5 Biodiversity

5.1 Introduction

This chapter provides an Ecological Impact Assessment (EcIA) which addresses the potential ecological impacts that may occur in the future on the terrestrial, avian and aquatic ecology of a Proposed Development at Cappanihane, Co. Limerick and its surrounding environs.

This report has been undertaken in accordance with the guidelines issued by the Environmental Protection Agency (EPA) and the Chartered Institute of Ecology and Environmental Management (CIEEM).

It follows a standard approach based upon the description of the existing baseline conditions within the site of the Proposed Development. An evaluation of the likely habitats and species currently present within the Proposed Development site is also given, along with the identification of the potential ecological impacts arising from the construction and operation of the Proposed Development. An assessment of the likely significance of the identified impacts on Valued Ecological Receptors (VERs), both within and close to the Proposed Development site is also made. Where a significant negative impact has been identified, then suitable remedial mitigation measures are provided in order to prevent, reduce, or offset the impact.

The main objectives of this ecological assessment were:

- Undertake a desktop review of existing baseline ecological data for the Proposed Development site and the wider area, including European and National sites of biodiversity importance within the Zone of Influence of the proposed development site.
- Undertake a field survey of the receiving environment.
- Evaluate the features of biodiversity value within the Proposed Development site and within the Zone of Influence of the Proposed Development site.
- Evaluate the potential negative impacts of the Proposed Development site on features of biodiversity value within the Proposed Development site and its Zone of Influence.
- Evaluate potential significant effects upon European or National sites.
- Consider measures to mitigate the potential negative impact(s) of the project on the ecology of the receiving environment.

5.1.1 Legislative and Policy Context

The Irish Wildlife Act 1976 (and its amendment of 2000) provides protection to most wild birds and animals. Interference with such species can only occur under licence. Under the act it is an offence to “wilfully interfere with or destroy the breeding place or resting place of any protected wild animal”. The basic designation for wildlife is the Natural Heritage Area (NHA). This is an area considered important for the habitats present or which holds species of plants and animals whose habitat needs protection. Under the Wildlife Amendment Act (2000) NHAs are legally protected from damage. NHAs are not part of the Natura 2000 network and so the Appropriate Assessment process does not apply to them.

The Flora Protection Order 1999 provides statutory protection in Ireland to a number of rare plant species from being wilfully cut, picked, uprooted or damaged. It is also illegal under this order to alter, damage or interfere with their habitats.

The Birds Directive (Council Directive2009/147/EC) recognises that certain species of birds

should be subject to special conservation measures concerning their habitats. The Directive requires that Member States take measures to classify the most suitable areas as Special Protection Areas (SPAs) for the conservation of bird species listed in Annex 1 of the Directive. SPAs are selected for bird species (listed in Annex I of the Birds Directive), that are regularly occurring populations of migratory bird species, and the SPA areas are of international importance for these migratory birds.

The EU Habitats Directive (92/43/EEC) requires that Member States designate and ensure that particular protection is given to sites (Special Areas of Conservation) which are made up of or support particular habitats and species listed in annexes to this Directive.

The Water Framework Directive (WFD) (2000/60/EC), which came into force in December 2000, establishes a framework for community action in the field of water policy. The overall aim of the WFD is the eventual achievement of good status in all waterbodies. The WFD was transposed into Irish law by the European Communities (Water Policy) Regulations 2003 (S.I. 722 of 2003). The WFD rationalises and updates existing legislation and provides for water management on the basis of River Basin Districts (RBDs). RBDs are essentially administrative areas for coordinated water management and are comprised of multiple river basins (or catchments), with cross-border basins (i.e. those covering the territory of more than one Member State) assigned to an international RBD. Ireland is now within the 3rd cycle of the WFD (2022 – 2027).

5.1.2 Planning Policies

National

Nationally, the Government's commitment to sustainable development is set out in a number of documents including the National Planning Framework and the National Development Plan 2018 – 2027.

Regional

Planning at the regional level is now guided by the Regional Spatial and Economic Strategy (RSES). The RSES is a strategic plan which identifies regional assets, opportunities and pressures and provides appropriate policy responses in the form of Regional Policy Objectives.

Local

Planning policy at the local level is currently provided by the Limerick County Development Plan 2022–2028. This plan contains a number of objectives and Development Management Requirements relevant to ecology, biodiversity, green infrastructure and nature conservation. These are summarised in **Table 5.1**.

Table 5.1: Development Management Requirements Relevant to Ecology and Nature Conservation

Policy No:	Biodiversity Policy Objectives
EH P1	To 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. To maintain the conservation value of all-Natural Heritage Areas and proposed Natural Heritage Areas (pNHAs) for the benefit of existing and future generations.
EH P2	To ensure the sustainable management and conservation of areas of natural environmental and geological value within Limerick and to protect, enhance, create and connect, where ecologically suitable, natural heritage, green spaces and high-quality amenity areas for the benefit of biodiversity.

EH P3	To take into account the contents of the National Biodiversity Action Plan and the Biodiversity Climate Adaptation Plan and any forthcoming guidance or legislation on climate action, whether adaptation or mitigation that will emerge during the course of the Draft Plan
EH P4	To place ecological and environmental issues at the centre of planning policies and decisions and in doing so, will adhere to the objectives set out in Limerick's Heritage Plan 2017-2030.
EH P6	To ensure that water and air quality shall be of the highest standard, to ensure the long term economic, social and environmental well-being of Limerick's resources. The World Health Organisation Air Quality Guidelines will be the basis for the air quality guidance in Limerick.
EH P7	To proactively manage environmental noise, where it may have a significant adverse impact on the health and quality of life of communities in Limerick and to support the aims of the Environmental Noise Regulations, through the development and implementation of Noise Action Plans
EH 01	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 Draft Plan unless they comply with Article 6 of the Habitats Directive.
EH 02	To all developments in areas where there may be Lesser Horseshoe Bats, to submit an ecological assessment of the effects of the development on the species. The assessment shall include mitigation measures to ensure that feeding, roosting or hibernation sites for the species are maintained. The assessment shall also include measures to ensure that landscape features are retained, and that the development itself will not cause a barrier or deterrent effect on the species
EH 03	To require all developments where there are species of conservation concern, to submit an ecological assessment of the effects of the development on the site and nearby designated sites, suggesting appropriate mitigation measures and establishing, in particular, the presence or absence of the following species: Otter, badger, bats, lamprey and protected plant species such as the Triangular Club Rush, Opposite Leaved Pond Weed and Flora Protection Order Species generally
EH 04	Creation of New Habitats. It is an objective of the Council to a) Seek the creation of new habitats by encouraging wild green areas and new water features such as, pools and ponds in new developments. b) Encourage management plans for green areas to use the minimum of pesticides and herbicides. c) The creation of areas that are not subject to public access in order to promote wildlife use is strongly encouraged.
EH 05	To require new infrastructure and linear developments in particular, to demonstrate at design stage sufficient measures to assist in the conservation of and dispersal of species and to demonstrate a high degree of permeability for wildlife, to allow the movement of species and to prevent the creation of barriers to wildlife and aquatic life in the wider countryside
EH 06	To require road developments to incorporate from the design stage, elements that will assist in the conservation of the Barn owl.
EH 07	To continue to actively support the aims and objectives of the All Ireland Pollinator Plan 2021 – 2025, by encouraging measures to protect and increase the population of bees and other pollinating insects in Limerick. To support the aims of the National Biodiversity Action Plan and succeeding plans, in emphasising the importance of ecological issues in planning
EH 08	To require the provision of alternative roosting or settlement facilities for species, such as bird or bat boxes, swift boxes, artificial holts (for otters), or other artificially created habitats in proposed developments, where considered appropriate.
EH 09	To seek the conservation and protection of features of geological interest within Limerick, particularly those that would have been recognised in the past as Areas of Scientific Interest or by the Geological Survey of Ireland as being of particular value. To undertake a survey of such sites during the lifetime of the Draft Plan.
EH 010	To require the planting of native trees, hedgerows and vegetation and the creation of new habitats in all new developments and public realm projects. The Council will avail of tree planting schemes administered by the Forest Service, in ecologically suitable locations, where this is considered desirable. To require, in the event that mature trees, or extensive mature hedgerow is proposed to be removed, that a comprehensive tree and hedgerow survey be carried out by a suitably qualified individual, demonstrating that the subject trees/hedgerow are of no ecological or amenity value.
EH O11	To work with and facilitate the work of agencies addressing the issue of terrestrial and aquatic invasive alien species (IAS), by implementing biosecurity measures, selected control measures and surveys, where appropriate. To address the presence of Invasive alien Species on derelict sites under the provisions of the Derelict Sites Act through the preparation of a management and eradication plan for these species. To require the submission of a control and management

	program for the particular invasive species as part of the planning process, if developments are proposed on sites where invasive species are present. To employ biosecurity measures to prevent the spread of invasive alien species and disease and to insist that all such measures are employed on all development sites.
EH O12	To promote a network of green and blue infrastructure throughout Limerick. To promote connecting corridors for the movement of species 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, wetlands and designated sites. In this regard, new infrastructural projects and linear developments, will have to demonstrate at design stage, sufficient measures to assist in the conservation of and dispersal of species. To ensure the integration and strengthening of green infrastructure into the preparation of Local Area Plans. Where possible remove barriers to species movement, such as the removal of in-stream barriers to fish passage for example
EH O13	To prepare and implement a Green and Blue Infrastructure Strategy for Limerick City and Environs
EH O14	To increase the use of Nature Based Solutions (NBS) throughout Limerick.
EH O15	To protect ground and surface water resources and to take into account the requirement of the Water Framework Directive when dealing with planning and land use issues. To implement the provisions of the River Basin Management Plan 2018 - 2021 and any succeeding plan. The filling of wetlands, surface water features and modifications and drainage of peatlands shall generally be prohibited. To implement the measures put forward in the Limerick Groundwater Protection Plan, in assessing planning applications and their consequences for ground water.
EH O16	To ensure that septic tanks/proprietary treatment systems, or other wastewater treatment and storage systems which are required as part of a development, comply with the standards set out under EPA 2021 etc. and that they are constructed only where site conditions are appropriate. In respect of groundwater, it is a requirement that as part of the required site assessments the local groundwater conditions as identified in the groundwater protection scheme and the River Basin Management Plan 2018-2021 are properly assessed in informing the Groundwater Protection Response.
EH O17	To support commitments to achieve and maintain 'At Least Good' status, except where more stringent obligations are required. There shall be no deterioration of status for all water bodies under the Marine Strategy Framework Directive and its programme of measures, the Water Framework Directive and the River Basin Management Plan. Key challenges include, inter alia, the need to address significant deficits in urban waste-water treatment and water supply, addressing flooding and increased flood risks from extreme weather events and increased intense rainfall because of climate change.
EH O18	To maintain riverbank vegetation along watercourses and ensure protection of a 20m riparian buffer zone on greenfield sites and sites are maintained free from development. Proposals shall have cognisance to the contents of the Inland Fisheries Ireland document 'Planning for Watercourses in Urban Environments'

5.1.2.1 Heritage Plans

Ireland's National Biodiversity Plan identifies actions that need to be taken in order to understand and protect biodiversity in Ireland. It states that biodiversity and ecosystems in Ireland should be conserved and restored, to deliver benefits that are essential to all sectors of society and that Ireland should contribute to the efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally.

The County Limerick Heritage Plan 2017-2030 and Limerick Biodiversity Action Plan 2025-2030 (Draft) identify a number of objectives and policies in order to protect the natural heritage and biodiversity of County Limerick.

5.2 Methodology

5.2.1 Statement of Competence

This report was carried out by Neve McCann, BSc (Hons), MSc. Neve holds an honours degree in Zoology and a Master's in Applied Marine Conservation, equipping her with a robust

understanding of ecology, ecological assessments, and environmental conservation. She has advanced skills in data analysis and GIS tools, excelling in habitat mapping, biodiversity monitoring, and environmental assessments. Neve has played a key role in seafloor integrity and food webs assessments for Ireland's Marine Strategy Framework Directive, contributing to the most recent knowledge on the health of Irish waters. Neve has extensive fieldwork experience, having participated in numerous marine surveys and ecological projects. She is also a named coauthor on multiple technical reports related to the marine environment, including publications on underwater TV imaging analysis for marine fisheries management, the impacts and trade-offs of fisheries on benthic habitats, and the distribution of Vulnerable Marine Ecosystems in Irish waters. In her role as an ecologist, Neve collaborates with multidisciplinary teams to deliver high-quality environmental solutions, ensuring compliance with current environmental legislation and standards.

This report was co-authored by Larry Manning BSc (Hons). Larry has an honours degree in Applied Freshwater and Biology from GMIT (ATU) Galway, were he gained an education in ecology and environmental management. Larry has worked on a wide variety of ecological assessments and habitat/species management surveys, including working as a consultant MMO for the Irish Whale and Dolphin Group Consulting, taking a lead role in marine engineering projects and overseeing regulatory compliance. He has extensive experience in the field of fisheries monitoring and research both in North Atlantic waters and in Antarctic waters for CAMMLR representing the South Georgia and South Sandwich Islands government.

The author has worked as a fisheries scientist for the Marine Institute since 2017 on research projects, species management plans, and fisheries species-specific population analysis. While working in the Fisheries Ecosystem Advisory Service at the Marine Institute, Larry engaged with the fishing fleet directly while data gathering at sea on trawlers and played a vital role in gathering sensitive data pertaining to national catch quotas and landings obligations relevant to current regulations. Larry also has experience in implementing company strategy for offshore hydrographic and geophysical surveys in line with current legislation for Offshore windfarm development. During seismic surveys the author was employed as an offshore fisheries liaison officer which required in depth knowledge of regulatory frameworks to ensure the fishing fleet, the survey company, and the ships officers of the watch were all compliant and safe during highly complex and dynamic operations. The author also works as an ornithologist and provides habitat and species assessments for terrestrial infrastructure developments.

5.2.2 Study Area

The study area encompasses all the land within the area defined in the plan submitted for planning consent, i.e., the Proposed Development site. In addition, important ecological habitats and receptors within the Zone of Influence of the Proposed Development site were also studied.

5.2.3 Desk Based Studies

The desk study involved the examination of aerial photographs, current and historical maps and plans and drawings of the Proposed Development site. In addition, information was collated on designated nature sites within the Zone of Influence of the Proposed Development site and on protected and rare species within the 1km square of the site.

The following websites were used to access information and data:

- National Parks and Wildlife Service – www.npws.ie. Information held by NPWS on protected species within the Zone of Influence of the Proposed Development site was queried.
- National Biodiversity Data Centre – www.biodiversitycentre.ie. Data was gathered on rare, protected or threatened species located within the Zone of Influence of the Proposed Development site.
- Ordinance Survey Ireland – www.osi.ie. Current and historical maps, along with aerial photographs to ascertain current and past land-use and potential habitats within the Proposed Development site and surrounding lands.
- My Plan – www.myplan.ie – Additional mapping information.
- Google Maps & Street View – maps.google.ie – Aerial photographs.
- Environmental Protection Ireland – www.epa.ie.The EPA Appropriate Assessment tool was used to gather information on Natura 2000 sites within the Zone of Influence of the Proposed Development site. Information on Water Quality was also obtained from this site.
- Limerick County Council – Information pertaining to planning history in the area and other plans and projects to allow an assessment of the potential cumulative impacts.

5.2.4 Field Based Studies

A visit to the Proposed Development site at Cappanihane, Co. Limerick was conducted on November 12th, 2024, by a team of ORS Ecologists, when relevant field notes, species lists and photographs were taken. The habitats within the Proposed Development site were identified and classified according to 'A Guide to Habitats in Ireland' (Fossitt, 2000). Plant species present in each habitat type were recorded. Habitats were assessed for their potential to be protected habitats under Annex I of the EU Habitats Directive (92/43/EEC) and for their capacity to support rare, threatened, and endangered species. The methodology used in this report to assess the impact on habitats is based on NRA guidelines (2009).

The habitat mapping exercise had regard to the 'Best Practice Guidance for Habitat Survey and Mapping' (*Smith et al., 2011*) published by the Heritage Council. Scientific and common names for plants follow *Parnell et al. (2012)* and *Blamey et al. (1996)*, respectively. In addition to habitat identification, each habitat was assessed for its ecological significance, based on the National Roads Authority (NRA) Site Evaluation Scheme (NRA, 2009).

5.2.4.1 Terrestrial Mammals, Birds and Bats

Any signs and sightings of terrestrial mammals were noted in the site walkover in November 2024. All bird activity seen or heard was noted. Potential bat habitats and roosts were also noted.

5.2.4.2 Aquatic Surveys

Aquatic ecology surveys, including biological assessment (Q-values) of the stream near the site, were also carried out in November 2024 by ORS.

5.2.4.3 5.2.4.3 Seasonal Constraints

Having regards to the limited and largely improved habitats within the main area of the Proposed Development site, it was considered that there were no seasonal constraints associated with the habitat assessment element of the field work for this EcIA. The timing of the survey was ideal for the identification of mammal tracks and signs.

5.2.5 Assessment Methodology

5.2.5.1 Evaluation of Ecological Features

The methodologies used to determine the value of ecological resources, to characterise the impacts of the Proposed Development, and to assess the significance of impacts and any residual effects are described below. This approach is in accordance with the following guidelines and methodologies:

- Guidelines for Ecological Impact Assessment in the UK and Ireland by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018)
- Guidelines On the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
- Guidelines for Assessment of Ecological Impacts of National Road Schemes. (NRA, 2009).
- Guidelines on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission, 2013).

CIEEM suggest that to ensure a consistency of approach, ecological features are valued in accordance with their geographical frame of reference, as defined below:

- International
- National (Ireland)
- Regional (South)
- County (Limerick)
- District (Limerick County)
- Local/Townland (Cappanihane, County Limerick)

The above categories are then applied to the ecological features identified. Ecological features can be defined as:

- Designated sites (i.e., SACs, SPAs, NHAs, pNHAs, National Nature Reserves) or non-statutory locally designated sites and features.
- Non-designated sites and habitats and features of recognised biodiversity value, such as rivers and streams. The features being evaluated can be considered in the context of the site and locality and thus a more accurate assessment of the impacts in the locality can be made.

5.2.5.2 Assessment of Impacts

The assessment of potential ecological impacts has been carried out using guidelines published by the EPA and the CIEEM. They can be summarised as:

- The identification of the range of potential impacts which can reasonably be expected to occur should the Proposed Development receive planning consent.
- The consideration of the systems and processes in place to avoid, reduce and mitigate the possible effects of these impacts.
- The identification of opportunities for ecological enhancement within the Proposed Development site.

Impacts are defined as being positive, negative, or neutral. A significant impact is defined as an impact upon the integrity of a defined ecosystem and/or the conservation status of a habitat or

species within a given area. Where a potential negative impact has been identified, mitigation measures have been formulated using best practices techniques and guidance to prevent, reduce or offset the impact.

5.3 Characteristics of the Proposed Development

5.3.1 Description of the Proposed Project

The Applicant, Cycle0 (IE) Limited, proposes to develop a Renewable Biogas Facility (herein referred to as the Proposed Development) on a site located in the townland of Cappanihane, Bruree, Co. Limerick.

The proposed development comprises the construction of an anaerobic digestion facility to produce renewable biomethane, CO_2 (which will be captured), and a bio-based fertiliser from organic material. The total proposed gross floor area of the development (including internal plant areas and ancillary structures) will be c. 5,903 sq.m.

The development will consist of the following:

- Construction of 2 no. primary digesters (with an overall height of c. 9.1m), a pump house (with a gross floor area (GFA) of c. 279.8 sq.m), and 2 no. post digester tanks (with an overall height of c. 9.1m), located in the northeastern section of the site.
- Construction of 2 no. prepits (c. 4.8m in height), a pasteurisation buffer tank (c. 4.8m in height), and a pasteurisation unit (with a maximum height of c. 4.2m), located west of the primary digesters, within the northern section of the site.
- Construction of a digestate storage tank (c. 11.3 in height) located centrally on site, to the south of the primary and post digester tanks.
- Construction of a digestate treatment building and a feedstock reception building (with a height of c. 12m and a GFA of c. 2,797.2 sq.m) with odour abatement system (with a height of c. 11.0m to odour abatement stack), located in the northwestern section of site.
- Construction of combined heat and power (CHP) unit (c. 2.6m in height and c. 5.6m in height to flue, with a GFA of c. 38.53 sq.m), a biogas boiler (c. 2.6m in height and c. 5.6m in height to flue, with a GFA of c. 12.74 sq.m), a backup boiler (c. 2.6m in height), a gas treatment system (c. 4.2m in height), a biomethane compression system (c. 4.2m in height), and a safety flare (c. 11.3m in height), located south of the digestate storage tank, in the south-east section of the site.
- Construction of a CO_2 liquefactor (with an overall height of c. 10.7m to top of storage vessels), a propane tank compound accommodating 2 no. propane tanks (c. 1.6m in height), and an ESB substation (with a GFA of c. 23.5 sq.m and a height of c. 3.4m), located in the south-eastern section of the site.
- Construction of roofed silage clamps (with a GFA of c. 2,424 sq.m and a height of c. 8.7m) and a fuel storage tank (c. 2m in height), located in the western section of the site.
- Construction of a two storey office building (with a GFA of c. 327.4 sq.m and a height of c. 11m) within the western section of the site, adjacent to the site entrance.
- Alterations to the adjacent local road including a new site entrance and access arrangements, provision of a passing bay, boundary setbacks and replacement planting, and road improvements to allow for improved access and safety.

Associated and ancillary works including parking (8 no. standard, 3 no. EV and 1 no. accessible parking spaces and bike storage for 10 no. bikes), a new site entrance and gate, a weighbridge, solar PV arrays at roof level, wastewater treatment equipment, bunding and surface treatments, attenuation pond, boundary treatments, lighting, services, lightning

protection masts, drainage, landscaping, and all associated and ancillary works

Extracts from the planning drawings as submitted can be seen in **Figure 5.1**. A detailed description of the processes involved at this Proposed Development are included in **Chapter 2: Project Description** of this EIA.

Figure 5.1: Extract from Planning Drawings (as prepared by ORS. Ref no: 231240-ORS-ZZ-00-DR-AR-200)

5.4 Receiving Environment

This section provides an overview of the existing ecological conditions within the site and the surrounding environment.

5.4.1 Site Location & General Description

The proposed site is in the rural townland of Cappanihane on the northern side of the R518 Regional Road, linking O'Rourke's Cross and Lee's Cross, Co. Limerick. The site is currently used as agricultural pastureland and is surrounded by agricultural lands to the north and east, with the R518 regional route to the south and the L8658 local road to the west.

The application site comprises an area of c. 5.03 hectares. The site is located approximately 13km west of Kilmallock, Co. Limerick, 20km east of Newcastle West, Co. Limerick and 25km southwest of Limerick City. The approximate grid reference location for the centre of the site is R 48890 31642, ITM: 548844, 631675.

The area surrounding the site is predominantly rural, characterized by agricultural fields, hedgerows, and scattered residential properties. A map showing the approximate outline of the site and its surrounding environment is provided in **Figure 5.2**.

Figure 5.2: Map showing the site boundary. Source: Google Satellite.

5.4.1.1 Land Use and Habitats Surrounding the Proposed Development

An assessment of land use and habitats surrounding the Proposed Development site was conducted using up-to-date aerial imagery. The site is situated in a predominantly rural area characterized by agricultural activity, with fields delineated by hedgerows. The dominant habitat within the site is improved agricultural grassland (Fossitt Code: GA1). Other habitats present in the surrounding landscape include hedgerows (WL1), treelines (WL2), drainage ditches (FW4), and small areas of scrub (WS1).

The Lower Ballyteige stream, a tributary of the Maigue River (FW2), runs along the eastern boundary of the site and flows northeast. This watercourse runs adjacent to agricultural fields before joining the main Maigue River approximately 5 km to the northeast. The woodland northeast of the site, visible on the aerial imagery, is approximately 50 meters wide and extends for 390 meters, following the stream's course. Residential and farm buildings are situated near the woodland, approximately 250 meters northeast of the site boundary.

The site is centred within agricultural pasture, of which the R518 regional road forms part of the southern boundary, with a residential property located directly across the road. Additional agricultural fields extend beyond the road, with scattered residential buildings visible within the landscape. A narrow, unmarked local road (L8658) lies immediately to the west of the site, providing access to the Proposed Development.

The surrounding area features a typical rural landscape, with hedgerows and drainage features dividing agricultural fields and scattered residential dwellings, as shown in **Figure 5.4**.

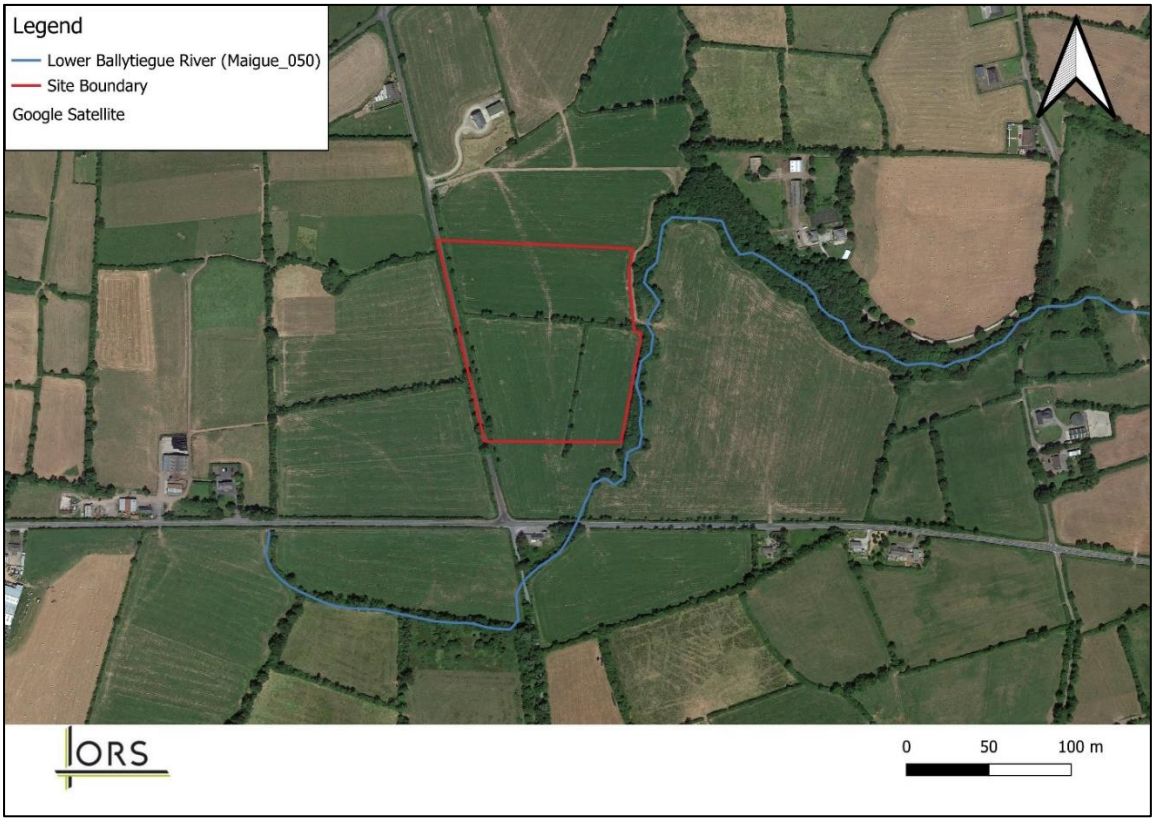

Figure 5.4 – Aerial Photograph Showing Habitats Surrounding the Study Area. Proposed Development Site is Outlined in Red

5.5 Designated Sites

5.5.1 Natura 2000 Sites

The proposed site is not within or immediately adjacent to any site that has been designated as a Special Area of Conservation (SAC) or a Special Protection Area (SPA) under the EU Habitats or EU Birds Directive.

There are three Natura 2000 sites within the Zone of Influence of this Proposed Development site. These sites are summarised in **Table 5.2**. The location of the site in relation to these designated areas are shown in **Figure 5.5** and a full synopsis of these sites can be read online on the website of the National Parks and Wildlife Service (www.npws.ie).

Table 5.2 – Natura 2000 Sites within 15km of the Proposed Development

Site Name & Code	Distance from Site	Qualifying Interests
Tory Hill SAC & pNHA (000439)	11.2km northeast of proposed development	• Semi- natural dry grasslands and scrubland facies on calcareous substrates (*Festuco- Brometalia*) (*important orchid sites) (6210) • Calcerous fens with *Cladium mariscus* and species of the *Caricion davallianae*. (7210) • Alkaline fens (7230)
Blackwater River (Cork/ Waterford) SAC (002170)	13.95 m southeast of proposed development.	• Freshwater Pearl Mussel *(Margaritifera margaritifera)* • White-clawed Crayfish *(Austropotamobius pallipes)* • Sea Lamprey *(Petromyzon marinus)* • Brook Lamprey *(Lampetra planeri)* • River Lamprey *(Lampetra fluviatilis)* • Twaite Shad *(Alosa fallax fallax)* • Salmon *(Salmo salar)* • Otter *(Lutra lutra)* • Estuaries • Mudflats and sandflats not covered by seawater at low tide • Perennial vegetation of stony banks • Salicornia and other annuals colonising mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Mediterranean salt meadows (*Juncetalia maritimi*) • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • Old sessile oak woods with Ilex and Blechnum in the British Isles • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)*
Lower River Shannon SAC (002165)	Located *ca*. 15.2 km north from proposed works.	• Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029] • Sea Lamprey (*Petromyzon marinus*) [1095] • Brook Lamprey (*Lampetra planeri*) [1096] • River Lamprey (*Lampetra fluviatilis*) [1099] • Salmon (*Salmo salar*) [1106] • Common Bottlenose Dolphin (*Tursiops truncatus*) [1349]

		• Otter (*Lutra lutra*) [1355] • Sandbanks which are slightly covered by sea water all the time. [1110] • Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Coastal lagoons* [1150] • Large shallow inlets and bays [1160] • Reefs [1170] • Perennial vegetation of stony banks [1220] • Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] • Salicornia and other annuals colonising mud and sand. [1310] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] • Mediterranean salt meadows (*Juncetalia maritimi*) [1410] • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. [3260] • Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae)* [6410] • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) *[91E0]

The generic conservation objectives of the SACs are:

To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.

The generic conservation objectives of the SPAs are:

To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.

The favourable conservation status of a habitat is achieved when:

- Its natural range and area it covers within that range is stable or increasing and 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 favourable conservation status of a species is achieved when:

- The 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 populations on a long-term basis.

5.5.2 Nationally Important Sites

The Proposed Development is not within or immediately adjacent to any nationally designated site, such as a Natural Heritage Area or a proposed Natural Heritage Area. It is within the Zone of Influence of three sites that have been designated as proposed Natural Heritage Areas. These sites are summarised in **Table 5.3** and a map showing their locations relative to the site is shown in **Figure 5.5**

Table 5.3 – Nationally Important Sites within 15km of the Proposed Development

Site Name & Code	Distance from Site
Heathfield Wood pNHA (001434)	8.8km west
Tory Hill pNHA (000439)	11.2km northeast
Adare Woodlands pNHA (0004290)	12.7km north

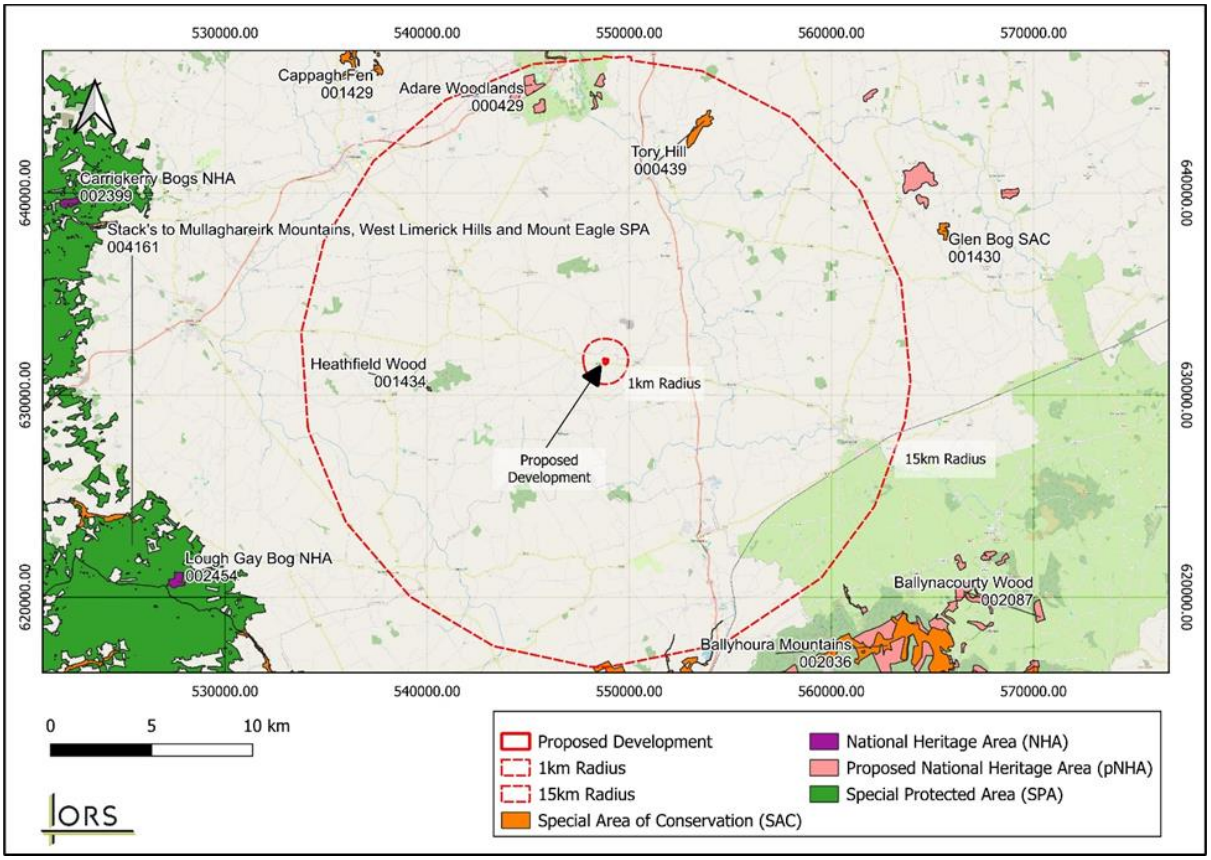

Figure 5.5 – Designated Sites within the Zone of Influence of the Proposed Development (Pinned).

5.6 Flora

5.6.1 Habitats within the Study Area

This section provides a detailed overview of the habitats within the Proposed Development site. A habitat map depicting the primary habitats in the proposed site area is presented in **Figure 5.8**.

The Proposed Development site consists of a single large field that will accommodate the Anaerobic Digestion Facility. The site will be accessed via a new entrance to be constructed along the western boundary, directly off the L8658 regional road.

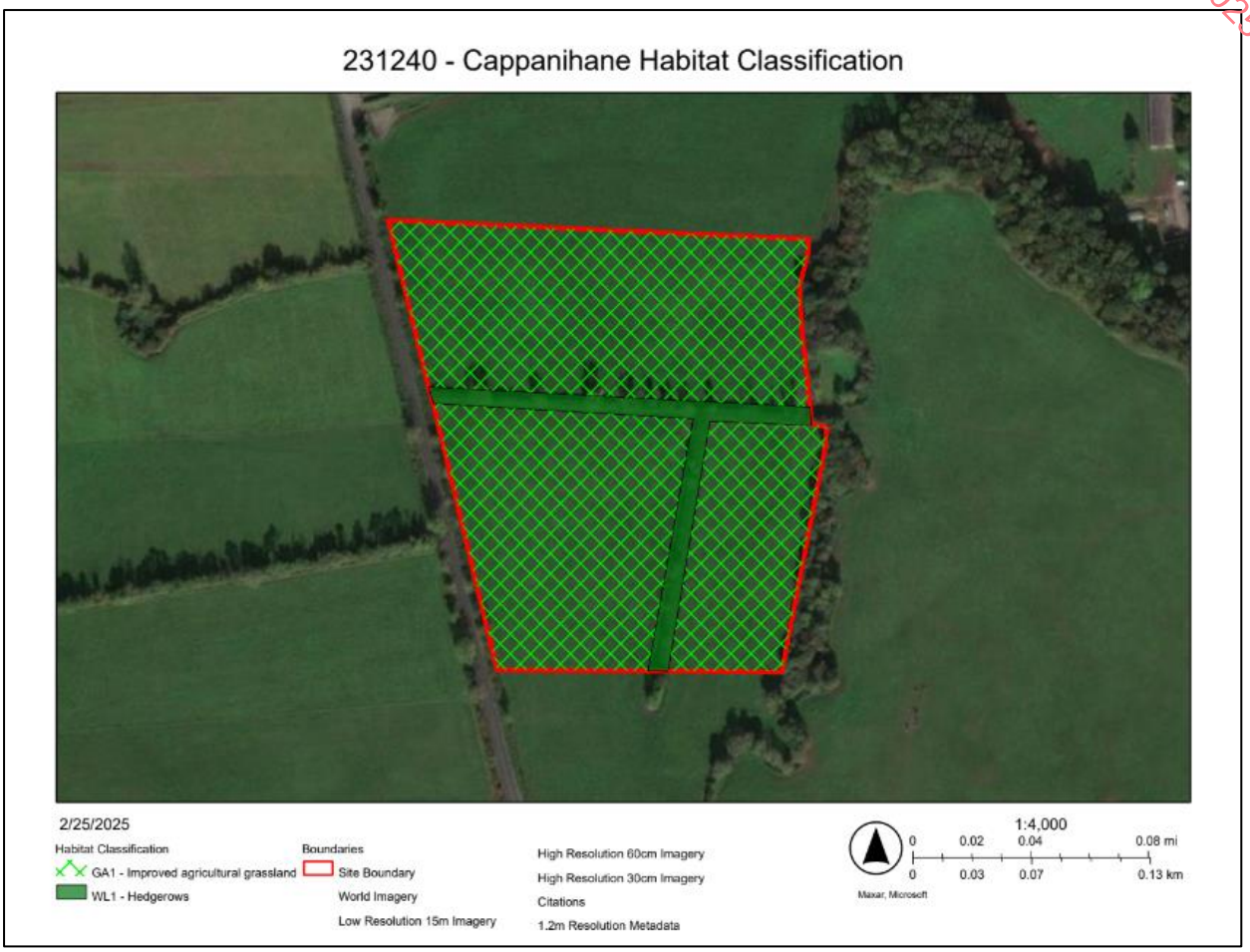

Figure 5.8 – Habitat Map of the Proposed Study Area

The proposed development site encompasses a variety of habitats that vary in ecological value. The dominant habitat within the site is highly modified improved agricultural grassland (Fossitt Code: GA1) dominated by ryegrasses (*Lolium spp.),* which has been subject to intensive agricultural use.

No wetland indicator species such as rushes (*Juncus sp*), meadowsweet (*Filipendula ulmaria*), or flag iris (*Iris pseudacorsu*) were observed within the grassland.

Low-value hedgerows (WL1) are present throughout the site. These hedgerows are relatively species poor and primarily function as boundary features, offering limited ecological significance.

A vegetative list of plants and trees within and along the site boundary was recorded. This list can be found in **Table 5.4**.

Table 5.4: List of Plant Taxa Recorded on Site.

Common Name	Scientific Name
Perennial ryegrass	*Lolium perenne*
Alder	*Alnus glutinosa*
Blackthorn	*Prunus spinosa*
St Anthonys Turnip	*Ranunculus bulbosus*
Stinging Nettle	*Urtica dioica*
Common ivy	*Hedera helix*
Spaghnum	*Sphagnum palustre*
Sorrel	*Rumex acetosa*
Spear Thistle	*Cirsium vulgare*
Lawyers Wig	*Coprinus comatus*
White Clover	*Trifolium repens*
Chickweed	*Stellaria media*
Common Beech	*Fagus sylvatica*
Daisy	*Bellis perennis*
Meadow Buttercup	*Ranunculus acris*
Common Dandelion	*Taraxacum officinale*
Little Robin	*Geranium purpureum*
Ash	*Fraxinus excelsior*
Beech	*Fagus sylvatica*
Sycamore	*Acer pseudoplatanus*
Hawthorn	*Crataegus monogyna*

5.6.1.1 Overall Evaluation of Habitats within the Proposed Development Site

The habitats within the Proposed Development site have been evaluated and are predominantly characterised as improved agricultural grassland (Fossitt Code: GA1). This habitat type has been highly modified due to intensive agricultural use and is considered to have low ecological value. The site is bordered by hedgerows (WL1), which are of low ecological significance due to their limited species diversity and primary function as boundary features.

The Lower Ballyteige watercourse, a tributary of the Maigue River, runs along the eastern boundary of the site. Although this watercourse is a notable hydrological feature, the habitats within the site itself lack significant ecological value, with limited potential to support notable biodiversity.

Overall, the habitats within the site are assessed as being of low conservation importance, reflecting the predominance of modified agricultural land and low-value boundary hedgerows.

5.6.1.2 Rare and Protected Plant Species

An examination of the website of the National Parks and Wildlife, the National Biodiversity Data Centre and the Online Atlas of Vascular Plants for Ireland revealed that there are no records for any plant species protected under the Flora Protection Order from within the 10km square of the Proposed Development. The habitats within the site are all highly modified and no protected plant species were noted within the Proposed Development site.

5.6.1.3 Invasive Species

An examination of the website of the National Parks and Wildlife, the National Biodiversity Data Centre and the Online Atlas of Vascular Plants for Ireland revealed a list of records of invasive

species that are regulated for control under the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477) within the 10km grid square (R43) of the proposed development. These include, Butterfly bush (*Buddleja davidii*), Cherry Laurel (*Prunus laurocerasus*), Hairy Rocket (*Erucastrum gallicum*), Japanese Knotweed (*Fallopia japonica*), Indian Balsam (*Impatiens glandulifera*), Sycamore (*Acer pseudoplatanus*).

None of these species were recorded within a 2km Grid Square of the site nor were recorded during the fieldwork carried out by ORS.

5.7 Fauna

5.7.1 Protected Mammals

Records from the National Biodiversity Data Centre reveal the presence of the following protected mammals from within the 10km square (R43)) of this Proposed Development site

- Eurasian Badger (*Meles meles*)
- Brown Long eared bat *(Plecotus auretus*)
- Eurasian pygmy shrew (*Sorex minutus)*
- Eurasian red squirrel (*Sciurus vulgaris*)
- European otter (*Lutra lutra*)
- Lesser noctule (*Nyctalus leisleri*)
- Pine Marten (*Martes martes*)
- Pipistrelle (*Pipistrellus Pipistrellus)*
- Soprano pipistrelle (*Pipistrellus pygmaeus*)
- West European Hedgehog (*Erinaceus europaeus*)

A custom polygon generated for the actual Proposed Development site revealed that European Badger (*Meles Meles*) have been recorded within a 2km square grid of the planning site. This species is protected under the Irish Wildlife Acts. The field survey of the Proposed Development site found no Badger setts present within the Proposed Development site, and no obvious worn tracks or trails that could be attributed to badgers were noted. There is little opportunity for badger setts in the Proposed Development site, however the habitats in the wider landscape are likely to be of local importance for all terrestrial mammals, including badgers.

5.7.2 Bats

5.7.2.1 Bat Suitability Index

The National Biodiversity Data Centre (NBDC) has produced a landscape suitability index for bat species in Ireland, and this is based on work by *Lundy et al (2011).* The results are provided as maps, where the area of concern is coloured to indicate the overall suitability of the landscape for bats. The index ranges from 0 to 100 with 0 being least favourable and 100 most favourable for bats. The overall assessment of bat habitats for the current study area is given as 39.67, which is moderately high. **Table 5.5** gives the suitability of the study area for the bat species found in the study area (based on NBDC).

Table 5.5 – Bat Suitablilty Index for the Proposed Development (NBDC)

Bat Species	Suitability Index
All Species	25.44
Brown Long-Eared Bat (*Plecotus Auritus)*	36
Soprano Pipistrelle (*Pipistrellus Pygmaeus)*	42
Natterer's *Bat (Myotis Nattereri)*	26
Nathusius' Pipistrelle (*Pipistrellus Nathusii)*	6
Daubenton's Bat (*Myotis Daubentoniid)*	26
Whiskered Bat (*Myotis Mystacinus)*	11
Leisler's Bat (*Nyctalus Leisleri)*	37
Lesser Horseshoe Bat (*Rhinolophus Hipposideros*)*	5
Common Pipistrelle (*Pipistrellus Pipistrellus)*	40

** Annex II Species*

5.7.2.2 Bat Features within the Proposed Development Site

There are no buildings within the site, however there are mature trees present outside the eastern boundary that are potentially of bat roost potential. The hedgerows throughout the site and the Lower Ballyteige stream flowing through the eastern boundary provide some connectivity to the wider landscape. These features may allow bats to commute or forage in the area, although the site itself is of limited value for these activities.

5.7.3 Birds

No birds of conservation concern were observed within the Proposed Development site during the site survey. Bird activity within the main agricultural field of the site was relatively low, with a limited number of species heard singing or observed flying overhead.

The following bird species (**Table 5.6**) were recorded during the survey, and their conservation status is listed according to Gilbert et al. (2021), where *green* indicates low conservation concern, *amber* indicates medium concern, and *red* indicates high concern:

Table 5.6: Bird species recorded on site

Species	Conservation Status
Blackbird (*Turdus merula)*	Green Status
Robin (*Erithacus rubecula)*	Green Status
Wren (*Troglodytes troglodytes)*	Green Status
Blue tit (*Cyanistes caeruleus)*	Green Status
Long tailed tit (*Aegithalos caudatus)*	Green Status
Rook (*Corvus frugilegus)*	Green Status
Jackdaw (*Corvus monedula)*	Green Status

Having regards to the network of treelines and hedgerows that surround the site, the site and its surrounding habitats are likely to be of medium local importance for birds.

5.7.4 Amphibians, Reptiles and Invertebrates

We saw no common frogs (*Rana temporaria*) on our site walkover, which took place on the 12th of November. The flow at the stream in which the discharge calculations were made would likely be suitable for frogs and smooth newts (*Lissotriton vulgaris*) to inhabit. In summer months, the viviparous lizard (*Zootoca vivipara*) may bask on rocks or at pathway or agricultural

road margins within the site. No Slowworm (*Anguis fragilis*) or their holes were observed. The improved agricultural grassland habitats within the site provide limited value to pollinating insects, however any unmanaged verges along the site perimeters and the hedgerows would provide suitable foraging habitats for pollinating insects in the late spring and summer

The improved agricultural grassland habitat within the Proposed Development site offers limited value to pollinators and other invertebrates. However, the hedgerows provide more diverse foraging habitats for pollinators, especially in late spring and summer. These areas may support a range of pollinating insects and other beneficial invertebrates. Additionally, the broader landscape, including the watercourses and woodlands, likely offers more abundant habitats for both amphibians and invertebrates.

5.8 Aquatic Environment

5.8.1 Water Features and Quality

5.8.1.1 Surface Waters – Water Framework Directive Status

The Proposed Development site is located within the Shannon Estuary South Hydrometric Area (HA 24) and Catchment (24), as well as the Maigue Sub-Catchment (040) and Sub-Basin (050). The primary hydrological feature in the vicinity is the Maigue River, which originates in the uplands and lowlands of County Limerick, primarily from natural springs and surface runoff.

The Lower Ballyteige stream (IE_SH_24M010500) borders the eastern boundary of the site and flows northeast, joining the Glenma Stream. This confluence connects to the main Maigue River network approximately 5 km northeast of the site. The Maigue River is a tributary of the Lower Shannon Estuary SAC, which drains the entire catchment.

The Water Framework Directive (WFD) operates on six-year cycles, with the most recent data covering the period from 2016 to 2021. The Directive assesses rivers, lakes, estuaries, groundwater, and coastal waters, assigning each waterbody one of five ecological statuses: High, Good, Moderate, Poor, or Bad. Additionally, each waterbody is assigned a risk category ("At Risk," "Not At Risk," or "Review"), indicating the likelihood of failing to meet WFD objectives by 2027.

The Maigue River waterbody (Maigue_050), which includes the Lower Ballyteige and Glenma streams as its receptors, is classified as "Not At Risk" under the WFD Cycle 3 HA 24 Shannon Estuary South Catchment Report (May 2024). However, adjacent waterbodies are classified as "At Risk," predominantly due to pressures from agricultural activity.

The Lower Ballyteige Stream flows northeast through the site for approximately 5 km before joining the Maigue River. The Maigue then flows northwest for approximately 14 km before entering the Lower River Shannon, roughly 15 km north of the Proposed Development site.

An overview of the groundwater vulnerability in the area and surrounding catchments is presented in **Figure 5.8**.

5.8.1.2 Surface Waters – Biological Quality Assessment

Sampling was conducted at two locations, upstream and downstream along the Lower Ballyteige stream (**Figure 5.7**). The assessment focused on macroinvertebrate populations as

biological indicators of water quality, following the EPA's methodology for deriving Q-values and assessing ecological status.

Figure 5.7 The site location and biological quality samples.

The downstream site exhibited a higher proportion of moderately sensitive and pollution-tolerant taxa, including *Gammaridae*, *Bloodworm*, and *Chironomidae*. While some highly sensitive taxa such as *Trichoptera* and *Hydropsychidae* were present, their relative abundance was lower compared to upstream. This suggests that the downstream site is subject to moderate pollution pressures, likely due to anthropogenic impacts or localised sources of nutrient enrichment.

The upstream site demonstrated a healthier ecological balance, with a higher relative abundance of highly sensitive taxa such as *Trichoptera*, alongside a balanced presence of moderately sensitive groups like *Hydrobiidae*. Pollution-tolerant taxa were present but in lower proportions compared to downstream, indicating reduced pollution impact.

The results of the biological water quality assessment from the Lower Ballyteige stream at points upstream and downstream are presented below in **Table 5.7**

Table 5.7 – Q Values Results of the Lower Ballyteige Stream

Station ID	Q-Value	Ecological Status
Station 1 – Downstream	Q3-4	Moderate
Station 2 – Upstream	Q4	Good

5.8.1.3 Ground Water

The Proposed Development site is within the Ballingarry Groundwater Body and the status of this waterbody is noted as good overall. However, according to the EPA database, groundwater vulnerability at the site is classified as moderate.

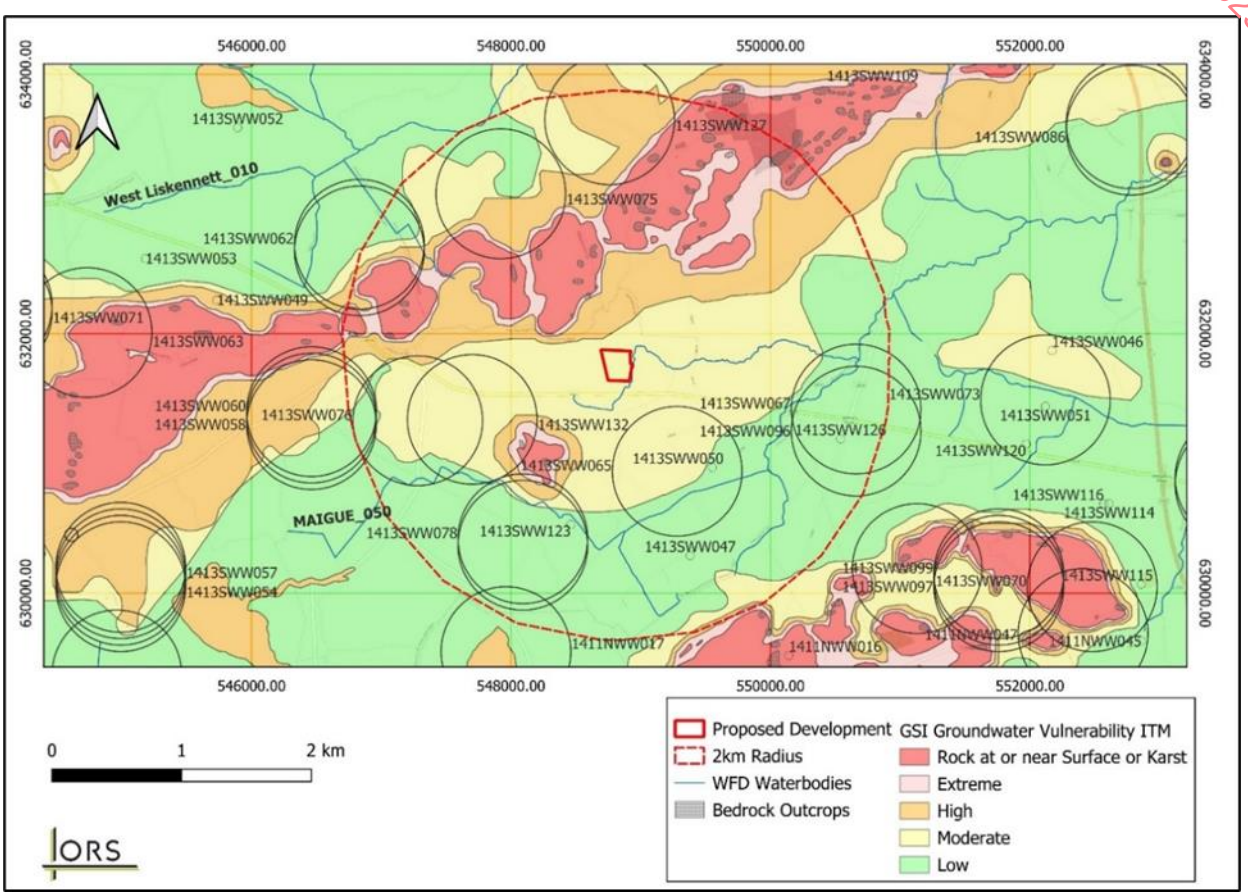

Figure 5.8 – The site location (Red Square shape in centre of figure) and Groundwater Vulnerability Classification

5.9 Ecological Evaluation

5.9.1 Summary of the Value of the Site

The Proposed Development site at Cappanihane, Co Limerick is within the Zone of Influence of three sites designated under the Natura 2000 network (SACs / SPAs). The closest of these is the Tory Hill SAC. This site is 11.2 km north-east of the site.

In addition, as the Lower Ballyteige stream is present adjacent to the site, there is a hydrological connection between the proposed site and the Lower Shannon SAC. The distance from the site to the SAC is 15.2 km. Considering the distance of the site from the Lower Shannon SAC and as long as adherence to good housekeeping & CEMP guidelines is maintained, potential impacts on the Lower Shannon SAC can be mitigated.

The Proposed Development site is also within 15km of three sites designated as Natural Heritage Areas (NHAs and pNHAs). The closest of these is the Heathfield Wood pNHA, which

is 8.8 west km of the Proposed Development site.

The NRA guidelines on the Assessment of Ecological Impacts on National Road schemes (NRA, 2009) provides a rationale for the evaluation of ecological receptors within a site. **Table 5.8** lists the habitats that have been described within the Proposed Development site and their associated ecological value, based on the NRA guidelines.

Table 5.8- Ecological Features and their Evaluation

Habitat	Rating	Criteria
Improved Agricultural Grasslands – (GA1)	No Value - Local Importance (Lower Value)	Limited biodiversity value although may provide some habitat opportunities for invertebrates and birds
Hedgerows (WL1)	Local Importance (Higher Value)	Essential in maintaining links and ecological corridors between features of higher ecological value. Provides value for local populations of birds, mammals and bats.

5.10 Impact Assessment

The information gathered as part of the desk study and field survey for this proposed application has been used to complete an Ecological Impact Assessment (EcIA). This EcIA has been undertaken following the latest guidelines set out by CIEEM (2018) and the EPA.

The identification of potential impacts and the assessment of their significance typically requires the identification of the type and magnitude of the impacts. For example, will the impacts be short term or long term, direct, indirect or cumulative and will they occur during construction or operation. This section will establish whether ecological impacts of the Proposed Development in Cappanihane, Limerick are likely to occur and whether or not they are significant. These potential impacts will be examined with respect to the ecological receptors identified in the previous section.

The emphasis in EcIA is on “significant” effects, rather than all ecological effects (CIEEM, 2018). For the purpose of EcIA, a “significant effect” is an effect that either supports or undermines biodiversity conservation objectives for important ecological features 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.

A significant effect is an effect that if sufficiently important to require assessment and reporting so that the decision maker (i.e., Local Authority) is adequately informed of the environmental consequences of permitting the project. In broad terms, significant effects encompass impacts on structures and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance, and distribution). (CIEEM, 2018).

5.11 Impacts upon Designated Sites

5.11.1 Natura 2000 Sites

The location of the proposed development is within a 15km Zone of Influence of sites designated under European Law. As such and in accordance with Article 6(3) of the EU Habitat's Directive (Council Directive 92/43/EEC) regarding Appropriate Assessment, the screening exercise for Appropriate Assessment was carried out to identify whether any significant impacts on designated sites are likely. The exercise was used to determine the appropriateness of the proposed project, in the context of the conservation status of the designated sites.

Based on the information provided and the assessment conducted, it was the opinion of the author that the proposed development at Cappanihane, County Limerick does not pose a significant risk to Natura 2000 sites due to the lack of any direct or indirect hydrological connection. Therefore, a Natura Impact Statement (NIS) was not required under Article 6(3) of the Habitats Directive.

However, the proposed development is hydrologically connected to the Lower Shannon Special Area of Conservation (SAC). The Lower Shannon SAC lies 15.2 km downstream of the proposed development site. This distance exceeds the typical 15 km guideline for assessing hydrological connections, thereby reducing the likelihood of significant impacts.

The proposed biogas facility does not plan to discharge directly into the Ballyteige Stream, other than storm water following treatment and attenuation. This further reduces the likelihood of any significant impacts. By adhering to good housekeeping practices, implementing the measures outlined in the Construction Environmental Management Plan (CEMP), and ensuring effective pollution control and surface water management, potential negative impacts can be mitigated. Through these precautions, the ecological integrity of the Lower Shannon SAC can be safeguarded.

5.11.2 Natural Heritage Areas

The Proposed Development will not lead to the loss or fragmentation of protected habitats within any pNHA or NHA.

5.11.3 Construction Phase

In the absence of suitable design and mitigation measures, the following impacts could occur during the site preparation and construction of the Proposed Development.

5.11.3.1 Habitat Loss and Fragmentation

The dominant habitat within the Proposed Development site is Improved Agricultural Grasslands. This habitat will be converted to Buildings and Artificial Surfaces. This habitat has limited ecological value and therefore its loss constitutes a negligible ecological impact.

Plans indicate that the mature vegetation along the perimeters of the Proposed Development site will be retained, and this will mitigate against any impacts due to the direct loss of these ecological features. However, damage to these existing hedgerows and mature trees and a subsequent reduction in their lifespan may arise if any root compaction occurs due to works or storage of heavy vehicles or spoil in the root protection zone (RPA) of these features. Any loss or damage to these features would have a negative impact upon the local biodiversity value.

5.11.3.2 Impacts on Local Wildlife

In the absence of mitigation, any removal of vegetation within the field during the bird nesting season could result in direct mortality of birds. In addition, during site preparation and construction, local populations of birds may be disturbed by the increase in noise, traffic and human activity.

During site preparation and construction, local populations of mammals may be disturbed by the increase in noise, traffic and human activity. Increased nighttime lighting could particularly impact local bat populations, disrupting their foraging behaviour. Nocturnal mammals such as foxes, badgers, and small rodents may experience disturbances from continuous noise during movement or foraging, and some species may avoid the area altogether if noise levels are high enough. Bats, which rely on echolocation for hunting, are particularly vulnerable to prolonged exposure to low-frequency noise, which could interfere with their navigation and foraging abilities, leading to reduced activity in the area.

There will be no loss or fragmentation of any habitats used by roosting or hibernating bats during construction.

There are no significant effects anticipated for Amphibians, Reptiles and Insects.
In the absence of appropriate design and mitigation measures, local wildlife could be impacted by noise and lighting disturbances. Birds, generally more sensitive to noise during the day, may be disturbed if they roost near the site, although they can typically adapt to moderate background noise. Long-term effects are unlikely unless the noise is exceptionally loud or intermittent.

5.11.3.3 Pollution to Surface and Ground Water

Site preparation and construction will occur on lands that are hydrologically connected to the Lower Ballyteige Stream. It is not foreseen that significant effects on this water feature will occur if adherence to CEMP and good housekeeping are observed to a high standard.

The site is in an area of moderate groundwater vulnerability. Any deep excavations that are required for the construction could lead to pollution of the groundwater with hydrocarbons or other pollutants.

5.11.4 Operational Phase

In the absence of suitable design and mitigation measures, the following impacts may arise during the operation of the Proposed Development that could affect the ecology / biodiversity of the Proposed Development site and its surrounding environs.

5.11.4.1 Impacts on Local Wildlife

In the absence of appropriate design and mitigation measures, local wildlife could be impacted by noise and lighting disturbances. Birds, generally more sensitive to noise during the day, may be disturbed if they roost near the site, although they can typically adapt to moderate background noise. Long-term effects are unlikely unless the noise is exceptionally loud or intermittent.
Mammals may also be affected, with human activity potentially causing disturbances. Increased nighttime lighting could particularly impact local bat populations, disrupting their foraging behaviour. Nocturnal mammals such as foxes, badgers, and small rodents may experience disturbances from continuous noise during movement or foraging, and some

species may avoid the area altogether if noise levels are high enough. Bats, which rely on echolocation for hunting, are particularly vulnerable to prolonged exposure to low-frequency noise, which could interfere with their navigation and foraging abilities, leading to reduced activity in the area.

5.11.4.2 Pollution to Surface and Ground Water

Run-off from impermeable areas within the Proposed Development site such as roads and car parking areas may contain potentially polluting substances such as hydrocarbons etc. This run-off could be mobilised to the Lower Ballyteige stream. In addition, structural weaknesses in any of the tanks could lead to pollution of the groundwater.

5.11.4.3 Flood Events

A flood event occurring on the developed site would cause the Sustainable Urban Drainage Infrastructure (SuDS) to become overwhelmed, creating additional pathways for potential contaminants to migrate off-site into downstream receptors along with elevated flow rates. The Proposed Development is located within Flood Zone C.

5.11.4.4 Cumulative Impacts

Cumulative impacts or effects are changes in the environment that result from numerous human-induced, small-scale alterations. Cumulative impacts can be thought of as occurring through two main pathways: first; through persistent additions or losses of the same materials or resource, and second, - through the compounding effects as a result of the coming together of two or more effects (*Bowers-Marriott, 1997*).

The proposed application was considered in combination with other developments or proposed developments in the general area and potential cumulative impacts were considered. Several other developments have been granted planning permission in the general area in the last five years. The proposed development may have cumulative impacts upon designated sites when considered in combination with other developments that have been screened properly for AA (Stage I) or where AA has taken place (Stage II). Any future individual application that has the potential to impact upon a Natura 2000 site will be subject to Appropriate Assessment as required under Articles 6(3) of the Habitats Directive. In the immediate vicinity of Cappanihane there are very few planning applications that are currently under review or have been given permission.

The creation of new areas of biodiversity within the Proposed Development site and the retention and protection of the existing hedgerows, will provide local ecological corridors and networks that will reduce the overall cumulative impact of this development in the Cappanihane area.

However, the creation of new areas of biodiversity within the Proposed Development site and the retention and protection of the existing hedgerows and stonewalls, will provide local ecological corridors and networks that will reduce the overall cumulative impact of this development in the Cappanihane area.

5.12 Mitigation Measures

5.12.1 Introduction

In order to avoid any reductions in water quality in the area surrounding the Proposed Development site in Cappanihane, Limerick, a number of mitigation measures must be implemented and followed. These measures will protect both surface and groundwater locally and will subsequently prevent significant effects on the Lower Ballyteige stream. Measures have also been suggested to protect or enhance the local biodiversity of the surrounding area and ensure the protection of local wildlife. The implementation of these site-specific mitigation measures will safeguard local habitats, species, and ecological receptors.
It is recommended that the measures contained herein, along with all other measures outlined in this EIAR are contained in a Construction and Environmental Management Plan and that all works are overseen by an onsite Environmental or Ecological Clerk of Works.

5.12.2 Pre-Construction and General Requirements

- Site preparation and construction must be confined to the Proposed Development site only and it must adhere to all the mitigation measures outlined in this Chapter. Work areas should be kept to the minimum area required to carry out the proposed works and this area should be clearly marked out in advance of the proposed works.

- Prior to the commencement of developments on site, the site engineer and the contractors must be made aware of the ecological sensitivity of the Proposed Development site and its connection to the Lower Shannon SAC. They must be made familiar with the mitigation measures outlined in this Chapter and CEMP and a signed statement saying that they have taken on board the mitigation measures contained herein should be presented to the local authority along with the Notice of Commencement. The applicant will be responsible for alerting the engineers and contractors to the sensitivity of the habitats and water receptors surrounding the Proposed Development site. This will be done prior to the commencement of any site works.

5.12.3 Protection of Terrestrial Habitats and Features

- In accordance with the policies and objectives of the Regional and County Development Plans, the existing green infrastructure (GI) of the Proposed Development site, i.e., the stonewalls and hedgerows, must be incorporated into the development. In order to prevent damage to treelines / hedgerows in the Proposed Development site that are to be retained, then protective barrier fencing should be erected at a minimum 2m out from these boundaries to protect these features prior to the commencement of site clearance works. There must be no dumping or storage of construction waste or machinery in this zone during construction.

- Any small tree or shrubs that require removal should be removed outside of the bird nesting season (March – August).

- Roadside hedgerows must be left intact, and the root systems of these hedgerows must not be damaged. Upon completion of the work, the soil should be reinstated, and grassy verge vegetation should be allowed to recolonise naturally.

5.12.4 Mitigation Measures during Construction

5.12.4.1 Protection of Water Quality and Management of Pollutants

- Efficient construction practices and sequences should be employed on site, and this will minimise soil erosion and potential pollution of local watercourses with soil and sediment. Unnecessary clearance of vegetation should be avoided and only areas necessary for building works should be cleared. The retention of these areas will also help retain storm water runoff from the site during construction and operation.

- It is vital that there is no deterioration in water quality at the Lower Ballyteige stream. Therefore, strict controls of erosion, sediment generation and other pollutants associated with the construction process should be implemented, including the provision of attenuation measures, silt traps or geotextile curtains to reduce and intercept sediment release into any local watercourses. Guidelines in the following best practice documents should be adhered to:

    - Construction Industry Research and Information Association (CIRIA) (2005) Environmental Good Practice on Site (C692).

    - Construction Industry Research and Information Association (2001) Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (C532).

    - Construction Industry Research and Information Association (2000) Environmental Handbook for Building and Civil Engineering Projects (C512).

    - Environmental Protection Agency (2015) List of Waste and Determining if Waste is Hazardous or Non-Hazardous.

    - Environment Agency et al. (2015) Guidance on the Classification and Assessment of Waste, Technical Guidance WM3.

- It is important that efficient construction practices and sequences are employed, and this will minimise soil erosion and potential pollution of the Lower Ballyteige stream with soil and sediment. Unnecessary clearance of vegetation should be avoided. These works should be overseen by an ecological Clerk of Works.

- Works should be avoided during periods of heavy rainfall.

- There must be no uncontrolled discharges of contaminated waters to ground or surface waters from this development, either during the construction or operation of the development. The control and management of hydrocarbons on site will be vital to prevent deteriorations in surface and groundwater quality locally. The following measures should be employed on site:

    - During construction re-fuelling of equipment and machinery must be done off site. If this is not possible, then a dedicated re-fuelling location must be established on site in the compound area away from ground clearance or rock-breaking activities.

    - Spill kits stations must be provided at the fuelling location for the duration of the works.

- Staff must be provided with training on spill control and the use of spill kits.
- All fuel storage containers must be appropriately bunded, roofed and protected from vehicle movements. These bunds will provide added protection in the event of a flood event on site.
- All chemicals must be stored as per manufacturer's instructions. A dedicated chemical store within a building or with inbuilt weather protection must be provided on site if chemicals are to be stored on site.
- Procedures and contingency plans must be established on site to address cleaning up small spillages as well as dealing with an emergency incident. A stock of absorbent materials such as sand, spill granules, absorbent pads and booms should be kept on site, on plant working near the water and at the refuelling area.
- Daily plant inspections will be completed by all plant operators on site to ensure that all plant is maintained in good working order. Where leaks are noted on these inspection sheets, the applicant must remove the plant from operations for repairs.
- All personnel shall observe standard precautions for handling of materials as outlined in the Safety Data Sheets (SDS) for each material, including the use of PPE. Where conditions warrant, emergency spill containment supplies should be available for immediate use.
- Best practice concrete / aggregate management measures must also be employed on site during construction.
- It is important that run-off from the construction works does not enter the Ballyteige stream/ River Maigue or any drains that lead to this river. Therefore, it is recommended that silt fences are installed along the eastern border of the construction site area. The silt fence should be sturdy and constructed of a suitable geotextile membrane (Hy-Tex Terrastop Premium silt fence, or similar) to ensure that water can pass through, but that silt will be retained. The silt fences must be capable of preventing particles of 425mm from passing though. The footing of the fencing to be buried into the ground and the visible fencing to be *ca.* 0.5m high.
- An interceptor trench will be required in front of this silt fence.
- The silt fences should be monitored daily to ensure that they remain functional throughout the construction of the Proposed Development. Maintenance of the fences should be carried out regularly. Fences should be inspected thoroughly after periods of heavy rainfall.
- Concrete Washout Skip: Chutes of concrete trucks are only to be washed out into an impermeable lined (polythene) skip. The washout water is to be removed off-site for treatment.
- The concrete washout skip is to be located to the east of the site, where the underlying overburden is greater.
- Excavations lined with an impermeable liner are not permitted as concrete washout bays on the site.

- Large excess loads of concrete are to be returned to the supplier or poured into concrete block modules (Betonblock or similar design), in order to minimise waste and reduce the risk of concrete being dumped throughout site.
- Best practice in bulk-liquid concrete management should be employed on site, addressing pouring and handling, secure shuttering, adequate curing times etc.
- Stockpile areas for sands and gravel must be kept to a minimum size, well away from drains on site.
- Where concrete shuttering is used, measures should be put in place to prevent against shutter failure and control storage, handling and disposal of shutter oils.
- Activities which result in the creation of cement dust should be controlled by dampening down the areas.
- Raw and uncured waste concrete should be disposed of by removal from the site.

5.12.4.2 Management of Construction Waste and Soil

- All construction waste must be removed from site by a registered contractor to a registered site. Evidence of the movement and safe disposal of the construction waste must be retained and presented to the Local Authority upon request. Removal of the construction waste should occur as soon as possible after construction works.
- All topsoil generated from site works should be stored within the Proposed Development site until it is required for landscaping. It must not be stored outside the Proposed Development site boundaries, and it must not be used for the infilling of any area outside of the Proposed Development site. If there is more topsoil than is needed for landscaping, it must be removed from site by a registered contractor for appropriate use elsewhere. The end location of the topsoil must be identified and records presented to the local authority if requested.

5.12.5 Mitigation Measures during Operation

5.12.5.1 Environmental Management System (EMS)

An Environmental Management System (EMS) will be prepared and implemented by the operating company during the operational phase. This is a practical document which will include detailed procedures to address the main potential effects on surface water and groundwater.

Having regard to current law and practice, the Proposed Development will require an application for an Industrial Emissions (IE) licence to the EPA. In the event of a grant of licence by the EPA to carry out activities that require such licence, it is expected that the licence will contain several conditions which the operator must remain in compliance with for the entire duration of the facility's lifespan. Typical conditions relating to the protection of receptors include:

- Emissions Limit Values for all emissions including surface water
- Monitoring requirements for surface waters
- Resource use and energy efficiency

- Waste management control and documentation
- Storage and transfer of substances
- Facility management
- Accident prevention and emergency response including fire water retention
- Operational Controls

Other conditions of relevance to uncontrolled releases will include:

- Dedicated hard standing for off-loading areas, with a minimum separation distance from adjacent water courses.
- Use of spill kits, bunded pallets and secondary containment units, as appropriate.
- All bunds sized to contain 110% of the volume of the primary storage vessel.
- Environmental Management System to include site specific standard operating procedures pertaining to waste management and emergency response.
- There will be no direct discharges to surface or groundwater bodies during the operational phase.
- The entire digestion tank area of the Proposed Development site will be underlain by an impermeable bund structure, acting as secondary containment in the event of a catastrophic failure.
- Tanks and bunds will be subject to integrity assessments by a suitably qualified engineer.

5.12.5.2 Landscaping and Lighting

The landscaping of the Proposed Development site offers the potential for biodiversity enhancements within the Proposed Development site. Future landscaping of the Proposed Development site should adhere to the following recommendations:

- The hedgerows around the site are important ecological corridors. These features should be enhanced and maintained for the benefit of wildlife.

- The existing gappy hedges should be enhanced with some more native shrubs if possible, such as hawthorn, gorse, and blackthorn. Trees such as willow provide early sources of pollen for bees, as would fruit blossoms such as crab apple and wild cherry. Planting should focus on providing year-long interest for pollinators. Planting should be delivered in accordance with the Landscape Plan which accompanies the application.

- The natural verges along the hedgerows could also provide excellent opportunity for the benefit of wildlife. These should be managed as old hay meadows, cutting only in late summer. This will be of significant benefit to local pollinators.

- It is recommended that further actions that are outlined as part of the National Pollinator Plan should be implemented. There is a specific guide for farms (Farmland: Actions to help pollinators - //pollinators.ie/farmland).

- Nesting areas for solitary bees could be included by providing south or east-facing banks or areas of bare earth. Bee boxes for cavity-nesting bees could be created by drilling holes in untreated wooden blocks and attaching them to an outdoor structure. The holes should be 10cm in depth and 4-8mm in diameter at a height of at least 1.5-2m. It is important to have holes of different sizes for the different species.

- Bat boxes could be installed around the Proposed Development site, on walls, tree trunks and posts. They should be located as high as possible (at least 4m off the ground) in a sunny but sheltered location. If erecting on a mature tree, choose one that has clean bark (no ivy) with no branches for 1m radius around the location of the box. If erecting on a building, erect as close as possible to the eaves.

- When erecting bat boxes externally (i.e. on a tree or external wall of a building), put up a minimum of three boxes facing in different directions to provide a range of temperature conditions. For example, boxes facing from south-east to south-west allow the sun to fall on each box for part of the day. During very hot days a south-facing box may overheat, but the other boxes should have some shade. Three boxes can be arranged around the trunk of large, mature and clean trunk trees. When erecting bat boxes, erecting three different types of bat boxes will increase the chance of catering for the different species likely to be found foraging on the Proposed Development site. Guidelines for the construction of bat boxes can be obtained on the website of Bat Conservation Ireland.

- The use of herbicides within the Proposed Development site should be minimised. The clearance of vegetation around fences should be done by hand if possible. Where spraying is necessary, it should be done with a knapsack sprayed to minimise spray and target required areas only.

- All rodenticides use on the Proposed Development site should be in accordance with the Campaign for Responsible Rodenticide use.

- Lighting should be kept to a minimum around the remaining trees on the Proposed Development site. Guidelines from Bat Conservation Ireland will be provided for considering how to avoid light pollution of the hedgerows to allow for feeding, commuting, and roosting.

- There should be no lighting directed from the Proposed Development site towards mature vegetation.

- Lighting shall be controlled to avoid light pollution of green areas and shall be targeted to areas of human activity and for priority security areas. Motion-activated sensor lighting is preferable to reduce light pollution. None of the remaining mature trees or trees proposed for planting shall be illuminated.

    - Dark corridor for movement of bats along the grounds of the Proposed Development site. Lighting shall be directed downwards away from the treetops.
    - All luminaires shall lack UV elements when manufactured and shall be LED.
    - A warm white spectrum (ideally <2700 Kelvin) to reduce blue light component.
    - Luminaires shall feature peak wavelengths higher than 550nm.
    - Tree crowns shall remain unilluminated.
    - Planting shall provide areas of darkness suitable for bats to feed and commute.

5.12.6 Use of the Biobased Fertilisers by Customer Farmers

- In order to avoid any reductions in water quality within the catchment as a whole, all biobased fertilisers must be used in accordance with S.I. 113 of 2022 European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2022).

- The spreading of the biobased fertiliser on the customer farms must be done in

accordance with the specific Nutrient Management Plan for that farm. Records will be kept by the farmer and routinely provided to the Applicant for verification.

5.13 Residual Impacts

According to Environmental Protection Agency guidelines, Residual Impact is described as '*the degree of environmental change that will occur after the proposed mitigation measures have taken place*.' The mitigation strategy above recommends actions to be taken to reduce or offset the scale, significance, and duration of the effects on the surrounding ecological receptors.

5.13.1 Construction Phase

A summary of the predicted effects associated with the construction phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual effects are summarised in **Table 5.7** in the conclusions section of this report.

The overall impact anticipated for the construction phase of the project following the implementation of suitable mitigation measures is ***neutral***, ***slight***, and ***temporary.***

5.13.2 Operational Phase

A summary of the predicted effects associated with the operational phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual effects are summarised in **Table 5.8** in the conclusions section of this report.

The overall impact anticipated for the operational phase of the project following the implementation of suitable mitigation measures is considered to be **neutral, slight**, and **short-term to long-term.**

5.13.3 Conclusion

With the recommended mitigation measures, it can be concluded that the Proposed Development site at Cappanihane, County Limerick will have a neutral impact upon local ecological receptors. The proposed landscaping plan and the creation of new habitats on the Proposed Development site will be a positive benefit to local ecology and with proper management of the Proposed Development site and its green areas, local areas of biodiversity will be allowed to develop.

Table 5.7 Predicted construction phase effects, mitigation measures and residual impact

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Habitat Loss and Fragmentation	**Improved Agricultural Grasslands**	The dominant habitat within the site is Improved Agricultural Grasslands. This habitat will be converted to Buildings and Artificial Surfaces. This habitat has limited ecological value and therefore its loss constitutes a negligible ecological impact.	Negative	Negligible	Temporary	• The landscaping of the site offers the potential for biodiversity enhancements within the site. • Any existing gappy hedges should be enhanced with native shrubs if possible, such as hawthorn, gorse, and blackthorn. • Planting should focus on providing year-long interest for pollinators. • Selected areas around the site to be seeded with species rich grassland to promote biodiversity.	**Positive, Slight, Long Term**

	Hedgerows and grassy verges	The proposed development site contains existing hedgerows that run through the middle of the site. Construction activities may result in the partial removal or disturbance of these hedgerows, which could impact local biodiversity and habitat connectivity.	Negative	Moderate	Permanent (If hedgerows are removed) / Temporary (If only disturbed)	• Where possible, existing hedgerows should be retained to maintain habitat connectivity. • If removal is unavoidable, replacement native hedgerow planting (e.g. Hawthorn, Blackthorn, Hazel) should be implemented along the site boundary or within green buffer areas as soon as possible. • Protective measures should be in place during construction to avoid unnecessary root damage or compaction of soil around retained hedgerows.	**Slight, to Moderate (Depending on extent of hedgerow loss)**

Disturbance to Local Wildlife		Any removal of vegetation during the bird nesting season could result in disturbance of birds. In addition, during site preparation and construction, local populations of birds and mammals may be disturbed by the increase in light, noise, traffic, and human activity. Dust from concrete could settle on vegetation, reducing insect prey.	Negative	Moderate	Long-term	• In accordance with the policies and objectives of the Regional and County Development Plans, the existing green infrastructure (GI) of the site, i.e., hedgerows, must be incorporated into the development. • In order to prevent damage to treelines / hedgerows in the site that are to be retained, then protective barrier fencing should be erected at a minimum 2m out from these boundaries to protect these features prior to the commencement of site clearance works. There must be no dumping or storage of construction waste or machinery in this zone during construction. • Any small tree or shrubs that require removal should be removed outside of the bird nesting season and bat active season (March – August). • Any trees that require removal should be left lying for a few hours after cutting them down to give any possible roosting bats a chance to leave. • In order to maintain dark Corridors for Bats, no artificial	**Neutral, Slight, Temporary**

						lighting directed toward hedgerows, trees, or the Ballyteige stream. Warm white LED lighting must be used (< 2700K, no UV, peak wavelength > 550 nm). • Install downward- facing lights only, with shield to prevent light spill into natural areas. • Ensure tree crowns remain unilluminated. • Use low noise machinery and restrict high-noise activities • to daytime hours avoiding dawn and dusk when bats are most active. • Water – spray exposed soil during dry conditions to reduce dust levels. over stockpiles and avoid material storage near sensitive habitats (hedgerows, stream).	

Pollution to Surface and Ground Water	**Surface Water** Lower Ballyteige Stream and downstream receptors of the Lower Shannon SAC (15.2km away).	The clearing of the site and the construction of an anaerobic digestor and associated works will generate sediment and without due care this sediment could be mobilised into the Lower Ballyteige Stream on days of excessively heavy rainfall. These works could also result in the pollution of the water with cement or other hydrocarbons.	Negative	Moderate	Temporary	• Install silt fences, sediment traps, and drainage swales to prevent sediment runoff. • Maintain a 10m buffer zone around the stream to avoid direct disturbance. • Conduct regular water quality monitoring throughout construction. • Use bunded storage areas for fuels, lubricants, and chemicals, • No refuelling of machinery near water sources. • Establish a designated concrete washout area at least 20 m from water features.	**Neutral, Slight, Temporary**

	Groundwater Ballingarry Groundwater Body	The site is in an area of moderate groundwater vulnerability. In the absence of mitigation, any deep excavations that are required for the construction could lead to pollution of the groundwater with hydrocarbons or other pollutants.	Negative	Moderate	Long Term	• Excavations to be backfilled as soon as possible to prevent any infiltration of contaminants to the subsurface and the aquifer. • Works should be avoided during periods of heavy rainfall. • The control and management of hydrocarbons on site will be vital to prevent deteriorations in surface and groundwater quality locally. The following measures should be employed on site: • During construction re-fuelling of equipment and machinery must be done off site. If this is not possible, then a dedicated re-fuelling location must be established on site in the compound area away from ground clearance or rock-breaking activities. • Spill kits stations must be provided at the fuelling location for the duration of the works. • Staff must be provided with training on spill control and the use of spill kits.	**Neutral, Slight, Temporary**

						• All fuel storage containers must be appropriately bunded, roofed and protected from vehicle movements. These bunds will provide added protection in the event of a flood event on site. • All chemicals must be stored as per manufacturer's instructions. A dedicated chemical store within a building must be provided on site if chemicals are to be stored on site. • Procedures and contingency plans must be established on site to address cleaning up small spillages as well as dealing with an emergency incident. A stock of absorbent materials such as sand, spill granules, absorbent pads and booms should be kept on site, on plant working near the water and at the refuelling area. • Daily plant inspections will be completed by all plant operators on site to ensure that all plant is maintained in good working order. Where leaks are noted on these inspection sheets, the applicant must remove the plant from operations for	

						repairs. • All personnel shall observe standard precautions for handling of materials as outlined in the Safety Data Sheets (SDS) for each material, including the use of PPE. Where conditions warrant, emergency spill containment supplies should be available for immediate use. • Best practice concrete / aggregate management measures must also be employed on site during construction.	

Table 5.8: Summary of predicted operational phase effects, mitigation measures and residual impact

Potential Source	Environmental Receptor	Impact Description	Quality	Significance	Duration	Mitigation	Residual Impact
Disturbance to Local Wildlife		The operation of the site will be associated with an overall increase in human activity, noise and lighting on the site. However, having regards to the overall low value of the site to mammals, this impact is not considered significant. However, mitigation measures will be included to ensure that all lighting used within the site is of a low level to ensure minimum disruption to bats (notably Soprano Pipistrelle) and other nocturnal mammals.	**Negative**	**Slight**	**Long term**	• The hedgerows could also provide excellent opportunity for the benefit of wildlife. These should be managed as old hay meadows, cutting only in late summer. This will be of significant benefit to local pollinators. Herbicides must not be used along these natural verges, and they should be 1.5m – 2m wide at the base. • It is recommended that further actions that are outlined as part of the National Pollinator Plan should be implemented. There is a specific guide for farms (Farmland: Actions to help pollinators - //pollinators.ie/farmland). • Nesting areas for solitary bees could be included by providing south or east-facing banks or areas of bare earth. Bee boxes for cavity-nesting bees could be created by drilling holes in untreated wooden blocks and attaching them to an outdoor structure. The holes should be 10cm in depth and 4-8mm in diameter at a height of at least 1.5-2m. It is important to have holes of different sizes for the different species. • Bat boxes could be installed around the site, on walls, tree trunks and posts. They should be located as high as possible (at least 4m off the ground) in a sunny but sheltered location. If erecting on a mature tree, choose one that has clean bark (no ivy) with no branches for 1m radius around the location of the box. If erecting on a building, erect as close as possible to the eaves.	**Neutral, Slight, Long term**

						• When erecting bat boxes externally (i.e. on a tree or external wall of a building), put up a minimum of three boxes facing in different directions to provide a range of temperature conditions. For example, boxes facing from south-east to south-west allow the sun to fall on each box for part of the day. During very hot days a south-facing box may overheat, but the other boxes should have some shade. Three boxes can be arranged around the trunk of large, mature and clean trunk trees. When erecting bat boxes, erecting three different types of bat boxes will increase the chance of catering the different species likely to be found foraging on the site. Guidelines for the construction of bat boxes can be obtained on the website of Bat Conservation Ireland. • The use of herbicides within the site should be minimised. The clearance of vegetation around fences should be done by hand if possible. Where spraying is necessary, it should be done with a knapsack sprayed to minimise spray and target required areas only. • All rodenticides use on the site should be in accordance with the Campaign for Responsible Rodenticide use. • Lighting should be kept to a minimum around the remaining trees on the site. Guidelines from Bat Conservation Ireland will be provided for considering how to avoid light pollution of the hedgerows to allow for feeding, commuting, and roosting. • There should be no lighting directed from	

						the site towards mature vegetation or the river. • Lighting shall be controlled to avoid light pollution of green areas and shall be targeted to areas of human activity and for priority security areas. Motion-activated sensor lighting is preferable to reduce light pollution. None of the remaining mature trees or trees proposed for planting shall be illuminated. • Dark corridor for movement of bats along the grounds of the site. Lighting shall be directed downwards away from the treetops. • All luminaires shall lack UV elements when manufactured and shall be LED. • A warm white spectrum (ideally <2700 Kelvin) to reduce blue light component. • Luminaires shall feature peak wavelengths higher than 550nm. • Tree crowns shall remain unilluminated. • Planting shall provide areas of darkness suitable for bats to feed and commute.	
Pollution to Surface and Ground Water		In the absence of mitigation, run-off from impermeable areas within the Proposed Development site such as roads and car parking areas may contain potentially polluting substances such as hydrocarbons etc. This run-	Negative	Moderate	Long Term	• An Environmental Management System (EMS) will be prepared and implemented by the operating company during the operational phase. This is a practical document which will include detailed procedures to address the main potential effects on surface water and groundwater. • The Proposed Development will operate	**Neutral, Slight, Long term**

		off could be mobilised to the Lower Ballyteige stream. Structural weaknesses in any of the tanks could lead to pollution of the groundwater.				under an Industrial Emissions Licence (IEL) issued by the Environmental Protection Agency (EPA). The licence will contain several conditions which the operator must remain in compliance with for the entire duration of the AD facility's lifespan. Including: ○ Emissions Limit Values for all emissions including surface water ○ Monitoring requirements for surface waters ○ Storage and transfer of substances ○ Facility management ○ Accident prevention and emergency response including fire water retention ○ Operational Controls Other conditions of relevance to uncontrolled releases will include: • Dedicated hard standing for off-loading areas, with a minimum separation distance from adjacent water courses. • Use of spill kits, bunded pallets and secondary containment units, as appropriate. • All bunds sized to contain 110% of the volume of the primary storage vessel. • Environmental operating plan to include site specific standard operating procedures pertaining to waste management and emergency response. • There will be no uncontrolled discharges to surface or groundwater bodies during the operational phase.	

						• The entire digestion tank area of the site will be underlain by an impermeable bund structure, acting as secondary containment in the event of a catastrophic failure. • Tanks and bunds will be subject to integrity assessments by a suitably qualified engineer.	

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