Aquatic Ecological Impact Assessment

Ballyglass Grid Connection

Co. Clare, Ireland

July 2026

PREPARED BY: Lauren Williams MCIEEM | Freshwater Ecologist | 13 Barra an tSean Baile | Goat St. | Dingle | Co. Kerry | E: laurenwilliams.ecology@gmail.com | P: 087 202 8258

CLIENT: Enerco |Lissarda Business Park | Lissarda | Cork |Ireland

Table of Contents

1 INTRODUCTION

This report contains the Aquatic Ecological Impact Assessment (EcIA) to accompany a planning application for a 110kV Air Insulated Switchgear (AIS) electricity substation to connect to and serve a solar farm; associated grid connection between the proposed substation and the existing Ardnacrusha 110kV substation comprising 110kV underground electricity cables of c. 5.6 km in length to be provided in an excavated trench including associated fibre cable and ducting on public and private lands, and all associated site development and reinstatement works; temporary construction and operational access from a new entrance from the L70382, vehicular entrance and access track from this public road; all ancillary site development, landscaping and earthworks.

The proposed development occurs in the townlands of Ballyglass, Blackwater, Castlebank, Lakyle, Mountcatherine, Oakfield, Parkroe, Reanabrone, Rosmadda West and Ruanard, Ardnacrusha, County Clare. It forms part of grid connection and access arrangements which will facilitate the connection of the permitted Ballyglass Solar Array Phase 1 (Clare County Council Reference P22-591 and An Coimisiún Pleanála Reference ABP-316043-23) and Phase 2 (Clare County Council Reference P24-60485 and An Coimisiún Pleanála Reference PL-500253-CE-25) to the national grid. A cumulative impact assessment of the proposed development with the Phase 1 and 2 solar farms is provided in this report.

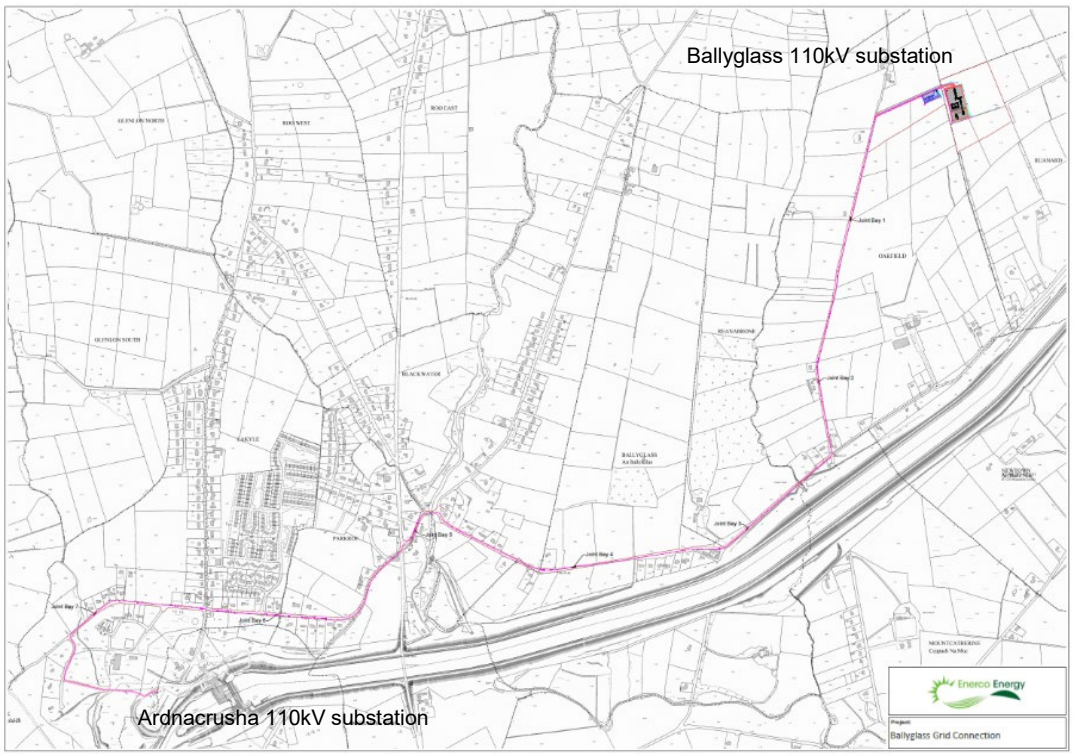


Figure 1-1 Proposed Ballyglass substation and grid connection route to Ardnacrusha substation.

The grid connection layout is shown in **Figure 1-1**. Undergrounding of the cable (total 5.6 km), with 4.75km following the public road corridor and 0.85km along new proposed access track across agricultural grassland and private access track. The public roads that will be cabled are L70382, R463 and L3056. There are a total of five watercourse crossings, none of which require instream works. The route crosses the path of the River Blackwater (Clare), which it is proposed to traverse by means of Horizontal Directional Drill (HDD), as well as the streams 'Oakfield 25'; two crossings of the 'West Roo' stream and one crossing of a drain adjoining the West Roo, each of which are proposed to be crossed using flatbed over or within the existing crossing structure.

2 METHODOLOGY AND SOURCES OF INFORMATION

2.1 Legislation and Guidance

The ecological impact assessment was prepared having due regard to relevant legislation and guidance documents as follows:

EU Legislation

- European Union Directive 2011/92/EU (the 'EIA Directive') as amended by Directive 2014/52/EU.
- EU Habitats Directive - Council Directive 92/43/EEC (1992).
- EU Water Framework Directive (2000/60/EC) (WFD) and Amending Directive (EU) 2026/805

National Legislation

- The Wildlife Acts 1976 and 2000 (as amended) which provide for the protection and conservation of wild fauna and flora, specifically from injury, disturbance, and damage to breeding and resting sites.
- Part XAB of the Planning and Development Act, 2000 (S.I. 30/2000) as amended and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011) as amended that transpose the EU Habitats Directive into Irish law.
- European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) which give legal effect in Ireland to the WFD.
- European Communities Environmental Objectives (Surface Waters) Regulations (S.I. No. 272 of 2009), as amended (S.I. 77 of 2019 and S. I. 50 of 2025).

National Plans

- The 4th National Biodiversity Action Plan 2023 - 2030 (NPWS, 2024), which sets the national biodiversity agenda for Ireland 2023-2030.
- Water Action Plan 2024: A River Basin Management Plan for Ireland (DHLGH, 2024) which sets out actions necessary to protect and restore water quality in Ireland.

Guidance

- EPA (2022) Guidelines on the Information to be contained in Environmental Impact Statements.
- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine by the Chartered Institute of Ecology and Environmental Management.
- NRA (2003, 2009) Guidelines for assessment of ecological impacts of national road schemes, Revisions 1 and 2.
- IFI (2016) Guidelines on protection of fisheries during construction works in and adjacent to waters. Inland Fisheries Ireland.

2.2 Study Approach

Field studies were conducted in relation to the proposed grid connection route (GCR) and substation, with wider surveys and desk study undertaken in relation to the permitted Ballyglass Solar Farm (Clare planning ref: 22591) and proposed Ballyglass Solar Farm (Phase 2) (Clare Planning ref: 2460485). The entire suite of field surveys carried out are presented in this report to inform the cumulative impact assessment of the solar arrays and the proposed substation/grid connection development. Field survey methods were consistent with standard and published protocols. Desk-based review of existing information informed the aquatic baseline assessment.

The downstream Zone of Influence (ZoI) was considered using expert judgement, taking account of existing watercourse morphology, size and flow types in terms of potential for downstream export of pollutants. Given there is hydrological connectivity to the River Shannon, which is part of the Lower River Shannon SAC (Site Code 002165), the potential ZoI included the hydrological connectivity to the River Shannon confluence / SAC boundary.

Hydrological connectivity to the River Shannon is via three main pathways: Oakfield Stream, Blackwater (Clare) River and West Roo Stream. There is a tenuous pathway from the proposed 110kV substation site via ephemeral land drains in the catchment of 'Knockbrack Drain' which also connects to the River Shannon via Errina Canal back-drain, Illaunyregan Stream and Doonass Demense stream.

2.3 Desk Study

A thorough desk-based search of available information was undertaken to assess potential presence/absence of protected aquatic species/habitats and identify key aquatic values and/or sensitivities. Online information, plus published and unpublished literature, from the following sources was utilised:

- Environmental Protection Agency (EPA) maps and data
- Water Framework Directive (WFD) maps and data (https://www.catchments.ie/)
- NPWS maps and data (https://www.npws.ie/maps-and-data)
- Geohive historical mapping (https://www.geohive.ie/)
- Geological Survey of Ireland (GSI) mapviewer
- National Biodiversity Data Centre (NBDC) maps and data
- Inland Fisheries Ireland (IFI) and WFD fish survey data

2.4 Field Studies

2.4.1 Survey Locations

Field survey of watercourses crossed by the proposed GCR were undertaken in 2025 (30 April, 1 May) and 2026 (5 February). The focus was on potentially affected watercourses at proposed GCR crossing points and drainage from the proposed 110 kV substation. These surveys built upon previous survey work undertaken on 15 December 2021 and 18 September 2022 in relation to permitted Ballyglass Phase 1 Solar Array. The aim of recent field studies (2025, 2026) was to: (1) characterise baseline conditions of instream habitats and identify key aquatic receptors in relation to the proposed substation and GCR, and (2) revisit watercourses previously surveyed in 2021/ 2022 to revalidate the baseline conditions of Oakfield Stream and Blackwater (Clare) River.

Focus was placed on general morphological condition, fisheries and any protected aquatic species value of instream habitats. Assessment of ecological value of watercourses was backed up by desk study information, where relevant. Watercourses were photographed and site coordinates were taken using handheld GPS.

Table 2-1 lists ITM (X, Y) co-ordinates of survey site locations. Aquatic survey sites are shown on **Figure 2-1**, below, which illustrates the proposed Ballyglass substation site and GCR red line boundary (RLB) in relation to permitted Ballyglass Solar Array (Clare planning ref: 22591, purple outline) and proposed Ballyglass Solar Array (Phase 2) (Clare Planning ref: 2460485, yellow outline).

Table 2-1 Ballyglass Solar – Aquatic Ecology Survey Locations

EPA Waterbody name and code	EPA Watercourse Name	Site Code	Stream Order	Easting (ITM)	Northing (ITM)
Blackwater (Clare)_020 IE_SH_25B060250	Oakfield 25	OF1A	~	561284	664968
		OF1B	1	560880	664400
		OF2	1	560886	664172
		OF3	1	560672	663279
		OF4	1	560801	662574
	Un-named (GCR Drain)	GCR Drain	~	560876	663134
	Blackwater (Clare) River	BWC1	4	559373	662473
		BWC2	4	561148	661580
	Un-named ('Toe-drain 1')	TD1	~	559536	662038
	Un-named ('Toe-drain 2')	TD2	~	560154	622193
North Ballycannan_010 IE_SH_25N170970	West Roo	WR1	2	558025	662027
	West Roo	WR2	2	558107	661790
	Un-named drain	WR3	~	558158	661788
Shannon (Lower)_060 IE_SH_25S012600	*Un-named ('Knockbrack Drain')*	KB2	~	561928	664989
		KB3	~	561998	664580
		KB5	~	562048	664326
		KB5A	~	561583	663990
		KB6	~	562146	663792
		KB7	~	562267	663615
		KB8	~	562163	663436
		KB9	~	562335	663100
	Un-named ('Errina Canal back-drain')	KB11	~	562430	662922
	Illaunyregan	KB12	1	562193	662340
		KB13	1	552361	661767

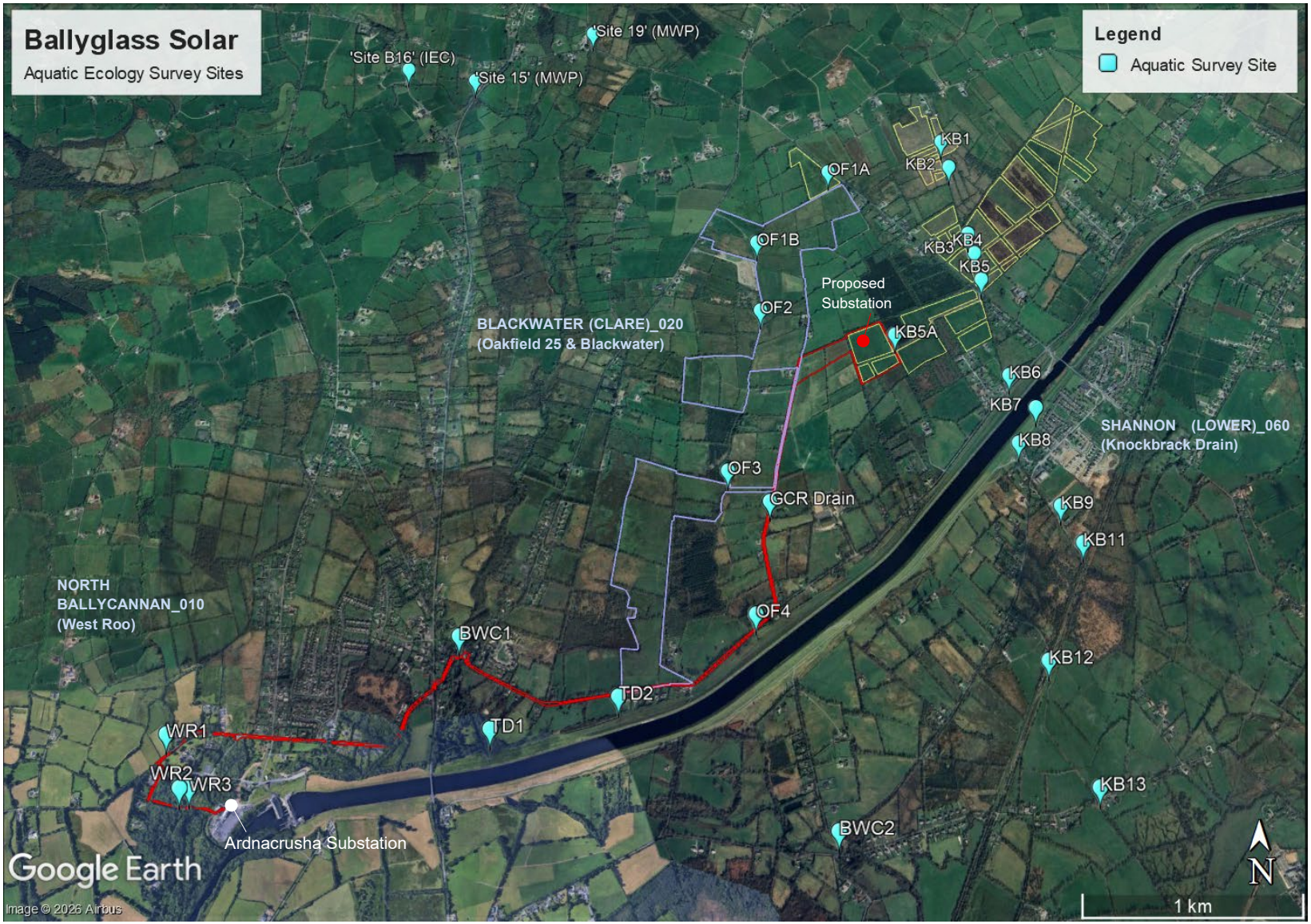


Figure 2-1 Ballyglass Solar Farm (Phase 1 & 2) with RLB of proposed Grid Connection Route & 110kV Substation

2.4.2 Field Survey Methods

Biological Water Quality

In Ireland, biological water quality is assessed using the Q-value metric. This system is based on field sampling and observations, which evaluates habitat quality and macroinvertebrate diversity and abundance to interpret ecological status as set out in **Table 2-2**. Water Framework Directive (2000/60/EC) (WFD) ecological status is assigned, based on the Q-value rating which is the biological quality element that determines water body status under the WFD. The objective of the WFD is to protect, enhance and restore all surface waters to at least good status by 2027. All surface waters must be maintained or restored to, at least, 'good' ecological status (Q4) and 'high' status waters must not suffer deterioration.

Watercourses were sampled during field studies (17 May 2024) in accordance with EPA protocols to determine Q-value and water quality implications. This involved taking a 2-minute, travelling kick-sample in a fast flowing (riffle) area of each watercourse using a long-handled sampling net (250 mm width, mesh size 0.25mm). Stone washing was employed to ensure "clinging" species, e.g. leeches and gastropods, were adequately collected. Relative abundance and sensitivity of aquatic organisms to pollution were then assessed at the bankside using the Q-rating system.

The EPA operate a national system of river monitoring which provides Q-value data for classification of ecological status on a three-yearly cycle. Available EPA data for the study area was reviewed. Q-values assist in characterising water and habitat quality for the purposes of EcIA as water quality is a primary determinant of habitat quality for aquatic organisms.

Table 2-2 Biological Water Quality and Status - Q-value system

Biotic Index	EQR	Quality Status	WFD Ecological Status
Q5	1.0	Unpolluted	High
Q4-5	0.9	Unpolluted	High
Q4	0.8	Unpolluted	Good
Q3-4	0.7	Slightly Polluted	Moderate
Q3	0.6	Moderately Polluted	Poor
Q2-3	0.5	Moderately Polluted	Poor
Q2	0.4	Seriously Polluted	Bad
Q1-2	0.3	Seriously Polluted	Bad

Fisheries Habitat Assessment

A field-based fisheries habitat assessment was undertaken, recording and evaluating the principle in-channel and bank-side habitats (e.g., substrates, flow types, instream vegetation, sedimentation), and the watercourse suitability as potential spawning, nursery, holding and residential sites for fish (salmonids, lampreys and European eel). The survey was based on expert judgement as to the suitability of channel morphology in relation to fisheries habitat. In the case of salmonid habitat, the Salmonid Life Cycle Unit Score (LCU) method was used to qualify habitat (O'Connor & Kennedy 2002, Loughs Agency 2008). This involved assigning a score equating to "Excellent", "Good", "Fair", "Poor" or "None" for each life cycle unit (Spawning, Nursery, Holding) as shown in **Table 2-3**. These scores were totalled to provide overall salmonid habitat score and descriptor, where applicable, as part of the characterisation of aquatic habitat and fisheries value.

Table 2-3 Salmonid Life Cycle Unit Score and Expert Judgement Qualification

Habitat quality	Life Cycle Unit Habitat score	Total score (3 x LCU)	Expert Judgement Qualification
Excellent	1	3 to 5	Watercourse is ideal habitat for the species owing to high quality and diversity of habitats (flow types, substrate types, bed profiles, riparian habitat) that support relevant salmonid life stages
Good	2	6 to 8	Likely that the watercourse supports the species owing to good quality of habitat conditions
Fair	3	9 to 11	Possible that the stream section could support the species but it there is sub-optimal diversity of flow, bed profile, substrate diversity and/or instream water quality and physical conditions
Poor	4	12	Possible, but unlikely, that the stream could support the species owing to impaired habitat conditions such as drainage, lack of flow, bed profile and substrate diversity and/or instream water quality and physical conditions
None	~	~	No possibility that the watercourse could support the species in question in the relevant life stage owing to completely unsuitable habitat and conditions

General Habitat Descriptions

Survey sites were visually assessed recording bankside and in-channel habitats and their suitability for aquatic fauna, including substrate and flow types, depth and width, shading, surrounding land-use and general morphological character. The latter were assessed, based on principles of the River Hydromorphology Assessment Technique (RHAT) (NIEA, 2014) whereby "departure from naturalness" is evaluated in terms of habitat quality for aquatic fauna.

2.5 Consultation

Inland Fisheries Ireland (IFI) was formally consulted in writing on 27 April 2022 regarding the proposed HDD crossing of the Blackwater (Clare) River, along with detail on watercourse crossings of the Oakfield 25 stream (upstream of the proposed GCR) that are now permitted for Ballyglass Solar Array (Phase 1) under Co. Clare planning ref. 22591. A formal response was received from IFI on 12 May 2022 and is included in **Appendix 3** to this report. As requested in IFI's response, an HDD Frack-Out Contingency Plan has been included in Section 5.2.1.2 of the CEMP for the current proposed grid connection (Enerco, 2026).

2.6 Ecological Valuation of Watercourses

The criteria used for assessment of ecological value of watercourses are adapted from [1]NRA Ecological Impact Guidelines (NRA, 2003, 2009) involving careful consideration of fisheries value, water quality and contextual information for the resource at a geographic level. The evaluation criteria used to classify sites is shown in **Table 2-4.** This is based on NRA (2003) guidelines, with slight modifications based on NRA (2009) to set out criteria that classify aquatic habitat value within the study area. The 2003 NRA guidelines reference aquatic habitats and fisheries clearly, while the 2009 guidelines have a more terrestrial focus. Criteria with direct relevance to aquatic habitats and fisheries have been retained in this table. EPA biological monitoring data and field-based study results were assessed in the context of national trends, guidelines, regulations and criteria of both the EU Habitats Directive (92/43/EEC) and Water Framework Directive (WFD) (2000/60/EC), as appropriate.

[1] NRA = National Roads Authority, now Transport Infrastructure Ireland (TII)

Table 2-4 Ecological evaluation criteria (NRA 2003, 2009)

Relevant Criteria	Category
International Importance: ▪ Sites designated (or qualifying for designation) as an SAC. ▪ Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988). ▪ Major salmonid (salmon, trout, or char) lake fisheries.	**A**
National Importance: ▪ Sites or waters designated or proposed as an NHA or Statutory Nature Reserve or National Park. ▪ Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU habitats directive. ▪ Resident or regularly occurring populations (assessed to be important at the national level) of species protected under the Wildlife Acts; and/or; species listed on a Red Data list. ▪ Major trout fishery rivers. ▪ Waterbodies with major amenity fisheries value. ▪ Commercially important coarse fisheries.	**B**
County Importance: ▪ Small water bodies with known salmonid populations or with good potential salmonid habitat, ▪ Undesignated sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive. ▪ Large water bodies with some coarse fisheries value. ▪ Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.	**C**
Local Importance (Higher Value): ▪ Small water bodies with some coarse fisheries value or some potential salmonid habitat. ▪ Any waterbody with unpolluted water (Q-value rating 4-5, Q5)	**D**
Local Importance (Lower value): • Water bodies with no current fisheries value and no significant potential fisheries value.	**E**

2.7 Impact Assessment Methodology

Potential direct, indirect and cumulative impact significance associated with the proposal were assessed in accordance with criteria set out in EPA Guidelines (EPA, 2022). Guidance was also sought from CIEEM (2018) and NRA (2009). Pre-mitigation and residual ecological impacts were assessed using the source-pathway-receptor (S-P-R) framework and classified and described according to the terminology of EPA (2022) with respect to significance and duration criteria set out in as set out in **Table 2-5** and **Table 2-6.** To assist with assigning impact significance, the matrix in **Appendix 1** was also used, which assists in assigning significance of effects in relation to the ecological quality category (sensitivity) of the watercourse in question. Special consideration was given to the prediction of how proposed measures may impact on any identified protected aquatic species and their habitats. Effects that are categorised as 'neutral', 'imperceptible', 'slight', 'not significant' or 'moderate' according to EPA (2022) Guidelines are *not significant* in Environmental Impact Assessment (EIA) terms. This is noted, as there is an increasing requirement in EIA for a binary outcome (i.e., significant / not significant) in the assessment of effects (e.g., CIEEM, 2018; TII, 2025).

Table 2-5 Significance of Ecological Effects Criteria (EPA, 2022)

Significance of Effects	Criteria
Neutral	No effects, or effects that are imperceptible within normal bounds of variation or within the margin of forecasting error
Imperceptible	An effect capable of measurement but without noticeable consequences
Not significant	An effect which causes noticeable changes in the character of environment but without significant consequences
Slight effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends
Significant effects	An effect which, by its character, magnitude, duration or intensity significantly alters a sensitive aspect of the environment
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
Profound impacts	An impact which obliterates sensitive characteristics

Table 2-6 Ecological Effects - Duration Criteria (EPA, 2022)

Impact Duration	Criteria
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects lasting less than a day
Temporary Effects	Effects lasting less than a year
Short-term Effects	Effects lasting one to seven years
Medium-term Effects	Effects lasting seven to fifteen years
Long-term Effects	Effects lasting fifteen to sixty years
Permanent Effects	Effects lasting over sixty years
Reversible Effects	Effects from which spontaneous recovery is possible within a reasonable timescale or which may be counteracted by mitigation.
Irreversible Effects	Effects from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it.

2.8 Statement of Competence

Lauren Williams BSc PGDip MCIEEM, is a Freshwater Ecologist with 26 years professional consultancy experience. Lauren holds a BSc in Zoology (University of Otago, New Zealand), a Certificate in Environmental Law and a Post Graduate Diploma in Environmental Monitoring Assessment and Engineering with Distinction from Trinity College Dublin. She is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). Laurens specialties are ecological impact assessment, water quality assessment, environmental monitoring and aquatic species/habitat survey including protected aquatic species and fisheries habitat assessment. Lauren has conducted baseline surveys and Environmental Impact Assessment reports for a wide range of large infrastructural developments across Ireland, including appearing as aquatic ecology expert witness at oral hearings. Her work has also involved large, catchment-based water quality monitoring projects and sampling for EPA national river monitoring programmes throughout Ireland.

3 RECEIVING ENVIRONMENT

3.1 Designated Conservation Areas

The proposed grid connection route, 110 kV substation site and solar array lands drain towards the River Shannon which is under designation as part of the Lower River Shannon SAC (Site Code 002165). There are three water sub-catchment pathways to the SAC via: (1) Blackwater (Clare) River including its tributary the Oakfield 25 stream, (2) "Knockbrack Drain" and (3) West Roo stream.

- The 110 kV substation and a short section (~330m) of the GCR are set in the catchment of the 'Knockbrack Drain' (Shannon (Lower)_060 river water body). The substation site is 4.7 km upstream of the SAC boundary via a tenuous overland and modified (agricultural) drainage pathway that connects to Knockbrack Drain. The proposal does not involve watercourses crossings in this sub catchment.

- The majority of the GCR (~3.5 km) is set within the catchment of the Blackwater (Clare) River (Blackwater (Clare)_020 river water body) including one flatbed over existing culvert crossing at Oakfield 25 stream (site OF4) on the R463, and one HDD crossing of the main channel of the Blackwater (Clare) River (site BWC1). These crossings do not involve instream works. The Oakfield stream crossing is 4.7 km upstream of the SAC boundary. The Blackwater (Clare) HDD crossing is 5.8 km upstream of the SAC boundary.

- A ~2 km section of the GCR is set within the subcatchment of the West Roo stream (North Ballycannan_010 river water body) including two crossings of West Roo main channel by flatbed over existing culverts (sites WR1, WR2) and one crossing of a minor drain that connects to West Roo (site WR3) using concrete flatbed formation alongside the existing culvert - Option D in the CEMP (Enerco, 2026). These three crossings do not involve instream works. The West Roo crossings are, at nearest, 1.3 km upstream of the confluence with Ardnacrusha tailrace canal, which flows a further 520 m to the SAC boundary on the River Shannon.

Relevant aquatic Qualifying Interests (QIs) of the Lower River Shannon SAC considered in the assessment are:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [Habitat 3260] (known as Floating River Vegetation (FRV))
- *Margaritifera margaritifera* (Freshwater Pearl Mussel)
- *Austropotamobius pallipes* (White-clawed Crayfish)
- *Petromyzon marinus* (Sea Lamprey)
- *Lampetra planeri* (Brook Lamprey)
- *Lampetra fluviatilis* (River Lamprey)
- *Salmo salar* (Salmon)

The Blackwater (Clare) River is one of the few larger tributaries of the Old River Shannon that adjoins downstream of Parteen regulating weir. This makes it one of the few salmon spawning and nursery tributaries of the Shannon that is not affected by the major fish passage barrier formed by Parteen weir. The importance of the Blackwater (Clare) River in terms of potential to support conservation objectives of the Lower Shannon SAC therefore cannot be understated. Any available spawning and nursery habitat in this channel gains extra significance because of its fish recruitment potential and contribution to supporting the conservation objectives of the Lower River Shannon SAC.

Note that the designated mussel population of the Lower River Shannon SAC is that of the Cloon River, a tributary of the Lower Shannon Estuary, which is not hydrologically connected to the proposed development.

3.2 Desk Study

3.2.1 Overview

The Blackwater (Clare) River is the main receiving water catchment for the proposed grid connection route. It has a total catchment area of 59.5km^2, of which the Blackwater (Clare)_020 river water body comprises 12.06 km^2. The river is fed by small tributaries that drain the southern flank of hills to the north of Clontra, Co Clare. The catchment is predominantly under agricultural land use, with some tracts of plantation conifer forest in the upper headwaters. The main river channel flows generally southwards meeting the Shannon River at Plassey. The northern part of the river catchment is underlain by undifferentiated sandstone, with limestones forming the base geology of the southern portion of the water catchment (nearer to the River Shannon) (GSI mapviewer). Whilst local geology along the Blackwater (Clare) River and Oakfield Stream would contribute slight alkalinity to downstream surface waters, most of the upstream catchment area is underlain by Old Red Sandstone, contributing soft water.

The proposed Ballyglass 110kV substation site, set within the adjacent Shannon (Lower)_060 water body (area 70.62 km^2) just the east of the Blackwater (Clare)_020. The proposed substation site in the townland of Ruanard is underlain by Lower Limestone Shale (sandstone, mudstone & thin limestone). The site drains in a south easterly direction via ephemeral field drains towards 'Knockbrack Drain', which passes beneath Ardnacrusha headrace canal ('Monaskeha Culvert') near Clonlara and has eventual connectivity to the River Shannon via a series of drained and modified channels including the Errina Canal back-drain, the Illaunyregan and Doonass Demense streams. There is a vertical drop (concrete shaft) into the Monaskeha Culvert which is impassable to fish.

The West Roo stream sub-catchment of the North Ballycannan_010 river water body (area 26.55 km^2), where grid connection route crossings are proposed, is dominated by agricultural land use and is underlain by Waulsortian Limestone. The West Roo flows ~750m from the proposed crossing at WR2, meeting the South Ballycar stream, which flows a further ~530m to join Ardnacrusha tailrace canal 1.3 km downstream of the dam and approximately 800m upstream of the confluence with the lower River Shannon at Parteen. The confluence of the South Ballycar stream with Ardnacrusha tailrace is highly modified, consisting of a high gradient open culvert (concrete bed and bank). It has no fish pass and is a major barrier to fish passage other than European eel (O'Donnell Environmental, 2024).

3.2.2 Biological Water Quality Data

Table 3-1 shows river Q-value monitoring data from EPA stations on the Blackwater (Clare) River. The Knockbrack Drain and West Roo streams are not monitored by the EPA. Ecological status (Q-rating) is determined by the according to **Table 2-2**, above. The Blackwater is at 'good' ecological status throughout according to recent EPA monitoring results (2023). The data indicates a decline in the upper catchment area (Glenomra) from 'high' to 'good' ecological status over recent years, which is outside the hydrological ZoI of the proposed development.

Within the hydrological ZoI, the Blackwater (Clare) River monitoring site RS25B060250 has recently improved from 'moderate' (Q3-4) to 'good' (Q4) ecological status, which is currently compliant with WFD objectives.

Table 3-1 Blackwater (Clare) River - EPA Q-value data

EPA Code	River	Station Name	2017/18	2021	2023	Ecological Status (2019-2024)
RS25B060120	Blackwater	Br d/s Killaly's Br	Q4	Q4	Q4	Good
RS25G120100	Glenomra	Br u/s Blackwater R confl.	Q4-5	Q4-5	Q4	Good
RS25B060250	Blackwater	Br SW of Mt St Catherine	Q4	Q3-4	Q4	Good

Project specific Q-values and macroinvertebrate lists arising from field studies for the proposed development are set out in **Appendix 2**, with a summary provided in **Table 3-2**. Ecological status is reported as 'potential', because it is not part of the formal EPA river monitoring programme and reporting. The published EPA methods were employed for Q-value evaluation (Toner *et al.,* 2005) but this project-specific data does not replace formal EPA classification of the river water body.

Table 3-2 Project-specific Q-value data and 'Potential' Ecological Status

River	Site Code	2021	2022	2023	2025
Blackwater (Clare)	BWC2		Q4 (Good)		Q4 (Good)
Oakfield 25	OF1B	Q3 (Poor)			Q3-4 (Mod.)
	OF2	Q3-4 (Mod.)			
	OF3	Q3-4 (Mod.)			
	OF4				Q4 (Good)
Knockbrack Drain	KB5				Q3 (Poor)
	KB6				Q3 (Poor)
	KB9				Q3-4 (Mod.)
West Roo	WR1			Q3-4 (Mod.)	

The project-specific Q-value data shows that the Blackwater (Clare) River and the lower reaches of its tributary, the Oakfield stream, are potential 'good' ecological status (Q4). The upper reaches of the Oakfield stream (OF1B) are currently potential 'moderate' ecological status (Q3-4). The Knockbrack Drain is potential 'poor' ecological status in its upper reaches, improving downstream to 'moderate'. The West Roo stream affected by the grid connection crossing (WR1) is also potential 'moderate' ecological status.

3.2.3 Existing Fisheries Data

Existing fisheries data for the Blackwater (Clare) was reviewed as part of the desk study. A previous report by Malachy Walsh and Partners relating to Carrownagowan Wind Array (MWP, 2019) provides evidence that salmon are entering the Blackwater (Clare) River system from the Shannon, and can navigate the fish pass on the steep culvert at the Ardnacrusha Headrace Canal (**Plate 3-1** and **Plate 3-2**, below), at least on occasion. A narrow, steep fish ladder is located on the RHS of the culvert slipway, but some of the baffles appear rotten and broken and therefore of questionable efficacy, although salmon spawning in the upstream catchment has been confirmed by the following electrofishing data.

From the MWP (2019) report: a 20-minute, single pass electrofishing survey in 2018 at the R465 bridge crossing (named "Site 15") on Blackwater (Clare) River captured brown trout (n=19) and salmon (n=7). Salmon were present in 0+ (young-of-the-year) and 1+ (previous year's spawned fish) age cohorts. Brook lamprey (n=17) and small numbers of three-spined stickleback, minnow and stoneloach were also present. Habitat survey at the R471 bridge crossing (named "Site 19") on Glenomra Wood Stream recorded Grade 1-2 salmonid spawning habitat, Grade 2 nursery and Grade 3 holding habitat (MWP, 2019), noting that Grade 1 is 'optimal', through to Grade 4 'poor' habitat. If salmon can access the upper Blackwater (Clare), they will certainly be utilising the suitable habitats of the Blackwater (Clare) downstream of Ardnacrusha Headrace Canal, and downstream of the Oakfield Stream confluence.

Plate 3-1 Blackwater (Clare) River – view through culvert beneath Ardnacrusha Headrace Canal (30/04/2025)

Plate 3-2 Blackwater (Clare) River – view of steep slope with fish pass on culvert beneath Ardnacrusha Headrace Canal (18/09/2022)

More recent electrofishing data was provided as part of environmental studies for the proposed Oatfield Wind Farm (ABP reference: 318782). Triturus Environmental Ltd carried out electrofishing surveys at sites in the Blackwater (Clare) catchment in August/September 2023 (IEC, 2023), recording a high density of mixed cohort brown trout and small numbers of juvenile salmon at Killally's Bridge (Site “B16” in that study, Figure 2-2).

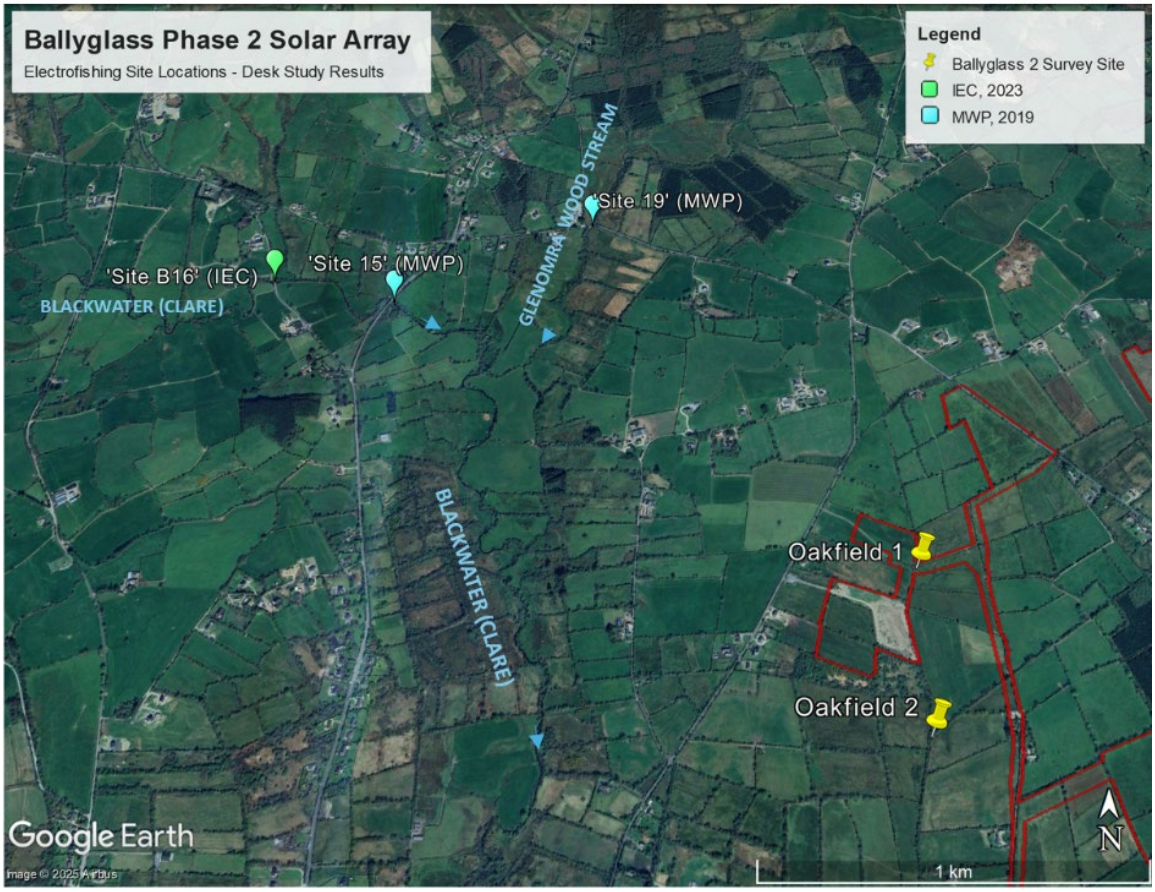


Figure 3-1 Location of Previous Electrofishing Surveys (MWP, 2019 and IEC, 2023)

The data proves that some returning adult salmon succeed in passing Ardnacrusha headrace culvert to spawn in the upper Blackwater (Clare) catchment. The river, whilst not part of the Lower River

Shannon SAC is considered to support conservation objectives for Atlantic salmon; Annex II Qualifying Interest species of the SAC.

Table 3-3 Previous Electrofishing Survey Locations from MWP (2019) and IEC (2023)

Survey Point (Site Code from MWP, 2019 and IEC, 2023)	River (EPA name)	Easting (ITM)	Northing (ITM)
'Site 15' (MWP)	Blackwater	559339	665582
'Site 19' (MWP)	Glenomra Wood Stream	559987	665892
'Site B16' (IEC)	Blackwater	558950	665665

The Shannon salmon population is not self-sustaining owing to the migration barriers imposed by the Shannon dams and hydroelectric scheme. The theoretical [2]Conservation Limit (CL) set for the Upper Shannon (above Parteen) by the [3]SSCS is currently 49,638 salmon per annum (TEGOS, 2026). Despite there being 30,895,619m^2 of fluvial habitat (the largest of any river system in the state) the Shannon recently only achieved a 3-year average count (2022-2025) of 454 returning salmon (TEGOS, 2024), equating to just 0.9% of its CL. This data explains why a tributary such as the Blackwater (Clare) River, which has a recruiting wild salmon population has significance in the context of the Shannon catchment and the Lower River Shannon SAC conservation objectives.

3.2.4 Water Framework Directive

The Proposed Development is set within the Shannon (Lower)_SC_100 (EPA Sub-catchment 25D_3). The proposed substation is within the Shannon (Lower)_060 river water body (RWB). The GCR is set across three EPA delineated RWBs Shannon (Lower)_060, Blackwater (Clare)_020 and North Ballycannan_010. Current EPA assigned river water body (RWB) status (2019-2024) for the relevant waterbodies is listed in **Table 3-3** (EPA, 2024)**.** The waterbodies and main receiving watercourses are illustrated **Figure 3-1**.

The Blackwater (Clare)_020 is classified at 'good' status but is '*At Risk'* meaning the EPA have identified issues and pressures (nutrient, agriculture) that could jeopardise the maintenance of good status as required under the WFD. North Ballycannan_010 is classified at 'good' status and '*Not at Risk'*, meaning the RWB is considered not at risk of failing its WFD objective of good status. The Shannon (Lower)_060 RWB is assigned 'moderate' status by the EPA for the 2019-2024 reporting period, and its risk category is '*Review'*. Where a water body is placed under 'review', it may show either an improving or a deteriorating trend, but more evidence is needed before it can be classified as either *At Risk* or *Not at Risk* of achieving its WFD objective of 'good' status.

Table 3-4 EPA Waterbody Status, Risk and Pressures

EPA Waterbody name and code	EPA Watercourse Name	EPA assigned Waterbody Status (2019-2024)	EPA Identified Risk / Issue / Pressures
Blackwater (Clare)_020 IE_SH_25B060250	Blackwater (Clare) Oakfield 25	Good (monitored)	At Risk Issues: Nutrients Pressures: Agriculture
North Ballycannan_010 IE_SH_25N170970	West Roo	Good (modelled)	Not at Risk (no listed issues or pressures)

[2] Scientifically derived sustainable stock level, i.e., the number of returning salmon that would be required to maintain the carrying capacity of the system based on its accessible area of fluvial habitat.

[3] Standing Scientific Committee on Salmon

EPA Waterbody name and code	EPA Watercourse Name	EPA assigned Waterbody Status (2019-2024)	EPA Identified Risk / Issue / Pressures
Shannon (Lower)_060 IE_SH_25S012600	*Unnamed (Knockbrack Drain)*	Moderate (modelled)	Under Review (no listed issues or pressures)
	Illaunyregan		

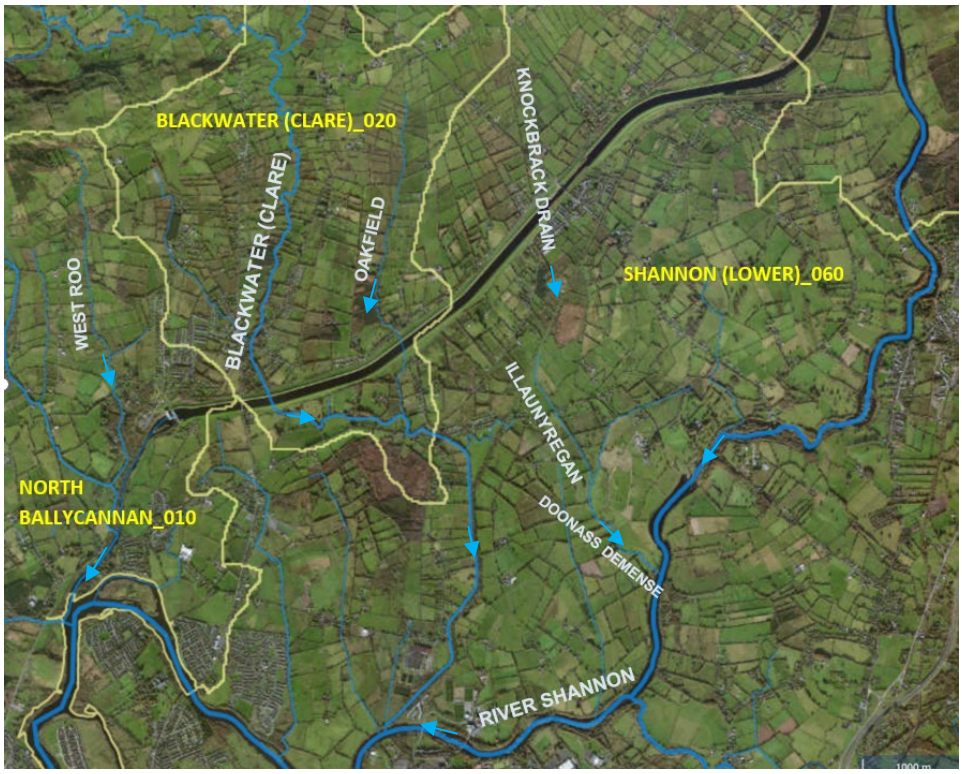


Figure 3-2 WFD River Water Bodies (RWBs) and watercourses draining the proposed development

3.3 Field Survey Results

Aquatic habitat descriptions should be read in conjunction with macroinvertebrate sampling and Q-value results shown in **Appendix 2**. Sites are assigned 'representative' ecological status based on field sampling as they are not formal status classifications reported to Europe. Q-value ratings were assigned using published EPA methods and protocols (Toner *et al,* 2005). Survey site locations are shown in **Figure 2-1**, Section 2.4.1, above.

3.3.1 Grid Connection Route Crossing Sites

Site Code, Habitat Description (2025)	Representative Image
Oakfield Site 4 (Site OF4): Small (width 1.6-2.0m, depth 5-10cm), channelised watercourse with reinforced concrete/stone banks passing into "Annegrove Culvert" beneath Ardnacrusha Headrace Canal. The culvert is low-gradient and has a low flow channel that would permit fish passage, meaning that trout (and brook lamprey) can be expected to be present upstream of the canal, i.e., could restock from downstream if necessary. Culverted beneath R463 road 40 m upstream of the headrace culvert. Macroinvertebrate sampling in 2025 (Appendix 2) merited a Q4 rating; potential "good" status, with a number of sensitive Heptagenid mayfly species present. Dissolved Oxygen = 92.0% saturation; 9.80 mg/l, and 12.9ºC. Potential spawning and nursery habitat for trout and brook lamprey – not in the modified, open reach upstream of the canal but certainly just upstream of the R463 road. This channel is of Local (lower value) Importance.	 **Plate 3-3** Downstream view from R463 culvert towards headrace canal culvert (April 2025)
Blackwater (Clare) River (Site BWC1): At Blackwater Bridge, proposed crossing point: moderate sized river (mean width 10m, depth 1.0 m). Deepened and slow-flowing upstream and downstream of the bridge, with glide/run habitat over silty embedded cobbles, mainly suitable for salmonid nursery and holding. Habitat in the nearby ZoI unsuitable for salmonid spawning. In September 2022 and April 2025, a turbid, obviously polluted discharge was evident at the right-hand side (RHS) bank, immediately upstream of the bridge. This formed a greyish, fine sediment layer over substrates for about 10m downstream, typical of sewage discharge. The emission is not marked on EPA mapping. The river broadens out into a slow-flowing glide 500m downstream of Blackwater Bridge before it passes over the steep fall into the Ardnacrusha Culvert which takes the river beneath the headrace canal. This channel is of County Importance owing to presence of Annex II Lower River Shannon SAC QI species, salmon.	 **Plate 3-4** View eastwards across Blackwater (Clare) river at Blackwater Bridge (April 2025)
West Roo (Site WR1) The proposed flat-bed crossing is over the **s**tone arch bridge on the L3056 road. The image shows downstream view through culvert from upstream of the road. The stream is small (W= 1.5m; D=15cm), forming step-pool, riffle-run sequences over substrates of bedrock (20%), boulder (20%), cobble/gravel (40%) and coarse sand. dominated by bedrock and embedded cobble with occasional interstitial pebble and coarse sand. A kick-sample in 2023 returned a Q-value of Q3-4, equating to potential moderate status (Appendix 2). Habitat of the West Roo is primarily suitable for trout nursery and eel, with patches of spawning habitat for trout and brook lamprey upstream and downstream, although lamprey nursery habitat is scarce. Salmon are unlikely to be present at this site (and upstream) because of (i) small stream size and (ii) pipe culverts at site WR2 (see below) form at least a partial barrier to upstream fish migration. Presence of salmon cannot be ruled out if they can pass the pipe culvert downstream as there is suitable salmonid spawning and nursery habitat. This channel is of Local (higher value) Importance owing to salmonid spawning habitat in the downstream ZoI.	 **Plate 3-5** West Roo stream at WR1, view downstream through L3056 culvert (Feb. 2026)

Site Code, Habitat Description (2025)	Representative Image
West Roo (Site WR2) This site is c. 240 m downstream of site WR1 on the main channel of the West Roo. The stream passes under the existing access track through a double pipe culvert (2 x Ø 500mm). Upstream, the watercourse is c.1.5m wet width and c.15cm depth. Has been historically deepened and straightened but has recovered quite 'natural' hydromorphology. Substrate heavily silted from around 10m upstream of culvert, composed of gravel with small cobbles upstream of the silted stretch. Riffle, no glide with a fairly fast flow. Riparian woodland present along the banks (ash, sycamore, elder, with opposite-leaved golden saxifrage, wood Sedge and celandine). Woodland present above culvert to access track. Downstream, the channel is c.2m wet width and c.30cm deep next to the culvert, shallower downstream (c.15cm). The downstream channel is more natural in form with a substrate of gravel, cobble and small boulders. Riffle, small glides with fast flow. Very good salmonid spawning and nursery habitat. Surrounding habitat woodland (hazel, ash, sycamore, soft shield-fern, hard fern). This channel is of Local (higher value) Importance owing to salmonid spawning habitat in the downstream ZoI.	 **Plate 3-6** West Roo stream at WR2, view downstream from existing pipe culvert (Feb. 2026).
West Roo (Site WR3) This is a small drainage channel (1.0-1.5 m width, depth c.5-10cm) that connects to the main channel of the West Roo c.50m downstream of the WR2 crossing. The channel is heavily overgrown with bramble, and its pathway to the proposed crossing point at WR3 is not visible or accessible. The drain passes under and existing flat slab culvert at access track. Substrates comprised of silt with some small cobbles. It is channelised along a parallel access track, to a second culvert at ITM 558111, 661740 where it discharges under the track by way of a double pipe culvert that then flows down the steep riverbank to the riverbank of the West Roo. The channel has little to no fisheries potential, with European eel and stickleback the only species potentially present. Habitat and flows are not suitable for salmonid spawning or nursery. Salmonids would not be able to migrate from the West Roo into this stream owing to the barrier formed by the second culvert outfall. This channel is of Local (Lower Value) Importance.	 **Plate 3-7** View upstream of drainage channel from the downstream culvert that connects to West Roo, towards existing slab culvert at WR3 crossing point (Feb. 2026)
GCR Drain: An over-the-edge drain runs alongside the small local road L70382. This drain is generally low gradient, dry and overgrown with grasses, meadowsweet, nettle and fool's watercress (*Helosciadium nodiflorum*). It mainly runs on the eastern side of the road, and in places on both sides of the road. It is in the catchment of the Oakfield stream, but hydrological connectivity is tenuous. Potential drainage (during rainfall events) would flow c.230m westwards along field boundary drains that connect (herringbone fashion) to the Oakfield stream. The drain, and the land drains connecting to the Oakfield stream have no fisheries significance. This L70382 parallel drain is highlighted because it forms a potential pathway for suspended solids wash out from the grid connection trenching works during the construction phase.	 **Plate 3-8** GCR drain on L70382 road within Oakfield stream catchment

3.3.2 Zone of Influence Sites - GCR and Solar Array

3.3.2.1 Blackwater (Clare) and Oakfield Stream

Table 3-5 Oakfield Stream & Blackwater (Clare) River: Habitat Conditions (2025)

Site Code, Habitat Description (2025)	Representative Image (2025)
Oakfield 1A (Site OF1A): Small (width 0.2-0.5m; 2cm depth), very low volume, deepened, channelised field boundary drain. Trickle flow evident with patches of narrow step-pool-run to sluggish glide. Steep, almost vertical banks. Substrates of silty cobble and gravel in short runs, with heavily silted glide reaches. Mature hedgerow (oak, hawthorn, willow, ash, ivy, bramble) on the true left bank, atop raised ditch. Improved grassland up to the bank, fenced, on true right side. Not suitable for Q-value sampling owing to low flow during dry spell in May 2025. Probably ephemeral. Low fisheries significance, although stickleback and eel cannot be ruled out.	 **Plate 3-9** View upstream of drain at OF1A that connects to Oakfield Stream (April 2025)
Oakfield 1B (Site OF1B): Small (width 0.6-0.9m; 2-5cm depth), low volume, deepened, channelised field boundary stream. Substrates comprise mainly gravel (80%), with coarse sand and a fine layer of mineral silt in short runs, with heavily silted glide reaches. A raised ditch separates the stream from the proposed solar array field on the western side of the stream. This is covered in bramble and bracken with scattered willow and hawthorn. Macroinvertebrate sampling (Appendix 2) merited a Q3-4 rating; potential "moderate" status, with a few sensitive *Rhithrogena* mayflies present. Dissolved Oxygen = 89.5% saturation; 8.74 mg/l, and 16.6°C. Potential spawning and nursery habitat for trout and brook lamprey.	 **Plate 3-10** View upstream of Oakfield Stream at OF1B (April 2025)
Blackwater (Clare) 2 (Site BWC2): Main channel of Blackwater (Clare) River. Site located c.3.1km upstream of the Lower River Shannon SAC boundary. Moderately large, swift flowing river set within riparian broadleaved wooded area forming dappled shade to the channel. Substrates of clean cobble, gravel and coarse sand with occasional small boulder. Patches of *Ranunculus* spp., an indicator of 'floating river vegetation'. Macroinvertebrate sampling (Appendix 2) merited a Q4 rating; potential "good" status, with several sensitive Heptagenid mayfly species present in good numbers. Dissolved Oxygen = 96.5% saturation; 10.2 mg/l, and 13.1°C. Excellent salmon and trout nursery habitat with good spawning potential. Good spawning habitat for lamprey species, with patches of silty nursery habitat.	 **Plate 3-11** View upstream of Blackwater (Clare) River at BWC2 (May 2025)

Site Code, Habitat Description (2025)	Representative Image (2025)
A total of 8 no. lamprey ammocoetes were captured (Plate 3-11) in a 5-min search covering a small patch (c.1m^2) of marginal silt deposited behind large woody debris near the L3058 bridge. This suggests a high density, locally, considering the Lower River Shannon SAC Conservation Objectives for juvenile lampreys are 1/m^2 (sea lamprey) and 2/m^2 (river/brook lamprey). These are likely to be the more common juvenile *Lampetra* spp. (brook/river lamprey) but equally, sea lamprey could spawn in the Blackwater (Clare) River downstream Ardnacrusha Headrace Canal culvert, because habitat conditions are generally suitable.	 **Plate 3-12** Lamprey ammocoetes, Blackwater (Clare) River at BWC2 (May 2025)

3.3.2.2 Ardnacrusha Headrace Toe-drain

Sites 'Toe-drain 1' (TD1) and 'Toe-drain 2' (TD2) [ITM: 559536, 662038 to 560154, 622193]

A portion (approximately 500m) of the proposed GCR from running along the R463 road drains to towards the Ardnacrusha headrace canal embankment toe-drain, which flows from Site TD1 for ~750m in a westerly direction to meet the Blackwater (Clare) main channel, 15m upstream of the Ardnacrusha Culvert at Site TD1. A small portion of the more southerly permitted Ballyglass Solar Array (Phase 1) development lands also drain via this artificial channel.

Plate 3-13 Headrace toe drain (TD1) showing concrete-lined channel (May 2025)

Plate 3-14 View westwards from Site TD2 showing low gradient, vegetated toe-drain (Sept. 2022)

The toe-drain was walked on 18 September 2022 and rechecked in May 2025 from the R463 road to the Blackwater (Clare) River outfall. The toe-drain runs west along the foot of the headrace embankment. The drain was either stagnant or dry, about 50 cm in wet-width, concrete lined on bed and banks (Plate 3-13, Plate 3-14) with a silty detritus layer along the bottom, overgrown with a mix of aquatic macrophytes and grasses. Emergent macrophytes included fools' watercress (*Helosciadium nodiflorum*), water starwort (*Callitriche stagnalis*), watercress (*Rorripa nasturtium-aquaticum*) with occasional branched burr-reed (*Sparganium erectum*). The toe-drain has no fisheries significance, very little aquatic ecological value at all and is unsuitable for Q-rating. The low gradient and abundance of aquatic plant growth will naturally attenuate flow and accumulate sediment. This pathway offers protection between the GCR and Solar Array lands as it would naturally settle out suspended solids before connecting to the Blackwater (Clare) River downstream.

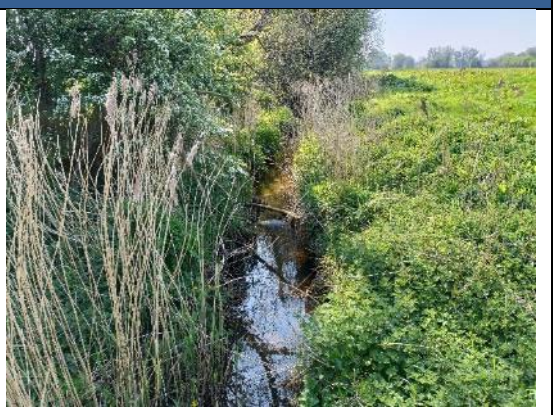
3.3.3 Zone of Influence Sites - Substation

3.3.3.1 'Knockbrack Drain' Catchment

Site Code, Habitat Description (2025)	Representative Image (2025)
Site KB2: Tiny, virtually dry field boundary drain, within dense hedgerow. Substrates of mud and silt. A small trickle of water was visible (wet width 10cm, depth <0.5cm) at the proposed crossing point, which then became stagnant and then dry in patches downstream. The drain is clearly ephemeral at this location. Substates of predominantly silt and woody debris with occasional embedded cobbles. No fisheries significance. Not suitable for Q-value sampling as the site was virtually dry. An embedded pipe culvert crossing is proposed at this location, which is approximately 6.2km upstream of the Lower River Shannon SAC boundary.	 **Plate 3-15** Site KB1 – virtually dry
Site KB3: Small, virtually dry field boundary drain. The channel is split in this reach, with KB3 being on the western side of a raised stone/earthen ditch covered in hedgerow. A small trickle of water was visible (wet width 20cm, depth <1cm) in places, which then became stagnant and then dry in patches downstream. The drain on the eastern side of the median hedgerow was dry at this point. Clearly an ephemeral drain. Substates of predominantly mud, silt and woody debris with occasional embedded cobbles. No fisheries significance. Not suitable for Q-value sampling as flow was too low and substrates not suitable. Embedded pipe culverts on both the western and eastern side of the median hedgerow strip are proposed at this location, which is c.5.8km upstream of the Lower River Shannon SAC boundary.	 **Plate 3-16** Site KB3, view downstream
Site KB5: Small, drained, channelised, very low volume field boundary drain. Culverted just upstream beneath the R471 road. A short reach of gravelly riffle-run was sampled and the macroinvertebrate community (Appendix 2) merited Q3 (representative 'poor' status) with species indicative of silty substrates (e.g., *Asellus*) and low abundances and diversity signifying ephemeral flow. Overall, the drain in this location is a minor watercourse becoming low gradient along the downstream field boundary with frequent emergent macrophytes (mainly *Helosciadium nodiflorum* and *Equisetum fluviatile*). No fisheries significance at this point in the catchment. This site is approximately 5.5km upstream of the Lower River Shannon SAC.	 **Plate 3-17** Site KB5, view downstream

Site Code, Habitat Description (2025)	Representative Image (2025)
Site KB5A: This drain borders the eastern side of the proposed 110 kV Substation location. Any drainage from the substation during construction/operation would flow across a broad, low gradient field to meet dry ditches that meet this small, very low volume field boundary drain located c. 100m to the east of the proposed substation. The upper reaches were dry, with a very low volume visible at the indicated KB5A survey point, where there was an existing small pipe culvert to access the field. The drain becomes low gradient and stagnant downstream of the existing field entrance (pipe culvert) at KB5A. It was completely choked with emergent *H. nodiflorum* and substrates were anoxic mud and silt. All adjoining herringbone field drains meeting this channel were dry. Clearly an ephemeral drain. No fisheries significance. Not suitable for Q-value sampling.	 **Plate 3-18** Site KB5A, view upstream
Site KB6: Sampled in the channelised reach between the R463 road and the Ardnacrusha Headrace Canal culvert. Small (0.9m width, 2-4cm depth), low volume, riffle-run habitat over gravel and coarse sand substrates with occasional cobble. It flows into the culvert down a vertical concrete shaft which is completely impassable by fish. Given the drain is largely unsuitable for fish upstream and has been highly modified by drainage, there is no fisheries significance at this point of the channel. The macroinvertebrate community (Appendix 2) merited Q3 (representative 'poor' status) with very low diversity and abundance overall, indicating ephemeral flows. Dissolved Oxygen = 89.5% saturation; 8.52 mg/l, and 17.8°C. A sewage smell was also noted.	 **Plate 3-19** Site KB6, view towards Ardnacrusha headrace culvert
Site KB7: Short light opening where the Knockbrack Drain emerges from the Ardnacrusha Headrace Canal culvert. No fisheries significance as the channel is piped all the way from this point almost as far as Site KB8 (see below).	 **Plate 3-20** View northwards showing Ardnacrusha headrace culvert exit

Site Code, Habitat Description (2025)	Representative Image (2025)
Site KB8: Low volume, channelised, urban property boundary stream with a dense cover of mature broadleaved trees (sycamore, beech). The channel forms a small stony bottomed stream at this point (mean 1.0m width, 5-8cm depth). It has patches of potential trout spawning and nursery habitat (gravelly riffles) and brook lamprey spawning potential. This is the first location, i.e., 700m downstream of the proposed Ballyglass Phase 2 Solar Array and 110 kV Substation on the Knockbrack Drain/channel, where fish are likely to be present.	 **Plate 3-21** Site KB8, view downstream
Site KB9: Low volume, channelised, field boundary stream with open banks (appears to have a recent, cut back riparian ditch on the true left). The channel continues as a small stony bottomed stream at this point (mean 1.0m width, 4-8cm depth). It has patches of potential trout spawning and nursery habitat (gravelly riffles) and brook lamprey spawning potential. Juvenile brook lampreys (ammocoetes) were captured in silty/sandy deposits and the channel margin at this location. Given brook lampreys were present, it can be assumed trout (but not salmon) can also spawn locally as the species have similar spawning habitat requirements. Dissolved Oxygen = 93.7% saturation; 10.1 mg/l, and 12.4^{o}C. The macroinvertebrate community (Appendix 2) merited Q3-4 (representative 'moderate' status), with a low abundance of Heptagenid mayflies (*Rhithrogena*) being the only Group A fauna recorded.	 **Plate 3-22** Site KB9, view upstream
Site KB11: Approximately 30m downstream of site KB10 the Knockbrack Drain meets the disused Errina Canal back-drain, where flow turns southwest along the toe of the canal embankment. The back-drain was 0.5-1.0m in width and 5-10cm depth. It is generally low gradient with either sluggish or slow glide flow and silty substrates. Very overgrown with bramble on the canal embankment side, with a riparian line of willow on the true right side. No trout spawning or nursery habitat, and completely unsuitable for salmon. No brook lamprey spawning habitat but given their presence upstream small numbers of juvenile brook lamprey may inhabit silt deposits. Low fisheries significance in general. This site is approximately 2.6km upstream of the Lower River Shannon SAC boundary.	 **Plate 3-23** Site KB11, view downstream (west)
Site KB12: About 600m downstream of site KB11, the Errina Canal back drain is culverted beneath the disused canal at the historic Newtown Lock (built in 1792). The stone arch culvert is passable by fish and there are patches of gravel slightly upstream of the lock with trout and brook lamprey spawning potential. Downstream of the lock culvert the channel has been dredged, is low-gradient and generally depositing in nature. It has little fisheries potential apart from brook lamprey nursery, stickleback and eel. The image is looking upstream from just below the Newtown Lock culvert. At this point the stream is marked on EPA mapping as the "Illaunyregan".	

Site Code, Habitat Description (2025)	Representative Image (2025)
Site KB13: About 650m downstream of site KB12, the Illaunyregan stream passes under the local road and a farm access track. From site KB13 downstream it forms a channelised, drain-like, low-gradient, stagnant-to-sluggish glide over silty substrates (1.5-2m width; 15-25cm depth). It is bound by stands of Common reed (*Phragmites australis)* in open reaches (as in the image), but had no instream vegetation under hedgerow (sycamore, willow, hawthorn) further downstream. Eel and stickleback would be likely, but there is no trout or brook lamprey spawning habitat. Another 800m downstream from site KB13, the Illaunyregan meets the EPA delineated Doonass Demesne stream, from where it is 550m to the SAC boundary or 1.2km to the River Shannon confluence.	 **Plate 3-24** Site KB13, view downstream

3.4 Notes on Hydrological Connectivity

Relevant to the assessment of effects, the following is noted in terms of hydrological connectivity:

- The proposed Ballyglass 110 kV substation (and its associated temporary construction compound) are in the catchment of the Knockbrack Drain, however, there is a wide buffer zone between the site and the nearby ephemeral drain (**Site KB5A)**. There are no instream works required for the substation or the GCR in this catchment. Knockbrack Drain is conveyed beneath the Ardnacrusha headrace canal through a culvert with a complete fish passage barrier (vertical drop > 3m) on the northern side of the canal. It is channelised around Clonlara village, eventually joining the Errina Canal backdrain, then culverted under the canal to become the Illaunyregan, then the Doonass Demense before meeting the River Shannon.
- The proposed GCR is mainly set within the Blackwater Clare River catchment, primarily within the Oakfield stream sub-catchment. There are no instream works required for proposed watercourse crossings (**Sites OF4, BWC1**) in this catchment. The Blackwater (Clare) and Oakfield culverts beneath Ardnacrusha headrace canal are passable by fish (at least partially / intermittently depending on flow conditions. The Oakfield joins the Blackwater (Clare), and the river is historically channelised (though recovered reasonably natural hydromorphology) down to the River Shannon.
- The proposed GCR watercourse crossings (**Sites WR1, WR2, WR3**) within the West Roo catchment do not require instream work. The West Roo flows ~750m from the proposed crossing at WR2, meeting the South Ballycar stream, which flows a further ~530m to join Ardnacrusha tailrace 1.3 km downstream of the dam and approximately 800m upstream of the confluence with the lower River Shannon at Parteen. The high gradient, open culvert at the confluence of South Ballycar stream with Ardnacrusha tailrace (concrete bed and bank, no fish pass) is a major barrier to fish passage other than European eel (O'Donnell Environmental, 2024).

3.5 Summary of Aquatic Receptor Sensitivity

Table 3-6 provides a summary of ecological value of watercourses potentially affected by the development and sets out the species and habitats of ecological interest, including SAC Qualifying Interests species of the Lower River Shannon SAC (where relevant), that occur or are likely to occur in the proposed development ZoI.

Table 3-6 SAC Qualifying Interests – Summary of Aquatic Ecological Value

	Blackwater (Clare) River	Oakfield Stream	Knockbrack Drain	West Roo
Salmon / Trout	Yes – The main channel along the potentially affected reach (downstream of Oakfield Stream confluence) comprises excellent salmon nursery with pockets of spawning gravels. An important salmon tributary of the otherwise impaired Shannon catchment. Salmon can evidently pass the Ardnacrusha headrace canal culvert (at least on occasion) and access u/s spawning habitat. Very good trout habitats.	No salmon - Stream size too small (and variable) for salmon. Water quality and hydromorphology are not suitable owing to channelization and drainage maintenance. The stream could support trout.	No salmon - completely unsuitable habitat for salmon in the drain itself (i.e., upstream of KB10), the Errina Canal back drain (KB11) and the Illaunyregan Stream (KB12, KB13). Potential trout habitat exists from Site KB8 downstream	Potential salmon spawning and nursery habitat in downstream ZoI, mainly downstream of Site WR2 where the channel has stable substrates, noting that the culvert at WR2 is potentially impassable to salmon. Good habitats for trout on the main channel (WR1, WR2).
Freshwater Pearl Mussel (FPM)	No evidence – no records for the species in the ZoI. Designated FPM population occurs in the Cloon River which is not in the ZoI.	No - completely unsuitable habitat	No – completely unsuitable habitat	No – completely unsuitable habitat
White-clawed Crayfish	No evidence despite focused manual searching during Q-sampling. Historical EPA records exist (1994, 2002) from upstream tributaries, so the species cannot be entirely ruled out in the affected reach. eDNA sampling at the R463 bridge (Site Blackwater (Clare) 1) has recorded crayfish DNA and crayfish plague DNA (IEC,	No evidence – but historical EPA records exist (1994, 2002) from upstream tributaries so the species cannot be ruled out in the affected reach.	No evidence – and unlikely given the ephemeral nature of the drain, especially upstream of Site KB8.	No evidence – but historical EPA records exist (1994, 2002) from nearby tributaries so the species cannot be ruled out in the main channel reach (Sites WR1, WR2).
Brook Lamprey	Yes – Suitable spawning and nursery habitat upstream and downstream of the Ardnacusha headrace canal. Lamprey ammocoetes captured in marginal silt at Site BWC2.	Likely, although habitat is limited owing to historical channelization and drainage maintenance.	Upstream of Site KB8 is completely unsuitable for brook lamprey (drained, ephemeral, inaccessible). Small numbers of juvenile brook lamprey were, however, evident at KB9. Patches of spawning and nursery habitat present between KB8 and KB13, i.e., at nearest 700m downstream of proposed development.	Likely, although habitat is limited owing to historical channelization and lack of marginal silt deposition which limits nursery potential.
Sea Lamprey	Possible presence downstream of headrace canal. Pockets of spawning and nursery habitat are present, and channel is naturally accessible from the River Shannon. Sea lamprey very unlikely to be able to pass the Ardnacrusha headrace canal culvert.	No - unsuitable habitat	No – completely unsuitable habitat	Generally unsuitable habitat upstream of WR2, but cannot be ruled out further downstream of WR2, closer to the River Shannon confluence.

4 ASSESSMENT OF EFFECTS

4.1 Relevant characteristics of the Proposal

The Construction and Environmental Management Plan (CEMP) (Enerco, 2026) was consulted for this assessment. The CEMP describes the proposed civil works, construction schedule and best practice environmental protection measures. Protective measures were built into the CEMP, informed by aquatic ecological constraints reporting by this author. The overall project design was informed (iteratively) by aquatic ecological sensitivities and includes design measures to avoid and/or limit the potential sources of water borne construction related pollutants (sediment, concrete, hydrocarbons) and control pathways to prevent export of pollutants into drains and/or watercourses from construction areas.

The Project involves:

- Construction of new 110kV substation;
- Underground 110kV underground cable grid connection to the existing Ardnacrusha 110kV substation, including associated joint bays, communication chambers and earth sheath link chambers;
- Temporary construction compound;
- Provision of vehicular construction and operational entrance and access track from the L70382.
- Site drainage;
- Spoil management, landscaping and earthworks.

4.1.1 Proposed 110kV Substation

The 110 kV substation and the short section of GCR (330m) are set in the catchment of the 'Knockbrack Drain' (Shannon (Lower)_060 river waterbody). The area of soil stripping for the proposed substation is 0.9 ha which is a relatively small area of temporarily exposed ground, noting that it is located on a gently sloping field of well-vegetated, improved grassland and rough pasture.

The proposed substation field slopes gently southwards, bound to the south and east by minor, ephemeral drains (see Site 'KB5A' above) with a tenuous connection of a further c. 700m to the Knockbrack Drain (itself of low local ecological importance). There is no connectivity from the newly proposed substation site to the more fisheries sensitive Oakfield stream or Blackwater (Clare) River. The substation location is ~4.7 km upstream of the Lower River Shannon SAC boundary via low quality field drains, then the Knockbrack Drain / Illaunyregan / Doonass Demense Streams. The proposed development does not involve watercourses crossings in this sub-catchment.

Surface water drainage proposals for the substation development have been developed to mimic the natural drainage patterns of the site and thereby be in accordance with the best management practices of Sustainable Drainage Systems (SuDS) including those set out in the SuDS Manual (C753) published by CIRIA in 2015. The access track and the majority of substation hardstanding are permeable allowing rainwater to infiltrate to underlying subsoils, and the existing greenfield drainage situation will therefore not materially alter. The run-off from relatively small solid hardstanding and bunded areas will discharge to soakaways via a Class 1 Full Retention Oil Separator.

There is no construction or operational discharge of wastewater involved. A 5m^3 foul holding tank is proposed as part of the operational development as normally used in ESB substations. It will be emptied periodically, with the capacity in excess of modelled holding requirements.

4.1.2 Proposed Grid Connection Route

The proposed GCR from the solar array will run for 5.6km from the internal 110kV sub-station in Parcel 3 of proposed Ballyglass Solar Farm (Phase 2) (Co. Clare Planning ref: 2460485) to the Ardnacrusha 110kV substation. It will serve both the permitted Ballyglass Solar Farm (Co. Clare planning ref: 22591) and proposed Ballyglass (Phase 2) project.

Underground cabling will run along a proposed new access track (~330m), then the Oakfield Lane (~1.3km); the R463 (~1.95km), the L3056 (~1.45km), then leaving the public road corridor and entering private track. The cable continues along this track for 0.57 km before connecting with the existing Ardnacrusha substation. There are five watercourse crossings in total along the route, none of which involve instream works.

The majority of the GCR (3.5km) is set within the catchment of the Blackwater (Clare) River (Blackwater (Clare)_020 river water body) and includes two watercourse crossings:

- **Watercourse Crossing 5** (Site OF4): Flatbed over existing culvert crossing at Oakfield 25 stream on the R463.
- **Watercourse Crossing 4** (Site BWC1): HDD crossing of the main channel of the Blackwater (Clare) River.

A ~2 km section of the GCR is set within the water catchment of the West Roo stream (North Ballycannan_010 river water body) including two crossings of West Roo main channel and one crossing of a side drain of the West Roo:

- **Watercourse Crossings 2 and 3** (Site WR2 and WR1, respectively): Flatbed over existing culverts – Option A (refer to CEMP) at Sites WR1, WR2 on West Roo main channel.
- **Watercourse Crossing 1** (Site WR3): Concrete flatbed formation alongside the existing culvert - Option D (refer to CEMP) over minor drain connected to West Roo.

The Oakfield 25 crossing (Site OF4) is 4.7 km upstream of the SAC boundary. The Blackwater (Clare) HDD crossing (Site BWC1) is 5.8 km upstream of the Lower River Shannon SAC boundary. The West Roo crossings are, at nearest (WR2), 1.3 km upstream of the confluence with Ardnacrusha tailrace canal, which flows a further 520m to the SAC boundary.

The GCR is proposed to be laid over 30-40 days during Weeks 13-37 of the overall construction period for permitted (Phase 1) and proposed (Phase 2) Ballyglass Solar Farm. This is two months after the initial site works for the proposed Ballyglass 110kV substation. Refer to **Table 4-1**, below, which sets out the overall construction sequencing for the solar arrays and the proposed development (Enerco, 2025).

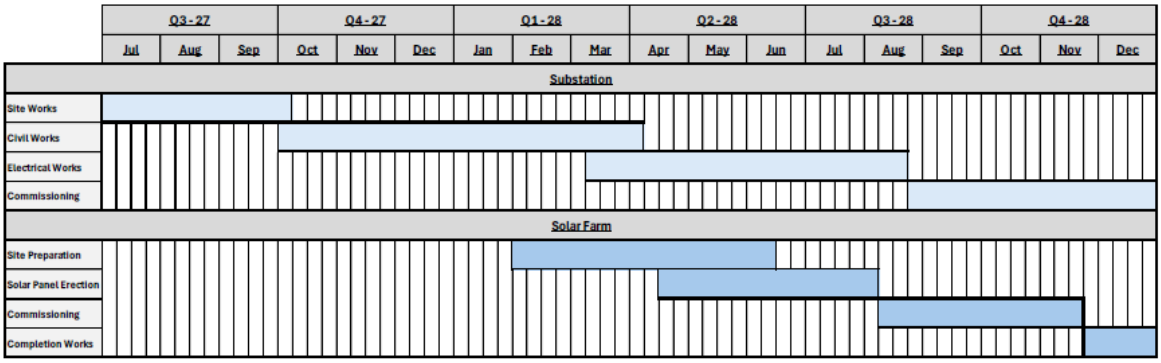
The grid connection CEMP (Enerco, 2026) sets out the construction methodology for the trenching/cabling and HDD crossing describing the required infrastructure and installation. Protective measures are built into the CEMP to prevent waterborne export of sediment and other pollutants into watercourses from the trenching / cabling areas and the HDD launch and reception pit areas.

Inland Fisheries Ireland (IFI) were consulted about the HDD crossing of the Blackwater (Clare) River. Refer to **Appendix 3** for a copy of their response. As requested by IFI, an HDD Frack-Out Contingency Plan has been included in Section 5.2.1.2 of the CEMP (Enerco, 2026).

4.1.3 Construction Phasing

The proposed grid connection works will take approximately 9 to 12 months to complete over an 18-month period. **Table 4-1** sets out overall phasing of the grid connection works in relation to the overall construction works schedule for the Ballyglass Solar Arrays Phase 1 (permitted) and Phase 2 (proposed). This is used to inform the impact assessment in terms of scale and duration of potential cumulative water quality effects.

Table 4-1 Proposed Construction Phasing by Month



4.2 Potential Effects

4.2.1 Construction Phase Effects

4.2.1.1 Sources of Construction Phase Effects

There are no instream works proposed for construction of the Ballyglass 110kV substation and GCR. Potential impacts and effects on aquatic receptors will therefore be indirect only, related to potential water quality degradation linked to three sources of water borne pollutant loss from construction areas: suspended solids, concrete and hydrocarbons. The mechanisms of effect on aquatic receptors are described below.

Suspended Solids: The principal source of potentially negative effects on aquatic receptors arises from the escape of excessive amounts of suspended solids during the construction phase. Solids export is linked to rainfall events occurring during earthworks, including erosion of soil stockpiles and excavated areas, e.g., access tracks, site compound and underground cabling trenches. Escaped solids can settle in watercourses, potentially smothering spawning and nursery habitats of fish, macroinvertebrates, and altering instream plant growth patterns (e.g., sediment can encourage rooted macrophyte growth). This may cause fish to abandon the area, at least in the temporary to short-term, and affect fish recruitment success.

Cement: Relatively small amounts of liquid cement usage will be required during the substation and GCR construction phase. There will be no on-site batching of concrete and no-washing out of concrete batch delivery trucks on-site. GCR joint bays utilise precast concrete units. Owing to its highly alkaline and corrosive nature, cement is potentially toxic to instream fauna and can cause fish and invertebrate kills downstream if it did reach watercourses. However, the likelihood of this occurring is very low and inherently limited using best construction practice around concrete use, as set out in the CEMP.

Hydrocarbons: Hydrocarbon spills and leakages can result in oil slicks and tainting of fish, or (if large enough) fish and invertebrate kills. They can be very detrimental to salmonid eggs and young fry in spawning areas. Hydrocarbons can reach drains and watercourses because of spills and leakage from poorly secured or non-bunded fuel storage areas; spills during re-fuelling; leaks from on-site vehicles, plant and equipment. Whilst likelihood of hydrocarbon loss occurring from a well-managed construction site is low, i.e., through implementation of best construction practice in terms of fuel storage and management, if an accidental leak or spillage occurred, the effects are considered on a catchment-specific basis, below.

The significance of effect related to the above impact sources depends on the scale of the proposed works, magnitude of the impact and sensitivity of the receiving watercourse(s). Given the proposed substation and GCR occur across three water sub-catchments, impact and effects are examined for each in **Sections 4.2.1.2 to 4.2.1.4**.

In addition, site clearance works, including those along road verges for GCR installation have potential to spread invasive alien plant species (IAPS), which, in the absence of mitigation, can have **long term significant negative** impacts on the physical nature and ecological function of watercourses and riparian corridors.

4.2.1.2 Substation Site - Knockbrack Drain Sub-catchment

A short section of new access track and GCR cabling (~330m) is proposed from the Oakfield Lane to the proposed 110kV substation site, which occurs in the Knockbrack Drain water catchment (Shannon (Lower)_060 RWB). This involves linear construction within green fields on lands that are gently rolling to flat. This inherently reduces risk of potential uncontrolled runoff of pollutants and increases effectiveness of proposed best practice run-off controls (e.g., temporary check dams, silt fencing), especially compared to broad-scale excavations or full field ploughing, the latter of which is ordinarily practiced in this type of agricultural setting. Permeable (compacted gravel) access tracks will have over-the-edge drainage to vegetated ground, with existing onsite drainage features (ephemeral field perimeter drains) and infiltration patterns remaining unchanged.

The proposed 110kV substation site (and associated temporary construction compound) is set on the slightly elevated side of a large agricultural field of improved grassland and rough pasture. The ephemeral drain at Site KB5A is ~75m away to the southeast of the site, with no preferential flow pathways to the drain. Any run-off from the access track and substation construction site would have to flow overland, across the vegetated field before reaching this drain. The KB5A drain is then of low gradient and well vegetated, which would facilitate settlement of suspended solids that did reach here. The drain has no fisheries significance. The nearest habitat of any potential fisheries significance (trout, brook lamprey) is at Site KB8 ~1.3km downstream of Site KB5A, via tenuous field drainage pathway that connects to Knockbrack Drain before passing beneath the Ardnacrusha headrace culvert at Clonlara.

The main source area of risk for hydrocarbon contamination in this water catchment is the temporary construction compound near the proposed Ballyglass 110kV substation, noting that the compound is distant (>100m) from the KB5A drain. Likewise, the main source of potential cement contamination is the substation site which is ~75m from the KB5A drain.

Given: (1) the relatively small source area for potential solids washout, concrete and/or hydrocarbon contamination in the catchment context; (2) the tenuous overland and attenuated hydrological connectivity to the Knockbrack Drain itself, (3) ameliorating factors along the run-off pathway, and (4) low sensitivity of the KB5A drain which is the potential receptor, the likelihood of any waterborne contaminants reaching firstly the KB5A drain, let alone reaching the slightly more sensitive habitat of the Knockbrack Drain at Site KB8 ~1.3km downstream is very low to nil.

The potential effect on aquatic ecological receptors of the Knockbrack Drain water catchment will be highly localised, limited to a short reach of the minor KB5A drain (which lacks fisheries sensitivity) and categorised as **imperceptible to neutral, temporary and reversible** (not significant in EIA terms).

4.2.1.3 GCR – Blackwater (Clare) Sub-catchment

Water Quality Degradation Effects on Aquatic Habitats - Cable Trenching

Trenching for underground cabling can give rise to potential for sediment export locally. Lean mix concrete will line the trench beneath the cabling, which, by nature, is contained within the trench and has a low risk of potential escape to nearby drains or watercourses. Only short lengths of trench will be open at any one time and these will be backfilled and reinstated as soon as possible after excavation and concomitant cable laying. Plant and machinery involved in the trenching are small and mobile and will not be refuelled within 50m of a watercourse or drain. Given the limited source areas at any one time and generally low gradient topography along the ~3.5km GCR route in this water sub-catchment, potential for excessive wash out of sediment is considered low and the construction activities are likely to be adequately managed using best construction practise in line with the CEMP.

However, the cable trenches in the approach zones to proposed flatbed over culvert crossing of the Oakfield stream culvert (Site OF4) and the HDD crossing at Blackwater Bridge on the R463 road will

require focused management to avoid entrainment of suspended solids to the more sensitive fisheries habitats located downstream on the Blackwater (Clare) River. There are no instream works which avoids direct impact on the watercourses.

In addition, over-the-edge road drainage from the Oakfield Lane (Site GCR drain) and the R463 road have connectivity to the Oakfield stream (Site OF4). Over-the-edge road drainage from a section of the R463 east of the Blackwater Bridge links to and the Ardnacrusha Canal toe-drain (Sites TD1, TD2). The roadside drains are ephemeral. Both the Oakfield stream and canal toe-drain sites ultimately connect to the more sensitive habitat of the Blackwater (Clare) River.

Potential suspended solids wash out to the Oakfield 25 stream at Site OF4, if it did occur in excess (which is unlikely), may affect 900m of the Oakfield stream down to the Blackwater (Clare) River confluence. The first ~300m of the stream (downstream of OF4) is the ESB 'Annegrove Culvert' beneath Ardnacrusha headrace canal and has low fisheries significance. The remaining 600m to the Blackwater (Clare) confluence is potential trout and brook lamprey habitat, though habitat quality is militated by historical drainage. It is considered that in the absence of robust mitigation in the area of sediment loss control, a localised effect along the lower 600m of the Oakfield 25 stream could occur whereby trout and brook lamprey habitat may be subject to slightly greater sedimentation and turbidity compared to baseline in this agricultural catchment. This may negatively affect that year's fish recruitment success and would last for one spawning season, noting that the stream is reasonably fast-flowing and will 'self-clean' during spates. Given the relatively limited source areas, turbulent nature and large dilution factor of the Blackwater (Clare) River downstream of the Oakfield 25 confluence, there is unlikely to be any measurable suspended solids increase in the Blackwater (Clare) itself associated with GCR related run-off to the Oakfield 25. The effect is categorised as localised **indirect temporary slight negative reversible** affecting the lower Oakfield 25 stream, with effects on the Blackwater (Clare) River being **indirect, temporary imperceptible negative and reversible** (not significant in EIA terms).

Water Quality Degradation Effects on Aquatic Habitats - HDD Watercourse Crossing

The HDD watercourse crossing of Blackwater (Clare) River at Blackwater Bridge involves civil works near the channel, with risk of contaminants entering the river. The main contaminant source during HDD works (apart from suspended solids associated with cable trench approaches) is the drilling fluid, which is a "mud" or "slurry" comprised of water and additives. It is proposed to use a natural, inert and biodegradable drilling fluid such as Clear Bore™ (Section 2.4.9.5 of CEMP; Enerco, 2026). Engineering and environmental control measures for prevention of leakage or spillage of drilling fluid from drilling pits or containers have been set out in Section 2.4.9.5 of the CEMP.

Potential exists for accidental frack-out or spillage of drilling fluids which could occur as part of a leak from the launch/reception pits or as a frack-out burst through river substrates. The risk of this occurring from a well-managed site is considered very low. However, if excessive quantities of drill fluid (mud slurry) escaped to the river, locally important fisheries habitat could be negatively affected in the temporary to short-term by sedimentation and/or turbidity effects. In this regard, it is noted there is no notable salmonid spawning or nursery habitat in the first 800m downstream of Blackwater Bridge. The river is impounded upstream of the Ardnacrusha headrace culvert (refer to **Plates 3-1 and 3-2,** Section 3.2.3, above), meaning the first 500m downstream of the HDD drilling operation is mainly a holding and migration habitat for salmonids (noting that sea lamprey . The next ~300m downstream comprises the headrace culvert itself, which is a migration route only. From that point downstream, The Blackwater (Clare) comprises fair to very good habitat for salmonid and lamprey spawning and nursery which could be subject to turbidity and perhaps some sedimentation which may slightly reduce recruitment success for one season. Whilst unlikely to occur, in the absence of robust emergency procedures for a frack out / spillage incident, the effect (only if frack out or spillage did occur) could be **indirect temporary moderate negative reversible** (not significant in EIA terms) in relation to fish holding habitat locally, and for the Blackwater (Clare) populations of salmon and lamprey which contribute to conservation objectives of the downstream Lower River Shannon SAC located from 800m downstream of the HDD crossing point.

4.2.1.4 GCR – West Roo Sub-catchment

As above, the cable trenching approach zones at proposed flatbed over culvert watercourse crossings can give rise to potential for sediment export down the receiving watercourse. There are no instream works which avoids direct impact on the watercourses. Given the limited source areas at any one time and generally low gradient topography along the ~2km GCR route in this water sub-catchment, potential for excessive wash out of sediment is, for the most part, low and the construction activities are highly likely to be adequately managed using best construction practise in line with the CEMP.

The approaches crossings and of the West Roo (WR1, WR2) and its adjoining drain (WR3) will, however, require focused management to avoid entrainment of suspended solids to the more sensitive salmonid and lamprey habitats located downstream on the West Roo. In the absence of robust mitigation in the area of sediment loss control, the effect would be **indirect temporary slight negative reversible** in terms of potential downstream effects of suspended solids on aquatic habitat of the West Roo Stream, affecting trout, brook lamprey, macroinvertebrate communities and potentially small numbers of salmon.

Potential Construction Phase Effects on Lower River Shannon SAC

Once the substation and GCR are constructed, there are no likely operational phase sources (emissions) of impact on aquatic ecological receptors locally. Potential effects on the Lower River Shannon SAC, at nearest 4.7 km downstream, are predicted to be neutral and **not significant**.

4.2.2 Operational Phase Effects

The proposed substation is on generally flat-to-gently-rolling topography and will continue to be drained by existing on-site (in-active) field drains which flow towards the Knockbrack Drain. The discharge rates shall be the equivalent of greenfield conditions, with no alteration to natural flow patterns and hence no significant change to the hydrological regime of the lands in question.

Hydrocarbon spillages could occur during maintenance in the substation operation phase, e.g., fuel or oil leaks from parked vehicles, uncontained spillage of transformer oil or lubricants for maintenance stored onsite. These events are unlikely to occur, can be remedied quickly, and would be highly localised to the substation itself which is distant (>75m) from drains and active watercourses. In addition, any surface water generated in the hardstanding and bunded areas will discharge to soakaways via a Class 1 Full Retention Oil Separator.

Once installed and land reinstated, underground cables (GCR) have no operational impact on aquatic ecology. Any required maintenance of cables is expected to involve periodic inspection at joint bays, with no watercourse interaction and no deleterious substances released. The operational phase effect of the GCR on aquatic ecological receptors is not neutral and **not significant**.

In relation to the proposed Ballyglass 110kV substation, the nearby drains including the Knockbrack Drain upstream of Site KB8 are of local (lower value) importance, increasing to local importance (higher value) in the downstream Knockbrack Drain (~1.3 km downstream). The potential operational phase effect is neutral and **not significant**.

In relation to the proposed grid connection route, the potential effect on aquatic receptors of local importance (higher value) of the downstream Knockbrack Drain (~1.3 km downstream) is **not significant**.

There are **not significant** aquatic ecological operational impacts predicted with regard to the GCR. the potential effect on aquatic receptors of local importance (higher value) of the downstream Knockbrack Drain (~1.3 km downstream) is **not significant**.

Potential Operational Phase Effects on Lower River Shannon SAC

Once the substation and GCR are constructed, there are no likely operational phase sources (emissions) of impact on aquatic ecological receptors locally. Potential effects on the Lower River Shannon SAC, at nearest 4.7 km downstream, are predicted to be neutral and **not significant**.

4.2.3 Decommissioning Phase Effects

Once the project is energised, the Ballyglass 110 kV substation and underground GCR will become the property of ESB Networks and will remain in-situ. This infrastructure will have a future long-term use as part of the national electricity transmission system. There is no potential for decommissioning effects on aquatic ecological receptors, and the effect is predicted to be neutral and **not significant**.

4.2.4 Cumulative Effects

Relevant to the cumulative impact assessment, the construction footprint for the proposed Ballyglass 110kV substation and grid connection to Ardnacrusha is a mainly linear development of 13.5 ha total, set across three water body catchments (total combined area 10,923 ha). The proposed development therefore represents just 0.12% of the combined river water body catchment areas. On its own, the project has a minor scale of construction footprint. Given the nature of works, with no instream works requirement, and the low gradient topography involved, such works are considered highly amenable to best construction practise in the area of water quality protection, primarily sediment loss control, as set out within the CEMP (Enerco, 2026).

On its own the proposed development (substation and GCR) is assessed (to have limited potential for adverse effects on aquatic receptors, i.e., limited to localised, indirect temporary slight or moderate negative effects in the construction phase, reversible within a short period of time; and neutral effects during operation as set out in **Section 4.2**, above.

The extent to which effects may occur in-combination with permitted Ballyglass Solar Array (Clare planning ref: 22591) and proposed Ballyglass Solar Array (Phase 2) (Clare Planning ref: 2460485) are examined in **Section 4.2.4.1**, followed by an examination of potential wider in-combination effects in **Section 4.2.4.2**.

4.2.4.1 Cumulative Effects with Ballyglass Phase 1 and 2 Solar Arrays

The principal source of potentially negative effects on aquatic receptors arises from the potential escape of suspended solids during the combined construction phases of the proposed development (Ballyglass substation and GCR) with the permitted and proposed Ballyglass Solar Array projects (Phases 1 and 2). For clarity the cumulative assessment is conducted below with regard to the three water catchments that are pathways for potential impact on aquatic receptors within separate river water bodies (RWBs): (1) Knockbrack Drain - Shannon (Lower)_060 RWB, (2) Blackwater (Clare) River including Oakfield 25 stream – Blackwater (Clare)_020 RWB and (3) West Roo – North Ballycannan_010 RWB.

4.2.4.1.1 Knockbrack Drain Sub-catchment

The main area of soil stripping for the proposed development is related to the substation site (0.9 ha), and (to a far lesser extent) the 330m access track (with GCR) and temporary construction compound. These are all within the Knockbrack Drain water catchment. The primary soil stripping area is related to the substation which is located on a dry and slightly elevated field that drains across a vegetated field with gently-sloping to flat topography to minor ephemeral field boundary drains that connect to Knockbrack Drain. With a high degree of inherent attenuation in the runoff pathway across the field, and within the drains themselves (e.g., emergent macrophtye growth at Site KB5A, refer to **Plate 3-18**), the potential for excessive suspended solids to reach the ephemeral field drains is low, let alone to reach the Knockbrack Drain further downstream.

The majority (Parcels 3 and 4) of the proposed Ballyglass Solar Array (Phase 2) is also within the Knockbrack Drain water catchment. The drain is largely ephemeral in the upper reaches where two culverts and associated access tracks for the proposed solar array occur alongside the drain, which has no fisheries sensitivity and the habitats are already dominated by soft sediment (Sites KB2 to KB5). Potential runoff from the substation site in this water catchment meets the Knockbrack Drain between sites KB5 and KB6, where the drain continues to be dominated by soft substrates and has no fisheries sensitivity.

The combined pathway has no fisheries sensitivity until downstream of the Ardnacruha headrace culvert (~1.3 km downstream of the substation site) where there is some potential trout and brook lamprey habitat of local value in the small watercourse commencing downstream of Clonlara at KB8 to KB9. Even at that point, the habitat is sub-optimal for trout and brook lamprey, but brook lamprey ammocoetes were recorded at KB9 with a few patches of sub-optimal spawning substrates observed.

The phased construction sequencing set out in **Table 4-1** shows the main period of soil stripping ('site preparation') for the sub-station will occur in early July of Year 1 and be complete by the beginning of October Year 1. The phasing creates a focused time gap of 4 to 7 months between the soil stripping of the substation area and soil stripping related to solar array site preparation (including access tracks / culverts). redistributed soil will be used in landscaping around the substation site. The soil will be tamped, rolled and reseeded in that first summer, prior to any work commencing on the solar arrays. The substation site will be surrounded in silt fencing which will augment the inherent level of attenuation of the site, i.e., low-gradient, grassy field. Revegetation of any exposed soil will commence during that first summer of Year 1, as the substation site is levelled and prepared meaning the area will pose a low risk of sediment loss to the Knockbrack Drain in any case. The solar array soil stripping involves narrow linear construction within green fields on relatively flat land which has a far greater level of inherent attenuation compared to, e.g., broad-scale excavations or field ploughing (the latter being common in this agricultural setting). The phased approach will reduce potential for cumulative sediment loss effects on aquatic receptors of local importance ~1.3 km downstream of the substation site. Importantly, the sub-station site does not drain to the Oakfield Stream / Blackwater (Clare) River, hence there is no risk to the more sensitive fisheries habitats of those watercourses.

In consideration of the above factors in the Knockbrack Drain catchment: (i) modest scale and nature of the proposed development, (ii) level of inherent attenuation on the runoff pathways, (iii) lack of significant aquatic ecological sensitivity in the reasonable zone of influence, the level of cumulative effect on aquatic receptors will be localised indirect, imperceptible-to-slight negative and reversible and **not significant** in EIA terms.

4.2.4.1.2 Blackwater (Clare) River and Oakfield 25 Stream Sub-catchment

In the absence of controls in sediment loss prevention, cumulative effects on aquatic receptors (if they did arise) could reach along the Oakfield 25 and be detected for a short distance along the Blackwater main channel downstream of the Oakfield 25 tributary confluence. Such effects would potentially relate to the installation of the GCR along the Oakfield Lane and R463, in-combination with permitted and proposed works involving soils tripping for Ballyglass Solar Arrays (Phases 1 and 2) and already permitted stream crossings on the Oakfield 25 stream (Phase 1 – two pre-cast box culvert crossings and one HDD cable crossing).

Note initially that the permitted Ballyglass Solar Array (Phase 1) includes appropriate mitigation for solar array construction activities that is conditioned as part of the planning permission (Clare planning ref: 22591), including instream works for 2 no. culverts on the Oakfield stream (located 1.5 km and 2.2 km , respectively, upstream of the proposed GCR crossing at the R463 road). Such mitigation set out in the Ecological Impact Assessment Reporting and NIS submitted for that project, reduces the significance of construction phase effects on aquatic receptors to a residual level that is temporary, slightly negative and **not significant** locally (Oakfield 25 stream and Blackwater (Clare) River) and has no likely significant effects on integrity of the Lower River Shannon SAC (4.7 km downstream of the proposed Oakfield GCR crossing on the R463 road). Hence the cumulative assessment, below, in-combination with the proposed development (GCR) in this water catchment is based on the finding of not significant residual effects for permitted Ballyglass Solar Array (Phase 1), i.e., with mitigations included for that project as conditioned within the planning consent. However, as required under the Habitats Directive, the assessment of effects does not take into account any mitigation proposed for the current grid connection project.

Note also that the substation site from the Oakfield Stream catchment - as currently permitted for Ballyglass Solar Array (Phase 1) (Clare planning ref: 22591) - has been relocated into the adjacent, Knockbrack Drain water catchment under the current proposal. Knockbrack Drain sub-catchment has no connectivity to the sensitive Blackwater (Clare) River (or Oakfield 25 stream) and greatly reduces potential for sediment effects on salmon and lampreys (ex-situ Annex II species of the Lower River Shannon SAC). The main source of potential sediment loss to the Oakfield Stream and Blackwater

(Clare) River (i.e., the substation site) has thus been relocated to a notably less sensitive water catchment.

The following source areas could give rise to cumulative escaped sediment being transported into the Oakfield 25 stream (trout, brook lamprey habitat) and Blackwater (Clare) River (salmon, trout, lamprey habitat):

- Permitted Ballyglass Phase 1 northern and central solar array development lands, plus a minor area of proposed Ballyglass Phase 2 (Parcels 1 and 2) and a portion of the GCR along the R463, drain to the Oakfield Stream at nearest ~900m upstream of the Blackwater (Clare) River confluence.
- A portion of the more southerly permitted Phase 1 development lands, plus the GCR route along the R463, drain towards the Ardnacrusha headrace embankment toe-drain, which flows for ~750m in a westerly direction to meet the Blackwater (Clare) main channel.
- The HDD crossing of Blackwater (Clare) River at Blackwater Bridge involving civil works near the channel, with risk of contaminants entering the river.

Given the project phasing, the proposed relocation of the substation site from Oakfield catchment into the less sensitive Knockbrack Drain catchment, plus the level of sediment loss avoidance / prevention conditioned for the Ballyglass Solar Array (Phase 1) the risk of cumulative sediment losses to levels that could cause significant effects on aquatic receptors is low in-combination with the proposed GCR traversing this water catchment.

The Ardnacrusha toe-drain is of no fisheries significance; low gradient and sluggish, with considerable in-stream plant growth (Sites TD1 and TD2). The drains would contribute a substantial attenuation role, facilitating settlement of escaped solids before discharging to the Blackwater. There will not be any short- or long-term significant impacts on aquatic receptors of the Blackwater associated with sediment loss from the southern lands of Phase 1 in combination with the proposed GCR along the R463 so long as trenching and cabling of the GCR is managed according to the CEMP (Enerco, 2026) with short excavation reaches at any one time. Any cumulative sediment loss via this pathway potentially involves the temporary GCR trenching activity and solar array installation at the southern end of Phase 1 lands, of which the latter does not involve soil stripping; therefore, the cumulative levels would be low and highly attenuated along the toe-drain pathway before reaching the Blackwater (Clare) River.

In line with requirements of the Habitats Directive whereby mitigations for the GCR cannot be considered at this stage of the impact assessment, if appropriate environmental controls were not employed in terms of controlling sediment runoff during the GCR construction along the R463 road, including the over crossing of the Oakfield 25 stream and HDD crossing of the Blackwater (Clare) River, there is potential for locally **indirect moderate negative** in-combination effects between residual (though not significant) Phase 1 and 2 solar array impacts on water quality in the Oakfield 25 stream and the GCR (if un-mitigated) along the Oakfield Lane and R463 road. This may affect trout and brook lamprey habitat of the lower 600 m of the Oakfield stream between Ardnacrusha headrace culvert and the Blackwater (Clare) confluence. Conservatively, fisheries habitats of the Blackwater (Clare), including salmon and lamprey (ex-situ QI species of the Lower River Shannon SAC), located a short distance (~1km) downstream of the Oakfield confluence may be affected. The reach affected is considered limited by the level of dilution and spate driven / turbulent nature of the Blackwater (Clare).

Conservatively, **indirect cumulative moderate to locally significant negative** effects on ex-situ QI species salmon and lampreys (sea, river, brook) within the non-SAC reaches of the Blackwater (Clare) River downstream of the Oakfield 25 stream confluence cannot be ruled out, therefore mitigation for cumulative effects is required.

4.2.4.1.3 West Roo Sub-catchment

Permitted and proposed Ballyglass Solar Arrays (Phase 1 and 2) have no footprint in the West Roo catchment through which the GCR traverses for ~2 km to reach Ardnacrusha substation. Hence there

is no pathway by which in-combination effects with Ballyglass Solar Arrays (Phase 1 and 2) may occur in the West Roo catchment.

4.2.4.2 Wider Cumulative Effects

Interaction between other proposed and permitted projects in the locality (shown in **Figure 4-2**) are examined in detail in **Table 4-1** in terms of hydrological connectivity with the proposed Ballyglass substation and grid connection. Potential for cumulative impact on water quality with consequent effects (if any) on aquatic ecology are described. Assessments of potential in-combination effects (if any) are made primarily in relation to cumulative construction phase sediment wash out, which is considered the primary source of cumulative effects given the relatively small scale and nature of the proposed development.

The identified projects, some permitted and others still yet to be decided, will have varying construction timelines. The assessment was made under the conservative assumption that construction phases coincide, which is probably unlikely to be the case because projects with recent planning permission are likely to proceed to construction before those that are yet to be determined (as of April 2026 when this report was compiled).

Pertinent to the cumulative assessment are the following factors:

- Large renewable energy projects have greatest potential for sediment loss during the construction phase, which is undoubtedly more pertinent for wind farms than solar arrays. Solar arrays are located on generally lower-gradient agricultural lands where potential for sediment wash-out is inherently lower, compared for example to steep (often peat soil) upland topography of wind farm sites.

- Solar farms, with their substation sites and grid connections do not involve anywhere near the level of earth movement (i.e., primarily limited to access tracks and substation areas) compared to wind farms. Wind farms have greater source areas for potential sediment loss (e.g., steep access tracks, hardstanding areas, turbine foundation areas, borrow pits etc).

- Given the low-gradient topography of solar array lands, they are also more amenable to silt control measures, where and if required. In contrast, wind farms have naturally steep runoff pathways that are generally more erodible and less straightforward to mitigate.

These characteristics are considered in the assessment of potential cumulative effects in-combination with wider projects as set out in **Figure 4-1**.

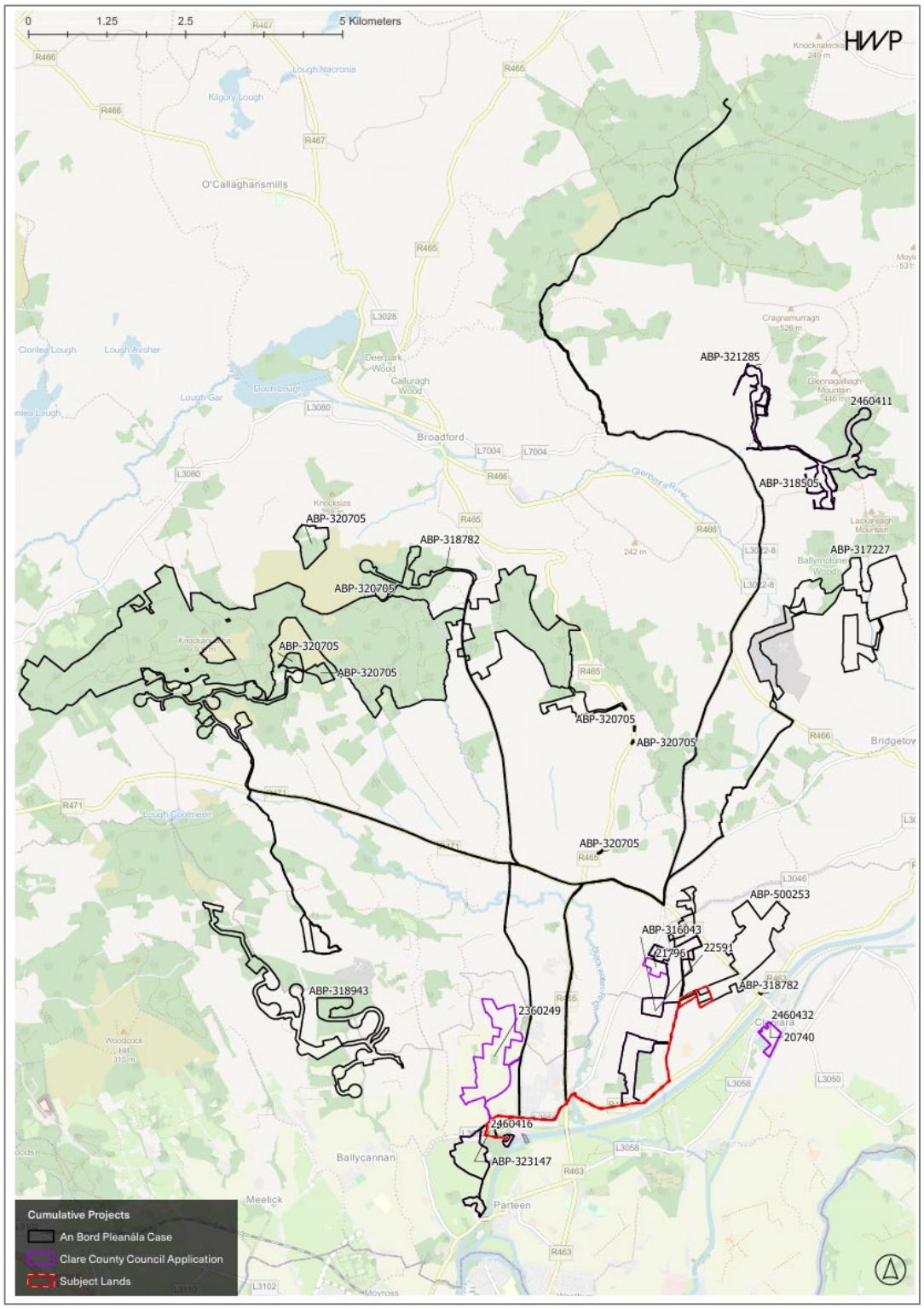


Figure 4-1 Map of projects considered in the cumulative assessment for the current planning application

Table 4-2 Potential Cumulative Effect Significance of Ballyglass Grid Connection and Substation other projects

Ref. Number	Distance from Subject Site	Status	Description	Hydrological Interaction with Ballyglass 2 – Aquatic Ecology	Potential for Cumulative Effect on watercourses and Lower River Shannon SAC
24/60416 & ACP-323147-25 Castlebank Green Energy Limited	0km (GCR)	Granted by ACP (with conditions) 14/01/2026	Development consists of planning permission for a period of 10 years to construct and complete a Solar Energy development with a total site area of 36.70 hectares. The Solar Farm will be operational for 40 years. The proposed grid route will connect the substation at Ardnacrusha Power Station via 38kV underground cable (1.2km in length, 320m of within local road L3056). A Natura Impact Statement (NIS) was submitted with this application.	This proposal is set in North Ballycannon_010 RWB. The permitted solar farm drains mainly via South Ballycar watercourse to the Ardnacrusha tailrace. The South Ballycar is a separate stream catchment to the West Roo, but is joined by the West Roo in the lower reaches, discharging to Ardnacrusha tailrace before meeting the Lower River Shannon SAC. Castlebank Solar Farm GCR is proposed to cross the West Roo stream at the same two locations as the proposed Ballyglass GCR (WR2, WR3) utilising the track through ESB lands. No instream works are proposed.	**No significant effects** – Low level of potential cumulative interaction (sources/pathways) between works for Ballyglass GCR and the Castlebank GCR. With water quality protection measures in place as set out in the EIAR and NIS for the Castlebank solar farm and proposed GCR, no significant negative cumulative effects on aquatic receptors of the West Roo or Lower River Shannon SAC are considered likely in-combination with Ballyglass GCR.
24/60411 & ABP-321285-24 Lackareagh wind farm	0km (GCR)	Granted by ACP 14/07/2025	The development will consist of: (i) The construction of 7 no. wind turbines. The proposed Grid Connection Route is to Ardnacrusha Power Station crossing over the Blackwater (Clare) by way of ducting alongside the existing bridge parapet. A Natura Impact Statement (NIS) was submitted with this application and details of the GCR route installation was included in the assessment.	The wind farm itself will be set in 2 separate RWBs north of the proposed development (Broadford_010, Ardcloony_010), with no hydrological connectivity to the Lower River Shannon SAC that is in common with Ballyglass substation or GCR. The wind farm drains mainly west to the Broadford River – Doon Lough – Owengarney and partly east to Ardcloony River. Both meet the Lower River Shannon but have no interaction with local watercourses draining Ballyglass proposal. The GCR for the wind farm has an interaction with the proposed Ballyglass GCR along a short section of the L3046 road near Ardnacrusha substation and crosses the Blackwater (Clare) River using a stainless-steel pipe fixture, strapped to the exterior of the existing R463 bridge at Site 'BWC1' (current study), with no instream works involved.	**No significant effects** – Very low level of potential cumulative interaction (sources/pathways) between works for Ballyglass GCR and the wind farm GCR. Water quality protection measures are conditioned in the Lackareagh Wind Farm planning permission, as set out in the EIAR and NIS for that project. With water quality protection measures implemented as conditioned in the planning permission, and as set out in the EIAR and NIS for the GCR, no significant negative cumulative effects on aquatic receptors of the Blackwater (Clare) River or Lower River Shannon SAC are considered likely in-combination with Ballyglass GCR.
24/60432 and 20/740 'Errina Locke' Housing Development	0.64km	24/60432 Granted 30/10/2024 20/740 Granted - 19/08/2021	24/60432 involved amendments to Housing layout approved under P20/740 to change house types and numbers with minor revision to road layout at Errina Locke including revised house boundaries & all ancillary site works. A Natura Impact	The development lands drain towards disused Errina Canal back-drain, 300m upstream of the Knockbrack Drain confluence with this back-drain (Site 'KB11' in the current study, which is 2.6km upstream of the SAC boundary). The back-drain is low gradient and depositing with considerable instream macrophyte growth	**No significant effects** – The 100m distance between the disused canal back-drain and the housing development provides a buffer between the construction site, which in combination with proposed measures for silt loss control in the Sediment Management Plan of the CEMP for the project will greatly reduce potential for elevated

Ref. Number	Distance from Subject Site	Status	Description	Hydrological Interaction with Ballyglass 2 – Aquatic Ecology	Potential for Cumulative Effect on watercourses and Lower River Shannon SAC
			Statement (NIS) was submitted as part of an RFI for the development. The NIS and the accompanying CEMP detail the pollution control measures to be implemented during construction.	which would act to attenuate sediment loss locally. The back-drain connects to the Lower River Shannon SAC via the culvert under Newtown Lock, then becoming the Illaunyregan and meeting Doonass Demense streams. The proposal has a 100m buffer of undeveloped land (green space) between the proposed housing estate and the Errina Canal back drain, part of which will be retained as natural wetland.	suspended solids losses in combination with Ballyglass 110 kV substation and 330m of GCR in this water sub-catchment. No significant negative cumulative effects on aquatic receptors of the canal back drain, Illaunyregan stream or Lower River Shannon SAC.
23/60249 Drummin Solar Farm	0km (GCR)	Granted - 06/09/2023	Solar farm on a site of 70 hectares on Land to the west/north-west of Ardnacrusha within the townlands of Castlebank, Drummin, Glenlon North, Glenlon South and Ballykeelaun Co Clare. The solar farm will be operational for 40 years. A Natura Impact Statement (NIS) was prepared in respect of the development.	This proposal is set within the North Ballycannon_010 RWB, which the Ballyglass GCR will traverse for ~2km along the L3056 road and ESB lands to the Ardnacrusha substation crossing the West Roo main channel (WR1, WR2) and side channel (WR3). Drummin Solar Farm occurs in the West Roo water catchment and its proposed GCR will cross the West Roo four times, including at the same three locations as the proposed Ballyglass GCR (WR1, WR2, WR3). The West Roo side channel (WR3) is to be subject to a new clear span crossing as part of the Drummin Solar Farm GCR works. Ballyglass GCR proposes a flatbed crossing alongside this new bridge, with no impingement on the channel and no instream works. A small portion (considered minor and insignificant) of the northern part of the development is set in the Blackwater (Clare)_020 RWB, draining via the Glenlon South stream to join the Blackwater (Clare) River just upstream of the Site 'BWC1' of the current study.	Very low risk of cumulative construction phase effects in the Blackwater (Clare) River catchment given the limited interaction of the permitted Drummin Solar Farm within the Glenlon South stream. If the Drummin Solar Farm GCR was under construction at the West Roo stream crossings in the same year as the Ballyglass GCR installation, the combination of sediment run-off from combined activities to the West Roo catchment could have a negative effect on fisheries habitats downstream of Site WR1 and WR2 (current study). The small scale and nature of the Ballyglass GCR works in this catchment are such that if the construction phases of these two projects coincided (which is not a given), the cumulative effect of elevated solids washout may reach a level of **indirect, temporary moderate negative** affecting localised salmonid recruitment in the small West Roo stream (impinging on trout and perhaps small numbers of salmon). The effect applies downstream of Site WR1 and WR2 (current study) and will not arise at all if the Ballyglass GCR works occur in the period May 1 to September 30th of any year (i.e., outside the salmonid spawning period) – Hence refer to Mitigation Measures Section 5.2.1. **No likely significant cumulative effects** on integrity of the Lower River Shannon SAC would occur as the potentially affected aquatic habitats of the West Roo are outside the SAC boundary and do not represent

Ref. Number	Distance from Subject Site	Status	Description	Hydrological Interaction with Ballyglass 2 – Aquatic Ecology	Potential for Cumulative Effect on watercourses and Lower River Shannon SAC
					significant ex-situ habitat for QI species of the SAC, especially considering the major fish passage barrier at the confluence of West Roo / South Ballycar streams with Ardnacrusha tailrace.
21/796	Adjacent Site	Granted – 26/01/2022	Fill the existing poor quality agricultural land with stone and soil to raise the level of the ground, widen existing agricultural entrance, including all ancillary site works	Located within Parcel 1 of the Proposed Development, immediately adjacent to the Oakfield Stream, draining to the upper reaches at Site Oakfield 1B. During survey work of April/May 2025, this work had been carried out and therefore no overlap between the construction phase of Ballyglass GCR in this catchment. The lands had been filled and contoured with vegetation becoming well established, meaning no potential for cumulative elevation of suspended solids in Oakfield Stream River Blackwater or the SAC.	**No significant effects** – works complete and bare ground largely revegetated by May 2025. No potential for in-combination sediment loss with proposed Ballyglass GCR in Oakfield stream catchment. No significant negative cumulative effects on aquatic receptors of the Oakfield stream, Blackwater (Clare) River or Lower River Shannon SAC.
318505 - Carrownagowan windfarm GCR	0.93km	Granted - 23/01/2025	Proposed construction of a 110kV underground grid connection cable connecting the permitted Carrownagowan windfarm to the existing 110kV substation at Ardnacrusha.	This GCR crosses Blackwater (Clare), Glendonagh Stream and Glenomra Woods River by HDD c.6km, 5.5km and 5km, respectively upstream of the Site 'BWC1' (current study) and c.8km, 7.5km and 7km, respectively, upstream of the Oakfield Stream confluence with Blackwater (Clare) River. An undercrossing of a very minor, drained, tributary (EPA name: Glenlon South) that connects to the Blackwater (Clare) occurs 1.2km upstream of Site 'BWC1' (current study). The undercrossing of Glenlon South involves minor instream works in an apparently ephemeral drain / watercourse (dries out periodically) which passes under the Lakyle Heights road by way of a small, existing 300mm Ø pipe.	**No significant effects** – No significant negative cumulative sediment loss potential with Ballyglass 2 Solar Array. The permitted GCR HDD crossings involve no instream works, and the Glenlon South culvert will be undercrossed with very minor "instream" works in a small, periodically dry channel. No significant negative cumulative effects on aquatic receptors of the Blackwater (Clare) River or Lower River Shannon SAC in-combination with the Ballyglass GCR.
318782 - Oatfield Wind Farm	1.12km	Decision Due - 24/06/2024 (Still with ACP when reviewed in March 2026)	Planning permission to develop a Windfarm and Ancillary Infrastructure within the townlands of Ballycar (North), Belvoir, Cloghera, Cloonsheerea, Cloontra, Cloontra East, Cloontra West, Crag, Derrynaveagh, Derryvinnan, Drumsillagh, Sallybank (Merrit),	The proposed windfarm involves Eastern and Western Development Areas (DAs). The Western DA is mainly set in the upper headwaters of Blackwater (Clare)_010 and Mountrice_010 RWBs. The Eastern DA is mainly set in the Mountrice_010 RWB. Both RWBs drain to the Blackwater (Clare)_020 and connect to the Lower River Shannon SAC	**No significant effects -** when mitigation measures are taken into account as proposed for the Oatfield Windfarm and given the considerable hydrological distance between the subject sites. There is no grid connection cable route to Ardnacrusha for the Oatfield Wind Farm, as a loop-in connection to an existing OH line is proposed.

Ref. Number	Distance from Subject Site	Status	Description	Hydrological Interaction with Ballyglass 2 – Aquatic Ecology	Potential for Cumulative Effect on watercourses and Lower River Shannon SAC
			Droomsillagh or Sallybank (Parker), Gortacullin, Knockbrack Lower, Knockshanvo, Kyle, Mountrice, Oatfield and Snaty, Co.Clare	roughly 12km south of the wind farm DAs themselves. An IPP cable route connects the DAs – also set in these connected RWBs. The GCR is to a loop in connection to the existing overhead 110 kV line located at Ballycar North which is also in the Blackwater (Clare)_010 RWB. These wind farm areas are 8.5km upstream of the Oakfield stream confluence and 6.5km upstream of the proposed Ballyglass GCR HDD beneath the existing R463 bridge at Site 'BWC1'.	
318943 - Ballycar Wind Farm	4.22km	Decision Due - 25/07/2024 Limited Agenda Oral Hearing 22/01/2026	Proposed 12 turbine windfarm, located on a 140-hectare site located within the townlands of Cappateemore East, Ballycannan West, Ballycannan East, Ballycar South, Ballycar North, and Glennagross	The proposed wind farm is set in separate watercourse sub-catchments of North Ballycannon_010 RWB, with all watercourse crossings (N = 7) in the upper headwaters of streams that have no connectivity to watercourses that are crossed by the Ballyglass GCR in the West Roo water sub-catchment of that RWB. A very minor works footprint is within the Blackwater (Clare)_010 RWB, located well over 10km upstream of Site Blackwater (Clare) 1 (current study). This is only to link into an existing Overhead Line (110kV OHL) via loop-in tower. No watercourse crossing / interaction is involved at that location.	**No significant effects -** No potential exists for significant negative cumulative effects on aquatic receptors of the North Ballycannon_010 RWB, the Blackwater (Clare)_020 RWB or Lower River Shannon SAC.
317227 - Fahy Beg Wind Farm	0.94km	Granted - 06/03/2024	Development of a wind farm together with the development of an underground grid connection cable to the national grid. The development will consist of 8 wind turbines, a permanent meteorological mast, an onsite 38kV electrical substation, and all associated site works. An Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) were submitted with the application.	The wind farm itself is in separate river catchments – connecting to the Lower River Shannon by the Bridgetown (Clare) and Black (O'Briensbridge) rivers near Parteen Weir, with a small portion of drainage to the upper Broadford River. The GCR has interaction within the Blackwater (Clare) catchment, crossing the Glenomra Wood and Blackwater (Clare) rivers 5km each to the north, and the minor channel of the Glenlon (South) 200m upstream of the existing R463 bridge (Site 'Blackwater (Clare) 1'). Each of these crossings will be carried out using HDD.	**No significant effects** – No instream works at watercourse crossings on the Fahy Beg GCR within the Blackwater (Clare)_020 RWB. No significant negative cumulative effects on aquatic receptors of the Blackwater (Clare)_020 RWB or Lower River Shannon SAC.

Ref. Number	Distance from Subject Site	Status	Description	Hydrological Interaction with Ballyglass 2 – Aquatic Ecology	Potential for Cumulative Effect on watercourses and Lower River Shannon SAC
320705 - Knockshanvo Wind Farm	0km (GCR)	Decision Due – 14/05/2025 – Still undecided as of March 2026	Proposed development of 9 no. wind turbines, 110kV substation and ancillary development located in the townlands of Snatty, Hurdlestown, Oatfield, Drumsillagh, Sallybank, Gortacullin, Aharinaghbeg, Knockshanvo, Cloontra, Cloghoolia, Ballycullen and others, County Clare.	The NIS for Knockshanvo Wind Farm was reviewed in March 2026. The Proposed Development is mainly set in the upper headwaters of Blackwater (Clare)_010 and Mountrice_010 RWBs. Both RWBs drain to the Blackwater (Clare)_020 and connect to the Lower River Shannon SAC approximately 12km south of the wind farm. The proposed GCR crosses the Blackwater (Clare) River by HDD c.6km upstream of the Site 'Blackwater (Clare) 1' (current study) and c.8km upstream of the Oakfield Stream confluence with Blackwater (Clare) River. An undercrossing of a very minor, drained, tributary (EPA name: Glenlon South) that connects to the Blackwater (Clare) occurs 1.2km upstream of Site 'BWC1' (current study). The undercrossing of Glenlon South involves minor instream works in an apparently ephemeral drain / watercourse (dries out periodically) which passes under the Lakyle Heights road by way of a small, existing 300mm ø pipe. While these RWBs drain to the Blackwater (Clare)_020 in which a portion of the Ballyglass GCR occurs, the wind farm areas themselves are 10.5km upstream of the Oakfield stream confluence and 8.5km upstream of the proposed Ballyglass 2 GCR HDD beneath the existing R463 bridge at Site 'BWC1'.	**No significant effects** when mitigation measures are taken into account as proposed for the Knockshanvo Windfarm and given the considerable hydrological distance between the subject sites. The Wind Farm is located in the same area as the Oatfield Wind Farm (see above) and has hydrological connectivity via the Blackwater (Clare)_010 RWB and Mountrice_010 RWB to the Blackwater (Clare)_020 RWB. The latter is the receiving RWB for the proposed Ballyglass GCR. The Ballyglass substation is in a separate, water catchment, unaffected by the wind farm. There is a minor potential for cumulative interaction with the Knockshanvo GCR which shares the same route for a short distance on the L3056 between the Lackyle/Castlebank local road and Ardnacrusha power station. The NIS for the Knockshanvo Wind Farm project proposes a suite of best practice mitigation measures designed to ensure that the construction of the wind farm and the GCR will not result in likely significant effects for those projects and those measures, combined with the water quality protection measures set out for the proposed Ballyglass GCR mean there will not be significant adverse in-combination effects on the Blackwater (Clare)_020 or Lower River Shannon SAC downstream.

Other principal catchment activities with potential cumulative effects on aquatic receptors include ongoing agricultural activities (nutrient and sediment runoff) and rural housing with associated infrastructure (e.g., septic tanks, domestic wastewater). These aspects are a continuously evolving background and have no additional in-combination effects with respect to the potential indirect temporary effects predicted during construction of the proposed substation and grid connection route.

4.3 Do Nothing Scenario

If the project does not go ahead there will be no potential construction phase effects on water quality and aquatic ecology related to sediment and/or hydrocarbon / concrete loss during the installation of the proposed substation and grid connection. The existing agricultural pressures on water quality (including nutrient runoff) that are identified by the EPA to affect the Blackwater (Clare)_020 will continue for as long as it takes for the programmes of measures set out in the most recent river basin management plan (DHLGH, 2024) to be implemented to a level that the water body is not at risk of failing to maintain 'good ecological status'.

5 MITIGATION

5.1 Overarching Mitigation Measures

The CEMP (Enerco, 2026) sets out best practise methods and measures in relation to construction of the proposed Ballyglass substation and grid connection route. Contractors will be obliged to adopt the CEMP as their own and adhere to their contents, updated to include any requirements conditioned in a planning permission.

A suitably qualified Environmental Clerk of Works (ECoW) will be appointed to oversee implementation of the mitigation strategy during the construction phase (refer to Section 4.1.2 of the CEMP).

Measures prescribed to protect aquatic ecology and fisheries during the construction works adhere to the following guidelines:

- Guidelines on protection of fisheries during construction works in and adjacent to waters (IFI, 2016).
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (TII, 2008)
- CIRIA C648 (Murnane et al. 2006) Control of water pollution from linear construction projects. Technical guidance.
- The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020).

Robust sediment control measures will be employed in all aspects of the construction. Key principles in mitigating run-off of suspended solids will be: (i) divert clean water away from construction areas;(ii) minimise erosion from exposed soils and (iii) prevent contaminated runoff from entering water courses (CEDR, 2018a). Methods to minimise and control sources and runoff pathways to prevent escapement of suspended solids are detailed in Section 3.1 of the CEMP.

5.2 Ballyglass 110kV Substation and GCR

Sections 5.2.1, 5.2.2 and 5.2.3 detail specific construction phase, operation phase and cumulative impact mitigation in relation to aquatic receptors.

5.2.1 Construction Phase Mitigation

Objective	Measure	Details of Mitigation
Water quality and Aquatic habitat protection	Temporary Works Drainage Management	During excavation and construction of access tracks and associated over the edge drainage: on tracks that run directly downhill towards watercourses and field boundary drains, there must be a series of temporary gravel check-dams, as necessary, installed along the parallel drainage flow path to attenuate and slow run-off velocities during the construction phase. These must remain in place until such time as the track surfaces have bedded in and over-the-edge drainage pathways have stabilised through natural revegetation. During soil excavation associated with temporary site compound and substation construction there must be temporary silt fencing installed on any downslope leading to the minor field drains. Any existing preferential over-land flow paths or dry field drains between the proposed substation access track / temporary compound area) must be bunded or have temporary check dams installed prior to works commencing to prevent escapement of suspended solids to downstream drains.
Water quality and Aquatic habitat protection – culvert under crossings	IFI Consultation	There are no instream works required, but IFI must be contacted in advance of GCR works commencing in proximity to watercourse crossings to provide a copy of the final CMS incorporating all best construction measures set out in the CEMP and mitigations in this section of the Aquatic EcIA. This relates to existing culvert over crossing works at Site OF4 (Oakfield stream), Sites WR1, WR2 and WR3 (West Roo stream) and Site BWC1 (Blackwater Bridge on R463) where HDD crossing is proposed. The final CMS for all crossings will also be provided to the Local Authority.
Water quality and Aquatic habitat protection – watercourse crossings at Sites OF4, BWC1, WR1, WR2 and WR3	Seasonal Timing of Over Crossing Works	The over crossing at the Oakfield 25 stream on the R463 (Site OF4) and the HDD crossing at Blackwater Bridge (Site BWC1) are not subject to seasonal timing restrictions as there are no instream works involved, however, as above, IFI will be notified well in advance of works commencing at these locations.
Water quality and Aquatic habitat protection – West Roo catchment	Seasonal Timing Restrictions for Watercourse Crossing Works – West Roo stream Sites WR1, WR2 and WR3	Over crossings (no instream works) in the West Roo catchment (Sites WR1, WR2, WR3) are technically not subject to timing restrictions that apply to the closed fisheries season. However, to prevent potential cumulative effects identified in-combination with the construction phase of Drummin Solar Farm GCR, the Ballyglass GCR crossings at these sites shall be carried out within the period May 1st to September 30th of any year. This is a precautionary measure, to prevent potential indirect cumulative effects on downstream salmonid spawning / nursery habitat related to possible suspended solids losses from both projects. If the Drummin Solar Farm GCR has been fully constructed and there is no overlap with its GCR construction phase and the Ballyglass GCR construction phase in the West Roo catchment, there is no necessity for this precautionary seasonal timing restriction because potential for cumulative effects will not arise. In that case, there is no timing restriction required for these crossings, but the final CMS shall be provided to IFI and the Local Authority, as above.
Water quality and Aquatic habitat protection – culvert under crossings	Best Practice during Culvert Over Crossing Works	There will be no discharge of suspended solids or any other deleterious matter to watercourses during the over crossing work. Any silt contaminated water from the works area will be treated prior to discharge. The contractor shall employ best practice sediment control methods to ensure sediment and other pollutants are not entrained to the watercourse. There must be no direct discharge (e.g., pumping) of silt/sediment laden water from the works to the active watercourse at any time.

Objective	Measure	Details of Mitigation
		Any preferential over-land flow paths or drains between the trenched over crossings must be bunded or have temporary check dams installed prior to works commencing to prevent any escaped solids from reaching the watercourses.
Water quality and Aquatic habitat protection – drain under crossings	Best Practice during Drain Under Crossing Works	The on-site land drains dry out regularly, especially from late spring to early autumn. Drain undercrossing construction shall be timed (where possible) to coincide with them being dry. In the event that drain crossings occur when there is water in them, temporary bunds shall be installed either side of the crossing point to prevent mobilisation of solids. Temporary bunds can be comprised of haybales wrapped in geotextile, staked down within the drain, or sandbags of good integrity filled with clean sand.
Prevention of spread of IAPS	IAPS Survey and Management	Transfer of invasive plant species between sites within catchments and to other catchments will be prevented according to Invasive Alien Plant Species (IAPS) measures set out in Section 3.7 of the CEMP. This includes a requirement for pre-construction IAPS survey at the substation site and along the access track and temporary compound area. If IAPS are recorded, an IAPS Management Plan will be drawn up and implemented.
Prevention and control of sediment loss	Best Management Practice – Cable Trenching	All trenching works shall be undertaken using a cut and fill procedure to ensure that only short sections of the trench (≤100m) are open at any time as set out in the CEMP. Any run-off water which gathers in an excavated trench must be collected and treated appropriately using Best Practice methods (e.g., silt bags, settlement systems) before being discharged. There will be no discharge of silt contaminated pump-out water to on-site drains or watercourses. Spoil heaps are unlikely to accumulate because trenches will be immediately back filled following ducting installation. Any freshly excavated spoil must be retained in an area over 10m away from any drain or watercourse until such time as the trench is refilled. The spoil heap must be located on either a well vegetated area surrounded by silt fencing or with the use of containment measures (geotextile mat or bag) and covered to reduce potential for sediment export. A ready supply of these materials must be always onsite to deal with such eventualities. Where ancillary onsite drains are crossed with underground ducting, the release of sediment over baseline conditions will be prevented by the use of silt traps, check dams and/or bunds (including the use of staked down geotextile wrapped haybales) in dry or stagnant drains. These will be put in place on either side of the dry drain crossing location in advance of construction works.
Prevention and control of sediment loss	Best Management Practice – Soil storage	Soil stripped in the construction of access track, temporary compound area and substation may be stored temporarily for reuse in reinstatement. Such material will be stored not less than 10m from any on-site drain and must be tamped down, reseeded with grass and allowed to revegetate for the duration of the construction phase. The stockpiles will be surrounded by well staked silt fencing.
Prevention and control of sediment loss	Best Management Practice – Soil spreading	Stripped soil that is used for site infill or reinstatement and landscaping around the substation and access track will be tamped down and immediately rolled and reseeded with an appropriate grass seed mix to establish vegetative cover and reduce potential solids washout. Any localised agricultural drains will have temporary bunds (e.g., sandbag or stake + geotextile) installed to prevent waterborne sediment run-off until such time as the reinstated areas have revegetated.
Avoid Hydrocarbon Loss	Best Management Practice - Hydrocarbons	No storage of hydrocarbons or any polluting chemicals can occur within 50m of watercourses or surface water features. Any diesel or fuel oils stored on site will be bunded to 110% of the capacity of the storage tank. Design and installation of fuel tanks to be in accordance with best practice guidelines and oil storage guidelines. Drip trays and spill kits must be kept available on site. Temporary parking and refuelling areas will be

Objective	Measure	Details of Mitigation
		designated within the construction compound. These areas will be at least 50m away from watercourses and drains.

5.2.2 Operational Phase Mitigation

Objective	Measure	Details of Mitigation
Water quality and Aquatic habitat protection	Drainage Maintenance	Access tracks will be embedded in with over-the-edge drainage to vegetated ground. The access tracks and any parallel, vegetated flow paths will be subject to routine maintenance and repair, as required, to ensure no obvious erosion and sediment washout is occurring. Over the course of the operation phase, observations shall be made during site visits. If there are any obvious erosion hot-spots on preferential flow paths from access tracks, then necessary surface repairs will be carried out as soon as practicable, with additional check-dams installed (and allowed to revegetate) into the preferential drainage flow path, where required to increase attenuation and slow run-off velocity locally.
Water quality and Aquatic habitat protection	Hydrocarbon spillage prevention	Throughout the operation phase, any hydrocarbon storage (oils, lubricants) stored onsite at the substation shall be secure and bunded to 110% of the capacity of the storage tank. Spill kits will be kept available on site.

5.2.3 Cumulative Effects Mitigation

Objective	Measure	Details of Mitigation
Minimise in-combination effects of sediment loss	Phasing of works	The overall project phasing as set out in the CEMP (Enerco, 2026) and in Table 4-1, above, along with rigorous implementation and maintenance of construction phase best practise and specific mitigation measures set out in the CEMP and **Section 5.2.1** of this document will reduce potential for cumulative impact arising from the construction of Ballyglass Solar Arrays (Phases 1 and 2) and the proposed Ballyglass Substation and GCR.
Water quality and Aquatic habitat protection – West Roo catchment	Timing of Crossing Works – West Roo stream Sites WR1, WR2 and WR3	Over crossings (with no instream works) in the West Roo catchment (Sites WR1, WR2, WR3) are technically not subject to timing restrictions that apply to the closed fisheries season. However, to prevent potential cumulative effects identified in-combination with the construction phase of Drummin Solar Farm, the GCR crossings at these sites shall be carried out within the period May 1st to September 30th of any year. This is a precautionary measure, to prevent indirect impact on downstream salmonid spawning habitat related to potential for cumulative suspended solids losses from both projects. In the event that the Drummin Solar Farm has been fully constructed and there is no overlap with the Ballyglass GCR construction phase in the West Roo catchment, there is no necessity for this precautionary seasonal timing restriction as the potential for cumulative effects will not arise.
Overseeing of environmental controls	Monitoring during Construction	The Environmental Clerk of Works (ECoW) will ensure that the timing of works in the West Roo catchment at Sites WR1, WR2 and WR3 be scheduled according to the possible seasonal restriction set out above. See Section 6 for full details of ECoW responsibilities.

6 MONITORING

6.1 Roles and Responsibilities

The appointed ECoW will be responsible for overseeing the implementation of pollution mitigation measures, ensuring compliance with any environmental planning conditions, monitoring and reporting on environmental aspects of the development. Should the ECoW observe that erosion and sediment control measures are not functioning properly, they shall have the authority to stop works and liaise with the construction site manager to ensure such measures are properly implemented in a timely fashion and in accordance with the CEMP.

6.2 Visual Monitoring

Daily water quality checks (twice daily during wet weather conditions) will be conducted at watercourses – only during active construction works involving GCR trenching/ducting and HDD works in the 50m either side of the watercourse crossing. This entails:

- Visual check of turbidity levels for obvious signs of sediment loss from the construction site.
- Upstream / downstream measurements during and after rainfall events (i.e., when the site is hydrologically active) using a calibrated hand-held turbidity probe. This applies to the following sites: OF4, BWC1, WR1, WR2, WR3. If there is a difference in turbidity readings that can be attributed to the construction site activity, additional on-site silt control measures shall be implemented.
- A visual check for evidence of oil slicks.
- Daily inspections of all silt fencing and other silt control measures for integrity and efficacy.
- Monitoring the condition of roads around the temporary work compound, construction areas and local roads, with additional erosion prevention measures and road washing to be implemented where necessary.
- Checking weather forecasts to ensure suitable programming of earthworks activities and suspending earthworks during heavy rain.
- Twice daily visual checks of the HDD crossing at Site BWC1 (Blackwater Bridge on R463) will be conducted by the ECoW to ensure all standard sediment control and emergency spillage / frack-out measures are in place.
- The ECoW shall ensure all sediment control and water quality protection measures are in place until such time as the ducting has been installed, the area reinstated and surrounding vegetation has re-established.

7 RESIDUAL EFFECTS

7.1 Ballyglass 110kV Substation and GCR

With construction best practice and mitigation measures implemented and monitored in accordance with the CEMP and Section 5 of this report, the residual construction phase effects (indirect and/or cumulative) on the Knockbrack Drain, Oakfield 25 Stream, Blackwater (Clare) River and West Roo stream, will be limited to, localised, **neutral to temporary not significant** effects on downstream aquatic receptors. Residual operational phase effects will be **neutral**.

The proposed substation and grid connection, alone or in combination with wider projects will not cause deterioration of WFD ecological status, nor prevention of attainment of official ‘good’ status in the future and is therefore compliant with WFD objectives.

7.2 European Sites

The Lower River Shannon SAC site boundary is at a considerable separation distance downstream of the proposed Ballyglass substation and GCR. The Oakfield 25 Stream crossing is 4.7 km upstream of the SAC boundary. The Blackwater (Clare) HDD crossing is 5.8 km upstream of the Lower River

Shannon SAC boundary. The West Roo stream/drain crossings are, at nearest (WR2), 1.3 km upstream of the confluence with Ardnacrusha tailrace canal, which flows a further 520m to the SAC boundary.

With construction best practice and mitigation measures implemented as set out in the with the CEMP and Section 5 of this report, there may be residual cumulative temporary, localised, slightly negative disturbance during the construction phase associated with low levels of sediment wash out arising from the proposed grid connection in combination with Ballyglass Phase 1 and 2 solar array construction, with temporary **not significant** effects on ex-situ Atlantic salmon productivity in the Blackwater (Clare) River (i.e., outside of the SAC), but this will have **no likely significant adverse** effect on Conservation Objectives for the Atlantic salmon of this SAC. There are no significant sources / pathways of negative impact on water quality or aquatic habitat of the SAC during the operation phase of the substation or GCR.

8 REFERENCES

CEDR (2018a) D4.1 Literature review on treatment of runoff from highway construction sites. Conference of European Directors of Roads. Available at: https://www.cedr.eu/peb-research-call-2016-water-quality (Accessed March 2026)

CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.

DHLGH (2024) Water Action Plan. Third Cycle of River Basin Management Plan for Ireland 2022-2027, Department of Housing, Local Government and Heritage.

Enerco (2025) Construction & Environmental Management Plan (CEMP) - Ballyglass Solar Array Phase 2. Enerco Energy, Lissarda, Co. Cork.

Enerco (2026) Construction & Environmental Management Plan (CEMP) - Ballyglass Grid Connection. Enerco Energy, Lissarda, Co. Cork.

EPA (2024) Cycle 3 HA 25D Lower Shannon and Mulkear Catchment Report. Environmental Protection Agency, Ireland. Available at: https://www.catchments.ie/ (Accessed March 2026)

EPA (2022) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EIAR), Environmental Protection Agency, PO Box 3000, Johnstown Castle Estate, Wexford, Ireland.

IEC (2023) Fisheries assessment of the proposed Oatfield wind farm, Co. Clare. Appendix 7.7 of EIAR for Oatfield Wind Farm. Prepared by Inis Environmental Consultants Ltd. for Ørsted Onshore Ireland Midco Ltd, 5th Floor, One Albert Quay, Cork, Ireland. Accessed online May 2025 under An Bord Pleanála reference: 318782.

IFI (2016) Guidelines on protection of fisheries during construction works in and adjacent to waters. Inland Fisheries Ireland. Available at: https://www.fisheriesireland.ie/media/guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters (Accessed August 2025)

MWP (2019) Carrownagowan Wind Array Aquatic Ecology and Fish Survey Report. Appendix 6 EIAR Malachy Walsh and Partners, Park House, Bessboro Rd, Mahon, Cork, Ireland. Available at: https://carrownagowanplanning.ie/wp-content/uploads/2020/12/Appendix%206-5%20Aquatic%20Ecology%20and%20Fish%20Survey%20Report.pdf (Accessed April 2026).

O'Donnell Environmental (2024) Castlebank Green Energy Solar Farm Ecological Impact Assessment. O'Donnell Environmental Ltd., Lawley House, Monahan Road, Cork City. T12 N6PY. (Refer to Clare Planning Ref. 24/60416)

NIEA (2014) River Hydromorphology Assessment Technique (RHAT) – Version 2. Northern Ireland Environment Agency. ISBN: 978-1-907053-65-8

NIEA (2014) River Hydromorphology Assessment Technique (RHAT) – Version 2. Northern Ireland Environment Agency. ISBN: 978-1-907053-65-8

NPWS (2012) Conservation Objectives: Lower River Shannon SAC 002165. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NRA (2003) Guidelines for assessment of ecological impacts of National Road schemes. Revision 1 National Roads Authority, Dublin.

NRA (2009) Guidelines for assessment of ecological impacts of National Road schemes. Revision 2 National Roads Authority, Dublin.

TEGOS (2025). The Status of Irish Salmon Stocks in 2025 with Catch Advice for 2026. Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries, 65 pp.

TII (2025) Draft Biodiversity Impact Assessment of Proposed National Roads, Greenways and Active Travel Projects - Standard TII Publication Number PE-ENV-07006.

Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, Craig, M. and Quinn, R. (2005) Water Quality in Ireland 2001-2003. Environmental Protection Agency, Wexford, Ireland.

APPENDIX 1 Impact Magnitude Criteria

Ecological Impact Assessment criteria for impact magnitude

Impact Magnitude	Internationally important (A sites)	Nationally important (B sites)	High value, locally important (C sites)	Moderate value, locally important (D sites)	Low value, locally important (E sites)
Profound negative	Any permanent impacts	Permanent impacts on a large part of a site			
Significant negative	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site		
Moderate Negative	Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a small part of a site	Permanent impact on a site if part of a designated site
Slight Negative		Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site
Imperceptible Negative			Temporary impacts on a small part of the site	Temporary impacts on a small part of the site	Permanent impacts on a small part of a site
Neutral	No impacts	No impacts	No impacts	No impacts	No impacts
Slight Positive				Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site

APPENDIX 2 Q-value Macroinvertebrate Taxa

KEY: + = Present (one or two); F = Few (1-5%); C = Common (6-20%); N = Numerous (21-50%); D = Dominant (51-75%); E= Excessive (>75%)

Habitat Codes		
R		Riffle
RN		Run
G		Glide
P		Pool
S		Step

Substrate Codes		
B	Boulder	>256mm
C	Cobble	>64-256mm
G	Gravel	>2-64mm
SD	Sand	<2mm
SL	Silt	<0.063mm

Table A2-1 Macroinvertebrate and Q-value results 2025

Watercourse		Knockbrack Drain		
Site Code		**KB5**	**KB6**	**KB9**
Sample Date		30/04/2025	30/04/2025	01/05/2025
Wet-width (m)		0.5m	0.9m	1.0m
Depth (cm)		1-2cm	2-4cm	4-8cm
Habitat type		RN-P (stagnant)	RF-RN	RF-RN
Volume		Very low	Low	Mod-Low
Substrate		G- 70%, C - 5%, SD/SL - 25%	G- 80%, C - 5%, SD/SL - 15%	G- 65%, C - 30%, SD/SL - 5%
Taxa	**EPA Quality**			
MAYFLIES (Ephemeroptera)				
Rhithrogena sp.	A			3
Seratella ignita	C			3
Baetidae	C	5	6	100+
STONEFLIES (Plecoptera)				
Brachyptera risi	A	1		
CADDISFLIES (Trichoptera)				
Polycentropidae	C	3		
Limnephilidae	C			7
TRUE FLIES (Diptera)				
Dicranota spp.	C		3	
Chironomidae	C		7	
Ceratopoginae	C	2	3	1
BEETLES (Coleoptera)				
Elmidae	C	2	4	12
Dytiscidae	C			3
F/W SHRIMPS (Crustacea)				
Gammarus sp.	C	100+	90	100+
Asellus sp.	D	5	10	2
WORMS (Annelida)				
Tubificidae	E	4		5
Q Value		Q3	Q3	Q3-4
Representative WFD Status		Poor	Poor	Moderate

Table A2-2 Macroinvertebrate and Q-value results 2025

Watercourse		Oakfield	Oakfield	Blackwater
Site Code		Oakfield 1B (OF1B)	Oakfield 4 (OF4)	Blackwater (Clare) 2 (BWC2)
Watercourse		Oakfield	Oakfield	Blackwater
Sample Date		30/04/2025	30/04/2025	01/05/2025
Wet-width (m)		0.70m	2.0m	7.0-8.0m
Depth (cm)		2-5cm	8cm	20cm (riffle)
Habitat type		S-P, RF-RN	RF-RN	P-RF-RN-G
Volume		Very low	Mod-low	Mod-High
Substrate		G- 80%, C - 5%, SD/SL - 15%	C-30%, G - 60%, SD -10%	B - 10%, C- 50%, G-30%, SD-10%
Taxa	**EPA Quality**			
MAYFLIES (Ephemeroptera)				
Ecdyonurus spp.	A		2	22
Heptagenia spp.	A		6	13
Rhithrogena sp.	A	4	35	100+
Seratella ignita	C			40
Baetidae	C	15	100+	60
STONEFLIES (Plecoptera)				
Brachyptera risi	A	5	15	3
Isoperla grammatica	A		1	3
CADDISFLIES (Trichoptera)				
Sericostoma personatum	B			6
Polycentropidae	C	3		2
Glossosomatidae	~	30	12	
Limnephilidae	C	3	5	2
Philopotomidae	C		2	
Hydropsychidae	C			12
Rhyacophilidae	C		4	7
TRUE FLIES (Diptera)				
Dicranota spp.	C	3	5	
Chironomidae	C	5		50
Ceratopoginae	C			
Simuliidae	C		15	50
BEETLES (Coleoptera)				
Elmidae	C	12	14	25
F/W SHRIMPS (Crustacea)				
Gammarus sp.	C	85	25	30
Asellus sp.	D			
SNAILS (Mollusca)				
Ancyclus sp.	C		15	
WORMS (Annelida)				
Tubificidae	E	25		
Q Value		Q3-4	Q4	Q4
Representative WFD Status		Moderate	Good	Good

Table A2-2 Macroinvertebrate and Q-value results 2021-2022

Watercourse		Oakfield 25			Blackwater (Clare)
Site Code		Oakfield 1B (OF1B)	Oakfield 2 (OF2)	Oakfield 3 (OF3)	Blackwater (Clare) 2 (BWC2)
Survey Date	**EPA Quality**	15/12/2021	15/12/2021	15/12/2021	18/09/2022
MAY FLIES (Ephemeroptera)					
Ecdyonurus			+	+	C/N
Heptagenia					F/C
Rhithrogenia	A		C	F	C
Serratella					+
Baetidae	C	C	N	N/D	F/C
STONE FLIES (Plecoptera)					
Nemouridae	A	+		+	
CADDIS FLIES (Trichoptera)					
Goeridae	B				+
Sericostoma personatum					+
Glossosomatidae	C			+/F	
Rhyacophila	C			+	F
Hydropsychidae	C				F/C
Polycentropidae	C	+		F	F
Limnephilidae	C	F/C		+	
TRUE FLIES (Diptera)					
Simuliidae	C	C/N	N		
Dicranota sp.	C			F/C	C
Water Beetles (Coleoptera)					
Elmidae	C		+	F	C
F/W SHRIMPS (Crustacea)					
Gammarus	C	C	C/N	C	F
Asellus	D	C/N	C	F/C	
WORMS (Annelida)					
Oligochaetae	E		+	+	F
Q Value		**Q3**	**Q3-4**	**Q3-4**	**Q4**

Table A2-3 West Roo Macroinvertebrate and Q-value results 2023

Watercourse		West Roo
Site Code		WR1
Sample Date		18/09/2023
Width (m)		1.60
Depth (cm)		8cm
Flow type		Riffle/run

Watercourse		West Roo
Site Code		WR1
Substrate		Cobble, pebble
Easting ITM		558025
Northing ITM		662027
Taxa	EPA Quality	
MAYFLIES (Ephemeroptera)		
Ecdyonurus	A	F
Rhithrogenia	A	F
Baetidae	C	F
STONEFLIES (Plecoptera)		
Leuctra	B	C/N
CADDISFLIES (Trichoptera)		
Polycentropidae	C	F
Limnephilidae	C	(+)
Philopotomidae	C	F/C
TRUE FLIES (Diptera)		
Dicranota spp.	C	F
Simuliidae	C	F
BEETLES (Coleoptera)		
Elmidae	C	F
Dytiscidae	C	
F/W SHRIMPS (Crustacea)		
Gammarus sp.	C	F
WORMS (Annelida)		
Tubificidae	E	F
Q Value		**Q3-4**
Representative Status		Moderate

APPENDIX 3 IFI Consultation Response

Iascach Intíre Éireann
Inland Fisheries Ireland

12.05.2022

Re. Stream Crossings for Ballyglass Solar Farm

Dear Lauren,

Thanks for your email inviting comment on the proposed Ballyglass Solar Farm. Following a site inspection I undertook on May 5th IFI have the following observations to make:

- The HDD crossing of the Blackwater is not subject to the close season subject to suitable mitigation measures in place in event of a frack-out. Siting of the launch and reception pits and de-siltation of any waters arising should also be considered
- A Section 14 licence will be required for any fish removal works, IFI do not need to supervise these works but may visit the site following notification of the commencement of works.
- Fish-bearing channels will be subject to the annual close season. Given the lack of sea lamprey or salmon in this system, works can commence on June 1st.
- It is likely that upstream migration is impacted by the length of culvert under the headrace canal and the overly-wide channel just upstream.
- Culvert backfill should be rounded washed stone approximately 4" down.

IFI may make further submissions at the planning stage.

Yours sincerely,

Jane Gilleran

.....

Jane Gilleran
Fisheries Environmental Officer
Inland Fisheries Ireland - Limerick

Plate 8-1