, but Alnus glutinosa is relatively rare. There is a luxuriant herb layer of species such as Phalaris arundinacea, Urtica dioica and Filipendula ulmaria.'

However, this habitat has been completely avoided by the Proposed Development as part of the design process. The habitat is outside of the boundary of the Limerick WWTP (to the northeast). Note also that this habitat is completely outside of the boundary of the Lower River Shannon SAC and is not associated with a watercourse located within the boundary of the SAC. It is therefore not a Qualifying Interest habitat of the SAC.

13.3.2.4 Terrestrial Fauna

The results of dedicated faunal surveys undertaken for the Proposed Development are set out in the sections below.

Otter

During the dedicated otter surveys undertaken, no evidence of holts was found within or in adjacent areas of Limerick WWTP and Corcanree Pump Station. However, a number of direct observations of otter were recorded during multi-disciplinary surveys and wintering bird surveys at Limerick WWTP. One individual otter was recorded foraging in and around Bunlicky Lake on a number of occasions.

Badger

No direct evidence of badger activity, nor any evidence of the presence of badger setts, was recorded within the Proposed Development site boundary or in adjacent areas at either of Limerick WWTP and Corcanree PS. No signs of badger such as prints, latrines, scat, or snuffle holes were recorded.

Other Faunal Signs

A mammal trail was recorded in the grassland within the footprint of the proposed new stormtank, as discussed in the section above. The trail travels from the proposed stormtank area towards the east into adjacent lands (Plate 13-11). No other signs of mammal activity were recorded.



PLATE 13-11 MAMMAL TRAIL NORTH OF CORCANREE PS

Bat Habitat Appraisal and Preliminary Roost Assessment

Limerick WWTP:

The existing buildings and infrastructure within Limerick WWTP were assessed as having *Negligible* suitability for roosting bats due to a lack of suitable roost features (Plate 13-12, Plate 13-13).

The locations where tree removal is required for the Proposed Development is shown in Figure 13-5. Trees within the southwestern temporary construction access route comprise immature to semi mature willow, hawthorn, ash and scrub. Within the mid-west section of the boundary, trees in the construction access footprint are mainly thin, immature ash and willow. The western treeline comprises closely spaced, relatively thin trees aged approximately 20 years, ranging from immature to semi-mature. A small number of stems have light ivy cover, but no potential roost features (PRFs) were identified. Accordingly, the trees along the western boundary of the WWTP are assessed as having no roosting potential (None – Collins 2023, Plate 13-14, Plate 13-15).

The linear woodlands around the perimeter of the WWTP were assessed as having *Moderate* to *High* commuting and foraging suitability for bats as they provide strong habitat connectivity to the wider landscape, linking hedgerow, trees, woodlands, lake shore and rivers.

Corcanree Pump Station:

Trees within the northern linear woodland of the pump station comprise immature to semi-mature mixed broadleaved trees. Thin stemmed ivy cover was noted on some specimens however no PRFs were identified.

Trees within the proposed construction access route into the Pump Station were assessed (shown on Figure 13-5). Similarly, the trees are immature with little to no ivy cover and no PRFs were identified. The tree species in these areas were semi-mature and lacked the thickness and size typically associated with bat roosting. Site access may be required to Corcanree PS at the southeastern corner of the site, however this comprises an existing site entrance. There will be no removal of any trees containing PRFs required for this access.

Following the assessment, no potential roosting features (PRFs) were identified in the trees designated for removal (Plate 13-16, Plate 13-17).

Spillane's Tower and an adjacent underground cavity were assessed for roost suitability (Plate 13-18). Both lie outside of the Proposed Development boundary but are adjacent to the proposed construction access route to the proposed storm tank area. The tower offers potential access via open window slits and a gap above the boarded door, though no crevices were found on its facades which are well pointed and in good repair. It was possible to view the internal structure of the tower, and no signs of roosting were recorded. The underground structure contains an opening to a cavity; however, this does not extend deeply. The entrance to the cavity was scrubbed over by bramble at the time of survey (Plate 13-19). Both structures were assessed as having *Low* roost suitability, given that these could be used by individual bats opportunistically, however they do not provide enough shelter or protection to be used on a regular basis or by larger numbers of bats (Collins 2023). Roost emergence surveys were carried out on these structures as described below. No evidence of roosting bats was found during the daytime inspection survey or emergence surveys.

The trees along the northern boundary of the Corcanree Pump Station have *Moderate* commuting and foraging suitability given that they provide connectivity with habitats in the wider landscape. However, the nearby embankment and treelines of the Lower River Shannon, which are located completely outside of the Proposed Development boundary, were assessed as having *High* potential.



PLATE 13-12 EXISTING BUILDING WITHIN LIMERICK WWTP WITH NEGLIGIBLE SUITABLE ROOST FEATURES FOR BATS



PLATE 13-13 EXISTING WWTP INFRASTRUCTURE WITH NEGLIGIBLE ROOSTING SUITABILITY FOR BATS



PLATE 13-14 TREES WITHIN FOOTPRINT OF CONSTRUCTION ACCESS INTO LIMERICK WWTP (SOUTH)



PLATE 13-15 TREES WITHIN CONSTRUCTION ACCESS AREA INTO LIMERICK WWTP (WEST)



PLATE 13-16 EXAMPLE OF THIN STEMMED IVY COVER ON TREES WITHIN LINEAR WOODLAND TO THE NORTH OF THE PUMP STATION



PLATE 13-17 TREES WITHIN PROPOSED CONSTRUCTION ACCESS INTO CORCANREE PUMP STATION

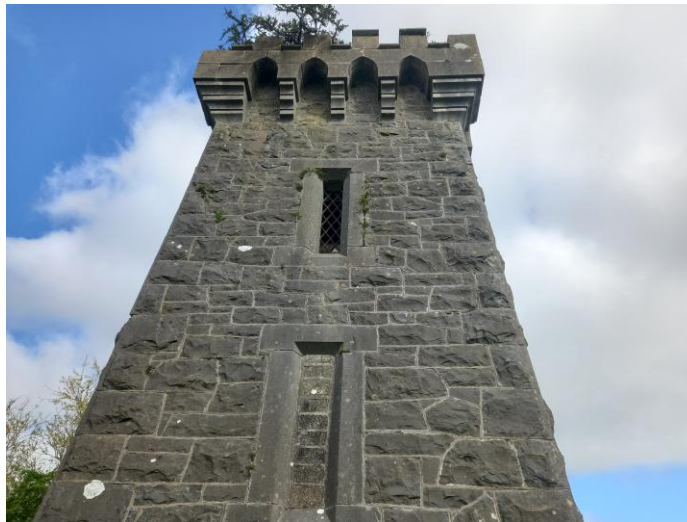


PLATE 13-18 SPILLANE'S TOWER, LOCATED ADJACENT TO THE PROPOSED CONSTRUCTION ACCESS ROUTE FOR THE STORM TANK.



PLATE 13-19 UNDERGROUND CAVITY LOCATED ADJACENT TO THE PROPOSED CONSTRUCTION ACCESS ROUTE FOR THE STORM TANK.



PLATE 13-20 NEARBY EMBANKMENT AND TREELINES OF THE SHANNON ESTUARY, WHICH ARE LOCATED COMPLETELY OUTSIDE OF THE PROPOSED DEVELOPMENT BOUNDARY, WERE ASSESSED AS HAVING HIGH POTENTIAL FOR COMMUTING AND FORAGING BATS



FIGURE 13-5 LOCATIONS OF VEGETATION TO BE REMOVED FOR CONSTRUCTION ACCESS

Dusk Activity Surveys 2023

Manual activity surveys comprised of dusk night bat walkover transects at both sites. A night bat walkover (NBW) survey took place on the 15th of August 2023 at Limerick WWTP with a total of 157 bat passes. A NBW survey was undertaken within the Corcanree PS site on the 24th of August 2023 with a total of 112 bat passes recorded (Table 13-12).

TABLE 13-12 NIGHT WALKOVER SURVEY RESULTS 2023

Date/site	Transect length (Km)	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Total
15/08/2023 Limerick WWTP	2.7	63	75	19	157
24/08/2023 Corcanree PS (within the PS site)	3.9	54	36	22	112

Walkover surveys were aimed at assessing the use of linear features and other habitats by bats. Bat activity was dominated by common and soprano pipistrelles during both transects.

During the transect at Limerick WWTP on the 15th of August, Soprano pipistrelles were the most commonly recorded species during the survey. No bat roosts or emerging bats were identified during the 2023 survey.

Common pipistrelles were recorded most during the 24th August survey at Corcanree PS. Leisler's bats were also recorded to a lesser extent at both sites. The highest activity was recorded along the treeline to the north of the site as well as the western boundary.

Figure 13-6 presents the spatial distribution of bat activity across the night walkover surveys.

Dusk Activity and Emergence Survey 2025

On the 23rd of July 2025, a dusk activity and emergence survey was undertaken at Corcanree PS. The transect survey included the adjacent site within the footprint of the proposed storm tank. An emergence survey of Spillane's Tower was also carried out.

Please note that Spillane's Tower and adjacent underground cavity (classified as having *Low* bat roosting potential, see Section 'Bat Habitat Appraisal and Preliminary Roost Assessment' above) will not be impacted by the Proposed Development and it is located completely outside of the Proposed Development boundary. However, they are adjacent to the proposed temporary construction access route. The emergence survey was carried out to provide supplementary baseline data of faunal usage of habitats in the wider area around the proposed works.

Activity consisted of 668 bat passes and was dominated by soprano pipistrelle. Surveyors were positioned at the tower for 1.5 hours and a small number of individual bats were observed commuting and foraging for extended periods. Therefore, the number of bat passes recorded is attributable to the same small number of bats.

TABLE 13-13 NIGHT WALKOVER SURVEY RESULTS 2025

Date/site	Km	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Total
23/07/2025 Spillanes Tower emergence and Corcanree PS (within the storm tank footprint)	1.7	116	428	8	668

During the emergence survey, no bats were recorded emerging from either Spillane's Tower or the adjacent underground structure.

During the subsequent transect survey of the storm tank footprint area, activity was low. Most activity was located along the treeline close to the Lower River Shannon. Bat activity along the boundary treeline of the Corcanree PS was low, with less than 5 no. bat passes recorded commuting during the transect survey. Bat activity was higher along treelines to the north of the site near the River Shannon. These treelines are completely outside of the Proposed Development site boundary.

Figure 13-7 presents the spatial distribution of bat activity across the night, as well as static detector locations.

Static Detector Surveys 2023

In total 6,743 bat passes were recorded at Corcanree PS over the static survey period (9 nights) in 2023. Limerick WWTP recorded 6,527 bat passes over the static survey period. Analysis of the detector recordings positively identified six bats to species level with *Myotis* genus also present.

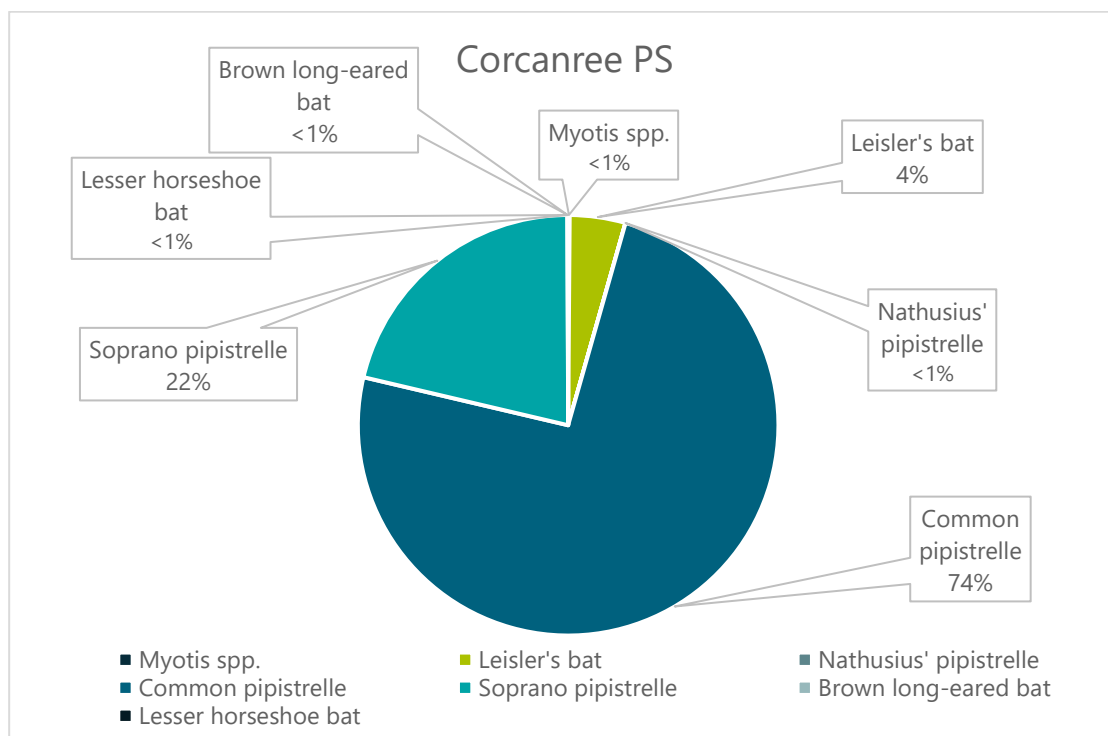


PLATE 13-21 STATIC SURVEY COMPOSITION CORCANREE PS 2023

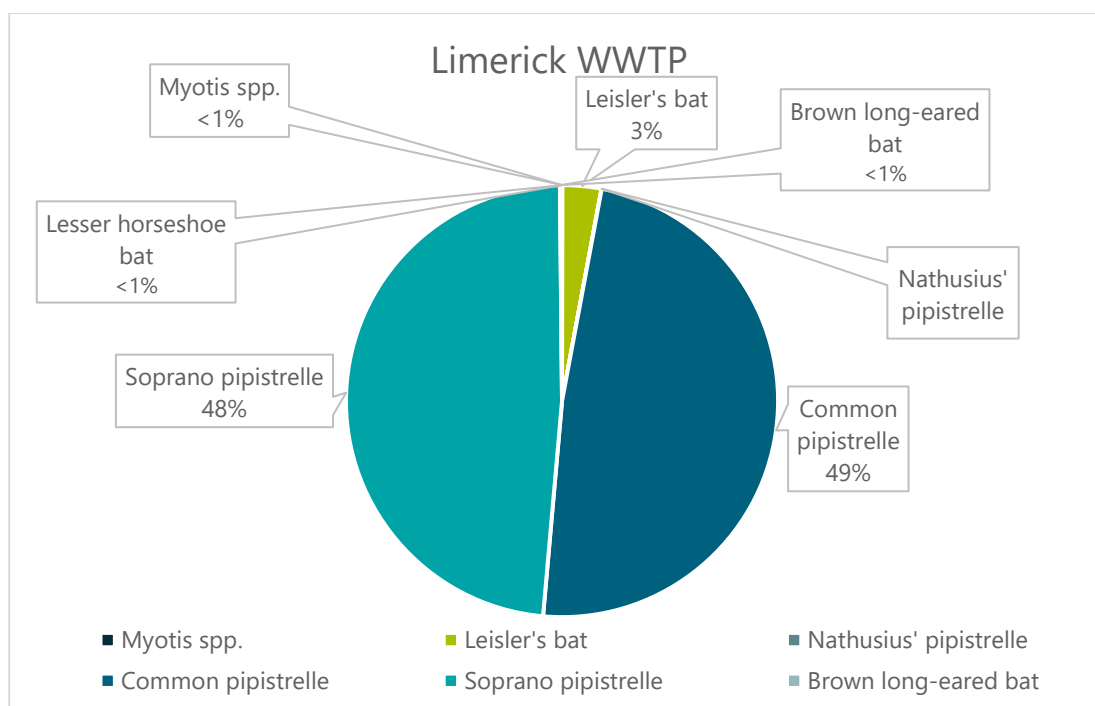


PLATE 13-22 STATIC SURVEY COMPOSITION LIMERICK WWTP 2023

Table 13-14 shows total bat passes per detector (per site). Species composition was similar at both Limerick WWTP and Corcanree PS. Common pipistrelle was the most frequently recorded species at D01 (Corcanree PS, n=5,008), while Soprano and Common pipistrelle had the same level of activity at D02 (Limerick WWTP). Leisler's bat activity was recorded throughout the deployment, though the activity levels varied slightly. *Myotis* spp., Brown long-eared bat and Nathusius' pipistrelle were recorded infrequently at both locations. One and two Lesser horseshoe bat passes were recorded at each location respectively.

Analysis of the detector recordings also highlighted the total bat passes per night, per detector. Total bat passes per detector, per night is shown in Plate 13-23. Species composition was similar at both locations, though activity levels varied throughout. D02 (Limerick WWTP) on 17th August had a higher number of bat passes than any other night, while activity was lowest on the 18th August at D02. Common pipistrelle activity was highest each night at D01 (Corcanree PS). At D02, Soprano pipistrelle activity dominated the last three days of the deployment. Lesser horseshoe bat was recorded at both locations only on the 23rd of August 2023.

TABLE 13-14 STATIC DETECTOR RESULTS 2023, TOTAL BAT PASSES.

Detector	<i>Myotis</i> spp.	Leisler's bat	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Lesser horseshoe bat	Total
D01/ Corcanree PS	8	288	0	5008	1435	1	2	6,743
D02/ Limerick WWTP	2	189	1	3163	3162	9	1	6,527

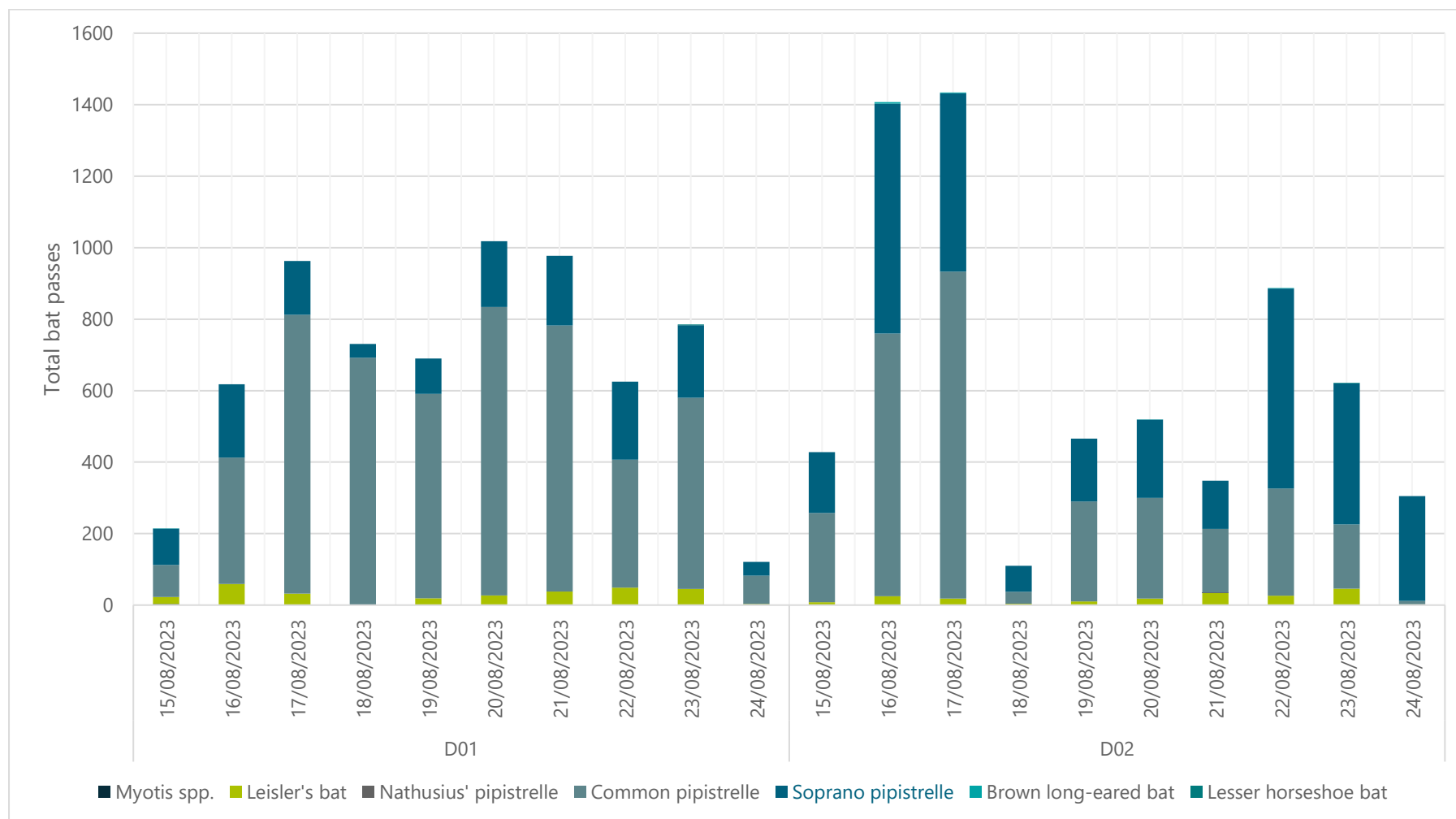


PLATE 13-23 TOTAL BAT PASSES PER DETECTOR PER NIGHT – 2023. D01=CORCANREE PS. D02=LIMERICK WWTP.

Static Detector Surveys 2025

Limerick WWTP:

In total, over the course of 22 nights, 16,403 bat passes were recorded. Analysis of the detector recordings positively identified four bats to species level with *Myotis* genus also present. Soprano (*Pipistrellus pygmaeus*) made up the majority of the activity recorded within the site (n=12481), followed by common pipistrelle (*Pipistrellus pipistrellus*) (n=3685). Leisler's bats (n=226) were less frequently recorded, while Brown long-eared bats (n=2) and *Myotis* spp. (n=9) were recorded rarely. No Lesser horseshoe bat or Nathusius' pipistrelle were recorded during the deployment.

Please note when comparing static survey data between 2023 and 2025 - static detectors recorded in-situ for 9 nights in 2023, while they recorded for 22 nights in 2025.

Plate 13-24 shows total bat species composition recorded at the site.

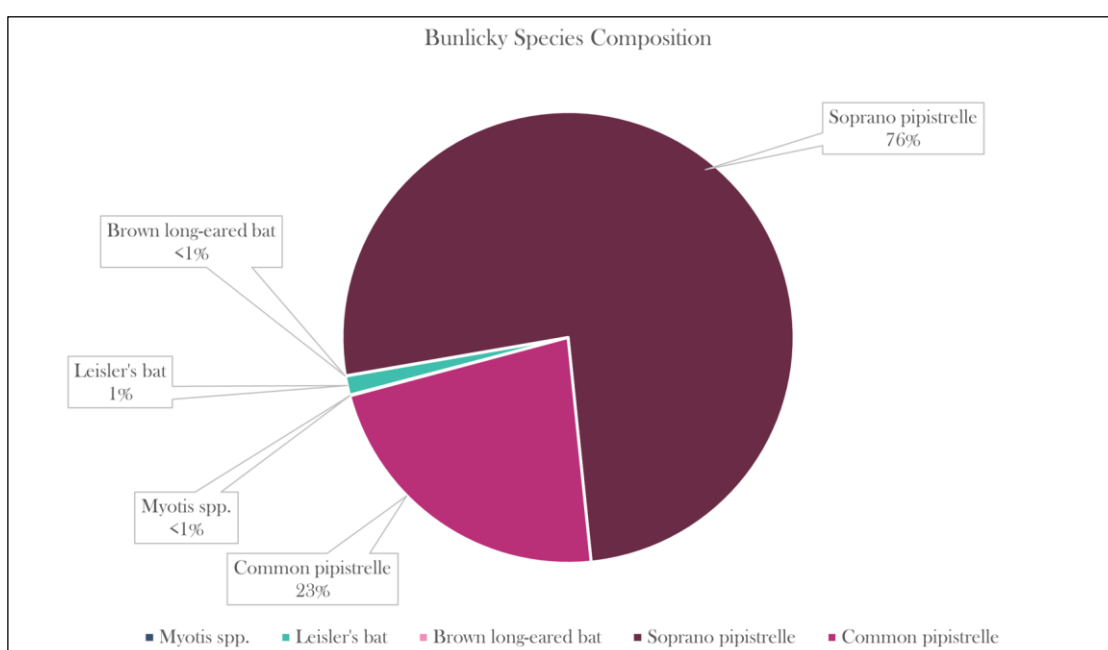


PLATE 13-24 LIMERICK WWTP BAT SPECIES COMPOSITION JULY 2025

Corcanree PS:

In total over the course of 22 nights, 3,720 bat passes were recorded. Analysis of the detector recordings positively identified four bats to species level with *Myotis* genus also present. Common pipistrelle (*Pipistrellus pipistrellus*) made up the majority of the activity recorded within the site (n=2598), followed by Soprano pipistrelle (*Pipistrellus pygmaeus*) (n=974). Leisler's bats (n=139) were less frequently recorded, while Brown long-eared bats (n=1) and *Myotis* spp. (n=8) were recorded rarely. Neither Lesser horseshoe bat nor Nathusius' pipistrelle were recorded. Plate 13-25 shows total bat species composition recorded at the site.

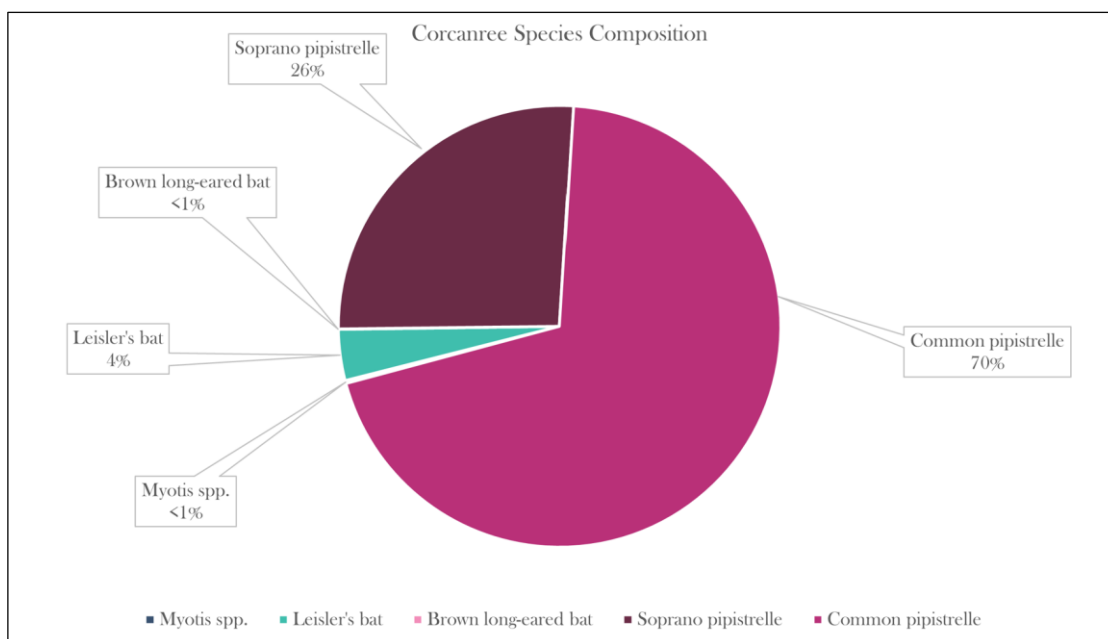


PLATE 13-25 CORCANREE PUMP STATION BAT SPECIES COMPOSITION JULY 2025

Table 13-15 shows total bat passes recorded per night at each of Limerick WWTP and Corcanree PS. Species composition was similar at both detectors. Soprano pipistrelle was the most frequently recorded species at Limerick WWTP (n=12,481). Common pipistrelle had a similar level of activity at both sites. Leisler's bat activity was also recorded at a similar level between both sites. *Myotis* spp. and Brown long-eared bat were recorded infrequently at both locations. No *Nathusius'* pipistrelle or Lesser horseshoe bat were recorded.

TABLE 13-15 STATIC DETECTOR RESULTS, TOTAL BAT PASSES, JULY 2025

Detector/ Site	<i>Myotis</i> spp.	Leisler's bat	<i>Nathusius'</i> pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long- eared bat	Lesser horseshoe bat	Total
Limerick WWTP	9	226	-	3685	12481	2	-	16,403
Corcanree Pump Station	8	139	-	2598	974	1	-	3720

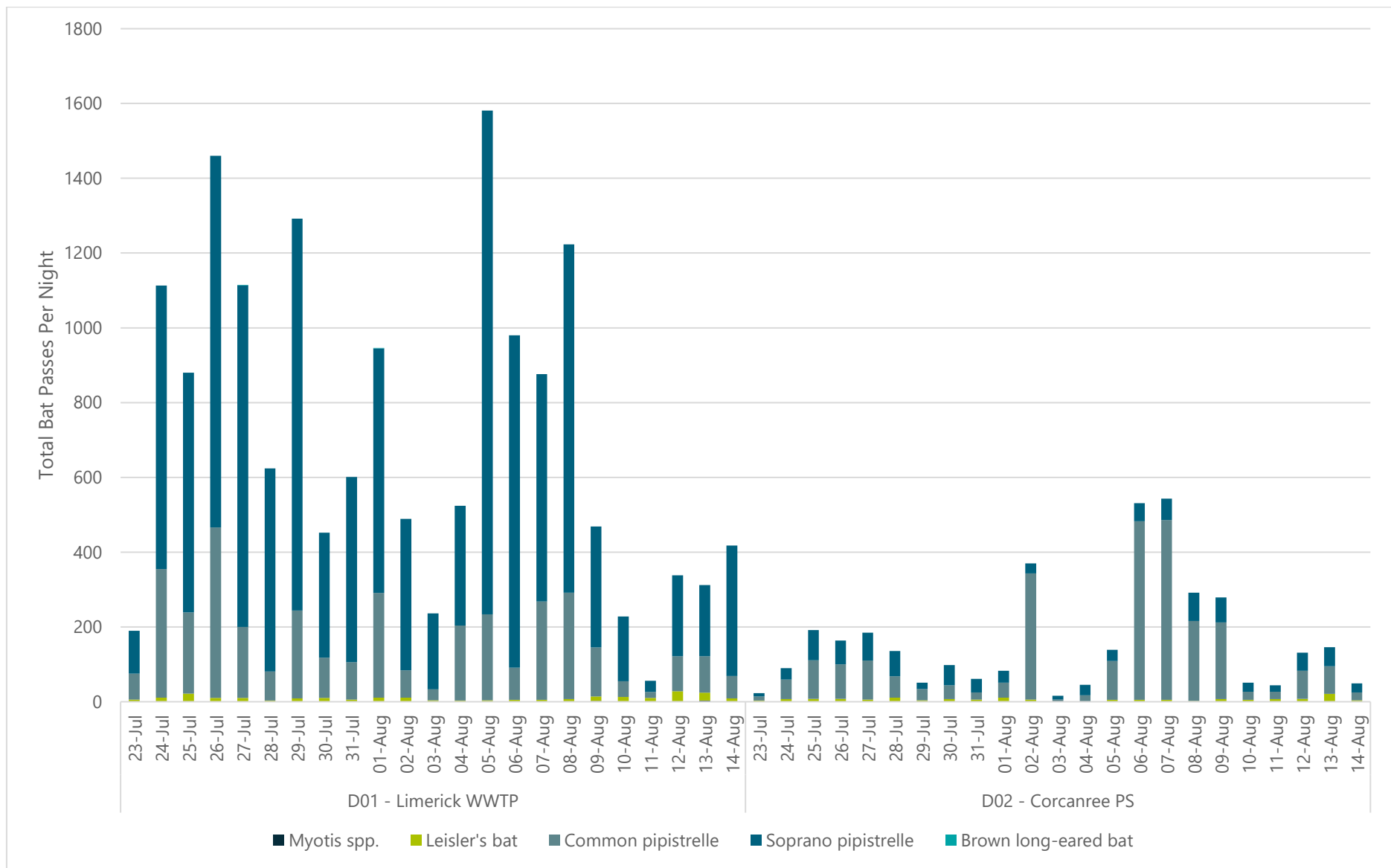


PLATE 13-26 TOTAL BAT PASSES PER DETECTOR PER NIGHT – 2025. D01=LIMERICK WWTP. D02=CORCANREE PS.

Interpretation of Data

Limerick WWTP and Corcanree PS are located within the range of seven species of bats: Soprano pipistrelle, Common pipistrelle, Daubenton's bat, Leisler's bat, Whiskered bat, Lesser horseshoe bat and Brown long-eared bat. Six of these species were identified in the data gathered during the 2023 and 2025 surveys. *Myotis* spp. were recorded also but were not identified to species level. A single *Nathusius'* pipistrelle was recorded on the Limerick WWTP site in 2023, outside of the current known range of this species. However, this species is under recorded throughout Ireland and is likely present in this area. Lesser horseshoe bat was recorded at both Corcanree PS and Limerick WWTP only on the 23rd of August 2023 (3 bat passes total).

Bat activity was low throughout for all species except for Soprano and Common pipistrelle during both the manual and the static surveys and no bat roosts were identified during the bat habitat appraisal and preliminary roost assessment.

The data gathered in 2025 through static surveys and the manual transect at Corcanree suggest that the trees surrounding both Limerick WWTP and Corcanree PS are used by commuting and foraging bats, mainly soprano and common pipistrelles. The data demonstrates that the trees along the northern boundary of Corcanree PS which require removal as part of the Proposed Development, are used by a relatively low number of bats. Thin stemmed ivy cover was noted on some specimens however no PRFs were identified in these trees. In turn the data shows that bats commuting through the area are more likely to use the mature treelines and embankment along the Lower River Shannon to the north, which are completely outside of the Proposed Development boundary.

Spillane's Tower, a structure located adjacent to the proposed construction access route to the proposed storm tank at Corcanree, was identified as having *Low* roost potential. However, no evidence of roosting bats was found, and no bats were recorded emerging from the structure during emergence surveys. No other potential bat roosts were identified.

All bat species in Ireland are protected under the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts 1976 (as amended). Bats as an Ecological Receptor have been assigned *Local Importance (Higher value)* on the basis that the habitats within the study area are utilized by a regularly occurring bat population of Local Importance.

Neither Limerick WWTP nor Corcanree PS have the potential to support a roosting site of ecological significance.



FIGURE 13-6 BAT TRANSECT SURVEY RESULTS AND STATIC DETECTOR LOCATIONS 2023



FIGURE 13-7 BAT TRANSECT SURVEY RESULTS AND STATIC DETECTOR LOCATIONS 2025

Birds

The following common passerine bird species were recorded incidentally during ecological surveys:

Limerick WWTP: Chaffinch (*Fringilla coelebs*), sedge warbler (*Acrocephalus schoenobaenus*), stonechat (*Saxicola rubicola*), blackbird (*Turdus merula*), robin (*Erithacus rubecula*), goldfinch (*Carduelis carduelis*), pied wagtail (*Motacilla alba yarrellii*).

Proposed Development footprint area for the storm tank north of the Corcanree PS: Woodpigeon (*Columba palumbus*), chaffinch, blue tit (*Cyanistes caeruleus*), willow warbler (*Phylloscopus trochilus*), wren (*Troglodytes troglodytes*), great tit (*Parus major*), blackbird, starling (*Sturnus vulgaris*), thrush (*Turdus philomelos*) and stone chat.

The habitats surrounding Limerick WWTP and Corcanree PS in the form of linear woodlands, as well as trees and scrub found within the sites, provide suitable breeding habitat for the above listed species as well as other common passerine species and are likely to be used as such. Wet grasslands provide suitable potential breeding habitat for birds such as sedge warbler.

A kestrel (*Falco tinnunculus*) was also observed hunting along the perimeter trees of the Limerick WWTP site. Swifts (*Apus apus*) were observed flying above Corcanree PS. Both species are listed on the Red List of Birds of Conservation Concern in Ireland (BoCCI) (Gilbert et al., 2021). Swallows (*Hirundo rustica*) were also recorded flying within both sites.

Wintering Bird Surveys

Wintering bird surveys were undertaken in the vicinity of Limerick WWTP and Corcanree PS for the Proposed Development during the wintering seasons 2020/2021, 2022/2023 and 2024/2025. The full Winter Bird Survey Reports are provided in Appendix 13-1 in Volume 4 of this EIAR and the results are summarised here.

Only one SCI species of River Shannon and River Fergus Estuaries SPA (located adjacent to the Proposed Development boundary) was recorded roosting or feeding within the Proposed Development, within Limerick WWTP, across all survey years. Black-headed gulls were recorded roosting on wastewater treatment plant infrastructure during the majority of the surveys carried out. The size of flocks ranged between 4 and 50 in 2024/2025, between 1 and 204 in 2022/2023 (average of 67 individuals) and between 24 and 118 in 2020/2021 (average of 71 individuals). The birds were recorded roosting on the storm tank, aeration tanks and settlement tanks of Limerick WWTP. Black-headed gulls appear to be habituated to the activities within the WWTP and undisturbed by human activity and noise generated by the plant. The Site Synopsis for the SPA states that there are nationally important numbers of black-headed gull (2,681) – this figure is five year mean peak count for the period 1995/96 to 1999/2000. According to *The status and distribution of wintering waterbirds in Ireland in 2023: results from the Irish Wetland Bird Survey (IWeBS)* (Irish Wildlife Manuals 162⁴), based on I-WeBS counts of the 'Shannon and Fergus Estuary' between 2018/2019 and 2022/2023, black-headed gull were recorded in peak numbers of 1930 and a Mean of 865 (caveated as a low quality count/estimate).

Cormorant, also a listed SCI species of the nearby River Shannon and River Fergus Estuaries SPA, was recorded on several occasions in flight over the Proposed Development sites at Limerick WWTP and Corcanree PS across all survey years. This species was not recorded using the habitats within the Proposed Development site boundaries during any of the surveys undertaken. A well-known breeding colony of this species for which the SPA is designated uses trees on the adjacent Bunlicky Lake (west of Limerick WWTP) for breeding and roosting. High numbers of cormorants (between 19 and 150 in 2024/2025 and between 6 and 200 in 2022/2023) were recorded roosting on the island on Bunlicky Lake throughout the surveys.

Two red listed bird species on the Bird of Conservation Concern in Ireland (BoCCI) (Gilbert et al., 2021) were recorded from within the Proposed Development sites at Limerick WWTP and at the Corcanree PS. Snipe (*Gallinago gallinago*) were recorded on several occasions across all survey years, flushed from wet grassland in the western grasslands of Limerick WWTP and once on one occasion from the grassland

⁴ <https://www.npws.ie/sites/default/files/publications/pdf/irish-wildlife-manual-162.pdf>

in the north-east of the Corcanree PS. Two Grey wagtails (*Motacilla cinerea*) were recorded utilising trees and other vegetation at Limerick WWTP during the 2024/2025 and 2022/2023 surveys.

In addition, though not recorded using the sites for roosting or nesting, Red-listed Kestrel were recorded hunting overhead of the sites during all survey years.

A number of listed SCI species of River Shannon and River Fergus Estuaries SPA were recorded using habitats adjacent to or in the wider area of the Limerick WWTP and Corcanree PS throughout all survey years.

The remaining target species recorded in the wider area using habitats including wet grasslands, Bunlicky Lake, the Ballinacurra Creek Stream and mudflats of the Lower River Shannon included mute swans (*Cygnus olor*), Greylag geese (*Anser anser*), Mallards (*Anas platyrhynchos*), Coot (*Fulica atra*), moorhen (*Gallinula chloropus*), Grey heron (*Ardea cinerea*) and little egret (*Egretta garzetta*).

The number of black-headed gulls (SCI species) recorded roosting within the WWTP site ranged between 4 and 50 in 2024/2025, between 1 and 204 in 2022/2023 (average of 67 individuals) and between 24 and 118 in 2020/2021 (average of 71 individuals). The wintering population estimate for this species within the River Shannon and River Fergus Estuaries SPA is 2,681⁵ and is classified as a nationally important flock. When comparing the SPA population estimate to the average species count recorded roosting on the infrastructure within the WWTP, the habitats within the site boundary do not appear to support an important bird assemblage of Black-headed gulls. These gulls appear to be habituated to the activity within the WWTP and were not disturbed by human activity and noise generated by the plant. Black-headed gulls were also recorded utilising several habitats adjacent to the site boundaries such as, mudflats and sandflats, the Ballinacurra stream and Bunlicky Lake.

Based on the wintering bird assemblages recorded over three wintering survey seasons, it can be concluded that neither Limerick WWTP or Corcanree Pumping Station support important assemblages of wintering wildfowl, waders, or SCI species for which the River Shannon and River Fergus estuaries SPA has been designated. There is no potential for significant loss of supporting habitat for the SCI species of River Shannon and River Fergus Estuaries SPA. According to the site-specific conservation objectives document of the River Shannon and River Fergus Estuaries SPA, the SCI populations are primarily associated with intertidal sheltered and shallow subtidal, sand and mud flats habitats. These habitats are located within the vicinity of the project area, however, they do not occur within the Proposed Development boundary.

13.3.3 Identified Key Ecological Receptors

Based on the results of the desktop study and the surveys undertaken, the following Key Ecological Receptors have been identified:

13.3.3.1 Habitats

- Aquatic habitats and associated aquatic fauna – aquatic habitats and fauna which are designated Qualifying Interests (QIs) of the Lower River Shannon SAC are of International Importance. Further, these aquatic habitats are used as a resource for Special Conservation Interest species of the River Shannon and River Fergus Estuaries SPA.
- Woodlands, trees and scrub (WD1, WN5, WS1) – These habitats are of local importance (higher value) where they occur within the Proposed Development site as they have potential to provide shelter and foraging opportunity, as well as wildlife corridors for fauna.
- Wet grassland (GS4) and large sedge swamp (FS1) – These habitats where they occur within the Proposed Development are of local importance (higher value) given that they provide shelter and foraging opportunities for fauna.

⁵ <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004077.pdf>

13.3.3.2 Fauna

- Waterbirds using the adjacent habitats to the Proposed Development site are designated Special Conservation Interest species of the River Shannon and Fergus Estuaries SPA, including a nationally important breeding population of cormorant.
- Other bird species – habitats including trees, scrub and grasslands within the Proposed Development site provide habitat for passerine bird species of local importance (higher value).
- No bat roosts were identified within the site, however boundary habitats provide potential commuting and foraging habitat for local bat populations of local importance (higher value).
- No other holts were recorded within 150m of the Proposed Development sites and there is no suitable habitat for the species within the Proposed Development boundary. However, adjacent habitats provide suitable commuting and foraging habitat for the species, which would be an SAC population of International Importance associated with the Lower River Shannon SAC.

13.3.3.3 Protected Flora

- The FPO species, opposite leaved pondweed, is present within an OPW drain to the northeast of the proposed footprint of the storm tank. This is completely outside of the Proposed Development boundary, however the potential for water quality impacts on this waterbody must be considered.
- There are records of the FPO species, triangular club rush, within the hectad within which Limerick WWTP and Corcanree PS are present (NPWS records).

There is no suitable habitat for either of these species within the boundary of the Proposed Development. These species were not recorded in adjacent habitats during the surveys undertaken. However, the potential for impact on supporting habitat as a result of water quality deterioration must be considered on a precautionary basis.

13.4 Potential Impacts

13.4.1 Do-nothing Scenario

If the Proposed Development were not to go ahead, the existing WWTP would continue according to existing operations and the habitats within the site would continue under their current management regime. Short-sward grassland areas of the site (Amenity grassland GA2) are mowed regularly throughout the year.

The wet grassland habitat within the footprint of the proposed storm tank, adjacent to Corcanree PS, would likely remain in its low management state, with willow scrub gradually taking over in the area.

The existing Plant would continue to discharge to the Shannon Estuary. The Plant as it currently operates will not be able to treat effluent to a sufficient standard for expected future loading increases if the upgrades do not go ahead, thereby resulting in a negative impact on water quality of the Shannon Estuary.

Without the provision of stormwater storage, the WWTP will remain in breach of the UWWTD and incoming recast UWWTD. Environmental incidents will also continue to be reported in the AERs, and it would influence a deterioration in receiving water quality.

The opportunity to provide a central bioresource centre for sustainable cycling of wastes in the southwestern region and the production of biosolids would be lost.

13.4.2 Construction Phase

13.4.2.1 Habitat Loss

Temporary habitat losses

There will be temporary loss of small sections of the perimeter linear woodland (WD1) to accommodate construction access into the site. This will comprise two no. access points into Limerick WWTP and one no. access point into Corcanree PS. There will be a second entrance to Corcanree, southeast, however this will not

require tree removal. These access points, which will require tree removal, are shown in Map Figure 13-5 in Volume 3 Figures. The trees in the footprint of these areas are semi-mature to immature trees and scrub. These trees will be replanted after construction with semi-mature specimens. In addition, felled trees will be retained within the sites as deadwood as part of the landscaping plan.

The temporary loss of these sections of trees is considered a temporary, non-significant effect.

There will be temporary loss of agricultural grassland (GA1) to the south of Limerick WWTP to facilitate the potential construction compound, which will be restored after construction. The temporary loss of this grassland is considered a temporary, non-significant effect. The use of the northern internal compound area as a temporary construction compound will not result in any significant habitat loss given that the area already comprises hardstand.

There will be temporary loss of amenity grassland (GA2) to the west of Corcanree PS to facilitate the construction compound, which will be restored after construction. The temporary loss of this grassland is considered a temporary, non-significant effect.

Permanent Habitat Losses

Habitat Loss Avoidance:

The layout for the Proposed Development has been designed to retain habitats of ecological value where possible, applying the avoidance principle. This includes the majority of trees at the Corcanree PS, with permanent tree loss restricted to permanent access requirements between the new storm tank and existing PS site. An area of species rich grassland within the northwest of Corcanree PS has also been avoided. Initially the temporary site compound was proposed in this area, but it was decided to locate the compound within species poor amenity lawn to the west of the site boundary.

Habitat loss at Limerick WWTP has been restricted to the footprint of new infrastructure and hardstanding areas (incorporating grasscrete where possible). Existing wet grassland, swamp habitats, willow scrub and trees are retained around these areas where possible. In addition, while it was initially proposed to use Uisce Éireann lands to the east of the Limerick WWTP boundary, give the value of woodland habitats to the east of the boundary, including the Annex I wet woodland area to the northeast, it was determined that these habitats should be retained and avoided, and therefore it is proposed to use the existing hardstanding area to the north of the WWTP, or alternatively there is the potential to use the Third Party agricultural lands to the south of Limerick WWTP for the temporary construction compound.

The permanent habitat losses associated with the Proposed Development are quantified in Table 13-16 below.

TABLE 13-16 PERMANENT HABITAT LOSSES ASSOCIATED WITH THE PROPOSED DEVELOPMENT

Habitat	Area Lost
Linear woodland (WD1)	0.09ha /903 m ²
Riparian woodland (WN5)	0.18ha /1827 m ²
Reed swamp (FS1)	0.41ha /4052 m ²
Wet grassland (GS4)	0.52ha /5175 m ² * Approx 0.15ha at Corcanree PS and 0.37ha at Limerick WWTP
Scrub (WS1)	0.01ha /125 m ²
Amenity grassland (GA2)	0.1ha /1030 m ²
Dry meadows/grassy verges (GS2)	0.07ha / 690m ²
Buildings and artificial surfaces (BL3)	0.03ha /310 m ²

The loss of artificial surfaces (BL3) to facilitate the Proposed Development is not considered significant in the context of biodiversity at any scale.

Scrub (WS1):

There will be a loss of 0.01ha of scrub (WS1) within the Limerick WWTP to facilitate construction of the proposed new Regional Bioresource Centre. Given the low species diversity of this habitat where it is lost (comprising grey willow), its context within an operational WWTP, and the abundance of this habitat in the wider landscape, the small-scale loss of this habitat is not considered significant at any scale.

Grasslands (GA2, GS2):

There will be a loss of 0.1ha of amenity grassland (GA2) within the Limerick WWTP. Given the low species diversity of this habitat, the small-scale loss of this habitat is not considered significant at any scale.

There will be a loss of 0.07ha of dry meadows/grassy verge (GS2) habitat to facilitate the construction of the new Regional Bioresource Centre. Given the low species diversity of this habitat where it is lost (dominated by willow herb and nettle) and the abundance of this habitat in the wider landscape, the small-scale loss of this habitat is not considered significant at any scale.

Woodland Habitats (WD1, WN5):

There will be a loss of 0.09ha of immature to semi-mature linear woodland (WD1) to facilitate construction of the proposed new storm tank adjacent to Corcanree PS. This habitat is young, species poor and in poor condition (ash die back). As outlined above, the avoidance principle was applied, and tree removal will only be carried out within this habitat where permanent access is required. Furthermore, extensive areas of higher-quality native riparian woodland associated with wetlands and the Shannon Estuary occur in the wider landscape. Given the small scale of the loss and the availability of similar or better-quality habitats nearby, this effect is considered a permanent, not significant effect.

There will be a loss of 0.18ha of immature to semi-mature wet woodland (WN6) within the Limerick WWTP to facilitate construction of the proposed new AGS tanks and Regional Bioresource Centre. This woodland is successional and species-poor, and its removal represents a very minor proportion of the available riparian woodland resource locally. As discussed in Section 13.3.2.1, this habitat does not conform to the Annex I habitat type given the small size, context and lack of understory indicators. As outlined in Irish Wildlife Manual (IWM) 146- *The Monitoring and Assessment of four EU Habitats Directive Annex I Woodland Habitats*⁶:

'Strips which are short, narrow and discontinuous and surrounded by open habitat should not be assigned to 91E0, if they cannot be considered to be functioning woodlands.'

Therefore, this impact is also assessed as a permanent, not significant effect.

Wet grassland (GS4):

There will be a combined loss of 0.52ha of wet grassland (GS4) as a result of the Proposed Development. This comprises approx 0.15ha at Corcanree PS and 0.37ha at Limerick WWTP.

Given the species poor nature of the habitat, its context within a developed and operational site, and the availability of higher value wetlands in the wider landscape associated with the Shannon Estuary, the small-scale loss of this habitat is considered a permanent, non-significant effect.

Reed and large sedge swamp (FS1):

There will be a loss of 0.41ha of reed swamp (FS1) within the Limerick WWTP to facilitate construction of the proposed AGS tanks. The habitat is species poor and is located within a developed and operational site. Extensive areas of similar and higher-quality reed and sedge swamp are present along the Lower River

⁶ <https://www.npws.ie/sites/default/files/publications/pdf/IWM146.pdf>

Shannon/Shannon Estuary and associated wetlands in the wider area. Therefore, the small-scale loss of this habitat is considered a permanent, non-significant effect.

Overall, the Proposed Development represents an extension to existing operational facilities and will not alter the ecological character of the site. Given the species poor nature of the habitats being lost, and their availability in the wider landscape in association with the Shannon Estuary and other wetland habitats, the permanent loss of habitats associated with the Proposed Development is considered to be a permanent, non-significant effect.

13.4.2.2 Deterioration of Water Quality – Effects on Aquatic Habitats and Associated Aquatic Fauna

The construction of the Proposed Development carries a risk of silt/sediment run-off and run-off of pollutant materials including cement and hydrocarbons.

The construction footprint within Limerick WWTP includes wet channels with potential connectivity through agricultural fields to Bunlicky Lake in the west. The lake is located within River Shannon and River Fergus Estuaries SPA. There is therefore potential for impacts on the lake via these conduits.

The construction footprint for the proposed storm tank at Corcanree PS is completely buffered from the Shannon Estuary in terms of run-off via an existing flood embankment. However, an OPW drainage channel with likely connectivity to the Shannon, as well as hosting the FPO species opposite leaved pondweed, is present completely outside of the Proposed Development boundary but is located to the north east of the site.

Deep excavations are required for the proposed storm water tank and as such there is also a risk of groundwater contamination, which can also result in infiltration to surface water bodies. In addition, there is a need for surface management of groundwaters requiring pumping from the excavation.

According to the flood risk assessment, there is a moderate risk of a coastal flood event within the Corcanree PS, as such with potential to impact temporary working areas/compound associated with the construction of the storm tank. The footprint of the proposed storm tank itself is not at risk at flooding. Therefore, on a precautionary basis there is a risk of flood and surface run-off from the compound area.

The Shannon Estuary in the vicinity of the development site is a wide, deep, estuarine waterbody. Previous IFI surveys (Section 13.3.1.8) have identified that the Lower River Shannon, from Limerick Docks to the lower estuary, is dominated by coarse fish species such as plaice, smelt, flounder, sand goby, and sprat. Further detail with regard to the estuarine environment is provided in Chapter 12 'Biodiversity (Marine)'.

The deterioration of the aquatic environment has a potential to affect aquatic species which use it, as significant sedimentation can result in smothering or oxygen starvation for species. Increased sedimentation can impact on fish species by clogging gills, reducing visibility when foraging, and clogging spawning gravels for salmonids and lamprey. The release of certain materials, such as hydrocarbons or cement products, would be toxic to fish life. In turn, as mentioned above, potential fish-kills would result in indirect impacts to otter via reduced fish biomass for foraging.

Further assessment with regard to potential impacts on water quality are provided in Chapter 16 (Water) of this EIAR and impacts with regard to marine biodiversity are assessed in Chapter 12 'Biodiversity (Marine)'. Potential for a significant short term negative effect on surface water quality of the Shannon Estuary, deterioration in groundwater quality and deterioration in estuarine habitats thus affecting aquatic fauna as a result of the construction phase of the development was identified. Mitigation measures will be in place and are detailed in Section 13.5.1 of this report.

13.4.2.3 Effects on Terrestrial Fauna

13.4.2.3.1 Waterbirds

Habitat Loss

During the dedicated wintering bird surveys undertaken of the Proposed Development over three wintering seasons at both Limerick WWTP and Corcanree PS, no significant usage of habitats by SCI species was recorded.

Flocks of black-headed gull were recorded roosting on existing WWTP infrastructure. This infrastructure will be retained.

The agricultural field to the south of the Limerick WWTP may potentially be used temporarily as a construction compound, however this will not result in any permanent loss of habitat used by waterbird species. The existing hardstand area to the north of the WWTP which is proposed for use as a temporary internal construction compound will not result in any loss of SCI supporting habitat.

There will be no loss of significant supporting habitat for waterbirds in the wider area including those which are designated as SCI species of River Shannon and River Fergus Estuaries SPA.

There is no potential for significant effect to waterbirds as a result of habitat loss.

Deterioration of Habitat due to Water Quality

There is hydrological connectivity between the Proposed Development site at Limerick WWTP with Bunlicky Lake. There is hydrological connectivity between the Proposed Development at Corcanree PS and the Shannon Estuary. In the absence of mitigation, there is potential for a temporary significant effect on waterbirds as a result of deterioration of water quality of supporting habitat.

Please note that mitigation measures with regard to impacts on water quality thus affecting supporting habitat for waterbirds in the freshwater environment, i.e., the Bunlicky Lake adjacent to Limerick WWTP, are provided in Chapter 16 'Water'.

Please note that mitigation measures with regard to impacts on water quality thus affecting supporting habitat for waterbirds in the marine/estuarine environment are provided in Chapter 12 'Biodiversity (Marine)'.

With the construction phase mitigation measures in place to prevent impacts on water quality, there is no potential for residual significant effect on waterbirds as a result of habitat degradation within Bunlicky Lake or the Shannon Estuary.

Disturbance

Impacts on Wintering Populations:

Based on the noise monitoring surveys undertaken to inform the baseline assessment, as included in Chapter 10 'Noise and Vibration', existing noise levels recorded at the inlet works and secondary treatment tank locations within the Limerick WWTP indicate existing background noise levels of approximately 65 - 75 dB LAeq, which are dominated by pumps & their associated motors and wastewater movement. The worst-case scenario sound levels likely to occur associated with general construction works, within 10m of works in the west of Limerick WWTP will be approx. 79 to 87dB, associated with clearing works, distribution of materials and mixing/pumping concrete. Continuous flight auger piling at the AGS tank location is likely to take 6 to 7 weeks and emit approx. 71dB of continuous noise at 50m. Sheet piling is likely to take approx. 10 days and emit 71dB (vibratory hammer) or 81dB (worst case scenario impact hammer) at 50m (Chapter 10, Table 10-17).

The potential for significant disturbance effects to waterbirds as a result of construction of the Proposed Development was considered. As discussed in Section 13.3.2.4, flocks of black-headed gull were recorded roosting on infrastructure at Limerick WWTP. These roosts were recorded on infrastructure within the east of

the Limerick WWTP. The noisiest construction works will occur to the west of the WWTP. The birds were notably accustomed to the day-to-day activities within the WWTP site during the wintering bird surveys.

Given the distance between the works at point source and the locations of roosting areas within the WWTP (approx. 50m), the existing disturbance levels at the WWTP, the noise buffering capacity of existing infrastructure and the temporary nature of the noisiest works (with only 10 days required for sheet piling), no potential for adverse disturbance of the roosting black-headed gull flock within Limerick WWTP is predicted. However, mitigation measures to further reduce any potential effect as a result of disturbance are outlined in Section 13.5.1.2.

The potential for disturbance effects on other wintering waterbirds using habitats within Bunlicky Lake was considered. The lake edge is located approx. 150m from the main works areas/excavation area within the WWTP, with construction access required within approx. 80m of the lake. However, the WWTP site is well screened from the lake by existing linear woodland along the western boundary of the site. It is further buffered and screened by agricultural grasslands and lakeshore wooded areas.

According to the TIDE Waterbird Disturbance and Mitigation Toolkit⁷, for auditory disturbance to qualify as high level, it must constitute a sudden noise event of over 60dB (at the bird, not the source), or a more prolonged noise of over 72dB. Moderate noise level effects comprise occasional noise events above 55dB, regular noise 60 -72dB or long-term regular noise above 72dB. Low noise effects are those less than 55dB which are likely to be masked by background inputs. Noise between 55-72dB in some highly disturbed areas (industrial or urban areas, areas adjacent to roads) may feature a low level of disturbance provided the noise level was regular, as birds will often habituate to a constant noise level. The Waterbird Disturbance Toolkit provides a matrix table illustrating the standard distance decay rates for noise (Plate 13-27). According to this, if the point source of noisiest general construction activity is 87dB (outlined above), then at a distance of minimum 85.33m (as per table in Plate 13-27), the perceived noise level is well within 'acceptable' receptor dose of approx. 48dB. Therefore, based on the noise/distance decay rate and existing background noise levels in the wider area, the general construction works are unlikely to result in significant disturbance impacts to breeding or wintering SCI species on Bunlicky Lake.

With regard to proposed piling works required at Limerick WWTP, continuous flight auger piling at the AGS tank location is likely to take 6 to 7 weeks and emit approx. 61.5dB of continuous noise at 150m (Chapter 10, Table 10-17). Sheet piling is likely to take approx. 10 days and emit 61.5dB (vibratory hammer) or 71.5dB (worst case scenario impact hammer) at 150m. Given this, the existing noise levels at the lake, and the short duration of the piling works required, the potential for adverse disturbance effects to wintering bird species using Bunlicky Lake as a result of piling works is unlikely, however mitigation measures to further reduce any potential effect are outlined in Section 13.5.1.2.

Similarly, the construction area for the proposed storm tank adjacent to Corcanree PS is heavily screened by existing treelines, scrub and riparian treeline of the Shannon Estuary. No significant waterbird roosting areas were identified within the PS site, within the proposed storm tank footprint nor on the adjacent section of the Shannon Estuary (Section 13.3.2.4).

No blasting is proposed as part of the construction phase.

Impacts on Breeding Cormorant

The lake treelines which are used by cormorants for breeding are located adjacent to the N18 Limerick Southern Ring Road and are approx. 230m from the works area within Limerick WWTP. The Limerick Agglomeration Strategic Noise Maps⁸ indicate that background road traffic noise from the N18 is significant in the vicinity of Bunlicky Lake and is within the scale of 65 to 69dB. Therefore, birds using these habitats will be accustomed to levels of noise associated with a busy trafficked road.

⁷ https://www.tide-toolbox.eu/tidetools/waterbird_disturbance_mitigation_toolkit/

⁸ <https://www.limerick.ie/council/services/environment-and-climate-action/environmental-control/strategic-noise-maps-limerick>

General construction noise levels likely to occur within 10m of works in the west of Limerick WWTP will be approx. 79 to 87dB, associated with clearing works, distribution of materials and mixing/pumping concrete. At a distance of approximately 230m from the works area at Limerick WWTP and according to noise decay rates, general construction noise emissions from the works at the breeding colony are likely to be significantly reduced (Plate 13-27) and are not likely to result in a cumulative noise level out of character with existing noise levels at the colony.

Continuous flight auger piling at the AGS tank location at Limerick WWTP is likely to take 6 to 7 weeks and emit approx. 59dB of continuous noise at 200m (Chapter 10, Table 10-17). The location of the breeding cormorant colony is approx. 230m from the piling area at Limerick WWTP. At this distance, the noise emission from CFA is expected to be further reduced and below 59dB, particularly with consideration of existing buffering woodland and vegetation which will provide screening. Therefore, no potential for adverse disturbance effects on the breeding colony as a result of CFA piling is predicted.

Sheet piling is expected to take approx. 10 days. At 200m, noise emissions from sheet piling are expected to be in the range of 59dB (vibratory hammer) or 69dB (worst case scenario, impact hammer) (Chapter 10, Table 10-17). As outlined above the existing noise levels at Bunlicky Lake are in the range of 65 to 69dB due to traffic noise from the N18. Given the existing background noise levels at the lake, the predicted noise level from vibratory hammer piling, occurring 230m away from the breeding colony, is not likely to be out of character with the existing environment and as such the potential for adverse effects on SCI species is unlikely. However, on a precautionary basis, given the sudden nature and predicted noise level of impact hammer piling, it is considered that there is a potential for adverse effect via disturbance during the sensitive breeding period for cormorant during 1st March to 30th June as a result of this method. Mitigation is therefore provided in Section 13.5.1.2 below.

Vibration Impacts

The maximum likely vibration level from the Proposed Development site at the nearest sensitive location has been predicted based on the relevant information available in BS 5228-2:2009 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.

Ground borne vibration levels from CFA piling vary significantly depending on the type of ground (as set out in BS 5228:2009⁹). However, even on firm ground, ground borne vibration at 20m is only 0.3mm/s PPV, which is around the onset of perceptibility in a typical residential property. Ground borne vibration levels from driven sheet steel piling at a distance of 35m ranges from 0.5 – 3.0 mm/s PPV. At the distance between the excavation site to Bunlicky Lake and the edge of the main estuary channel, the ground borne vibration levels will be <0.1mm/s PPV.

The proposed closest location of low-impact vibratory piling method, such as CFA piling to the Shannon Estuary is 50m from the Corcanree Storm Tank. Therefore, based on interpolation of the ground borne vibration levels, the maximum ground borne vibration levels from the CFA piling at 50m will be <0.1 mm/s PPV.

Based on the low predicted impact of vibration associated with piling, as well as the short-term duration of these works, there is no potential for adverse effect via disturbance of bird species.

⁹ British Standards Institution (BSI) (2014). BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1 Noise & Part 2 Vibration.

Metres from Source	dB(A)										
0.67	120	110	100	95	90	85	80	75	70	65	60
1.33	114	104	94	89	84	79	74	69	64	59	54
2.67	108	98	88	83	78	73	68	63	58	53	48
5.33	102	92	82	77	72	67	62	57	52	47	42
10.67	96	86	76	71	66	61	56	51	46	41	36
20.67	90	80	70	65	60	55	50	45	40	35	30
42.67	84	74	64	59	54	49	44	39	34	29	24
85.33	78	68	58	53	48	43	38	33	28	23	
170.67	72	62	52	47	42	37	32	27	22		
341.33	66	56	46	41	36	31	26	21			
682.66	60	50	40	35	30	25	20				
1365.32	54	44	34	29	24						

PLATE 13-27 MATRIX TABLE DEMONSTRATING STANDARD DISTANCE DECAY RATES FOR NOISE – SOURCE: WATERBIRD DISTURBANCE TOOLKITERROR! BOOKMARK NOT DEFINED.

13.4.2.3.2 Other Bird Species

Habitat Loss

As discussed above, there will be loss of areas of linear woodland, wet woodland, scrub, swamp and wet grassland. Scrub, woodland and trees offer potential nesting habitat for passerine bird species. Wet grassland and reed/sedge habitats also offer some roosting potential for snipe and other ground dwelling birds. However, trees requiring removal for construction access will be replanted post construction. The loss of wet grassland and swamp habitat required (0.52ha and 0.41ha respectively) is a small fraction relative to the availability of the habitat in the wider area, particularly along the extent of the Lower River Shannon and Estuary. Therefore, there is no potential for significant effect to bird species as a result of habitat loss.

Furthermore, a Landscape Masterplan and Planting Plan (Appendix 15-1 in Volume 4 of this EIAR) is in place as part of the Proposed Development which will include the establishment of new tree clusters and treeline around the proposed new storm tank.

Disturbance

The potential for disturbance to passerine and ground nesting bird species using the site during construction has been considered. If vegetation clearance work is required during nesting season (1st March to 31st August inclusive), there is potential to disturb or destroy nesting birds in trees, scrub, reed swamp or wet grassland habitats. Such an effect would not likely result in a significant effect on the population of the species or the conservation status of the species. However, it would result in a permanent significant effect to the individual birds involved.

13.4.2.3.3 Bats

Roost Habitat Loss

No bat roosts or evidence of roosting bats were recorded within the Proposed Development sites during the dedicated surveys undertaken in 2023 and 2025 and the sites do not present significant suitable roosting features for bats.

Trees to be removed during construction were assessed as having no roost suitability (the locations of these trees are shown on Figure 13-5).

Structures within the wider WWTP and PS will be retained and no demolition is proposed.

Therefore, there is no potential for significant effect to the local bat population due to loss of roosts or roost resources. However, precautionary mitigation is provided in Section 13.5.1.4 below.

Commuting/Foraging Habitat Loss

The construction of the Proposed Development will result in the temporary loss of small sections of linear woodland due to construction access requirements (Figure 13-5).

There will be a permanent loss of 0.09ha of linear woodland adjacent to Corcanree PS and loss of 0.18ha of woodland at Limerick WWTP.

However, this will not result in any significant severance of connectivity or commuting/foraging corridors. There are extensive linear habitat features within the wider area around Limerick WWTP and Corcanree PS which will be retained and avoided. These include the linear woodlands surrounding Limerick WWTP and wider habitats, and the treelines associated with the Shannon Estuary adjacent to the Corcanree PS.

Therefore, there will be no significant effect as a result of loss of linear habitat connectivity.

Disturbance/Displacement

The potential for disturbance to bats during construction was considered.

As detailed above, no bat roosts are present within Limerick WWTP nor Corcanree PS and there is therefore no potential for disturbance to bat roosts. However, precautionarily, there could be a potential for disturbance of commuting corridors through insensitive use of construction phase lighting, resulting in potential barriers to commuting where lights are directed at linear vegetation. This is considered to be a temporary, non-significant effect via disturbance/displacement of commuting bat species.

13.4.2.3.4 Otter

Habitat Loss

No otter holts were recorded within the Proposed Development site or within the wider survey area during the dedicated surveys undertaken. There are no instream works required nor loss of riparian habitat. Therefore, there is no potential for significant effect to otter as a result of habitat loss.

Disturbance

The potential for disturbance of otter was considered. During the dedicated otter surveys undertaken, no signs of otter resting or breeding places were found within 150m of the Proposed Development, including along the Shannon Estuary, Ballincurra Creek or Bunlicky Lake. However, otter were recorded foraging in Bunlicky Lake and suitable habitat for them exists in the wider areas around Limerick WWTP and Corcanree PS. Precautionarily, potential for disturbance to otter was identified, as a result of noise from construction and due to the potential for establishment of a holt in the interim between baseline otter surveys and commencement of construction. This if it were to occur is considered a temporary, significant negative effect.

Barrier Effect/Reduction of Prey Biomass

Given that there is no requirement for instream works or works within riparian zones, there is no potential for barrier effects to otter. A potential for impact was identified as a result of construction of the Proposed

Development in the form of reduction in fish biomass due to deterioration of water quality. This is considered to be a temporary, significant effect.

The potential for the new storm tank area adjacent to Corcanree PS to result in barrier effects to otter was considered. However, fencing and tree planting will be provided around the new storm tank, but this boundary will not result in barrier effects to commuting otter, as the boundary is sufficiently set back from the Shannon Estuary shoreline, as well as associated flood embankment and treelines, retaining sufficient commuting habitat for otter.

Deterioration of Habitat due to Water Quality

There is hydrological connectivity between the Proposed Development site at Limerick WWTP with Bunlicky Lake. There is hydrological connectivity between the Proposed Development at Corcanree PS and the Shannon Estuary. In the absence of mitigation, there is potential for a temporary significant effect on otter as a result of deterioration of water quality of supporting habitat.

Please note that mitigation measures with regard to impacts on water quality thus affecting supporting habitat for otter in the freshwater environment, i.e., the Bunlicky Lake adjacent to Limerick WWTP, are provided in Chapter 16 'Water'.

Please note that mitigation measures with regard to impacts on water quality thus affecting supporting habitat for otter in the marine/estuarine environment are provided in Chapter 12 'Biodiversity (Marine)'.

With the construction phase mitigation measures in place to prevent impacts on water quality, there is no potential for residual significant effect on otter as a result of habitat degradation within Bunlicky Lake or the Shannon Estuary.

13.4.3 Operational Phase

Please note that operational impacts on the marine/estuarine ecology are assessed in Chapter 12 'Biodiversity (Marine)'.

13.4.3.1 Impacts on Terrestrial Habitats

There will be no additional loss of habitat or other impacts to habitats as a result of the operational phase. A Landscaping Plan is in place as part of the Proposed Development which includes beneficial measures for biodiversity (Appendix 15-1).

13.4.3.2 Impacts on Terrestrial Fauna

Disturbance to Fauna due to Site Operations

The site is an existing wastewater treatment facility which is subject to ongoing human disturbance and operations of the plant. Fauna which are or may be in the vicinity of the site, such as waterbirds and otter, are likely to be accustomed to a degree of disturbance due to existing activities at the site, as well as surrounding land uses and the N18 Limerick Southern Ring Road. Further, as described in Chapter 10 of this EIAR (Noise & Vibration), based on the noise monitoring results undertaken at Limerick WWTP and Corcanree PS, existing operations at the sites are inaudible relative to existing background road traffic noise levels. There is likely to be a slight increase in activity at the site if there is a requirement for more personnel or more vehicles entering the site. However, these activities will be mainly during normal daylight hours and no significant increase in activity relative to operations in place currently is expected. Therefore, there is no potential for significant disturbance to fauna as a result of operational activities at the sites.

Bats

Roost Habitat Loss

No additional effects with regard to bat roost habitat loss are anticipated during operational phase.

Commuting/Foraging Habitat Loss

No additional effects with regard to commuting/foraging habitat loss are anticipated during operational phase.

Disturbance/Displacement

As discussed in previous sections, no bat roosts have been recorded within the Proposed Development sites, and no potential for disturbance to any roost sites has been identified.

Given that it is proposed to develop an area of the Limerick WWTP and the area adjacent to the Corcanree PS which are currently unlit at night, on a precautionary basis it is deemed that there is a potential for permanent significant effect via displacement of commuting bat species using existing dark boundaries of the Proposed Development site, as a result of new external lighting fixtures. These include the western boundary of Limerick WWTP and the area north of Corcanree PS. Mitigation with regard to this is provided in the following section.

13.4.4 Impacts on Designated Sites

The EPA Guidance (2022) states "A biodiversity section of an EIAR, for example, should not repeat the detailed assessment of potential effects on European sites contained in documentation prepared as part of the Appropriate Assessment process, but it should refer to the findings of that separate assessment in the context of likely significant effects on the environment, as required by the EIA Directive."

Therefore, the assessment of impacts on European Sites is not repeated here. However, the conclusions of the Natura Impact Statement (NIS) which accompanies this application are included here. The following European Sites were screened in for Appropriate Assessment:

- Lower River Shannon SAC
- River Shannon and River Fergus Estuaries SPA

The NIS concludes that, the Proposed Development, individually or in-combination with other plans or projects, will not adversely affect the integrity of any European Site.

As discussed in Section 13.3.1.1, the potential for likely significant effect was identified on the following Nationally Designated sites:

- Fergus Estuary and Inner Shannon, South Shore [000435]
- Fergus Estuary and Inner Shannon- North Shore [002048]

A potential for likely significant effect on these designated sites was identified via water quality deterioration.

Limerick WWTP is located within the boundary of Fergus Estuary and Inner Shannon – South Shore pNHA. However, as described in above sections the WWTP is comprised of primarily industrial habitats. There is no potential for impacts on the pNHA due to habitat loss. As discussed in Section 13.4.2.2, the construction footprint within Limerick WWTP comprises potential drainage channels with potential connectivity through agricultural fields to Bunlicky Lake in the west. The lake is located within River Shannon and River Fergus Estuaries SPA. There is therefore potential for impacts on the lake via these conduits. The construction footprint for the proposed storm tank at Corcanree PS is completely buffered from the pNHA in terms of run-off via an existing flood embankment. However, an OPW drainage channel with likely connectivity to the Shannon, as well as hosting the FPO species opposite leaved pondweed, is present completely outside of the Proposed Development boundary but is located to the north east of the site. However, a range of bespoke mitigation measures are provided in Chapter 16 (Water) to prevent impacts to water quality during construction. With the proposed mitigations in place, there is no potential for significant effects via water quality deterioration on the

pNHA during construction of the Proposed Development. Furthermore, as outlined in Chapter 12 'Biodiversity (Marine)', there is no potential for significant effect as a result of operation of the Proposed Development on the marine environment.

13.5 Mitigation Measures

Please note that mitigation measures with regard to the marine/estuarine environment are provided in Chapter 12 'Biodiversity (Marine)'.

13.5.1 Construction Phase

13.5.1.1 Habitat Loss

Temporary habitat losses:

There will be some loss of sections of Linear woodland (WD1) to facilitate construction access as depicted in Figure 13-5 above. The following measures will be in place:

- Trees to be lost for construction access will be strictly limited to the width required for access (approx. 5m).
- After construction, trees will be replanted to restore the habitat and connectivity. Trees will be of native stock and will be species that are already present within the habitat and will comprise semi-mature specimens.
- Any trees that are felled to facilitate construction access will be re-used as deadwood for biodiversity enhancement purposes as part of the proposed Landscape Masterplan and Planting Plan.

Permanent Habitat Losses:

As discussed in Section 13.4.2.1, no significant effects via habitat loss as a result of the Proposed Development are predicted. A Landscaping Plan with measures for biodiversity enhancement is included as part of the Proposed Development. The Plan includes the following measures:

Limerick WWTP:

- Meadow management of existing amenity grassland areas in line with All Ireland Pollinator Plan;
- Grasscrete in new hardstanding areas where feasible;
- Any trees that are felled to facilitate construction access will be re-used as deadwood for biodiversity enhancement purposes as part of the proposed Landscape Masterplan and Planting Plan;
- Installation of 1 or more swift boxes to a building/infrastructure in an appropriate location to be agreed with the Project Ecologist, in line with Bird Watch Ireland guidelines¹⁰;
- Installation of kestrel nesting box within the linear woodland edge to the west of Limerick WWTP, given that kestrel were regularly recorded hunting in the area. The nest should be very sturdy and not rock or move. It is vital that the box is not covered or obstructed by branches or leaves in order to achieve a clear flight path. Installation will require a lone standing tree, or if unavailable, a constructed bare pole. The entrance of the nest should face away from prevailing winds and be installed at a height of at least 3 metres; and
- Installation of 3 no. bat boxes along linear woodland edge to the west of Limerick WWTP, where bat roosting suitability is currently limited. Bat boxes will be of a design that is suitable for installation on trees. It will be ensured that there is no obstruction to flight path for access to the bat box by vegetation. The bat boxes will be installed at least 3m from the ground. The locations will be chosen based on an assessment of proposed external lighting and lux contours and it will be ensured that they are installed in areas of darkness. This will be decided by a qualified ecologist or the project ECoW.

Corcanree PS:

- Meadow management of existing amenity grassland areas in line with All Ireland Pollinator Plan;

¹⁰ https://birdwatchireland.ie/app/uploads/2019/10/Saving-Swifts-Guide_pdf.pdf

- New trees proposed around the new storm tank (both linear treeline and tree clusters);
- Green roof on top of the storm tank, with planting in line with the All-Ireland Pollinator Plan;
- Green walls around the storm tank (i.e ivy walls); and
- Swift boxes (as many as feasible) to be incorporated onto storm tank.

13.5.1.2 Construction Impacts on Waterbirds

Disturbance

Mitigation measures will be in place to limit potential noise impacts on waterbirds as outlined in Section 13.4.2.3.1 above. These will include:

- Construction activities will be restricted to daytime hours as outlined:
 - Monday to Friday: 07:00 hours – 19:00 hours;
 - Saturday: 08:00 hours – 14:00 hours.
- An on-site speed limit will be enforced for all traffic;
- Noise emissions and will comply with the g recommendations of BS 5228;
- Machines will be operated at low speeds and will be shut down when not in use;
- Mechanical plant used on site will be fitted with effective exhaust silencers. Vehicle reverse alarms will be silenced appropriately to minimise noise breakout from the site while still maintaining their effectiveness;
- Compressors will be of the “noise reduced” variety and fitted with properly lined and sealed acoustic covers;
- In all cases, engine and/or machinery covers will be closed whenever the machines or engines are in use;
- All pneumatic percussive tools will be fitted with mufflers or silencers. Mechanical static plant will be enclosed by acoustic sheds or screens;
- For sheet piling, vibration hammer will be used, with impact hammer used only when vibration hammer is unable to complete the drive due to high ground resistance.
- Furthermore, for sheet piling, an acoustic screen will be used, enclosing the hammer head and the top of the pile, which will reduce noise by 5 to 10dB (BS5228 2009-2014).
- The use of the impact hammer sheet piling method, if needed, will be avoided at Limerick WWTP during the cormorant breeding period 1st March to 30th June.
- Employees working on the site will be informed about the requirement to minimise noise and undergo training on the following aspects:
 - The proper use and maintenance of tools and equipment;
 - The positioning of machinery on-site to reduce the emission of noise;
 - Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment; and
 - The use and maintenance of sound reduction equipment fitted to power pressure tools and machines.

Habitat Degradation

Please note that mitigation measures with regard to impacts on water quality thus affecting supporting habitat for waterbirds in the freshwater environment, i.e., the Bunlicky Lake adjacent to Limerick WWTP, are provided in Chapter 16 ‘Water’. Please note that mitigation measures with regard to impacts on water quality thus affecting supporting habitat for waterbirds in the marine/estuarine environment are provided in Chapter 12 ‘Biodiversity (Marine)’. With the construction phase mitigation measures in place to prevent impacts on water quality, there is no potential for residual significant effect on waterbirds as a result of habitat degradation within Bunlicky Lake or the Shannon Estuary.

13.5.1.3 Construction Impacts on Other Bird Species

Disturbance

As detailed above, in the absence of mitigation, there is a potential for disturbance and mortality of breeding passerine and ground nesting bird species if the vegetation clearance works occur during the bird nesting season (1st March to 31st August inclusive). Therefore, the following mitigation will be in place:

- Any requirement for removal of vegetation will be carried out in line with the provisions of the Wildlife Act. Therefore, the necessary removal of trees, and clearance of wet grassland and swamp habitat within the site will not be carried out between 1st of March and 31st of August inclusive, unless a breeding bird survey is carried out by a qualified ecologist 2 weeks before scheduled clearance, and a second survey no more than 48 hours before the felling.

13.5.1.4 Construction Impacts on Bats

Bat Habitat loss

Some vegetation removal is required for construction site access and to facilitate new infrastructure. As discussed in Section 13.4.2.3.3, no significant effect as a result of loss of commuting/foraging habitat is anticipated and the site will remain suitable for commuting and foraging overall, with connectivity within the site and to the wider area being largely retained. In addition, all areas requiring clearance to facilitate construction access (Figure 13-5) will be restored and replanted with native tree species common to the site and local area.

A Landscape Masterplan and Planting Plan is also in place for the Proposed Development which will result in a net gain in linear and commuting habitats for bats. In addition, new roosting habitat potential will be provided for bats in the form of bat boxes installed in the western linear woodland at Limerick WWTP.

Disturbance

As detailed in previous sections, no bat roosts were recorded within the Proposed Development sites. Vegetation requiring removal was assessed as having no potential roost features.

However, regarding the linear woodland section to be removed at Corcanree Pump Station, a number of trees are currently in poor condition, with some affected by ash dieback. On a precautionary basis, it is acknowledged that their roost suitability could change if deterioration occurs over the planning consent process (e.g., due to disease or wind damage). Therefore, the following mitigation measures will be implemented:

- Although no potential roost features (PRF) were found during the dedicated baseline assessments, on a precautionary basis the condition of the trees to be felled will be assessed again in advance of felling, due to the possibility of deterioration of trees and development of PRFs.
- If any trees have developed a new Potential Roost Feature (PRF), this will be inspected by a licenced bat ecologist no more than 24 hours in advance of felling.
- If roosting bats are detected, the felling of the tree in question will not progress until a derogation is obtained from the NPWS.

The requirement for a pre-commencement survey does not present a lacuna in the survey assessment but is fully in line with best practice guidance. The purpose of the pre-commencement survey will be to assess any changes in the baseline conditions of the site since the time of carrying out the baseline surveys. Should a bat roost be identified during this pre-commencement survey, a bat derogation licence will need to be obtained from NPWS and further mitigation prescribed by a licenced ecologist prior to commencement of works.

Further, to prevent any potential barrier effects associated with construction phase lighting spillage onto linear habitats, the following mitigation will also be in place. These measures will also include for construction lighting, if required, along the construction access route to the proposed stormtank area at Corcanree PS.

- Work will be completed during daylight hours. However, if lighting is needed for construction during certain periods over winter months, this lighting will be downwards facing with downward lighting

accessories used including louvres, baffles or shields. In addition, any required lighting will be directed away from key commuting corridors including the linear woodlands surrounding Limerick WWTP and Corcanree PS.

- Construction phase lighting along the proposed construction access route into Corcanree PS in the vicinity of Spillane's Tower will be avoided. If absolutely necessary, it will be ensured that lighting is installed away from the Tower and underground cavity, and this will be checked and signed off by the project ecologist/ECOW.

13.5.1.5 Construction Impacts on Otter

No otter holts were recorded within 150m of the Proposed Development sites. However, given the suitability of habitats adjacent to Limerick WWTP and Corcanree PS to support otter as well as recorded otter activity during the surveys undertaken, the following mitigation will be in place:

- A pre-commencement survey for Otter will be carried out prior to any works commencing. Should Otter holts be recorded within 150m of the proposed works at Limerick WWTP or Corcanree PS, a derogation license will be obtained from NPWS and works carried out in accordance with NRA (2006) *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes*. The otter survey will be carried out no more than 10 months in advance of commencement. The survey will be supplemented with an additional inspection immediately prior to commencement.

The requirement for a pre-commencement survey does not present a lacuna in the survey assessment but is fully in line with best practice guidance. The purpose of the pre-commencement survey will be to assess any changes in the baseline conditions of the site since the time of carrying out the baseline surveys. Should an otter holt be identified during this pre-commencement survey, and if it is deemed that the construction works have the potential to significantly disturb otter, a derogation licence will be obtained from NPWS and further mitigation prescribed by a suitably qualified ecologist prior to commencement of works.

Please note that mitigation measures with regard to impacts on water quality thus affecting supporting habitat for otter in the freshwater environment, i.e., the Bunlicky Lake adjacent to Limerick WWTP, are provided in Chapter 16 'Water'. Please note that mitigation measures with regard to impacts on water quality thus affecting supporting habitat for otter in the marine/estuarine environment are provided in Chapter 12 'Biodiversity (Marine)'. With the construction phase mitigation measures in place to prevent impacts on water quality, there is no potential for residual significant effect on otter as a result of habitat degradation within Bunlicky Lake or the Shannon Estuary.

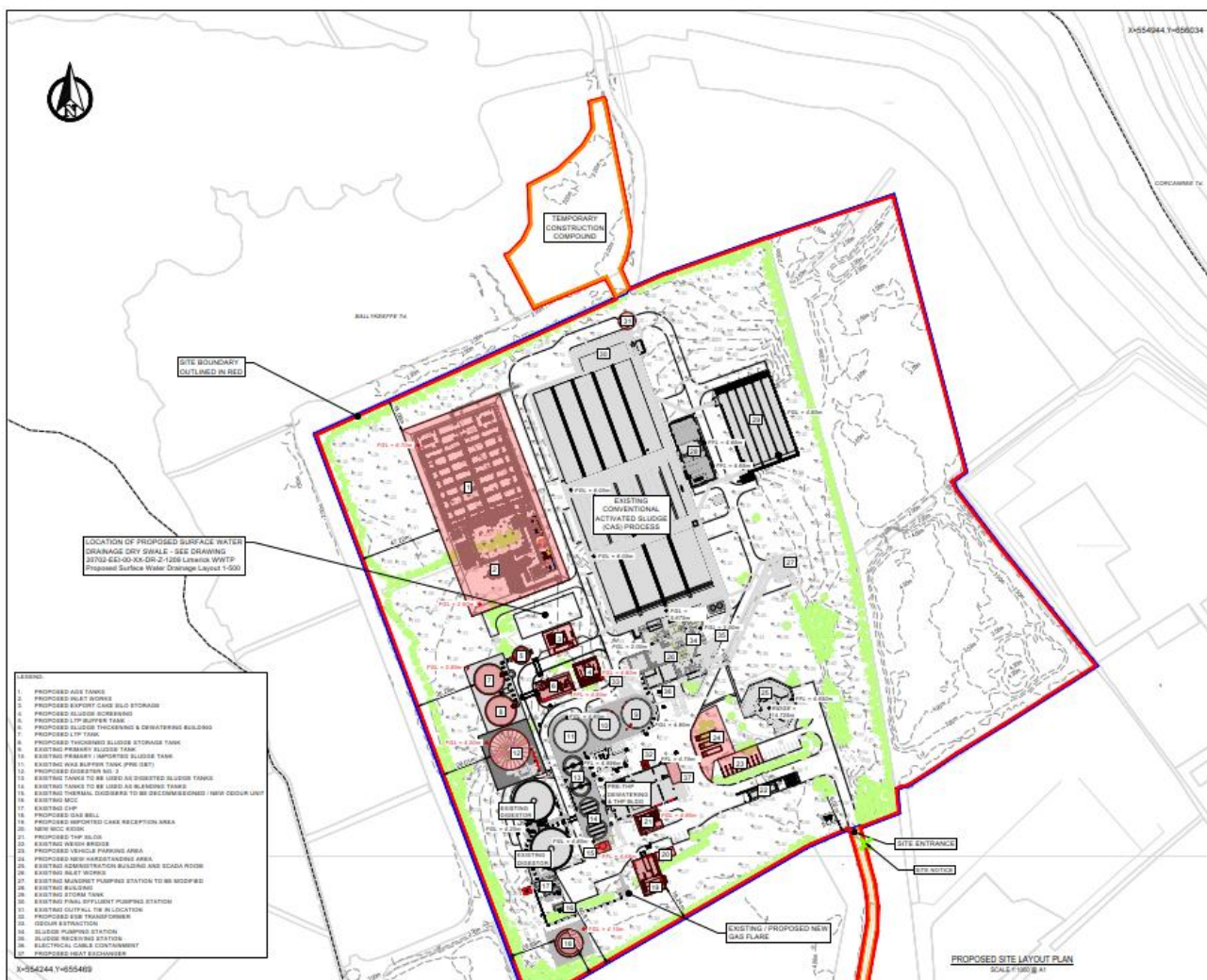


FIGURE 13-8 LIMERICK WWTTP CONSTRUCTION LAYOUT

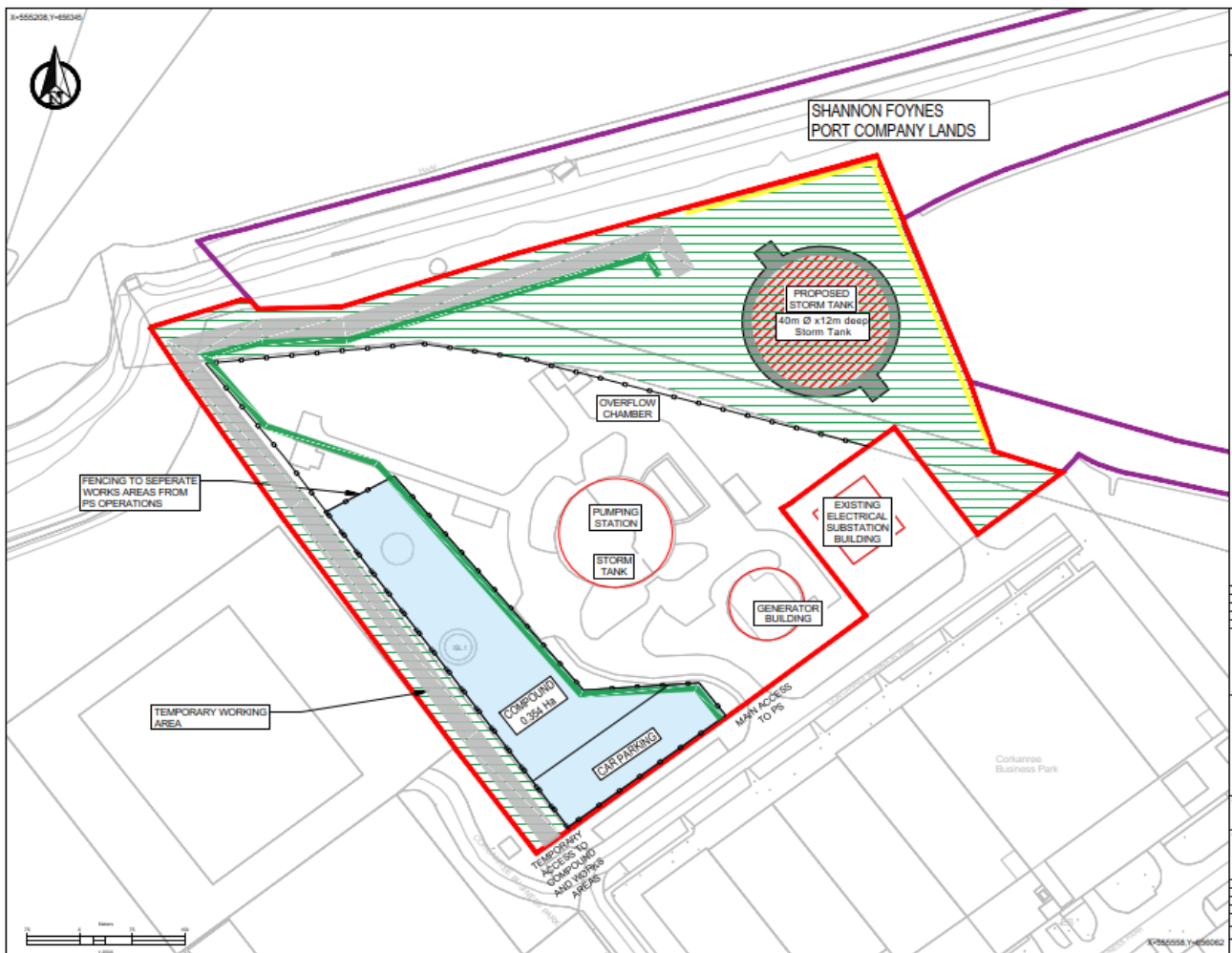


FIGURE 13-9 CORCANREE PS - CONSTRUCTION LAYOUT

13.5.2 Operational Phase

13.5.2.1 Operational Impacts on Terrestrial Fauna

Faunal Habitat Loss

With the Landscaping Plan in place, there will be additional habitats created for fauna within the Proposed Development sites, which will include increased potential bat roosting habitat, bird nesting habitat, and wildlife corridors. No potential for significant effect on fauna as a result of habitat loss during the Operational Phase is predicted.

Lighting Impacts

An external lighting design has been provided as part of the Proposed Development. Limerick WWTP is already subject to external lighting on existing surfaced areas and infrastructure.

Consideration was given to ecological sensitivities on the site in the design of the lighting layout, including peripheral woodland areas with suitability for bat foraging. Therefore, the proposed new lighting layout has been designed with the following mitigations in place, in line with Bat Conservation Trust - Guidance Note 08/18 *Bats and artificial lighting in the UK* and 2022 NPWS guidance (Marnell et al. 2022).

Limerick WWTP

- All lights will be of maximum warm colour temperature 2700K.
- External lights will contain motion sensor systems, therefore, there will be the option for all lights to be off, or dimmed, when not needed.
- Light spill onto the vegetation and linear features around the site boundary of Limerick WWTP has been completely avoided for the most part, with small sections kept below a lux level of 1. However, as outlined in the above point, the site will be dark when not in use due to the provision of motion sensor.
- Lighting will be directional and will be focused onto roads and infrastructure and away from adjacent habitats. Directional accessories including baffles and cowls will be used.

Proposed New Storm Tank Location at Corcanree PS:

The location of an existing lighting column currently operational within the PS provides sufficient lighting coverage for the proposed storm tank. The existing 6m column will be replaced with 2 no. luminaires to cover the interface area between the existing PS and the proposed new storm tank. The following mitigations will be in place:

- Luminaries will be of max colour temperature 2700K.
- Task lighting only is required, and these will comprise motion sensors with a manual override. The storm tank area will therefore be dark when not in use.
- There will be no light spill onto the proposed tree planting to the north of the storm tank, or into the SPA/SAC boundary.

Otter

The potential for impacts on otter as a result of potential decrease in prey biomass due to water quality deterioration has been considered. However, the potential for deterioration in water quality as a result of operation of the Proposed Development has been fully assessed in Section 13.4.3.2 above. No effects on otter in this regard are predicted and no mitigation is required.

No effects on otter as a result of disturbance due to operation of the Proposed Development are predicted and no mitigation is required in this regard.

13.6 Residual Impacts

With the mitigation measures implemented as set out in Section 13.5 above, there is no potential for residual significant effect on biodiversity at any geographic scale.

Based on the above, in view of best scientific knowledge, on the basis of objective information, the Proposed Development will not significantly affect surface or ground water in the area during either construction or operation of the Proposed Development. In addition, there is no potential for significant negative impacts on fauna as a result of disturbance. No otter breeding or resting habitats were identified during ecological surveys. Mitigation measures and best practice measures have been included to ensure there is no potential for significant effect via disturbance on otter, bats, waterbirds or other bird species.

All identified pathways for significant impact on biodiversity, as well as Nationally Designated Sites and European Designated Sites (Section 13.4.4) have been robustly blocked through measures to avoid impacts and the incorporation of best practice and mitigation measures into the project design. Therefore, there is no potential for residual significant effect on any Designated Sites as a result of the Proposed Development.

After implementation of the mitigation measures outlined in this report, no potential for residual significant effect on any ecological receptors, their integrity or conservation status, remain.

13.7 Cumulative Impacts and Interactions

The potential for the Proposed Development, when considered on its own, to result in residual effects (non-significant) on the following receptors was identified:

- Surface water quality
- Habitats
- Bird species
- Bat species
- Otter

Taking account of the above, an assessment was made on the potential for cumulative effects with other projects to occur when considered in combination with the Proposed Development. This assessment involved a search of relevant online Planning Registers, reviews of relevant documents, planning application details and planning drawings, and served to identify past and future projects, their activities, and their environmental impacts. Projects where no complete source-pathway-receptor chain was identified or where no potential for significant cumulative effects was identified on the basis of nature, scale and location, were excluded from the assessment. The projects considered include those listed below.

13.7.1 Other WWTP Discharges and Proposed Upgrades

The potential for cumulative water quality impacts to occur, resulting in a significant effect on aquatic habitats and species, has been considered. This cumulative impact assessment was undertaken with regard to the assessments set out in Chapter 16 (Water Environment) of this EIAR.

The following projects in the wider area have been considered in the assessment.

Castletroy WWTP is located approximately 10 km upstream of Limerick WWTP. It currently treats a collected organic load of c. 35,000 PE with a design DWF of 6,050 m³/day. Because Castletroy WWTP is located upstream of Limerick WWTP, the effluent release may affect the concentrations around the Limerick WWTP outfall location.

The proposed upgrade of Castletroy WWTP will be required to cater for 81,000 PE. In addition, it is proposed to construct a new c. 3,750 m³ stormwater storage tank to limit the no. of annual overflow events. The proposed upgrade works will make provision for a new stormwater storage tank, increased aeration capacity by retrofitting the existing aeration tanks IFAS process, increased capacity of the existing Salsnes filter units with 2 no. additional units incl. forward feed pump arrangement and additional sludge storage capacity. The existing

primary discharge point will be retained. This project has been granted and is currently in its construction phase.

The Shannon Town WWTP is located at Tradaree Point approximately 3.8 km south east of Shannon Town and has a primary discharge outfall about 200 m south of the shoreline. It has a domestic capacity of 12,500 PE and a total capacity, including industrial water, of 22,043 PE. The WWTP provides secondary treatment before the effluent is released into the Shannon Estuary. In early 2020, the next phase of the upgrades to the WWTP commenced which will improve the wastewater treatment performance, increase the capacity at the plant and ensure compliance with the Wastewater Treatment Regulations. The Shannon Town WWTP capacity will be upgraded to 28,000 PE.

With the proposed improvements in treatment processes in place for all three WWTPs, no potential for significant cumulative impact on aquatic habitats and fauna is predicted.

13.7.2 Other projects considered in the wider area

13.7.2.1 Limerick City Flood Relief Scheme

The existing information on the proposed Limerick City Flood Relief Scheme (FRS) was reviewed¹¹. However, the project is in early design stages and public consultations. The scheme may include the extent of the Shannon Estuary in the vicinity of the Proposed Development, as well as the Ballinacurra Creek Stream. The FRS is likely to comprise riverbank defence works and will require environmental assessments and associated mitigation measures. In consideration of this, and the prescribed mitigations and Landscape Masterplan and Planting Plan associated with the Proposed Development, significant cumulative effects are not anticipated.

13.7.2.2 Other Projects

In the vicinity of Limerick WWTP:

- Planning Reference 2561339 – For a retention application for alterations to an existing Waste Transfer Station permitted by Limerick City and County Council Planning Reference 16/642. Permission for retention is being sought for: a) The existing warehouse building and adjacent storage tank which represents a building of reduced scale to that previously permitted by 16/642; b) 3 no. ancillary sheds and tent structure; c) Construction Office, and Office and WC; d) Retention and relocation of 2 no. existing modular office buildings; and e) All ancillary hardstanding, roads and parking areas. Planning permission is being sought for: a) The construction of a proposed new access road from the adjacent Limerick Waste Water Treatment Plant Road which will result in the closure of the existing temporary vehicular access from the Dock Road and creation of a pedestrian access only. b) Construction of an ESB Substation and all ancillary landscaping and site development works. The application relates to development which is for the purposes of an activity requiring a waste licence.

The EclA submitted as part of the above application was reviewed online¹². New site access will require the removal of Norway maple planted along the WWTP access road. With the mitigations provided in the EclA and NIS for the development outlined above, along with the prescribed mitigations as part of this planning application, there is no potential for cumulative significant effect.

- Planning Reference 16642 - A 10 year permission is sought to construct the development of a waste transfer facility in two phases. The facility is intended to handle up to 90,000 tonnes of waste per annum. Phase I shall comprise: (i) 1,180sqm administration building; (ii) five bay 898sqm fleet vehicle maintenance and repair garage; (iii) Civic Amenity Area and associated office; (iv) Lean to roofed bin storage / cleaning area; (v) skip compactor storage and hook storage/set down area; (vi) bin management office; (vii) C&D segregation, crusher and storage area; (viii) dedicated timber bay; (ix) 3 no. open, covered glass bay storage areas; (x) truck wheel wash; (xi) 2 no. weighbridges and associated kiosk; (xii) on site car

¹¹ <https://www.floodinfo.ie/frs/en/limerick/home/>

¹² <https://eplan.limerick.ie/iDocsWebDPSS/ViewFiles.aspx?docid=1644212&format=djvu>

parking, truck parking and a bicycle store; and (xiii) automatic truck wash; (xiv) all associated site works including (a) Class I by-pass fuel/oil interceptors, (b) rainwater harvest system, (c) underground attenuation system; (d) 3 no. underground storage tanks (e) connection into the Bunlicky Wastewater Treatment Plant, (f) internal site security fencing; (g) perimeter fencing; (h) landscaping, (i) 2 no. gantry signs; and (j) building signage. Phase II shall comprise: (i) a modular waste transfer building with a maximum floor area of 5,102sqm; (ii) external concrete apron for the turning and parking of articulated vehicles with associated service and circulation areas; (iii) 4 no. rooms to house mechanical structures and to facilitate a switch room, generator, substation and a bunded oil storage facility; (iv) carbon filtration system to the rear of the building; (v) 1 no. open, covered storage bay to accommodate wrapped, bailed waste; (vi) truck wheel wash (vii) temporary construction access located at the south western corner of the site and (viii) all associated site works (This development will be subject to a separate application for a Waste Licence to the Environmental Protection Agency. An Environmental Impact Statement (EIS) will be submitted to the planning authority with the application)

- Planning Reference 19672 -The installation of roof mounted solar panels to existing materials recovery facility and all ancillary works and services.

No potential for significant cumulative effects with regard to the above listed projects, in-combination with the Proposed Development, was identified.

In the vicinity of Corcanree Pump Station:

The following permitted development adjacent to the Corcanree PS was considered during this assessment:

- Planning Reference 221280 - a 7-year planning permission for demolition of 3 no. commercial buildings and removal/demolition of a number of sheds/outbuildings, refurbishment of Block B an existing warehouse building (1,140sqm), provision of 3 no. retail warehouse units (total 2,593sqm) in Block D fronting onto Dock Road, provision of 2 no. logistics warehouse units in Block H (2,790sqm) with an optional mezzanine floor which has the potential to increase floorspace by 350sqm, provision of 34 no. commercial/enterprise units delivered in 5 no. blocks (A, B1, E, F & G) with a total floor area of 9547sqm and an optional mezzanine floor area which has the potential to increase the overall floor area by 1,870sqm, if constructed, totem and building signage and all associated site works including provision of an ESB substation, pumping station and emergency storage, PV panels, mechanical ventilation mounting plant and external condenser units. Primary access to the site will be through the Corcanree Business Park via the Greenpark Roundabout. The existing access serving the site from Dock Road will be restricted to a left in left out junction.

The EIAR and NIS for this development were reviewed online¹³. The Proposed Development is permitted and is located directly adjacent to the proposed storm tank area at Corcanree Pump Station. The planning permission includes for surface water quality mitigation including silt fencing along the OPW drainage channel to the north of the site and other water quality control measures.

The reported usage of site by bats was low. It is proposed to plant a hedgerow of native species (70% hawthorn and blackthorn, as well as crab apple, elderberry, guelder rose, hazel, holly, ivy and spindle) around the east, north and western perimeter of the development site.

With the proposed Landscape Masterplan and Planting Plan in place for the Proposed Development, which also includes screening of the development from the Shannon Estuary with linear treeline planting along the northern boundary of the proposed storm tank, there will be no potential for significant cumulative effects as a result of linear habitat loss. Both developments will be sufficiently screened from the Shannon Estuary.

Once the mitigations outlined for both water quality and disturbance impacts are applied for both developments, it is anticipated that there is no potential for significant cumulative effects to biodiversity.

¹³ <https://eplanning.ie/LimerickCCC/AppFileRefDetails/221280/0>

The following development was also considered during this cumulative impact assessment, however no potential for significant cumulative effects was identified:

- Planning Reference 20687 - Construction of an extension to the north-east side of the existing raw material store building, the recladding of existing asbestos cladding of this building with plastisol coated metal cladding and associated site works

The following application at Irish Cement Ltd was reviewed, however, no potential for significant cumulative effects in combination with the Proposed Development was identified:

Planning Reference 16345 - Application for 10 year permission for development to allow for the replacement of fossil fuels through the introduction of lower carbon alternative fuels and to allow for the use of alternative raw materials in their Limerick Cement Factory. To facilitate the on-site handling, storage, and introduction of the alternative fuels and alternative raw materials it is proposed to construct: a tyre storage area with tyre handling/separation area, and associated conveyor kiln 6 with fire water retention tank; a proposed pumpable fluids storage tank which is located within a concrete bund area with associated uploading station all within a 2.4m high security fencing; a proposed fine solids handling building with 2 no. associated truck unloading areas & associated feed conveyors; associated switch room building & associated conveyor from screening building to dosing building at front end of kiln 6, as well as a fine solids transfer building, associated conveyor connecting to a proposed fine solids dosing building to back end of kiln 6 and associated fore-water retention tank; a proposed alternative raw materials storage building with concrete path surround; 3 no. proposed silos for the introduction of free-flowing solids; a proposed by-pass filter comprising a bag filter and a cooling tower with concrete path surround and 1 no. fire-water retention tank. The works include for the demolition of 4 no. steel and metal clad covered car park bay structures. The works also include for associated mechanical equipment and ancillary works, including provision of short sections of internal roadway, pavement, fencing and landscape works. In reducing the quantity of fossil fuel use, the proposed development seeks to introduce a range of alternative fuels up to a maximum of 90,000 tonnes per annum. The use of alternative raw materials is contained within this proposed overall quantity. The application area extends to 10.52 hectares within Limerick Cement Factory (this application relates to an activity for which an Industrial Emissions Licence applies under the Environmental Protection Act 1992, as amended (Industrial Emission Licence Register Number P0029-03. An Environmental Impact Statement accompanies this planning application)

13.7.3 Plans

The following development plans have been reviewed and taken into consideration in terms of cumulative effects assessment and compliance with biodiversity policy:

- Limerick Development Plan 2022-2028
- Limerick Biodiversity Action Plan 2025-2030
- National Biodiversity Action Plan 2023-2030
- Regional Spatial and Economic Strategy for the Southern Region

The review focused on policies and objectives that relate to Biodiversity and natural heritage. Policies and objectives relating to sustainable land use were also reviewed.

TABLE 13-17 REVIEW OF PLANS

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
Limerick Development Plan 2022-2028	Policy EH P1 Protection of Natural Heritage and Biodiversity. It is a policy of the Council to: a) Protect and conserve Limerick's natural heritage and biodiversity, in particular, areas designated as part of the European Sites Natura 2000 network, such as Special Protection Areas (SPAs) and Special Areas of Conservations (SACs), in accordance with relevant EU Directives and national legislation and guidelines. b) Maintain the conservation value of all Natural Heritage Areas and proposed Natural Heritage Areas (pNHAs) for the benefit of existing and future generations.	The proposed development has been designed so that there will be no adverse effect on any European Site including Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA. The Site-Specific Conservation Objectives for the relevant QIs and SCIs of these sites have been reviewed in light of the proposed development. Appropriate mitigation measures have been included in order to ensure the integrity of the Natura 2000 Network.
	Objective EH O1 Designated Sites and Habitats Directive. It is an objective of the Council to ensure that projects/plans likely to have significant effects on European Sites (either individually or in combination with other plans or projects) are subject to an appropriate assessment and will not be permitted under the Plan unless they comply with Article 6 of the Habitats Directive. The Council, will through the planning enforcement process where applicable, seek to restore the ecological functions of designated sites, where they have been damaged through inappropriate development.	The precautionary principle has been applied in the design of the proposed development with precautionary mitigation included to avoid adverse effect on European Sites and wider biodiversity through water quality deterioration, and disturbance during construction and operation.

Limerick Biodiversity Action Plan 2025-2030	Action B.2. Ring fence a percentage of development contribution specifically for biodiversity	A Landscape Masterplan and Planting Plan is in place for the Proposed Development which includes measures for biodiversity enhancement, including meadow management, tree planting and creation of faunal habitat.
	Action B.15. Promote native/local provenance for trees, shrubs plants etc. and LCCC to include this as a criteria for procurement	All trees and shrubs proposed as part of landscaping measures will be of native provenance.
	Action B.18. Promote the prevention of fragmentation of ecological corridors including hedgerows and riverine features	Enhancement of ecological corridors is a key objective of the Proposed Development with landscaping measures proposed to ensure continued and enhanced wildlife connectivity
	Action C.1. Protect and enhance Biodiversity on all developments in Limerick including new, existing and refurbished developments along with Greenways and all infrastructural developments - New measures introduced to be highlighted in new developments and progress implementation of the Greenway Biodiversity Action Plan	The Proposed Development has been designed to avoid loss of high value habitat. It has also been designed to incorporate biodiversity enhancement proposals as part of a Landscape Masterplan and Planting Plan.
	Action C.3 - In line with LCCC Tree Policy increase the planting of suitable trees and hedgerows of local provenance	All trees and shrubs proposed as part of landscaping measures will be of native provenance.
National Biodiversity Action Plan 2023-2030	Objective 1: Adopt a Whole-of Government, Whole of-Society Approach to Biodiversity. Proposed actions include capacity and resource reviews across Government; determining responsibilities for the expanding biodiversity agenda providing support for communities, citizen scientists and business; and mechanisms for the governance and review of this National Biodiversity Action Plan.	The Proposed Development will not contravene the proposed objectives of the NBAP. On review of the NBAP, no potential for cumulative effect when considered in-combination with the Proposed Development was identified.
	Objective 2: Meet Urgent Conservation and Restoration Needs. Supporting actions will build on existing conservation measures. Efforts to tackle Invasive Alien Species will be elevated. The protected area network will be expanded to include the Marine Protected Areas. The ambition of the EU Biodiversity Strategy will be considered as part of an evolving work programme across Government.	
	Objective 3: Secure Nature's Contribution to People. Actions highlight the relationship between nature and people in Ireland. These include recognising the tangible and intangible values of biodiversity, promoting nature's importance to our culture and	

	heritage and recognising how biodiversity supports our society and our economy.	
	Objective 4: Enhance the Evidence Base for Action on Biodiversity. This objective focuses on biodiversity research needs, as well as the development and strengthening of long-term monitoring programmes that will underpin and strengthen future decision-making. Action will also focus on collaboration to advance ecosystem accounting that will contribute towards natural capital accounts.	
	Objective 5: Strengthen Ireland's Contribution to International Biodiversity Initiatives. Collaboration with other countries and across the island of Ireland will play a key role in the realisation of this Objective. Ireland will strengthen its contribution to international biodiversity initiatives and international governance processes, such as the United Nations Convention on Biological Diversity.	
Regional Spatial and Economic Strategy for the Southern Region	RPO 1 b. The RSES seeks to protect, manage, and through enhanced ecological connectivity, improve the coherence of the Natura 2000 Network in the Southern Region. c. RSES support for other plans/ programmes (and initiatives arising) is on the basis of appropriate SEA, SFRA, EIA and AA processes being undertaken in order to ensure the avoidance of adverse effects on European Sites and ensure implementation of mitigation measures where required.	The site-specific conservation objectives for Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA were comprehensively reviewed in undertaking this assessment. The surveys undertaken in the preparation of this application, the design of the development and the proposed mitigations in place, demonstrate that the Proposed Development will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any European Site, during construction or operation of development. The proposed upgrades will help Uisce Éireann to meet the aims of the Strategy with regard to improvement in wastewater infrastructure and avoiding adverse impacts on the integrity of the Natura 2000 network. The design of the Proposed Development and associated landscaping plan aims to maintain and enhance wildlife commuting corridors and retain and enhance existing features of ecological value.

	RPO 5 - Population Growth and Environmental Criteria Increased population growth should be planned with regard to environmental criteria, including: • Assimilative capacity of the receiving environment; • Proximity of Natura 2000 sites and potential for adverse effects on these sites, and their conservation objectives; • Areas with flood potential	The site-specific conservation objectives for Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA were comprehensively reviewed in undertaking this assessment. The surveys undertaken in the preparation of this application, the design of the development and the proposed mitigations in place, demonstrate that the Proposed Development will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any European Site, during construction or operation of development. The proposed upgrades will help Uisce Éireann to meet the aims of the Strategy with regard to improvement in wastewater infrastructure and avoiding adverse impacts on the integrity of the Natura 2000 network. The design of the Proposed Development and associated landscaping plan aims to maintain and enhance wildlife commuting corridors and retain and enhance existing features of ecological value.
	RPO 11 k. To plan increasing population growth in all Key Towns on a phased basis in collaboration with Irish Water, the local authority and other stakeholders to ensure that the assimilative capacity of the receiving environment is not exceeded and that increased wastewater discharges from population growth does not contribute to degradation of water quality and avoids adverse impacts on the integrity of water dependent habitats and species within the Natura 2000 network. RPO124 Green Infrastructure a. It is an objective to promote the concept of connecting corridors for the movement of wildlife and encourage the retention and creation of features of biodiversity value, ecological corridors and networks that connect areas of high conservation value such as woodlands, hedgerows, earth banks, watercourses and wetlands. The RSES recognises the	The site-specific conservation objectives for Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA were comprehensively reviewed in undertaking this assessment. The surveys undertaken in the preparation of this application, the design of the development and the proposed mitigations in place, demonstrate that the Proposed Development will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any European Site, during construction or operation of development. The proposed upgrades will help Uisce Éireann to meet the aims of the Strategy with regard to improvement in wastewater infrastructure and avoiding adverse impacts on the integrity of the Natura 2000 network.

	necessity of protecting such corridors and the necessity to encourage the management of features of the landscape.	The design of the Proposed Development and associated landscaping plan aims to maintain and enhance wildlife commuting corridors and retain and enhance existing features of ecological value.
	RPO 208 Irish Water and Water Supply It is an objective to: a. Support the implementation of Irish Water Investment Plans (prepared in five-year cycles) and subsequent investment plans and seek such plans to align the supply of water services with the settlement strategy and objectives of the RSES and Metropolitan Area Strategic Plans for Cork, Limerick, Shannon and Waterford; b. Support the role of Irish Water Investment Plans in taking into account seasonal pressures on critical service infrastructure, climate change implications and leakage reduction in the design of all relevant projects; c. Deliver and phase services, subject to the required appraisal, planning and environmental assessment processes and avoid adverse impacts on the integrity of the Natura 2000 network; d. Local Authority Core Strategies shall demonstrate compliance with DHPLG Water Services Guidelines for Planning Authorities and demonstrate phased infrastructure led growth to meet demands on the water supply, suitability of new and/or existing drinking water sources (for example hydro morphological pressures) and prevent adverse impacts on the integrity of water dependent habitats and species within the Natura 2000 network.	
	RPO 212 Strategic Wastewater Treatment Facilities a. It is an objective to support investment and the sustainable development of strategic wastewater treatment facilities by Irish Water in the Region arising from initiatives including Investment Plans, Strategic Drainage Area Plans subject to appropriate environmental assessment and the planning process.	

	b. For the management of wastewater, increasing population growth should be planned on a phased basis in collaboration with Irish Water and the local authorities to ensure that the assimilative capacity of the receiving environment is not exceeded and that increased wastewater discharges from population growth does not contribute to degradation of water quality and to avoid adverse impacts on the integrity of the Natura 2000 network.	
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13.7.4 Conclusion of Cumulative Effects Assessment

Following the detailed assessment provided in the preceding sections, it is concluded that, the proposed development will not result in any significant residual effects on biodiversity, when considered on its own. Following the review of the above plans and projects, it is concluded that there is no potential for it to contribute to any significant cumulative effects on Biodiversity when considered in-combination with other plans and projects.

13.8 Difficulties encountered in Compiling Information

The information provided in this document accurately and comprehensively describes the baseline ecological environment; provides an accurate prediction of the likely ecological effects of the Proposed Development; prescribes mitigation as necessary; and describes the residual ecological impacts. The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines. No significant limitations in the scope, scale or context of the assessment have been identified.

13.9 References

- Andrews, H. (2018). *Bat Roosts in Trees: A Guide to Identification and Assessment for Tree-Care and Ecology Professionals*. Pelagic Publishing, Exeter.
- Bibby, C.J., 2000. Bird census techniques. Elsevier. Available online: <https://www.ebcc.info/wp-content/uploads/2020/06/gregory-bird-census-and-survey-techniques.pdf>.
- Birds Directive (2009/47/EC) – http://ec.europa.eu/environment/naturelegislation/birdsdirective/index_en.htm
- BirdWatch Ireland website <http://www.birdwatchireland.ie/>
- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.3. Chartered Institute of Ecology and Environmental Management, Winchester.
- Collins, J. (ed.) (2023) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition)*. The Bat Conservation Trust, London.
- Crowe, O. (2005) Ireland's Wetlands and their Waterbirds: Status and Distribution. BirdWatch Ireland, Rockingham, Co. Wicklow.
- EPA website: <http://www.epa.ie>.
- European Communities (Conservation of Wild Birds) Regulations, 1985, SI 291/1985 & amendments – <http://www.irishstatutebook.ie>.
- European Communities (Environmental Impact Assessment) Regulations, 1989 to 2006.
- European Communities (Natural Habitats) Regulations, SI 94/1997, SI 233/1998 & SI 378/2005 – <http://www.irishstatutebook.ie>.
- Fossitt, J. A. (2000). A Guide to Habitats in Ireland. Dublin: The Heritage Council.
- Gilbert G, Gibbons DW and Evans J (1998). Bird Monitoring Methods: A manual of techniques for key UK species. RSPB, Bedfordshire
- Gilbert G, Stanbury A Lewis (2021). Birds of Conservation Concern in Ireland 4: 2020–2026. Birdwatch Ireland.
- Inland Fisheries Ireland website <http://www.fisheriesireland.ie/>
- Habitats Directive (92/43/EEC).
- National Biodiversity Data Centre website <http://www.biodiversityireland.ie/>
- NPWS Protected Site Synopses available on <http://www.npws.ie/en/ProtectedSites/>.
- NPWS (2012) Conservation Objectives: River Shannon and River Fergus Estuaries SPA 004077. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
- NPWS (2012) River Shannon and River Fergus Estuaries SPA 004077 Conservation Objectives Supporting Document Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
- NPWS (2012) Appendix 8. River Shannon and River Fergus Estuaries SPA 004077 Conservation Objectives Supporting Document Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
- NPWS (2012) Appendix 9. River Shannon and River Fergus Estuaries SPA 004077 Conservation Objectives Supporting Document Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
- NPWS (2023) - The Monitoring and Assessment of four EU Habitats Directive Annex I Woodland Habitats - Irish Wildlife Manuals 146

NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes. National Roads Authority, Ireland. <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf>

Preston C.D. et. al. (2002). New Atlas of the British and Irish Flora. Oxford University Press.

Water status data available on <http://www.epa.ie> and <http://www.wfdireland.ie>

Wildlife Act 1976 and Wildlife (Amendment) Act 2000.



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