



APPENDIX 2

AQUATIC BASELINE REPORT

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1. INTRODUCTION

1.1 Background

MKO has been appointed to conduct an Aquatic Baseline Survey and subsequent Aquatic Baseline Report for the area within and in the vicinity of the proposed Slieveacurry Renewable Energy Development. Aquatic baseline surveys were carried out in regard to the permanent built infrastructure of the Proposed Project. The permanent built infrastructure of the Proposed Project is located only within the Proposed Wind Farm Site and Proposed Grid Connection Site, and this report considers these locations.

Aquatic Baseline Surveys were undertaken in September 2025. Desk studies were undertaken between September 2026 and February 2026. This report provides a baseline assessment of the aquatic condition of the lands within and in the vicinity of the Proposed Wind Farm Site and the Proposed Grid Connection Site and acts as an aquatic baseline record to which future records and monitoring can be compared.

1.2 Statement of Authority

Aquatic Baseline Surveys were undertaken by Mark Whelan (B.Sc., M.Sc.) and Niamh Rowan (B.Sc.) of MKO on the 9th, 10th, 25th and 26th of September 2025. Further Aquatic Surveying was undertaken by Cuan Feeley (B.Sc.) and Aran von der Geest Moroney (B.Sc.) on the 2nd of October 2025. Mark, Niamh, Cuan and Aran have extensive experience in undertaking ecological surveys and assessments.

This report has been prepared by Mark Whelan and has been reviewed by Aran von der Geest Moroney. Mark is an ecologist with MKO with a years' experience in professional consultancy. Aran is a senior ecologist with MKO with over 5 years' experience in professional consultancy. Mark and Aran have extensive experience in undertaking ecological surveys and assessments for large scale infrastructural projects such as wind farms, railways, roads and flood relief schemes.

1.3 Survey Locations

The aquatic baseline surveys for the Proposed Wind Farm Site and Proposed Grid Connection Site took place predominantly in the vicinity of Slieveacurry, County Clare, with sites further downstream on the Annagh catchment located in proximity to the town of Milltown Malbay, County Clare. Locations for survey sites in the vicinity of the Proposed Wind Farm Site and the Proposed Grid Connection Site (including sites where Environmental DNA samples were taken) are shown in Figure 1-1.

The Study Area for aquatic ecology surveys consisted of the Water Framework Directive (WFD) hydrological catchments and subcatchments which the Proposed Wind Farm Site and the Proposed Grid Connection Site are located within, and the freshwater habitats therein. Focus has been placed on those watercourses which interact with the Proposed Wind Farm Site and the Proposed Grid Connection Site, and those watercourses which are within close proximity to same.

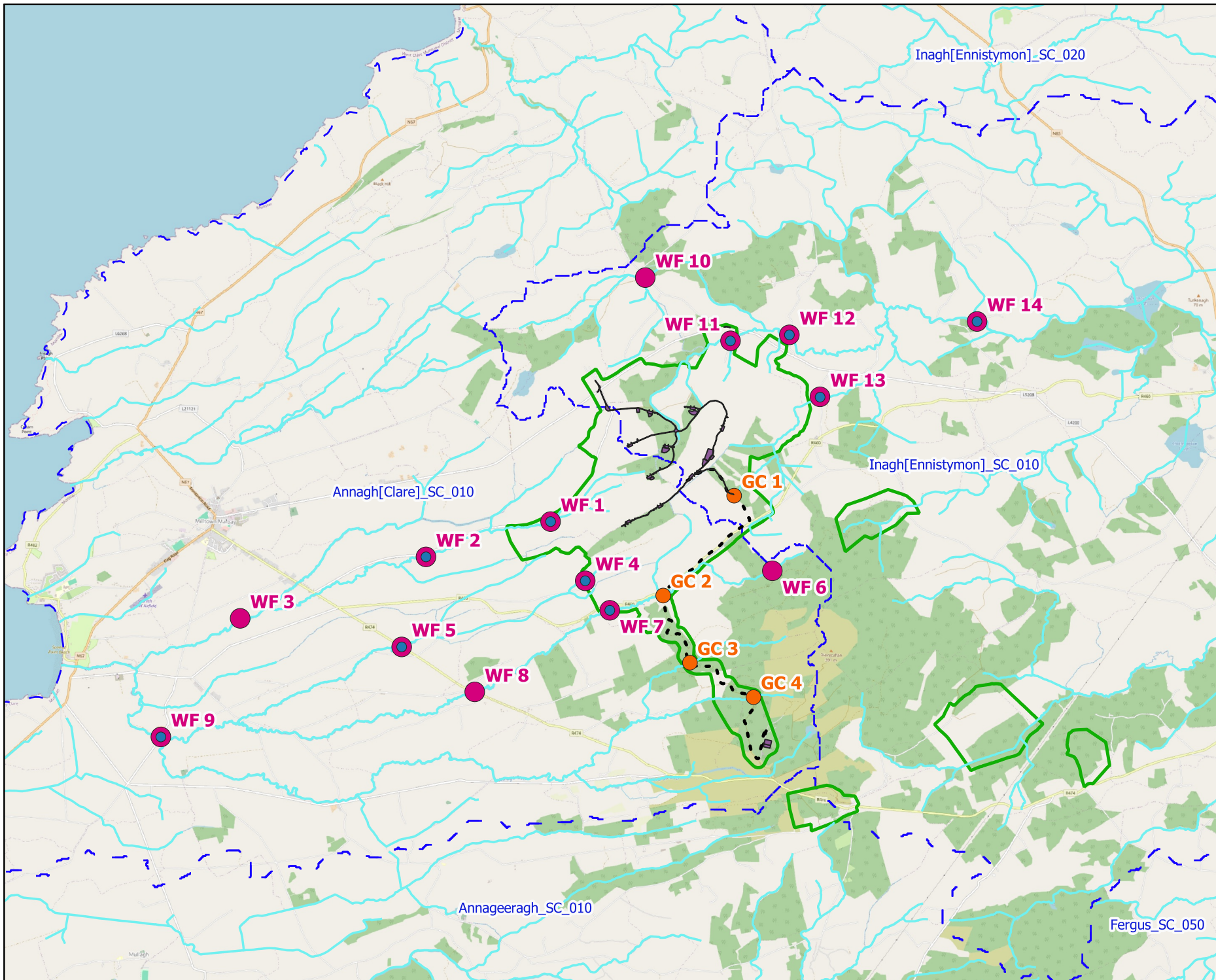
Wet grassland (GS4) and **Improved agricultural land (GA1)** were the dominant habitats in the landscape surrounding the survey locations. Aquatic Baseline surveys undertaken within the vicinity of the Proposed Wind Farm Site and Proposed Grid Connection Site covered both low order, upper reach streams and downstream, high order rivers. Nomenclature for surveyed watercourses follows that of the Environmental Protection Agency (EPA).

A total of fourteen Proposed Wind Farm Site (WF) survey sites across seven separate EPA watercourses were selected for assessment (Table 1-1,

Figure 1-1). A total of four Proposed Grid Connection Site (GC) survey sites were selected for assessment. The eighteen survey sites in the vicinity of the Proposed Wind Farm Site and Proposed Grid Connection Site were located within the Mal Bay Catchment (EPA ID: 28), of which six sites were located within the Inagh[Ennistymon]_SC_010 subcatchment, while twelve sites were located within the Annagh[Clare]_SC_010 subcatchment.

Table 1-1. Survey Site Locations within the vicinity of the Proposed Wind Farm Site and the Proposed Grid Connection Site.

Site no.	Watercourse	EPA name	EPA code	Hydrological catchment	Hydrological sub catchment	X (ITM)	Y (ITM)
Proposed Wind Farm Site Survey Locations							
WF 1	Glendine [Clare]_010	Ballynew	28B27	Mal Bay	Annagh[Clare]_S C_010	510484	679262
WF 2	Glendine [Clare]_010	Glendine [Clare]	28G02			507784	678509
WF 3	Glendine [Clare]_010	Glendine [Clare]	28G02			506054	677822
WF 4	Kildeema_010	Kildeema North	28K19			510949	678387
WF 5	Kildeema_010	Kildeema North	28K19			508327	677446
WF 6	Kildeema_010	Kildeema	28K01			513542	678515
WF 7	Kildeema_010	Kildeema	28K01			511272	677953
WF 8	Kildeema_010	Kildeema	28K01			509341	676805
WF 9	Annagh [Clare]_010	Kildeema/ Annagh	28K01			504815	676185
WF 10	Inagh [Ennistymon]_040	Derrymore 28	28D03		Inagh [Ennistymon]_SC _010	511787	682687
WF 11	Inagh [Ennistymon]_040	Fahanlunaghta more	28F09			515905	682090
WF 12	Inagh [Ennistymon]_040	Derrymore 28	28D03			513821	681851
WF 13	Inagh [Ennistymon]_040	Knockacarn	28K42			514244	680970
WF 14	Inagh [Ennistymon]_040	Derrymore 28	28D03			516463	682052
Proposed Grid Connection Site Survey Locations							
GC 1	Inagh [Ennistymon]_040	Stream Order 1 Tributary of Knockacarn	No Data	Mal Bay	Inagh [Ennistymon]_SC _010	513018	679588
GC 2	Kildeema_010	Kildeema	28K01		Annagh[Clare]_S C_010	511998	678172
GC 3	Annagh[Clare]_010	Doonsallagh East	28D08		512388	677220	
GC 4	Annagh[Clare]_010	Annagh [Clare]	28A03		513291	676730	



- ### Map Legend
- eDNA survey locations
 - Proposed Grid Connection Site
 - Survey Locations
 - Proposed Wind Farm Site Survey Locations
 - - - Proposed Underground Cable Connection
 - Permanent Built Infrastructure of the Proposed Project
 - EIA Site Boundary
 - WFD River Waterbodies
 - WFD Hydrological Subcatchments

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Drawing Title	
Aquatic Survey Locations	
Project Title	
Slievecurry Renewable Energy Development, Co. Clare	
Drawn By	Checked By
MW	AvdGM
Project No.	Drawing No.
240718	Figure 1-1
Scale	Date
1:70,000	24/04/2026

MKO
 Planning and Environmental Consultants
 Tuam Road, Galway
 Ireland, H91 W84
 +353 (0) 91 735611
 email: info@mkofireland.ie
 Website: ww.mkofireland.ie

2. METHODOLOGIES

2.1 River Habitat Assessment

Aquatic Habitat Assessments/ Appraisals were undertaken in order to determine the riverine habitat types present at each of the survey locations within and in the vicinity of the Proposed Wind Farm Site and the Proposed Grid Connection Site. The survey design and methodologies were derived from current ecological best practice guidance documents. Habitats were classified in accordance with the national habitat classification system used in Ireland - A Guide to Habitats in Ireland (Fossitt, 2000).

Riverine habitat assessments were conducted utilising elements of the following methodologies and literature to characterise the selected sites along the watercourse:

- › Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003),
- › Guidelines for Assessment of Ecological Impacts of National Road Schemes (TII, 2009),
- › Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000).

All sites were assessed in terms of the following variables:

- › Channel width and depth.
- › Bank profiles, including bank height and riparian vegetative composition.
- › Substrate type, listing substrate fractions in order of dominance.
- › Flow type.
- › In-stream macrophyte and aquatic bryophytes occurring and the prominence of each (DAFOR scale).
- › Water clarity and colouration.
- › Riparian vegetation composition.

The survey was devised to gather ecological baseline information including any habitat features that could potentially support protected aquatic species within the wider area. In addition, surveys considered the potential presence of problematic invasive alien species, with an emphasis on those species listed on the First Schedule of the European Union (Invasive Alien Species) Regulations 2024 (S.I. No 374 of 2024) and the Third Schedule of Regulations 49 & 50 of the Birds and Natural Habitats Regulations 2011 (S.I. 477 of 2015). The assessments have regard to the TII guidance document - Guidelines on management of noxious weeds and non-native invasive plant species on national roads (Transport Infrastructure Ireland, TII, 2010).

During the site visit, additional information on any other species of local biodiversity value occurring within the site was recorded in order to provide a complete baseline understanding of the development site.

2.2 Fisheries Habitat Assessment

An assessment of the riverine habitats at each sample location was undertaken to determine the potential for watercourses within the study area to support fish species, including Salmonids, Lamprey spp., and European eel, among other fish species likely to utilise watercourses within the study area.

Fisheries habitat assessments were conducted utilising elements of the following methodologies and literature to characterise the selected sites along the watercourse:

- › Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003)
- › Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000).

- › Channels & Challenges. Enhancing Salmonid Rivers. Irish Freshwater Fisheries Ecology & Management Series (O'Grady, 2006)
- › Life Cycle Unit method (Kennedy, 1984; O'Connor & Kennedy, 2002)
- › NPWS Irish Wildlife Manuals lamprey surveys (O'Connor, 2004; O'Connor, 2006; and O'Connor, 2007)
- › Evaluation of Habitat for Salmon and Trout. Department of Agriculture Fisheries Division. EU Salmonid Enhancement Programme (DOA-NI, 2005)
- › Restoration of Riverine salmon habitats (Hendry, K. & Cragg-Hine, D., 1997)
- › Ecology of the Atlantic Salmon, Conserving Natura 2000 Rivers (Hendry, K & Cragg-Hine, D., 2003)
- › Habitat requirements of Atlantic salmon and brown trout in rivers and streams (Armstrong, J.D. et al., 2003)
- › Ecology of the River, Brook, and Sea Lamprey (Maitland, 2003)
- › Monitoring the River, Brook and Sea Lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus* (Harvey J. & Cowx I. 2003).
- › The Eel: Biology and Management of Anguillid Eels (Tesch, F.W., 2007)

2.3 Electrofishing Surveys

Electrofishing operations for the purpose of forming baseline fisheries data of the Proposed Wind Farm Site were undertaken on the 9th, 10th and 25th September 2025.

A 5- minute timed electrofishing survey was undertaken at each of the WF survey locations, to determine the presence/absence of fish species within the study area while adhering to best practice methodology (Electric Fishing in Wadeable Reaches, Central Fisheries Board (CFB, 2008)), as well as European standards for electrofishing (CEN, 2003). Two suitably qualified ecologists conducted electrofishing operations at the electrofishing locations as per Fig 1-1, using an E-fish EF-500B-SYS Electric Fishing Backpack System.

Fish captured during electrofishing operations at each site were kept in a holding container with oxygenated water. Stress to fish via temperature and low oxygen levels was reduced via frequent freshwater changes and monitoring of water temperature within the holding container, ensuring temperatures of 20°C were not surpassed. All fish temporarily captured during the survey were identified to species level and measured. All fish temporarily captured were allowed to recover and subsequently returned to the watercourse in the vicinity of where they were collected.

Biosecurity measures were followed as per Section 2.7 below.

2.4 Macroinvertebrate Surveys

A two-minute kick-sample and stone-wash, as well as a 1 min hand search of larger substrata or organic material (e.g., submerged tree limbs/vegetation) was performed at each of the survey locations, as per methodology used by the Environmental Protection Agency (EPA) as part of the Water Framework Directive (WFD) River Monitoring Programme (Toner *et al.*, 2005).

Dislodged fauna were caught in a one metre square standard hand net (250 mm x 250 mm, 300 mm bag depth, 1 mm mesh size) situated downstream of the sampler disturbing the stream/riverbed substrate. The sampler moved upstream and across the channel while performing the kick-sample to ensure all microhabitats presents within the watercourse were surveyed. All material collected in the net was transferred via rinsing to a white heavy duty plastic tray (485 x 335 x 80mm) filled with water for identification of macroinvertebrates in situ. Large stones and organic material within the sample such as leaves, twigs, algae or bryophytes were examined for any macroinvertebrates present and subsequently removed from the tray.

Specimens present in the sample were identified to the lowest possible taxonomic level using the FBA Guide to Freshwater Invertebrates (Dobson *et al.*, 2012). The Q-value system assigns macroinvertebrate taxonomic groups to one of five WFD status pollution sensitivity groups (from A, most pollution sensitive to E, most pollution tolerant). The Q-value is calculated based on the relative abundance of Pollution Sensitive Group A and B taxa to Pollution Tolerant Group C, D and E taxa within the sample, and the surveyed stretch of watercourse is assigned an associated pollution status. The EPA Quality (Q)-Rating System is summarised in

Table 2-1.

Table 2-1. EPA Quality (Q) Rating System.

Biotic Index	Quality Status	Quality Status	Quality Class	Condition
Q5, Q4-5	High	Unpolluted	Class A	Satisfactory
Q4	Good	Unpolluted	Class A	Satisfactory
Q3-4	Moderate	Slightly Polluted	Class B	Unsatisfactory
Q3, Q2-3	Poor	Moderately Polluted	Class C	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously Polluted	Class D	Unsatisfactory

2.5 Otter Surveys

Otter surveys were conducted as per TII (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes). This involved a search for all Otter signs, e.g., spraint, scat, prints, slides, trails, couches and holts both upstream and downstream of proposed survey locations. Within the Proposed Wind Farm Site study area, otter surveys were conducted 150m upstream and downstream of all survey points. Due to the small-scale nature of works proposed to be undertaken along the Proposed Grid Connection Site, as well as high levels of disturbance from the existing road, Otter surveys were conducted in the vicinity of grid route survey locations. In addition to the width of the rivers, a 10m riparian buffer (both banks) is considered to comprise part of the Otter habitat (NPWS 2009. Threat Response Plan: Otter (2009-2011)).

2.6 eDNA Surveys

The Proposed Wind Farm Site is not located within the immediate spatial vicinity (10km) of NPWS records of freshwater pearl mussel (FPM, *Margaritifera margaritifera*) or white-clawed crayfish (WcC, *Austropotamobius pallipes*). Both of these species are protected in Ireland under the Wildlife Acts and the Habitats Directive (92/43/EEC), where WcC and FPM are designated under Annex II and V. Given the potential ecological sensitivity and legislative protection afforded to both of these species, environmental DNA (eDNA) surveys for FPM and WcC were conducted at 10 of the visited survey sites which were situated on both the Inagh[Ennistymon]_SC_010 and the Annagh[Clare]_SC_010 subcatchments (Table 2-2). Additionally, eDNA samples taken at all ten survey sites were assessed in terms of presence/absence of Crayfish plague (*Aphanomyces astaci*).

Table 2-2. List of survey sites in which eDNA sampling was undertaken. Further details of each location are provided in Table 1-1.

eDNA Site Code	X (ITM)	Y (ITM)
WF1	510484	679262
WF 2	507784	678509
WF 4	510949	678387

WF 5	508327	677446
WF 7	511272	677953
WF 9	504815	676185
WF11	515905	682090
WF 12	513821	681851
WF 13	514244	680970
WF 14	516463	682052

To detect populations of FPM, WcC or the presence of Crayfish Plague within the study area, a composite water sample was collected from the watercourse at each of the selected eDNA survey sites in September 2025 and analysed for FPM, WcC and Crayfish Plague. eDNA sampling sites were strategically chosen to maximise longitudinal (instream) coverage within the subcatchments, facilitating the likelihood of species detection. All chosen sampling locations were either in direct proximity to or were hydrologically connected downstream of the Proposed Wind Farm Site and the Proposed Grid Connection Site.

Each composite (~500ml) water sample was collected from each watercourse, with 20 x 25ml samples taken along the watercourse, for a representative geographic spread at the site. The composite sample was filtered and fixed on site using a sterile proprietary eDNA sampling kit. The sample was stored at room temperature and sent to the laboratory for analysis following return from site. Given the high sensitivity of eDNA analysis, a single positive qPCR replicate is considered as proof of the species' presence. Whilst an eDNA approach is not currently quantitative, the detection of the target species' DNA indicates the presence of the species at and or upstream of the sampling point.

2.7 Biosecurity Measures

Biosecurity measures which were implemented followed *IFI Biosecurity Protocol for Field Survey Work*, (IFI, 2010). Due to increasingly prevalent spread of Crayfish plague in Ireland and to prevent the spread of aquatic invasive species, all equipment was scrubbed and cleaned prior to and post works with Virkon Aquatic. Additionally, all equipment was cleaned with Virkon Aquatic between survey sites when this involved upstream movement, inter-watercourse movement or inter-subcatchment movement. Any instance of invasive species was recorded and conveyed to IFI via electrofishing data returns.

3. DESK STUDY

A Desk Study was conducted to gather baseline information from publicly available sources and records on the aquatic habitats and aquatic dependent species within the vicinity of the survey area.

In preparation of the desk study, the following sources were used to gather information:

- › Review of online web-mappers: National Parks and Wildlife Service (NPWS), EPA, Water Framework Directive (WFD), Inland Fisheries Ireland.
- › Review of OS maps and aerial photographs of the survey area.

3.1 EPA Water Quality.

The EPA Envision map viewer was consulted on 12th September 2025 and the 17th of February 2026 regarding the water quality status and risk of the rivers which comprise the Proposed Wind Farm Site and Proposed Grid Connection Site survey locations. **Error! Reference source not found.** presents a summary of the waterbody WFD status for 2013-2018, waterbody WFD status for 2016-2021 and WFD 3rd Cycle River Waterbodies Risk Projection, as well as details of the corresponding Proposed Wind Farm Site and Proposed Grid Connection Site survey locations.

There were 16 EPA monitoring points within the vicinity of the study area, two of which were located within the Inagh [Ennistymon]_SC_010 subcatchment and fourteen were located within the Annagh [Clare]_SC_010 subcatchment. (Table 3-2).

Table 3-1. WFD Status and Risk of surveyed watercourses within the vicinity of the Proposed Wind Farm Site and Proposed Grid Connection Site.

Survey Locations	Watercourse	EPA name	EPA code	Catchment	SubCatchment	Waterbody WFD Status for 2013-2018	Waterbody WFD Status for 2016-2021	WFD 3rd Cycle River Waterbodies Risk Projection
Proposed Wind Farm Site Survey Locations								
WF1	Glendine [Clare]_010	Ballynew	28B27	Mal Bay	Annagh [Clare]_SC_010	Poor	Moderate	At risk
WF 2	Glendine [Clare]_010	Glendine [Clare]	28G02			Poor	Moderate	At risk
WF 3	Glendine [Clare]_010	Glendine [Clare]	28G02			Poor	Moderate	At risk
WF 4	Kildeema_010	Kildeema North	28K19			Good	Good	Not at risk
WF 5	Kildeema_010	Kildeema North	28K19			Good	Good	Not at risk
WF 6	Kildeema_010	Kildeema	28K01			Good	Good	Not at risk
WF 7	Kildeema_010	Kildeema	28K01			Good	Good	Not at risk
WF 8	Kildeema_010	Kildeema	28K01			Good	Good	Not at risk
WF 9	Annagh [Clare]_010	Kildeema	28K01			Moderate	Bad	At risk
WF 10	Inagh [Ennistymon]_040	Derrymore 28	28D03			Inagh [Ennistymon]_SC_010	Moderate	Moderate
WF 11	Inagh [Ennistymon]_040	Fahanlunaghtamore	28F09		Moderate		Moderate	At risk

WF 12	Inagh [Ennistymon]_040	Derrymore 28	28D03			Moderate	Moderate	At risk
WF 13	Inagh [Ennistymon]_040	Knockacarn	28K42			Moderate	Moderate	At risk
WF 14	Inagh [Ennistymon]_040	Derrymore 28	28D03			Moderate	Moderate	At risk
Proposed Grid Connection Site Survey Locations								
GC 1	Inagh [Ennistymon]_040	Stream Order 1 Tributary of Knockacarn	No Data	Mal Bay	Inagh [Ennistymon]_SC_010	Moderate	Moderate	At risk
GC 2	Kildeema_010	Kildeema	28K01		Annagh [Clare]_SC_010	Good	Good	Not at risk
GC 3	Annagh[Clare]_010	Doonsallagh East	28D08		Moderate	Bad	At risk	
GC 4	Annagh[Clare]_010	Annagh [Clare]	28A03		Moderate	Bad	At risk	

Table 3-2. EPA Water Quality Data.

Watercourse	Subcatchment	Sampling Station	Location	Sampling Year	Q-Value & Water Quality Status
Inagh [Ennistymon]_040	Inagh [Ennistymon]_SC_010	DERRYMORE - Cloonanaha Br [Station Code: RS28D030450]	E 114181, N 181573	1991	Q 4-5 - High
Inagh [Ennistymon]_040		DERRYMORE - Derrymore Bridge [Station Code: RS28D030500]	E 114516, N 181524	1991	Q 5 - High
Annagh [Clare]_010	Annagh [Clare]_SC_010	Br E.S.E. of Doonsallagh Ho [Station Code: RS28A030200]	E 111293, N 175991	2024	Q 3-4 - Moderate
Annagh [Clare]_010		ANNAGH (CLARE) - Br at X-Roads N. of Mt Scott [Station Code: RS28A030400]	E 107569, N 175233	2006	Q 4 - Good
Annagh [Clare]_010		ANNAGH (CLARE) - Carrowduff Bridge [Station Code: RS28A030700]	E 104857, N 176137	1991	Q 4-5 - High
Annagh [Clare]_010		ANNAGH (CLARE) - Stackpoole's Bridge [Station Code: RS28A030800]	E 104585, N 177040	2024	Q 4 - Good
Annagh [Clare]_010					

Annagh [Clare]_010	Annagh [Clare]_SC_010	Bridge u/s Mouth of River [Station Code: RS28A030900]	E 103718.59, N 177124.29	2024	Q 3-4 – Moderate (Brackish)
Annagh [Clare]_010		GLENDINE (CLARE) - Bridge u/s Annagh River [Station Code: RS28G020300]	E 104608, N 177119	1988	Q 4-5 – High
Kildeema_010		KILDEEMA - Doonsallagh Bridge [Station Code: RS28K010500]	E 109382, N 176773	2006	Q 3-4 – Moderate
Kildeema_010		KILDEEMA - Bridge d/s Doonsallagh Br [Station Code: RS28K010600]	E 106882, N 176149	1991	Q 5 – High
Kildeema_010		Bridge u/s Annagh River [Station Code: RS28K010800]	E 104925.16, N 176127.46	2024	Q 4 – Good
Glendine [Clare]_010		GLENDINE (CLARE) - Br u/s confl with S. Branch [Station Code: RS28G020040]	E 109603, N 179105	1991	Q 4 – Good
Glendine [Clare]_010		GLENDINE (CLARE) - Second Bridge u/s Honan's Br [Station Code: RS28G020080]	E 109035, N 178796	2006	Q 4 – Good
Glendine [Clare]_010		GLENDINE (CLARE) - Honan's Bridge [Station Code: RS28G020100]	E 108661, N 178672	1991	Q 4-5 – High
Glendine [Clare]_010		Br u/s confl with S. Branch [Station code: RS28K110040]	E 106929, N 178341	1991	Q 4 – Good
Glendine [Clare]_010		Knockloskeraun Bridge, S of M [Station code: RS28G020200]	E 105251, N 177413	2024	Q 4 – Good

3.2 Salmonid River Status

Watercourses designated as Salmonid Waters under S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations (1988) are those fresh waters classified under the first schedule, which are 'capable of supporting Salmon (*Salmo salar*), Trout (*Salmo trutta*), Char (*Salvelinus*) and Whitefish (*Coregonus*)' species. There are no watercourses designated as Salmonid Waters within the vicinity of the Proposed Wind Farm Site and the Proposed Grid Connection Site. The nearest designated waterbody identified under S.I. No. 293/1988 is the mainstem of the River Fergus, which is located approximately 20km to the east of the Proposed Wind Farm Site and the

Proposed Grid Connection Site at its nearest point and is not directly hydrologically connected to either the Annagh [Clare]_SC_010 or the Inagh [Ennistymon]_SC_010 subcatchments.

3.3 NPWS Data

3.3.1 Freshwater Pearl Mussel & White-clawed Crayfish

There are no records of Freshwater Pearl Mussel within or directly adjacent to the Proposed Wind Farm Site or Proposed Grid Connection Site.

There are no records of White-clawed Crayfish within or directly adjacent to the Proposed Wind Farm Site or Proposed Grid Connection Site. There are also no NPWS records of WcC occurring within either of the Annagh or the Inagh subcatchment areas.

3.3.2 Annex I habitats

There are no mapped instances of Annex I freshwater habitats occurring within the vicinity of or directly hydrologically connected to the Proposed Wind Farm Site and the Proposed Grid Connection Site.

3.3.3 FPO Macrophytes

Aquatic plant species protected under the Flora (Protection) Order 2022 (S.I. No. 235/2022) were not recorded within the 10km hectads of the Proposed Wind Farm Site and the Proposed Grid Connection Site. The NPWS Rare/Threatened Plants Database notes the occurrence of Mudwort (*Limosella aquatica*) at Inchaquin Lough, located approximately 16km northeast of the the Proposed Wind Farm Site and the Proposed Grid Connection Site. Lough Inchaquin drains longitudinally to the Shannon estuary via the River Fergus and is not directly hydrologically connected to the catchments which lie in the vicinity of the Proposed Wind Farm Site and the Proposed Grid Connection Site.

3.4 Inland Fisheries Ireland Data

Inland Fisheries Ireland (IFI) WFD Fish Ecological Status: Rivers, Lakes and Transitional Waters dataset was queried on the 12th of September 2025 and the 16th of February 2026 via the IFI Open Data Portal Mapviewer. Surveys were conducted by IFI as part of water sampling for the Water Framework Directive (WFD), on the Kildeema_010 and Glendine [Clare]_010 watercourses situated within the Annagh [Clare]_SC_010 subcatchment. These surveys were in close proximity to sites WF3, WF5 and WF9. Surveying conducted by IFI identified the presence of brown trout (*Salmo trutta*), Atlantic salmon (*Salmo salar*) and European eel (*Anguila anguila*), and sites were assigned a WFD fish ecological status score (Table 3-3).

Table 3-3. IFI Water Framework Directive Fish Ecological Status Data.

River Name	Site name	Species Present	Sampling Year	WFD Fish Ecological Status at site
Annagh (Kildeema) River	Kildeema Br._A	Brown trout (<i>Salmo trutta</i>) Salmon (<i>Salmo salar</i>)	2020	Good
Annagh (Kildeema) River	Donnsallagh Br._A	Brown trout (<i>Salmo trutta</i>)	2020	Moderate



		Salmon (<i>Salmo salar</i>)		
Annagh (Glendine) River	Knockloskeraun Br. S of M_A	Brown trout (<i>Salmo trutta</i>) European Eel (<i>Anguila anguila</i>)	2020	Good

4. FIELD SURVEY RESULTS

4.1 Aquatic Survey Results

Aquatic Baseline Surveys undertaken in the vicinity of the Proposed Wind Farm Site included:

- > River habitat assessment,
- > Fisheries habitat assessment,
- > Electrofishing surveys,
- > Macroinvertebrate surveys,
- > Otter Surveys,
- > Kingfisher suitability assessment,
- > eDNA surveys at certain locations.

Aquatic Baseline Surveys undertaken along the Proposed Grid Connection Site included:

- > River habitat assessment,
- > Fisheries habitat assessment,
- > Macroinvertebrate surveys,
- > Kingfisher suitability assessment,
- > Otter Surveys.

Sections 4.1.1 and 4.1.1.7 summarise survey findings for fisheries, macroinvertebrate and macrophyte assessments at each survey site, as well as the physical attributes and habitats present within each watercourse in the vicinity of the study area. No significant constraints or limitations in gathering information were encountered.

Appendix I presents a collated record of the fish species found at each survey location electrofishing was conducted on.

Appendix II presents a collated record of the Q-Values assigned across all survey locations.

4.1.1 Proposed Wind Farm Site Survey Locations

4.1.1.1 WF Survey Site 1 (WF 1)

Survey site WF 1 was located along the upper reaches of the Ballynew River (EPA code:28B27, ITM X: 510412 Y: 679224). Properties of the watercourse at this sample location are provided in Table 4-1 and a representative photograph of the survey location is shown in Plate 4-1.

Table 4-1 Properties of the watercourse at survey location WF1.

Properties	Record			
Average Depth (m)	0.3			
Average Bank Width (m)	2.8			
Average Wet Width (m)	1.9			
Flow	Moderate			
Colouration	Slight brown humic staining			
Clarity	Slightly turbid			
Bank height (m)	LHB	0.8	RHB	0.4
Dominant Substrates	Bedrock: 70% Boulder (>128mm): 10% Cobble (>32-128mm): 10%			

	Gravel (8-32mm): 5% Fine Gravel (2-8mm): 5%
Substratum Condition	Bedrock planes with some deposition of semi-compacted cobble and gravel interspersed with boulders.

This stretch of Eroding/upland river (FW1) was characterised by extensive bedrock sheeting which occurred at a moderate gradient and thus hosted sections of shallow (<15cm depth) bedrock chutes leading to short free-falling flows which fell into pools and thus transitioned to pool outflows. The profile of the pool tailings exhibited rippled water and unbroken standing waves which occurred over cobble-dense riffles, which often transitioned into smooth, narrow glides which were interspersed with boulders occurring over the bedrock planes which facilitated the deposition of some pockets of gravel on the downstream face of said instream boulders. The downstream extent of the site contained some pools with reduced flow despite the moderate gradient, due to instream large woody debris (LWD) which interspersed the channel occasionally. There was evidence of a track leading down to the stretch from the northern (right hand) bank, in which grew a green-white gelatinous complex in shallow saturated potholes, potentially where runoff from the surrounding pasture partially drained along the track. There was also evidence of historical poaching which was presumably a result of livestock entry to the channel via the identified track from the surrounding pastoral land.

Average water depth was shallow (averaging approx. 0.3m) along the surveyed stretch owing to the predominant bedrock chutes, however there was one observed deep pool of approximately 70cm in depth in the centre of the stretch, at the tail end of a bedrock chute.

Along the right hand bank, there was a riparian buffer of Riparian woodland (WN5) at the watercourse margin, which transitioned to surrounding pastoral Wet grassland (GS4). Emergent and bankside vegetation included soft rush (*Juncus effusus*), great woodrush (*Luzula sylvatica*), softshield fern (*Polystichum setiferum*), hard fern (*Blechnum spicant*), wild Angelica (*Angelica sylvestris*), and wood sorrel (*Oxalis acetosella*). The watercourse was extensively shaded as a result of the Mixed broadleaved woodland (WD1) which occupied the left bank and extended laterally to form an extensive standing. This woodland was predominantly composed of beech (*Fagus sylvatica*) and sessile oak (*Quercus petrae*).

Lamprey spp. spawning and nursery potential were assessed as *Poor* and *Negligible* respectively, given the predominance of exposed bedrock planes with few areas of finer substrates which occurred at pool outflows. Salmonid spawning and nursery potential were assessed as *Poor*, given that there were indeed areas of suitable gravel deposits located within riffles, however these gravel beds were seemingly shallow on a vertical axis and were deposited directly over bedrock, limiting their potential use. Some glide outflows from deeper pools and bedrock chutes were interspersed with occasional boulders and cobbles, providing *Moderate* nursery potential for juvenile salmonids.

Salmonid and eel holding potential was assessed as *Moderate* for the surveyed stretch as a whole continuum, owing to the presence of sporadic holding pools which were located at the outflow of bedrock chutes and step sequences. These pools were deep and interspersed with occasional boulders, providing good adult holding habitat where they did occur within the watercourse. However, given the scattered nature of these pools, which were often sided longitudinally along the watercourse by shallow bedrock chutes and shallow glides lessened overall holding suitability.

Overall, this site provided *Poor* fisheries value to the majority of species and respective life cycle stages. The shallow, exposed bedrock which dominated much of the surveyed stretch provided some potential for spawning habitats for lamprey spp. and salmonids, with the slightly coarser gravels favouring salmonid spawning habitat as opposed to a finer substratum which is typically more suitable for lamprey spp.. The occurrence of glides interspersed with cobbles and boulders provided some nursery habitat for lamprey and salmonids, while the observed deeper pools were assessed as suitable holding water for both eels and salmonids, although such pools were sporadic and scarce in their occurrence.

Two brown trout and one European Eel were captured during electrofishing at survey location WF1. Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section 2) are presented in **Error! Reference source not found.** 4-2.

Table 4-1. Electrofishing results at survey location WF 1.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	15
Brown Trout (<i>Salmo trutta</i>)	12
European Eel (<i>Anguila anguila</i>)	18

Biological water quality based on Q-sampling was calculated as **Q3-4 - Moderate** for survey site WF1. Group A 'Very pollution sensitive' and group B 'Moderately Pollution Sensitive' taxa were few and totalled three individuals, each representing a different taxon. Group C 'Pollution tolerant' taxa dominated the sample, with *Gammarus* and *Baetis rhodani* being the most abundant taxa. No taxon within Groups D 'very pollution tolerant' or E 'most pollution tolerant' were present within the sample. Results of Q-Value assessment are summarised in Table 4-3.

Table 4-2. Results of the macroinvertebrate sample at survey location WF 1.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Ecdyonurus</i> sp.	1
Group B – Moderately Pollution Sensitive	<i>Glossosomatidae</i>	1
	<i>Limnephilidae</i>	1
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	8
	<i>Pediciidae</i>	1
	<i>Dicranota</i>	2
	<i>Hydropsyche</i>	1
	<i>Polycentropodidae</i>	1
	<i>Ancylus</i> spp.	7
	<i>Gammarus</i> spp.	11
	<i>Rhyacophilidae</i> sp.	1
	<i>Tipulidae</i> sp.	1
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-1 A representative image of the downstream extent of survey site WF 1.



Plate 4-1. Mid-section of the surveyed site, facing upstream where a pool can be seen beyond the unwetted section of cobble-boulder deposit located in the foreground.

4.1.1.2 WF Survey Site 2 (WF 2)

Survey site WF 2 was located along the Glendine River (EPA code: 28G02, ITM X: 640567 Y: 671870). The surveyed stretch was approximately 500m downstream of the confluence between the Glendine (South) watercourse and the Glendine River. Properties of the watercourse at this sample location are provided in Table 4-3 and a representative photograph of the survey location is shown in Plate 4-2.

Table 4-3. Properties of the watercourse at survey location WF 2.

Properties	Record
Average Depth (m)	0.35
Average Bank Width (m)	2.2
Average Wet Width (m)	2
Flow	Moderate
Colour	High level of brown humic staining
Clarity	High turbidity
Bank height (m)	LHB 0.8 RHB 0.8
Dominant Substrates	Boulder: 30% Cobble (>32–128mm): 40% Gravel (8-32mm): 20% Fine gravel (2-8mm): 10%
Substratum Condition	Semi-compacted substrate, which was boulder and cobble dominant. The minor proportion of gravels was in a similar semi-compacted state. No evidence of siltation present.

This Eroding/upland river (FW1) was characterised by a sinuous channel with substrate consisting of semi-compacted boulder, cobble and some gravels, which was deposited within a mix of pools, riffles and glides. The predominant pool formation was evidently caused by erosion along the cut bank, which led to multiple pools in which depths ranged from 0.4-0.8m and extended into the undercut banks along the outside bend of meanders. Occurring riffles and glides had a mosaic of boulders and cobbles, which were interspersed with interstitial gravels which ranged from coarse to fine in diameter, all of which were in a semi-compacted state. Some uncompacted gravels lay within pool tailings and along the wetted sections of point bars which formed occasionally along the inner meander bends. Pools occupied 30% of the surveyed stretch, with glides and riffles representing 45% and 25% of microhabitats present respectively.

At the time of survey, the watercourse had a high degree of brown humic staining and turbidity, which was noticeably more coloured than the previously surveyed site WF1 which lay approximately 2.7km upstream. Bank height on both sides was 0.8m, and consisted of compacted earth, which met the watercourse at a steep angle on both sides. The right-hand bank had a thin and occasional riparian buffer of Mixed broadleaved Woodland (WD1) which was disbanded by Wet grassland (GS4) grazing pasture which extended outward laterally. The left-hand bank was characterized by Riparian Woodland (WN5) which occupied its entirety.

Marginal vegetation covering the right-hand bankside included meadowsweet (*Filipendula ulmaria*), ribwort plantain (*Plantago lanceolata*), spear thistle (*Cirsium vulgare*), soft rush, yellow iris (*iris pseudacorus*) with occasional stands of non-native montbrecia (*Crocsmia x crocosmiiflora*). Along the exposed sections of earthen bank grew the bryophyte *Chiloscyphus polyanthos*. Shrubs present along the right-hand bank included infrequent thickets of gorse (*Ulex europaeus*) and bramble (*Rubus fruticosus*). Grey willow (*Salix cinerea*) represented the primary constituent of the immediate visible Riparian woodland (WN5) which occupied the entirety of the left-hand bank and in sporadic occurrences on the right-hand bank.

Salmonid spawning habitat was assessed as *Moderate*, owing to the presence of riffles at pool tailings which contained suitable gravels within a likely highly oxygenated microhabitat. The gravels at these pool tailings was predominantly of a coarser variant, and as such was classed as *Moderate* in suitability

for the spawning requirements of lamprey spp. The boulder-cobble sequence riffles which were interspersed with gravels provided *Excellent* salmonid nursery habitat, although were semi-compacted in nature. Given the absence of finer sediment beds, lamprey spp. nursery habitat was assessed as *Poor*.

Well-shaded river margins created by adjacent treelines added to the *Good* holding habitat for salmonids, as there were a number of pools and glides which occurred under shade and extended into undercut banks occurring along a depth gradient of 40-50cm. The boulder-cobble sequences which occurred in pools and glides likely provided adequate holding habitat for eels, although the compaction evident within the substratum likely made the occurrence of suitable sheltering features moderately infrequent, and as such limited assessment of eel suitability to *Moderate*.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-4. In addition to the fifteen brown trout which were captured and returned, two eels were missed (seen but not captured) during the electrofishing survey.

Table 4-4. Electrofishing results at survey location WF 2.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	14
Brown Trout (<i>Salmo trutta</i>)	13
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	13
Brown Trout (<i>Salmo trutta</i>)	11
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	10
Brown Trout (<i>Salmo trutta</i>)	13
Brown Trout (<i>Salmo trutta</i>)	11
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	6
Brown Trout (<i>Salmo trutta</i>)	7

Kick-sampling was carried out in areas of riffle and glide. Biological water quality based on Q-sampling was calculated as **Q4 – Good** for survey site WF 2, on the basis of moderate macroinvertebrate diversity, however there was low total abundance recorded. Pollution Sensitive Group A and B taxa (of which there were 4 individuals spanning two taxonomic groupings) represented ~35 % of the sample. The sample was composed predominantly of Group C ‘Pollution Tolerant’ taxa, of which *Gammarus* spp. and *Baetis rhodani* were the most prevalent, with 3 individuals of each taxon present. ‘Very’ and ‘Most’ Pollution tolerant’ taxa Groups D and E were absent from the sample. Results of kick-sampling are summarised in Table 4-6.

Table 4-5. Results of macroinvertebrates sample at survey location WF 2

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Ecdyonurus</i> spp.	3
Group B – Moderately Pollution Sensitive	<i>Lectura</i> spp.	1
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	3
	<i>Polycentropus</i> spp.	1
	<i>Gammarus</i> spp.	3
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-2. A representative image of Survey Site WF 2.

4.1.1.3 WF Survey Site 3 (WF 3)

Survey site WF 3 was located along the Glendine River (EPA code: 28G02, ITM X: 506054 Y: 677823), approximately 500m downstream of the confluence between the Glendine and the Kilcorcoran stream. Properties of the watercourse at this sample location are provided in Table 4-6 and a representative photograph of the survey location is shown in Plate 4-3 and Plate 4-4.

Table 4-6. Properties of the watercourse at survey location WF 3.

Properties	Record
Average Depth (m)	0.3
Average Bank Width (m)	2.2
Average Wet Width (m)	1.9
Flow	Low
Colour	Slight brown humic staining
Clarity	Clear when undisturbed, with plumes of silt readily remaining in suspension when wetted areas adjacent to poached banksides were disturbed underfoot.
Bank height (m)	LHB 2 RHB 2
Dominant Substrates	Bedrock: 60% Boulder (>128mm): 5% Cobble (>32-128mm): 20% Gravel (8-32mm): 5% Fine gravel (2-8mm): 8% Silt (<0.25mm): 2%, in wetted areas adjacent to poached banksides.
Substratum Condition	Semi-compacted

This stretch of Eroding/upland river (FW1) had a hydromorphological composition of primarily riffle-step formations occurring over cobble and bedrock planes, which were especially prominent in the upper extent of the surveyed stretch. Along the right bankside, there was evidence of cattle access and recent poaching at multiple points throughout the surveyed stretch. Riverine silt deposits were common directly adjacent to these access points from the Wet grassland (GS4)/ Improved agricultural grassland (GA1) mosaic, which represented the surrounding land use on both banksides. Within the lower extent of the surveyed stretch, a thin (~1m lateral coverage) Scrub (WS1) buffer comprised of Bramble and young Grey willow stands was present on both banksides, which transitioned to a dense Riparian woodland (WN5) of mature grey willow trees and beech that encroached over the watercourse from the left bankside. Other marginal and riparian vegetation identified throughout the surveyed stretch consisted of ribwort plantain, non-native montbrecia, bracken fern (*Pteridium aquilinum*), broad-leaved dock (*Rumex obtusifolius*), common ragwort (*Jacobaea vulgaris*), and the liverwort *Conocephalum* spp.

The bedrock-dominant substrate composition provided *Poor* salmonid spawning habitat throughout the surveyed stretch. The encroaching treeline within the upper surveyed extent contributed channel shading, trailing vegetation, and occasional instream LWD, which provided locally *Good* salmonid nursery & holding habitat, but the limited extent of this treeline combined with the large substrate composition and relative shallowness limited the surveyed stretch as a whole to a classification of *Moderate* in terms of holding habitat for salmonids. Substrate composition similarly determined the surveyed stretch to be *Poor* in terms of eel and lamprey habitat, as the low-density of semi-compacted cobbles were unlikely to provide extensive suitable refugia for eel, while the extremely limited nature of silt/sand beds determined the surveyed stretch largely unsuitable in terms of lamprey spawning and nursery habitat provision.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4- 7. Thirty brown trout of various lifestages were captured while surveying at this location.

Table 4- 7. Electrofishing results at survey location WF 3.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	16.5
Brown Trout (<i>Salmo trutta</i>)	10
Brown Trout (<i>Salmo trutta</i>)	17
Brown Trout (<i>Salmo trutta</i>)	11
Brown Trout (<i>Salmo trutta</i>)	9.4
Brown Trout (<i>Salmo trutta</i>)	14.5
Brown Trout (<i>Salmo trutta</i>)	16.4
Brown Trout (<i>Salmo trutta</i>)	7.4
Brown Trout (<i>Salmo trutta</i>)	13.5
Brown Trout (<i>Salmo trutta</i>)	10.6
Brown Trout (<i>Salmo trutta</i>)	7.5
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	6.3
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	11
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	9.3
Brown Trout (<i>Salmo trutta</i>)	10.3
Brown Trout (<i>Salmo trutta</i>)	8.3
Brown Trout (<i>Salmo trutta</i>)	7.7
Brown Trout (<i>Salmo trutta</i>)	8.5
Brown Trout (<i>Salmo trutta</i>)	11.5
Brown Trout (<i>Salmo trutta</i>)	7.7
Brown Trout (<i>Salmo trutta</i>)	8.8

Brown Trout (<i>Salmo trutta</i>)	8.9
Brown Trout (<i>Salmo trutta</i>)	10.8
Brown Trout (<i>Salmo trutta</i>)	9.7
Brown Trout (<i>Salmo trutta</i>)	9.6
Brown Trout (<i>Salmo trutta</i>)	8.8
Brown Trout (<i>Salmo trutta</i>)	18

Kick-sampling was carried out in areas of riffle and glide. Biological water quality based on Q-sampling was calculated as **Q3.4 - Moderate** for survey site WF 3. One Very Pollution Sensitive Group A taxon was present, a single *Rithrogena* Sp. individual. The Pollution Sensitive Group B taxon *Glossosomatidae* was common, representing ~18% of the total sample. The sample was composed predominantly of Group C ‘Pollution Tolerant’ taxa, of which *Simuliidae* was the dominant taxa, comprising ~70% of individuals. No Group D ‘Very Pollution Tolerant’ or Group E ‘Most Pollution Tolerant’ taxa were present within the sample. The results of macroinvertebrate sampling at survey site WF3 are presented in Table 4-8.

Table 4-8. Results of macroinvertebrates sample at survey location WF 3.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Rithrogena</i> sp.	1
Group B – Moderately Pollution Sensitive	<i>Glossosomatidae</i>	34
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	4
	<i>Chironomidae</i>	2
	<i>Gammarus</i> sp.	1
	<i>Simuliidae</i>	132
	<i>Hydropsyche</i> sp.	1
	<i>Ancyclus fluviatilis</i>	2
	<i>Potamopygrus antipodarum</i>	9
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-3. A representative image of the upstream extent of survey site WF3.



Plate 4-4. representative image of the downstream extent of survey site WF3.

4.1.1.4 WF Survey Site 4 (WF 4)

Survey site WF 4 was located on the headwaters of the Kildeema north watercourse (EPA code: 28K19, ITM X: 510907 Y: 678401). The features of the watercourse at this survey location are provided in Table 4-9 and a representative photograph of the survey location is shown in Plate 4-5.

Table 4-9. Properties of the watercourse at survey location WF 4.

Properties	Record
Average Depth (m)	0.15
Average Bank Width (m)	1.8
Wet Width (m)	1.6
Flow	Moderate
Colour	Slight brown humic staining
Clarity	Slightly turbid
Bank height (m)	LHB 3 RHB 2
Dominant Substrates	Boulder (>128mm): 10% Cobble (>32–128mm): 50% Gravel (8-32mm): 30% Fine gravel (2-8mm): 5% Silt (<0.25mm): 5%
Substratum Condition	Semi compacted boulder-cobble-gravel mosaic with slight siltation evident when disturbed.

This stretch of **Eroding/upland river (FW1)** was characterized by a narrow channel in which semi-compacted cobble-gravel step sequences defined the substratum, with some silt plumes arising into suspension once the bed was disturbed. Any water present in the channel was slightly brown in colour, likely arising from dissolved humic substances. The downstream extent of the surveyed stretch contained a double underroad pipe culvert (Plate 4-6), while the mid-section of the channel contained what was presumably a livestock barrier, consisting of a field gate and a pallet (Plate 4-7). There was a narrow section of unhindered channel (<40cm in wetted width) directly under the field gate.

Shallow riffle sequences (<0.2m) defined the watercourse profile, however there were some areas of glides which occurred directly adjacent to banksides and often extended into slightly undercut banks, which was most visible occurring on the left-hand side of the upper end of the surveyed stretch. There was one notable pool within the stretch, located directly under the field gate previously described.

Both banks were steep and relatively high, with the left bank in particular forming a steep embankment of approximately 3m in height. Both banksides had a riparian buffer of Scrub (WS1), of which gorse and bramble were the primary constituents. Emergent and bankside vegetation which grew below and among the scrub consisted of hart's-tongue fern (*Asplenium scolopendrium*), meadow buttercup (*Ranunculus acris*), willowherb (*Epilobium* sp.), lesser spearwort (*Ranunculus flammula*), devil's bit scabious (*Succisa pratensis*), creeping tomentil (*Potentilla anglica*), false oat-grass (*Arrhenatherum elatius*), watercress (*Nasturtium officinale*) and soft rush. Extending beyond the immediate riparian scrub, the surrounding land use on both banksides consisted of Wet grassland (GS4).

Some unconsolidated gravels present at pool tailings at the immediate head of a riffle formation and behind larger cobbles & boulders provided *Moderate* spawning potential for both salmonids and lamprey spp. However, given the coarser nature of these substrates and as such the limitation of fine gravels and sands within the surveyed stretch, lamprey spp. nursery habitat was assessed as *Poor*. The presence of suitable areas of refugia behind larger cobbles and boulders within riffles had the potential to provide *Good* nursery habitat for salmonids. Pool microhabitats were limited throughout the survey stretch and sporadic in occurrence, and where they occurred, they were depth-limited within this narrow headwater channel. As such salmonid holding potential was limited to *Moderate*. The dominant cobble substrate, which was interspersed with some boulders and finer substrata were assessed to provide *Good* refugia for eels.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-10. In addition to the five trout which were successfully captured and released, two salmonids (likely brown trout) were missed (seen but not captured) during the electrofishing survey.

Table 4-10. Electrofishing results at site WF4.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	13
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	9

Kick-sampling was carried out in areas of pool, riffle and glide. Biological water quality based on Q-sampling was calculated as **Q4 - Good** for survey site WF 3. Pollution Sensitive Group A and B taxa (8 individuals across four taxa) represented ~13% of the sample, where the Group A *Ecdyonurus* spp. constituted the most abundant taxon in this grouping. The sample as a whole was composed predominantly of Group C ‘Pollution Tolerant’ taxa, of which *Baetis rhodani*. was the dominant taxa, constituting ~67% of the total sample. ‘Very’ and ‘Most’ Pollution tolerant’ taxa Groups D and E were absent from the sample. Results of kick-sampling are summarised below in

Table 4-11.

Table 4-11. Results of macroinvertebrate sample at site WF4

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Ecdyonurus</i> spp.	4
	<i>Perla bipunctata</i>	1
Group B – Moderately Pollution Sensitive	<i>Baetidae</i> sp.	1
	<i>Hydropsyche</i> sp.	1
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	35
	<i>Simuliidae</i>	5
	<i>Gammarus</i> spp.	3
	<i>Dicranota</i> sp.	1
	<i>Polycentropus</i> sp.	1
	<i>Hydrachnidia</i>	1
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-5. A representative image of site WF4.



Plate 4-6. Double underroad culvert situated at the downstream extent of the surveyed area.



Plate 47. Field gate and adjacent pallet placed upon earthen embankment within the mid-section of the surveyed stretch.

4.1.1.5 WF Survey Site 5 (WF5)

Survey site WF 5 was located on the Kildeema north watercourse (EPA code: 28K19, ITM X: 508308 Y: 677445), approx. 0.4km downstream of the confluence between the Caherogan stream and the Kildeema North. Properties of the watercourse at this sample location are provided in Table 4-12 below and a representative photograph of the survey location is shown in Plate 4-8.

Table 4-12. Properties of the watercourse at survey location WF 5.

Properties	Record
Average Depth (m)	0.35
Average Bank Width (m)	2.5
Average Wet Width (m)	2.3
Flow	Moderate
Colour	Slight brown humic staining
Clarity	Slight turbidity
Bank height (m)	LHB 1.5 RHB 1.4
Dominant Substrates	Boulder (>128mm): 10% Cobble (>32-128mm): 75% Gravel (8-32mm): 10% Fine gravel (2-8mm): 5%
Substratum Condition	Semi-compacted

This cobble dominant stretch of Eroding/upland river (FW1) was bisected by a roadbridge, under which the watercourse passed through three culverts (Plate 4-9). At the time of visiting, only the middle and the right-side culvert had perceptible flow, while the leftmost culvert was comprised of standing water interspersed with dry exposed cobbles, indicating that water does not pass through the left-most culvert in low flow conditions. The surveyed section immediately downstream of the bridge was comprised of a riffle-glide sequence, where glides tending to deviate along the banksides, forming slightly undercut banks. Both glides and riffles had a substratum profile which consisted of semi-compacted cobble interspersed with gravels ranging from coarse to fine, with some boulders evident

throughout a small proportion of glides throughout the stretch. Immediately upstream of the bridge this characteristic riffle and glide sequence continued for a short section, before transitioning to a continuous, low-velocity pool which coincided with an upstream constriction of the watercourse channel.

Both banksides downstream of the bridge had a considerably thin and sparse Treeline (WL2) riparian buffer which quickly transitioned to a mosaic of Wet grassland (GS4) and Improved agricultural grassland (GA2), which was evidently utilized as grazing pasture on both adjacent sides. This riparian treeline was comprised predominantly of trees which favour saturated soils, including hawthorn (*Crataegus monogyna*) and grey willow. Emergent and bankside plants present included water cress (*Nasturtium officinale*), hemlock water-dropwort (*Oenanthe crocata*), purple-loosestrife (*Lythrum salicaria*), meadowsweet, harts-tongue fern and the non-native montbretia. Upstream of the bridge where the channel constricted, a dense Scrub (WS1) buffer comprised predominantly of bramble was present on both banksides.

Salmonid spawning habitat was assessed as *Moderate*, owing to the presence of some unconsolidated gravel at pool & glide tailings/riffle heads. There were also some loose gravel deposits on the immediate downstream extent of larger cobbles within riffle sections which could potentially support salmonid spawning. These larger cobbles which occur within riffle sections and glides provide *Moderate* nursery habitat for juvenile salmonids, providing refugia in sections of the watercourse which are presumably highly oxygenated. Given the limited nature of unconsolidated fine gravels and sands, lamprey spp. spawning habitat was assessed as *Moderate*. An assessment of *Poor* was deemed appropriate as a designation of lamprey spp. nursery habitat within the surveyed stretch, owing to the presence of some limited areas of finer gravels occurring within slower-velocity sections at the margins of glides.

Undercut banks which occurred within the downstream extent of the surveyed area downstream of the bridge provide suitable refugia for both adult salmonids and eels, which was supported by sporadic boulder step sequences and aided by moderate shading from the bankside treeline. Upstream of the bridge, the previously described long, continuous pool section had the potential to provide suitable holding habitat for adult salmonids and eels in areas where the substrate was interspersed with looser cobbles. This surveyed stretch was thus assessed as having *Good* fisheries habitat potential in terms of salmonid holding habitat and in terms of fishery habitat potential for eel.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-13. Species recorded included Atlantic salmon and Brown trout.

Table 4-13. Electrofishing results at survey location WF 5.

Species	Length (cm)
Atlantic Salmon (<i>Salmo salar</i>)	8
Brown Trout (<i>Salmo trutta</i>)	15
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	6
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	6
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	6

Kick-sampling was carried out in areas of riffle and glide. Macroinvertebrate diversity and density were *Moderate*. The Q rating assigned to survey location WF 5 was assigned **Q4 –Good**, on the basis that at least one Group A ‘Very Pollution Sensitive’ taxon (*Ecdyonurus* spp.) was present in reasonable numbers, and the Group B ‘Moderately Pollution Sensitive’ taxon *Glossomatidae* occurred in numerous abundance. *Baetis rhodani* was the primary constituent of Group C ‘Pollution Tolerant’ taxa present, with the other three Group C taxa present in small to fair numbers. Results of the macroinvertebrate survey conducted at site WF5 are presented in Table 4-14.

Table 4-14. Results of macroinvertebrates sample at survey location WF 5.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Ecdyonurus</i> spp.	12
Group B – Moderately Pollution Sensitive	<i>Glossomatidae</i>	20
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	6
	<i>Simuliidae</i>	5
	<i>Potamopyrgus antipodarum</i>	2
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-8. A representative image of survey site WF 5.



Plate 4-9. Culverted section of the watercourse where it passed under a roadbridge in the mid-section of Site WF5.

4.1.1.6 WF Survey Site 6 (WF6)

Survey site WF6 was located on the headwaters of the Kildeema, within the boundary of an active wind farm site (EPA code: 28K01, ITM X: 513558 Y: 678520). Properties of the watercourse at this sample location are provided in Table 4-15 and representative photographs of the survey location is shown in Plate 4- 10 and Plate 4- 11.

Table 4-15. Properties of the watercourse at survey location WF6.

Properties	Record
Average Depth (m)	0.2
Average Bank Width (m)	1
Average Wet Width (m)	0.8
Flow	Moderate
Colour	Orange staining when disturbed
Clarity	Turbid when disturbed, clear otherwise
Bank height (m)	LHB 1.5 RHB 1.5
Dominant Substrates	Bedrock: 65% Boulder (>128mm): 10% Cobble (>32–128mm): 20% Gravel (8-32mm): 5%
Substratum Condition	Bedrock-dominated, otherwise loose but coated in iron-oxidising bacteria precipitate.

This section of Eroding/upland river (FW1) was characterized by a bedrock-dominant substrate coated in an extensive gelatinous layer of insoluble reddish-orange slime, typical of a iron oxidising bacterial deposit. This deposit completely coated the wetted area and formed dense deposits in areas of low flow and formed thick plumes of material when disturbed underfoot, creating locally turbid

conditions as the gelatinous complex readily remained in suspension. The survey site was bisected by a gravel roadbridge, beneath which the river flowed through an arched span lined with corrugated iron on its underside (Plate 4-12). Microhabitat composition consisted of bedrock chutes, riffles occurring over sparse-cobbles, and some limited pools, the latter of which were solely present in the upstream extent of the surveyed site. Above these pools, the bank and channel width narrowed significantly, and encroaching Grey willow and other bankside vegetation provided near-unanimous channel shading. Evidence of bankside reinforcement beneath the bridge was present in the form of concrete which formed both banksides, of which the right side was bare while the left bank was partially recolonized, with some mosses and ferns (Harts-tongue and Bracken) growing in sporadic patches.

Aside from the mosaic of buildings and artificial surfaces (BL3) and recolonising bare ground (ED3) which was present beneath the bridge, the immediate riparian zone on both banksides of survey site WF6 consisted of a mosaic of dry acid grassland and heath. The vegetation profile consisted of the aforementioned ferns and willow, devil's-bit scabious, lesser spearwort, bilberry (*Vaccinium myrtillus*), ling (*Calluna vulgaris*), purple moor-grass (*Molinia caerulea*), yorkshire fog (*Holcus lanatus*), bentgrass (*Agrostis* spp.), rosebay willowherb (*Chamaenerion angustifolium*), rough hawkbit (*Leonodon hispidus*) and common bird's-foot trefoil (*Lotus corniculatus*). Beyond the immediate grassland riparian zone (~5m in width), a Conifer plantation (WD4) comprised of sitka spruce (*Picea sitchensis*) occupied the surrounding land on both banksides downstream of the bridge, and on the left side only of the watercourse upstream of the bridge. On the right bankside upstream of the bridge, the dry grassland/heath mosaic comprised the surrounding land.

This laterally constrained, moderate gradient section of the Kildeema was located within the very headwaters of the Annagh catchment and contained no significant gravel deposits. The deposits of finer sediments that were present were covered in the previously described gelatinous precipitate, and as such provided *Negligible* salmonid and lamprey spawning habitat. Similarly, lamprey nursery habitat was assessed as *Negligible*. The bedrock-dominant substrate and limited nature of refugia was *Negligible* in terms of salmonid nursery habitat, while the limited nature of suitable holding pools and the dense films of precipitate slime which occurred in the few pools present provided *Poor* salmonid holding and eel habitat.

Results of the timed qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-16. Rather than the standardised 5-minute survey time, electrofishing at this site was limited to 3:30 minutes, owing to the lateral constriction and vegetative encroachment of the channel in the upper extent. One lone European eel constituted the entirety of the capture.

Table 4-16. Electrofishing results at survey location WF6.

Species	Length (cm)
European Eel (<i>Anguilla anguilla</i>)	18

Kick-sampling was carried out in areas of riffle and glide. Macroinvertebrate diversity and density were extremely depauperate, with three individuals of the Group C 'Pollution Tolerant' *Chironomidae* spp. taxon being the sole macroinvertebrates present. Given the limited nature of macroinvertebrates present within the sample, it was deemed unsuitable to assign a Q-value score to survey location WF6. However, given the limited abundance and that three Group C taxa constituted the entirety of the sample, it is likely that water quality at survey location WF6 was of Poor status.

Table 4-17. Results of macroinvertebrate sampling at survey location WF6.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	-	-
Group B – Moderately Pollution Sensitive	-	-
Group D – Very Pollution Tolerant	<i>Chironomidae</i> sp.	3
Group E – Most Pollution Tolerant	-	-



Plate 4-10. A representative image of the upstream extent of survey site WF6, where the lateral bankside constriction and encroaching willow and ling obscured the wetted channel.



Plate 4-11. The downstream extent of survey site WF6, where a brown-orange gelatinous complex is seen enveloping all wetted substrate.



Plate 4-12. Upstream-facing perspective of the watercourse as it traverses beneath the bridge which bisected the surveyed area.

4.1.1.7 WF Survey Site 7 (WF 7)

Survey site WF 7 was located on the Kildeema Watercourse (EPA code: 28K01,ITM X: 511258 Y: 677962), ~0.7km downstream of the confluence between the Letterkelly watercourse and the Kildeema. Properties of the watercourse at this sample location are provided in Table 4-18. Plate 4-13 and Plate 4-14 show representative photographs of the survey location.

Table 4-18. Properties of the watercourse at survey location WF 7.

Properties	Record
Average Depth (m)	0.3
Average Bank Width (m)	3.2
Average Wet Width (m)	2
Flow	Moderate
Colour	Slight brown humic staining
Clarity	Slight turbidity
Bank height (m)	LHB 1.8 RHB 1.9
Dominant Substrates	Boulder (>128mm): 5% Cobble (>32–128mm): 55% Gravel (8-32mm): 25% Fine gravel (2-8mm) 15%
Substratum Condition	Loose

This surveyed stretch of Eroding/upland river (FW1) featured a cobble-dominant step sequence within the immediate downstream extent, of which gravels of varying size composition occupied the interstitial space between cobbles and the occasionally occurring boulders. At the lowermost surveyed section of the downstream extent the watercourse widened slightly, which co-occurred with a slight reduction in flow from the riffle-dominant step sequence immediately upstream, culminating in a pool-glide sequence. The mid-section of the surveyed extent was sectioned by a ford, presumably used by vehicles

as it was bordered at either side by a bankside gravel track. Situated on the downstream extent of the ford were several large boulders, presumably artificially placed in order to slow down the flow and preserve the vehicle ford. Immediately upstream of the ford the channel constricted slightly, which formed a narrow, deep channel comprised of deeper pools (~55cm) and glides, where larger boulders were interspersed. Abstraction piping was recorded within this deeper pool approximately 3 metres upstream of the ford.

The immediate bankside was comprised of a Scrub (WS1) riparian buffer on both banksides, occasionally interspersed with the occasional beech tree. This scrub sharply transitioned on both banksides to wet grassland (GS4) adjacent to the riparian zone, and in the upper extent Wet grassland directly bordered the watercourse at sections, particularly on the left-hand side. This scrub buffer was predominantly comprised of gorse, bramble and hawthorn. Other marginal and riparian vegetation included bracken fern (*Pteridium aquilinum*), jointed rush (*Juncus articulatus*), wild angelica (*Angelica sylvestris*), meadowsweet, soft rush, meadow buttercup and false oat-grass and water starwort (*Callitriche* sp.).

Salmonid and lamprey spp. spawning habitat were assessed as *Moderate*, owing to the infrequent occurrence of pool tailings/riffle heads and pool/glide edges with suitable deposits of fine gravel beds. Lamprey spp. nursery habitat was assessed as *Poor*, explained by the occurrence of occasional deposits of unconsolidated fine gravels on pool and glide borders & tailings, with finer suitable sediment beds being absent. Salmonid nursery habitat was classed as *Excellent*, as the oxygenated cobble-dominant riffles provided ideal refugia and foraging opportunities for juvenile-class salmonids. Salmonid holding habitat was assessed as *Good*, as the occasional pools present could provide adequate refugia where they extended occasionally into undercut banks, but the riparian scrub often failed to provide ideal shading and cover of such pools. The larger cobbles present within the transition between riffles and glides, predominantly on the section downstream of the ford, provided *Excellent* eel habitat, as there was an abundance of suitable interstitial space between the substrata which could host eels of various lifestages.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-19. Brown trout were the sole species recorded. In addition to the fourteen trout which were successfully caught and measured, three salmonids (presumably brown trout) were missed (seen but not captured) during the course of the electrofishing survey.

Table 4-19. Electrofishing results at survey location WF 5.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	13
Brown Trout (<i>Salmo trutta</i>)	13
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	14
Brown Trout (<i>Salmo trutta</i>)	14
Brown Trout (<i>Salmo trutta</i>)	17
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	7

Kick-sampling was carried out in areas of riffle and glide. Macroinvertebrate diversity and density were moderate. The Q rating assigned to survey location WF 7 was assigned **Q4 – Good**, on the basis that Group A ‘Very Pollution Tolerant’ and Group B ‘Moderately Pollution Tolerant’ taxa constituted ~15% of the sample, with the Group A taxon *Ecdyonurus* spp. present in fair numbers. Group C taxa

constituted the most abundant grouping present (~84%) of which *B. rhodani* was the most numerous taxon. Results of the kick-sample are summarised in

Table 4-20.

Table 4-20. Results of macroinvertebrates sample at survey location WF 7.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Ecdyonurus</i> spp.	3
	<i>Perlidae</i> (early instar)	1
Group B – Moderately Pollution Sensitive	<i>Baetidae</i>	1
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	15
	<i>Gammarus</i> spp.	4
	<i>Simuliidae</i>	4
	<i>Chironomidae</i>	2
	<i>Pediciidae</i>	2
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-13. A representative image of the upstream extent of Survey site WF 7.



Plate 4-14. A representative image of the downstream extent of Survey site WF 7.

4.1.1.8 WF Survey Site 8 (WF8)

Survey site WF8 was located on the Kildeema watercourse, approximately 2.2km downstream of survey site WF7, and approximately 3.4km upstream of the confluence where the Kildeema and the Kildeema North watercourses converge (EPA code:28K01,ITM X: 509341 Y: 676805). Properties of the watercourse at this sample location are provided in Table 4-21. Plate 4-15 and Plate 4-16 show representative photographs of the survey location.

Table 4-21. Properties of the watercourse(s) at survey site WF8.

Properties	Record
Average Depth (m)	0.1 downstream, 0.5 upstream
Average Bank Width (m)	1.6
Average Wet Width (m)	1.5
Bank height (m)	LHB 1.5 RHB 1.5
Flow	Moderate flow
Colour	Slight brown humic staining
Clarity	Slightly turbid
Dominant Substrates	Boulder (>128mm): 15% Cobble (>32–128mm): 60% Gravel (8-32mm): 10% Silt (<0.25mm): 15%, coating much of the substratum directly adjacent to and immediately adjacent to the poached right bankside
Substratum Condition	Compacted

This surveyed stretch of Eroding/upland River (FW1) exhibited notable continuity in both its channel width and adjacent bankside height, suggesting it was historically locally channelised. At the time of visiting, left and right banksides were uniform in height (~1.5m) and there was little variability in the channel width (~1.5m). At the mid-point of the surveyed stretch, there was an area of significant poaching (Plate 4-17), where recent livestock access was evident from the surrounding Improved agricultural grassland (GA1). Poaching on the right bankside contributed to a significant localized

instream silt-load, which visibly coated substratum adjacent to and immediately downstream of the access point. Within the downstream extent of the surveyed site, cobble-step formations represented the dominant microhabitat present, with silt coating the semi-compacted substrate in marginal areas of low flow particularly. Upstream of the access point, encroaching vegetation contributed to marginal shading, which co-occurred with a decline in riffle-step formations and instead the dominance of deeper & continuous pools and glides which often laterally extended into undercut banksides. Large boulders and some areas of gravel and silt beds were present within this upper surveyed extent.

Aside from the access point, there existed a continuous thin scrub buffer comprised predominantly of bramble on both the left and right banksides. Other marginal and riparian vegetation consisted of common ragwort, bracken, angelica spp., false oat-grass, and the non-native montbretia. Within the upper surveyed extent, some young grey willow encroached over the watercourse, and often contributed significantly to the aforementioned localized shading, aided by the undercut banks.

The limited nature of gravel deposits and the silt-laden and compacted nature of the substrate composition at site WF8 determined salmonid spawning habitat to be of *Poor* status, particularly within the adjacent and downstream extent of the livestock access point. Similarly, the limited and compacted nature of finer substrates determined lamprey spawning and nursery habitat to be of *Poor* quality, particularly as finer silt sediments present were littered with detritus. The compacted cobble-riffle step formations which characterized the lower surveyed extent provided *Moderate* salmonid nursery habitat, providing some but limited suitable refugia for juveniles. The continuous pool and glide formations which co-occurred with undercut banks, overhanging vegetation and some boulders determined salmonid holding habitat to be locally of *Good* quality within the upper surveyed extent, with the marginal refugia created by this channel structure being of *Good* quality in terms of eel habitat.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-22. Brown trout of various age classes and one individual European Eel were captured during the electrofishing survey at WF8.

Table 4-22. Electrofishing results at survey site WF8.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	10.1
Brown Trout (<i>Salmo trutta</i>)	16
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	17.3
Brown Trout (<i>Salmo trutta</i>)	20.3
Brown Trout (<i>Salmo trutta</i>)	16.8
Brown Trout (<i>Salmo trutta</i>)	18
Brown Trout (<i>Salmo trutta</i>)	18
Brown Trout (<i>Salmo trutta</i>)	16.5
Brown Trout (<i>Salmo trutta</i>)	14.7
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	11.9
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	10.3
Brown Trout (<i>Salmo trutta</i>)	12.2
Brown Trout (<i>Salmo trutta</i>)	9.4
Brown Trout (<i>Salmo trutta</i>)	13.7
Brown Trout (<i>Salmo trutta</i>)	10.4
Brown Trout (<i>Salmo trutta</i>)	14
Brown Trout (<i>Salmo trutta</i>)	12.8
Brown Trout (<i>Salmo trutta</i>)	8.5
Brown Trout (<i>Salmo trutta</i>)	16.4
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	15

Brown Trout (<i>Salmo trutta</i>)	9.4
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	7.4
Brown Trout (<i>Salmo trutta</i>)	12.5
Brown Trout (<i>Salmo trutta</i>)	13.2
Brown Trout (<i>Salmo trutta</i>)	7.9
Brown Trout (<i>Salmo trutta</i>)	9.5
Brown Trout (<i>Salmo trutta</i>)	9.4
Brown Trout (<i>Salmo trutta</i>)	9.3
Brown Trout (<i>Salmo trutta</i>)	9.4
Brown Trout (<i>Salmo trutta</i>)	8.4
Brown Trout (<i>Salmo trutta</i>)	8.3
Brown Trout (<i>Salmo trutta</i>)	7.4
Brown Trout (<i>Salmo trutta</i>)	8.9
European Eel (<i>Anguila anguila</i>)	32

Kick-sampling was carried out at survey site WF8 in areas of riffle and glide. The Q rating assigned to survey location WF 8 was **Q3 - Poor**, on the basis that Group A ‘Very Pollution Tolerant’ taxa were absent from the sample, while some Group B ‘Moderately Pollution Tolerant’ taxa were present but depauperate in terms of richness and abundance, with 5 *Glossosomatidae* constituting the entirety of identified Group B taxa. Group C taxa represented the dominant grouping (~70%) of which *Chironimidae* were the most abundant. Results of the kick-sample are summarised in Table 4-23.

Table 4-23. Results of macroinvertebrate sampling at survey location WF8.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	-	-
Group B – Moderately Pollution Sensitive	<i>Glossosomatidae</i>	5
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	1
	<i>Philopotamidae</i>	1
	<i>Hydropsyche</i> spp.	2
	<i>Hydrachnidia</i>	3
	<i>Chironomidae</i>	5
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-15. A representative image of the upstream extent of survey site WF8.



Plate 4-16. A representative image of the downstream extent of survey site WF8, with wire evident traversing the channel width to presumably prevent cattle access further downstream of the accessible area of poached right bankside.



Plate 4-17. An image of the heavily poached area of right bankside located at the mid-section of the surveyed stretch, where recent livestock access to the Kildeema watercourse was evident.

4.1.1.9 WF Survey Site 9 (WF9)

Survey site WF9 was located directly above and below the confluence of the Kildeema with the Annagh River (EPA codes: 28A03 & 28K01, ITM X: 504788 Y: 676194), where surveying began immediately downstream of the confluence on the main stem of the Annagh river and terminated on the Kildeema River approximately 23m upstream of the confluence. Properties of the watercourse(s) at this sample location are provided in Table 4-24. Plates 4-19, 4-20 and 4-21 show representative photographs of the survey location.

Table 4-24. Properties of the watercourse(s) at survey site WF9.

Properties	Record
Average Depth (m)	0.65
Average Bank Width (m)	5
Average Wet Width (m)	5
Bank height (m)	LHB 2.5 RHB 1.9
Flow	Moderate flow
Colour	Highly coloured brown humic staining
Clarity	Slightly turbid
Dominant Substrates	Bedrock: 40% Boulder (>128mm): 20% Cobble (>32-128mm): 20% Gravel (8-32mm): 10% Fine gravel (2-8mm): 5% Silt (<0.25mm): 5%
Substratum Condition	Semi-compacted

This surveyed stretch of river situated within the mid-to-lower Annagh subcatchment displayed features consistent with the classification of an Eroding/upland river (FW1). The commonly occurring exposed bedrock substrate present throughout the surveyed stretch was occasionally interspersed with some

areas of boulder & cobble with interstitial gravel, and often co-occurring where river sections would vary laterally in their substrate composition, as bedrock was partially covered with a thin layer of smaller substrates. There was notable variation in microhabitats and flow types present, with cobble-dominated riffles and deep (~1.4m+) pools representing the primary hydromorphological features present. The downstream extent of the surveyed stretch was characterized by a deep pool which extended along the left-hand bank of the Annagh River main stem, with some areas of gravel and silt deposits present at the pool tailing and border. The uppermost surveyed stretch of the river consisted of a free-fall cascade of approximately 0.3m in height, which fed into a deep, bedrock-lined pool (Plate 4-20).

The immediate bankside consisted of wet grassland (GS4), which transitioned to a mosaic of wet grassland (GS4) – improved agricultural grassland (GS1), that was evidently used as grazing pasture on both the left and right banks. Despite fencing being present on both banksides, there was livestock poaching evident on the right-hand bank of the Annagh River, immediately downstream of the confluence. The riparian grassland was occasionally interspersed with trees including hawthorn and grey willow. Emergent and bankside vegetation consisted of gorse, spear thistle, purple-loosestrife, yellow iris, ribwort plantain, wild angelica, broad-leaved dock, common ragwort and common bird’s-foot trefoil.

The occurrence of cobble-bedrock riffles with interstitial gravel provided localised *Good* spawning habitat for salmonids, whereas the finer gravels and sands deposited at pool edges and tailings provided *Good* localised lamprey spp. spawning and nursery potential, albeit restricted to a select few suitable substrate beds occurring in areas of low-flow. However, throughout the surveyed stretch as a whole such suitable salmonid and lamprey spawning and nursery features were limited, leading to an overall assessment of *Moderate* when taking the entirety of the surveyed location into account. The larger cobbles and boulders present in areas of riffle provided *Good* salmonid nursery habitat, whereas the large deep holding pools present on both the Annagh and the Kildeema watercourses at this location provided *Excellent* holding potential for adult salmonids. Similarly, the deep pools present and the larger cobbles & boulders present within glide areas throughout the surveyed stretch provided *Excellent* potential habitat for eels.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-25. Brown trout, juvenile Atlantic salmon and eel were recorded during the electrofishing survey at WF9.

Table 4-25. Electrofishing results at survey location WF 9.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	15.5
Brown Trout (<i>Salmo trutta</i>)	14.5
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	6
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	6
Brown Trout (<i>Salmo trutta</i>)	8
Atlantic Salmon (<i>Salmo salar</i>)	9.7
Atlantic Salmon (<i>Salmo salar</i>)	12.4
Atlantic Salmon (<i>Salmo salar</i>)	8
Atlantic Salmon (<i>Salmo salar</i>)	9
Atlantic Salmon (<i>Salmo salar</i>)	7
Atlantic Salmon (<i>Salmo salar</i>)	9
Atlantic Salmon (<i>Salmo salar</i>)	6.5
Atlantic Salmon (<i>Salmo salar</i>)	6.5
European Eel (<i>Anguilla anguilla</i>)	7
European Eel (<i>Anguilla anguilla</i>)	8

Kick-sampling was carried out in areas of riffle and glide. The Q rating assigned to survey location WF 9 was **Q3-4 – Moderate**, on the basis that Group A ‘Very Pollution Tolerant’ and Group B ‘Moderately Pollution Tolerant’ taxa were present but depauperate in terms of richness and abundance. Group C taxa represented the dominant grouping (~96%) of which *P. antipodarum* was the most abundant taxon. Results of the kick-sample are summarised in Table 4-26.

Table 4-26. Results of macroinvertebrate sampling at survey location WF9.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Ecdyonurus</i> sp.	1
Group B – Moderately Pollution Sensitive	<i>Glossosomatidae</i>	1
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	12
	<i>Gammarus</i> spp.	5
	<i>Potamopyrgus antipodarum</i>	31
	<i>Rhyacophilidae</i>	2
	<i>Hydropsyche</i> sp.	1
	<i>Polycentropus</i> spp.	2
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-18. Downstream-facing extent of survey location WF9.



Plate 4-19. Upstream-facing extent of survey location WF9.



Plate 4-20. Cascade flowing into a bedrock-dominant pool at the upper extent of survey location WF9.

4.1.1.10 WF Survey Site 10 (WF10)

Survey site WF10 was located on the confluence of the Fahanlunaghta Beg watercourse with the Derrymore '28' watercourse. Surveying began on the main stem of the Derrymore '28' and concluded upstream on the Fahanlunaghta Beg, approximately 8 meters upstream of the confluence. (EPA codes: 28D03 & 28F08, ITM X: 511761 Y: 682709). Properties of the watercourse(s) at this sample location are provided in Table 4-27. Plate 4- 21 and Plate 4-22 show representative photographs of the survey location.

Table 4-27. Properties of the watercourse(s) at survey site WF10.

Properties	Record
Average Depth (m)	0.3
Average Bank Width (m)	2.5
Average Wet Width (m)	1.8
Bank height (m)	LHB 1.2 RHB 0.8
Flow	Moderate flow
Colour	Slightly coloured brown humic staining
Clarity	Slightly turbid
Dominant Substrates	Boulder (>128mm): 5% Cobble (>32–128mm): 20% Gravel (8-32mm): 60% Fine gravel (2-8mm): 10% Sand (0.25-2mm) 5%
Substratum Condition	Loose & unconsolidated

This surveyed stretch of Eroding/upland river (FW1) situated within the headwaters of the Inagh catchment was under moderate flow conditions and displayed slight brown humic staining with slight turbidity present upon the time of visiting. The surveyed stretch was mid-sectioned by a single span stone arch roadbridge, in which the Derrymore '28' watercourse flowed underneath in a continuous, unculverted channel directly downstream of the confluence. The downstream extent of the surveyed area contained a boulder-step sequence which had some large woody debris (LWD) present within the pools and glides of the channel. Immediately upstream of this sequence the Derrymore '28' transitioned to areas of continuous cobble and gravel riffle with a moderately fast flow regime. Upstream of the bridge, the substrate surrounding the confluence was dominated by a matrix of fine gravels interspersed with occasional sand deposits, which were usually deposited on the downstream extent of the occasional cobbles which interspersed the riffle-dominant morphology at this extent. Notably, there was evidence of fly tipping surrounding the bridge, with the largest accumulation of tipped waste being on the upstream extent. Undercut banks were present on both banksides at points (typically downstream of the bridge), while immediately downstream of the bridge a small side-channel met the Derrymore '28' on the right bank (Plate 4-23).

The immediate bankside consisted of a Scrub (WS1) buffer, which transitioned to a mosaic of Wet grassland (GS4) – Improved agricultural grassland (GS1) on the left-bankside, while on the right bankside a roadway (Buildings and artificial surfaces (BL3) ran parallel to the bank beyond this scrub buffer. which was evidently used as grazing pasture on both the left and right banks. Throughout the surveyed stretch encroaching willow trees provided moderate shading throughout, which was most prominent at the downstream extent of the surveyed area and least prominent upstream of the bridge. The riparian scrub consisted of gorse & bramble interspersed with aforementioned grey willow. Emergent and bankside vegetation consisted of meadowsweet, hart's-tongue fern, wild angelica, hard fern, common hogweed (*Heracleum sphondylium*), creeping buttercup (*Ranunculus repens*), herb robert (*Geranium robertianum*), opposite-leaved-golden-saxifrage (*Chrysosplenium oppositifolium*) and the high-impact 1st and 3rd schedule invasive Himalayan balsam (*Impatiens glandulifera*).

The occurrence of finer gravel beds interspersed with some sand occurring within riffles upstream of the bridge provided *Good* potential spawning habitat for salmonids and *Moderate* spawning and

nursery potential for Lamprey spp. Areas of cobble occurring within riffles provided *Good* potential in terms of nursery habitat for juvenile salmonids, while the boulder-step formations and LWD present within pools and glides provided localized *Good* holding potential for both adult salmonids and indeed eels.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-28. Brown trout of various age classes were the sole species recorded over the course of the survey.

Table 4-28. Electrofishing results at survey location WF 10.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	17
Brown Trout (<i>Salmo trutta</i>)	14
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	6
Brown Trout (<i>Salmo trutta</i>)	6

Kick-sampling was carried out in areas of riffle and glide. The Q rating assigned to survey location WF 9 was **Q3 - Poor**, on the basis that Group A ‘Very Pollution Tolerant’ taxa were absent from the sample, while there was a sole individual Group B Moderately Pollution Tolerant’ taxon present. Group C taxa represented the dominant grouping (~96%) of which *B. rhodani* and *Gammarus* sp. were the most abundant taxa. Results of macroinvertebrate sampling at survey location WF9 are presented in Table 4- 29.

Table 4- 29. Results of macroinvertebrate sampling at survey location WF10.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	-	-
Group B – Moderately Pollution Sensitive	<i>Sericostomatidae</i> sp.	1
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	10
	<i>Gammarus</i> spp.	7
	<i>Simuliidae</i> spp.	8
	<i>Dicranota</i> sp.	1
	<i>Seratella</i> spp.	2
	<i>Ancylus fluviatilis</i>	1
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-21. Downstream extent of the survey location WF10.



Plate 4-22. Upstream extent of survey location WF10.



Plate 4-23. Side channel which met the Derrymore ‘28’ watercourse at survey location WF10.

4.1.1.11 WF Survey Site 11 (WF11)

Survey site WF11 was located on the Fahanlunaghtamore watercourse within the Inagh subcatchment. (EPA code: 28F09, ITM X: 512973 Y: 681788). Properties of the watercourse(s) at this sample location are provided in Table 4-30. Plate 4-24 and Plate 4-25 show representative photographs of the survey location.

Table 4-30. Properties of the watercourse(s) at survey site WF11.

Properties	Record
Average Depth (m)	0.32
Average Bank Width (m)	2.2
Average Wet Width (m)	1.8
Bank height (m)	LHB 2.4 RHB 0.9
Flow	Moderate flow
Colour	Slightly coloured brown humic staining
Clarity	Slightly turbid
Dominant Substrates	Boulder (>128mm): 5% Cobble (>32–128mm): 20% Gravel (8-32mm): 55% Fine gravel (2-8mm): 15% Silt (>2mm): 5%
Substratum Condition	Loose & unconsolidated

This surveyed stretch of Eroding/upland river (FW1) was situated within the headwaters of the Inagh subcatchment. The surveyed stretch was mid-sectioned by a single-slab bridge which was positioned approximately 1 metre above the surface of the watercourse. The downstream extent displayed

evidence of extensive bank poaching on the left bankside, which released localised plumes of silt-rich mud into the watercourse when disturbed. The downstream extent of the surveyed area displayed moderate shading which was of an occasional high degree where willows spanned the extent of the watercourse from either of the steep banksides. The channel was in an apparent natural condition and likely was not subjected to intensive modification historically at this location. The channel exhibited significant flow diversity, with good representation from riffle, glide and pool microhabitats present within the surveyed extent. Downstream of the bridge, glides and pools interspersed with boulders and cobbles tended to flow adjacent to and within the undercut banks present on the right bankside, while upstream the watercourse consisted of a deeper (~0.4m) pool which spanned the width of the channel. Gravels ranging in composition from coarse to fine occupied the interstitial space between cobbles and boulders, and represented the dominant substrate in areas of riffle. Some growths of filamentous green algae present on larger substrata likely indicate evidence of nutrient enrichment within the watercourse at this location.

Bankside land use external of the immediate riparian zone was dominated by Wet grassland (GS4), which was evidently used as cattle pasture. Within the downstream extent, the right bankside was comprised of a laterally narrow but dense Riparian woodland (WN5). The immediate riparian zone had a buffer of Scrub (WS1) on the left bankside, which consisted of bramble predominantly, and was interspersed with grey willow and masses of great woodrush within the downstream surveyed extent. Upstream of the bridge, shading of the channel declined as a scrub buffer occupied both banksides, coinciding with a reduction in tree density. Emergent and bankside vegetation was comprised of hart's-tongue fern, Hard fern, softshield fern, soft rush, creeping buttercup, herb robert, opposite-leaved-golden-saxifrage, ivy (*Hedera helix*), hogweed (*Heracleum sphondylium*) and the small creeping moss *Rhynchostegium riparioides*.

The presence of some areas of gravel-dominant riffle microhabitat provided *Good* spawning potential for salmonids, although the substrate size was largely unsuitable for lamprey spp. spawning and nursery requirements, and as such this location was assessed to have *Moderate* fisheries potential for lamprey spp. spawning and *Poor* potential for nursery habitat. The deposits of cobbles and some boulders within glides were strengthened by shaded points to provide *Excellent* salmonid nursery habitat, which was most prominent on the downstream extent of the visited survey extent. Undercut banks of moderate depth and the section of continuous pool upstream of the roadbridge had the potential to provide *Good* holding habitat for salmonids, while the unconsolidated nature of the substrate within these microhabitats provided *Good* habitat potential for eel.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-31. Brown trout of various age classes were the sole species recorded over the course of the survey.

Table 4-31. Electrofishing results at survey location WF 11.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	14
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	6
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	6

Kick-sampling was carried out in areas of riffle and glide. The Q rating assigned to survey location WF 9 was **Q3 - Poor**, on the basis that Group A 'Very Pollution Tolerant' taxa were absent from the sample, while there was one sole individual of Group B Moderately Pollution Tolerant' taxon present. Group C taxa represented the dominant grouping (~85%) of which *Gammarus* spp. were the most

abundant taxa. Two group D taxa, *Asseles Aquaticus* and *Nematoda* were also observed. Results of macroinvertebrate sampling at survey location WF9 are presented in Table 4-32.

Table 4-32. Results of macroinvertebrate sampling at survey location WF11.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	-	-
Group B – Moderately Pollution Sensitive	<i>Glossosomatidae</i>	1
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	5
	<i>Gammarus</i> spp.	7
	<i>Simuliidae</i>	3
	<i>Chironomidae</i>	7
	<i>Seratella ignata</i>	1
	<i>Diptera</i> sp.	1
Group D – Very Pollution Tolerant	<i>Asseles Aquaticus</i>	1
	<i>Nematoda</i>	2
Group E – Most Pollution Tolerant	-	-



Plate 4-24. The downstream-facing extent of survey location WF11.



Plate 4-25. The upstream extent of survey location WF 11.

4.1.1.12 WF Survey Site 12 (WF12)

Survey site WF12 was located on the Derrymore ‘28’ watercourse within the Inagh subcatchment. (EPA code: 28D03, ITM X: 513800 Y: 681861). Properties of the watercourse(s) at this sample location are provided in Table 4-33. Plate 4-26 and Plate 4-27 show representative photographs of the survey location.

Table 4-33. Properties of the watercourse(s) at survey site WF12.

Properties	Record
Average Depth (m)	0.4
Average Bank Width (m)	2.9
Average Wet Width (m)	2.8
Bank height (m)	LHB 2 RHB 2
Flow	Fast, particularly upstream
Colour	Slightly coloured brown humic staining
Clarity	Slightly turbid
Dominant Substrates	Bedrock: 5% Boulder (>128mm): 10% Cobble (>32–128mm): 20% Gravel (8-32mm): 25% Fine gravel (2-8mm): 30% Silt (>2mm): 10%
Substratum Condition	Loose & unconsolidated

This surveyed stretch of Eroding/Upland River (FW1) was situated approximately 0.16km downstream of the confluence between the Derrymore ‘28’ and a smaller watercourse which flowed to the Derrymore from the south. The surveyed stretch was mid-sectioned by a single-slab bridge which was positioned approximately 1.8 metres above the surface of the watercourse at the time of visiting. The

downstream extent of the surveyed site below the bridge had a substratum profile characterised by boulder and cobble interspersed with gravel, and occasional exposed bedrock. Microhabitat composition was dominated within the lower extent by glides and pools, which scoured along the left bankside, creating a deep (~55cm) channel which slightly undercut into the earthen bank. The moderate flow at the downstream extent facilitated the deposition of finer gravels and some silt at pool margins, which tended to be situated in highly localised and limited embryonic sub-surface bars adjacent to the right bankside. The moderate shading present below the bridge declined with upstream movement, as the upper extent of the visited survey was characterized by steep vegetated banks littered with occasional Grey willows to provide some localised shading where they occurred. Substrate composition upstream had greater representation of exposed bedrock planes than the downstream extent, and contained several large boulders which in isolation encouraged the formation of eddies, and when occurring in tandem with channel-spanning cobbles created step formations leading into pools (Plate 4-28).

The immediate riparian zone largely consisted of a Scrub (WS1) buffer, which transitioned sharply to Wet grassland (GS4), which was saturated on the left-bankside. Emergent and riparian vegetation consisted of hart's-tongue fern, hard fern, softshield fern, bracken fern, creeping buttercup, herb robert, yellow iris, wood rush, meadowsweet, common hogweed, nipplewort (*Lapsana communis*), cock's foot grass (*Dactylis glomerata*), square-stalked St. John's-wort (*Hypericum tetrapterum*), tutsan (*Hypericum androsaemum*), the non-native montbrecia and the 1st and 3rd scheduled invasive Himalayan balsam.

The presence of some areas of gravel-containing smooth, fast glides provided *Moderate-Good* spawning opportunity for salmonids and *Moderate* spawning potential for lamprey spp. However, the limited nature of finer sediment beds occurring within suitable areas of slower, undisturbed flow regimes determined lamprey spp. nursery habitat to be assessed as *Poor*, as swifter flows typically dominated areas of extremity fine sediment deposits present. Salmonid nursery and holding habitat was assessed as locally *Good*, as undercut banks occurring with trailing bankside vegetation were complimented by the diversity of substrate size present within the channel to provide adequate suitability. Similarly, undercut banks provided some suitable refugia for eel, and as such this surveyed stretch was assessed as *Moderate* in this regard.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-34. Brown trout of various lengths, typically representing 1+ adult age classes were captured during the electrofishing survey at site WF12.

Table 4-34. Electrofishing results at survey location WF 12.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	22
Brown Trout (<i>Salmo trutta</i>)	14
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	13
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	13

Kick-sampling was carried out in areas of riffle and glide. Macroinvertebrate richness and abundance was observed to be low. The Q rating assigned to survey location WF 9 was **Q3 - Poor**, on the basis that Group A 'Very Pollution Tolerant' taxa were absent from the sample, while there were four Group B Moderately Pollution Tolerant' taxa present. Group C taxa represented the dominant grouping (~66%) of which *B. rhodani* were the most abundant. Results of the kick-sample at site WF12 are presented in Table 4-35.

Table 4-35. Results of macroinvertebrate sampling at survey location WF12.

Indicator Group	Taxon	Abundance
Group A - Very Pollution Sensitive	-	-

Group B – Moderately Pollution Sensitive	<i>Sericostomatidae</i>	2
	<i>Glossosomatidae</i>	4
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	8
	<i>Gammarus</i> spp.	4
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-26. The downstream extent of the survey location WF12, facing upstream.



Plate 4-27. The upstream extent of the survey location WF12, facing downstream.

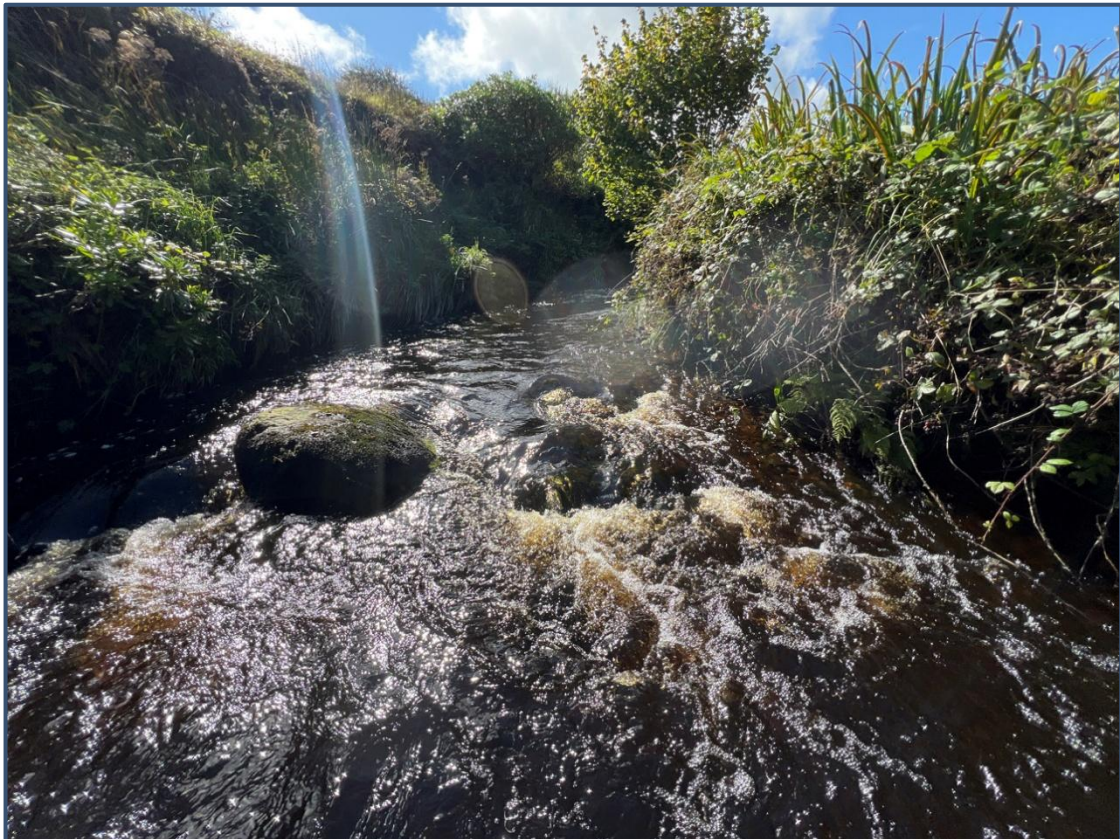


Plate 4-28. Flow regime of bedrock and cobble step leading into a deeper pool at the upstream extent of survey location WF12.

4.1.113 WF Survey Site 13 (WF13)

Survey site WF13 was located on the Knockacarn watercourse within the Inagh subcatchment (EPA code: 28K42, IG Ref: R 13842 81832). The survey location was situated approximately 1.95km upstream of the confluence between the Knockacarn and the Derrymore '28'. (EPA codes: 28D03, ITM X: 514233 Y: 680988). Properties of the watercourse(s) at this sample location are provided in Table 4-36. Plate 4-29 and Plate 4-30 show representative photographs of the survey location.

Table 4-36. Properties of the watercourse(s) at survey site WF13.

Properties	Record
Average Depth (m)	0.28
Average Bank Width (m)	2.2
Average Wet Width (m)	2.2
Bank height (m)	LHB 1.6 RHB 1.3
Flow	Moderate
Colour	Slightly coloured brown humic staining
Clarity	Slightly turbid
Dominant Substrates	Bedrock: 40% Boulder (>128mm): 30% Cobble (>32-128mm): 20% Gravel (8-32mm): 10%
Substratum Condition	Loose & unconsolidated

This surveyed stretch of Eroding/Upland River (FW1) was framed at its lower extent by a bedrock and boulder step fall, which was preceded by a deep pool of up to 0.5m depth directly upstream of this sequence. Throughout the surveyed stretch, the substrate profile was defined by sequential bedrock steps which occurred intermittently, with bedrock sequences being disbanded by sections of boulder and cobble, of which smaller cobbles and gravels occupied the interstitial space. A series of riffles and glide sequences occupied the downstream extent below the single span stone arch bridge which mid-sectioned the surveyed stretch, concluding at the aforementioned deep pool and fall sequence. Immediately downstream of the bridge, a continuous pool of smooth, unbroken water ran longitudinally under the bridge, which flowed to an area of glide as the channel narrowed.

The immediate riparian zone largely consisted of Wet grassland (GS4), which was evidently used as cattle pasture on the right bankside. This wet grassland was interspersed at points downstream of the bridge with a Scrub (WS1) habitat comprised predominantly of gorse, which thickened on the right-bankside at the upstream surveyed extent. Immediately beyond the upstream limit, sporadic trees encroaching over the channel disrupted the scrub situated on the right bank. Marginal and riparian vegetation consisted of hart's-tongue fern, hard fern, meadowsweet, wild angelica and garden heliotrope (*Heliotropium arborescens*). Instream, stonewort (*Chara* sp.) and greater water-moss (*Fontinalis antipyretica*) occurred intermittently at channel edges, while filamentous algae was present on some larger instream boulders, likely being indicative of nutrient enrichment within the watercourse.

The dominance of larger substrates restricted salmonid spawning habitat to *Poor* status, with the reduced density of coarse gravel deposits largely unsuitable. This substrate profile was of *Negligible* suitability for lamprey spp., as finer gravels, sands and silts were largely absent from this survey location. Salmonid nursery, holding and eel habitats were assessed as *Good*, owing to the variety of complex microhabitats interspersed with larger boulders capable of providing cover, and deeper glides upstream with overgrowing and trailing bankside vegetation providing sufficient shading and refugia.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-37. Brown trout of various lengths (7-13cm) were captured, of which juvenile trout were the primary age class.

Table 4-37. Electrofishing results at survey location WF 13.

Species	Length (cm)
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Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	7
Brown Trout (<i>Salmo trutta</i>)	8
Brown Trout (<i>Salmo trutta</i>)	9
Brown Trout (<i>Salmo trutta</i>)	13
Brown Trout (<i>Salmo trutta</i>)	12
Brown Trout (<i>Salmo trutta</i>)	13
Brown Trout (<i>Salmo trutta</i>)	6

Kick-sampling was carried out in areas of riffle and glide. Macroinvertebrate richness and abundance was observed to be moderate, with 42 individuals across 11 taxonomic groupings identified. Site WF13 was assigned a Q value of **Q3-4 – Moderate**, owing to the presence of group A and B taxa, the dominance of Group C taxa (of which *B. rhodani* was the most prevalent) and the occurrence of Group D ‘very pollution tolerant’ within the sample. The results of macroinvertebrate sampling at site WF13 are presented in Table 4- 38 below.

Table 4- 38. Results of macroinvertebrate sampling at survey location WF13.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Ecdyonurus</i> sp.	4
	<i>Perlidae</i> (early instar)	1
Group B – Moderately Pollution Sensitive	<i>Glossosomatidae</i>	4
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	12
	<i>Gammarus</i> spp.	2
	<i>Hydropsyche</i> sp.	1
	<i>Serratella</i> spp.	3
	<i>Limnius</i> sp.	1
	<i>Hydrachnidia</i>	1
	<i>Simuliidae</i>	3
	<i>Ancyclus fluviatilis</i>	5
<i>Syllidae</i>	1	
Group D – Very Pollution Tolerant	<i>Glossiphoniidae</i>	5
Group E – Most Pollution Tolerant	-	-



Plate 4-29. Downstream extent of Survey site WF13, facing downstream towards a bedrock & boulder step fall sequence.



Plate 4-30. The upstream extent of survey location WF13.

4.1.1.14 WF Survey Site 14 (WF14)

Survey site WF14 was located on the Derrymore ‘28’ watercourse within the Inagh subcatchment (EPA code: 28D03,ITM X: 516387 Y: 682053). The survey location was situated approximately 1.15km downstream of the confluence between the Knockacarn and the Derrymore ‘28’ watercourses. Properties of the watercourse at this sample location are provided in Table 4-39. Plate 4- 31 and Plate 4- 32 show representative photographs of the survey location.

Table 4-39. Properties of the watercourse(s) at survey site WF14.

Properties	Record
Average Depth (m)	0.45
Average Bank Width (m)	5-6
Average Wet Width (m)	5-6
Bank height (m)	LHB 1-1.5 RHB 2-3
Flow	Moderate -fast
Colour	Highly coloured brown humic staining
Clarity	Slightly turbid
Dominant Substrates	Boulder (>128mm): 10% Cobble (>32–128mm): 20% Gravel (8-32mm): 40% Fine gravel (2-8mm): 30%
Substratum Condition	Loose & unconsolidated

This surveyed stretch of Eroding/upland river (FW1) was comprised of an unshaded channel at its downstream extent, in which a smooth, moderate to fast glide represented the predominant flow and microhabitat typology. The channel had a mean depth of 0.45m, which was moderately uniform laterally. apart from one deeper channel of approximately 1m+ depth which was located immediately downstream of the single span stone arch bridge which mid-sectioned the survey area. Below the bridge, loose, unconsolidated gravel dominated the substratum, of which there was notable variation in size ranging from fine to coarse, with the finer gravels predominantly present in subsurface bars adjacent to banksides in areas of reduced flow. Intermittent boulders and cobbles were present downstream, while the upstream section above the bridge had an increased density of larger substratum, co-occurring with an increase in instream LWD and shading from the ash & willow Riparian woodland (WN5) which encroached over the channel from both banksides.

The downstream left-bankside led directly to a private residential garden, which was classed as Amenity grassland (GA2). This garden formed the left side immediate riparian zone and land use for a stretch of approximately 25 metres, before transitioning downstream to Scrub (WS1), matching that of the right bank, which was also scrub-dominated downstream of the bridge.

Emergent and riparian vegetation consisted of bramble, hart’s-tongue fern, meadowsweet, ribwort plantain, nettle, softshield fern, and the high-impact 1st and 3rd schedule invasive Himalayan balsam. Instream, water milfoil (*Myriophyllum* spp.) was an occasionally occurring instream macrophyte within the downstream section of the watercourse.

The dominance of gravels, many of which were classed as fine, provided *Excellent* salmonid spawning habitat. Lamprey spp. spawning habitat was given an assessment of *Good*, with nursery habitat being classed as being *Moderate*. Although gravels present at glide margins were of a suitable composition for lamprey nursery habitat, the fast to moderate flow rate by which they were met exceeded conditions which would be typical under an idealistic habitat scenario. The mean depth and adequate provision of suitable refugia that occurred sporadically in marginal shallower areas where occasional boulders disrupted glides to create eddies and provide cover provided *Moderate* salmonid nursery habitat. Throughout the surveyed stretch, salmonid holding habitat was restricted to *Moderate* status, largely owing to the dominance of finer substratum and lack of shading, which likely created suitable refugia solely in covered bankside margins and deeper pools littered with boulders. However, upstream of the bridge, holding habitat was locally *Excellent*, as the encroaching trees and instream LWD provided

excellent shading and shelter. Eel habitat was assessed as *Moderate* throughout the surveyed stretch, as some suitable areas were present where boulders and cobbles co-occurred to create adequate instream refugia.

Results of the 5-minute qualitative electrofishing survey conducted at this site (using methodologies described in Section) are presented in Table 4-40. One adult brown trout was captured over the course of the survey.

Table 4-40. Electrofishing results at survey location WF 14.

Species	Length (cm)
Brown Trout (<i>Salmo trutta</i>)	18

Kick-sampling was carried out in areas of riffle and glide. Macroinvertebrate richness and abundance was observed to be moderate, with 42 individuals across 11 taxonomic groupings identified. Site WF13 was assigned a Q value of **3-4 – Moderate**. There were 5 taxa which were classed as either Group A ‘very pollution sensitive’ or Group B ‘moderately pollution sensitive’. ‘Pollution tolerant’ Group C taxa constituted ~86% of the total sample, of which *Simuliidae* sp. were the most prevalent. Results of the kick-sample at survey location WF14 are presented in Table 4-41.

Table 4-41. Results of macroinvertebrate sampling at survey location WF12.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Ecdyonurus</i> sp.	2
Group B – Moderately Pollution Sensitive	<i>Sericostomatidae</i> sp.	1
	<i>Leuctra</i> sp.	2
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	5
	<i>Gammarus</i> sp.	7
	<i>Hydropsyche</i> sp.	1
	<i>Chironomidae</i> sp.	2
	<i>Dicranota</i> sp.	2
	<i>Serratella</i> sp.	1
	<i>Limnius</i> sp.	2
	<i>Simuliidae</i> sp.	12
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-31. The downstream extent of survey site WF14.

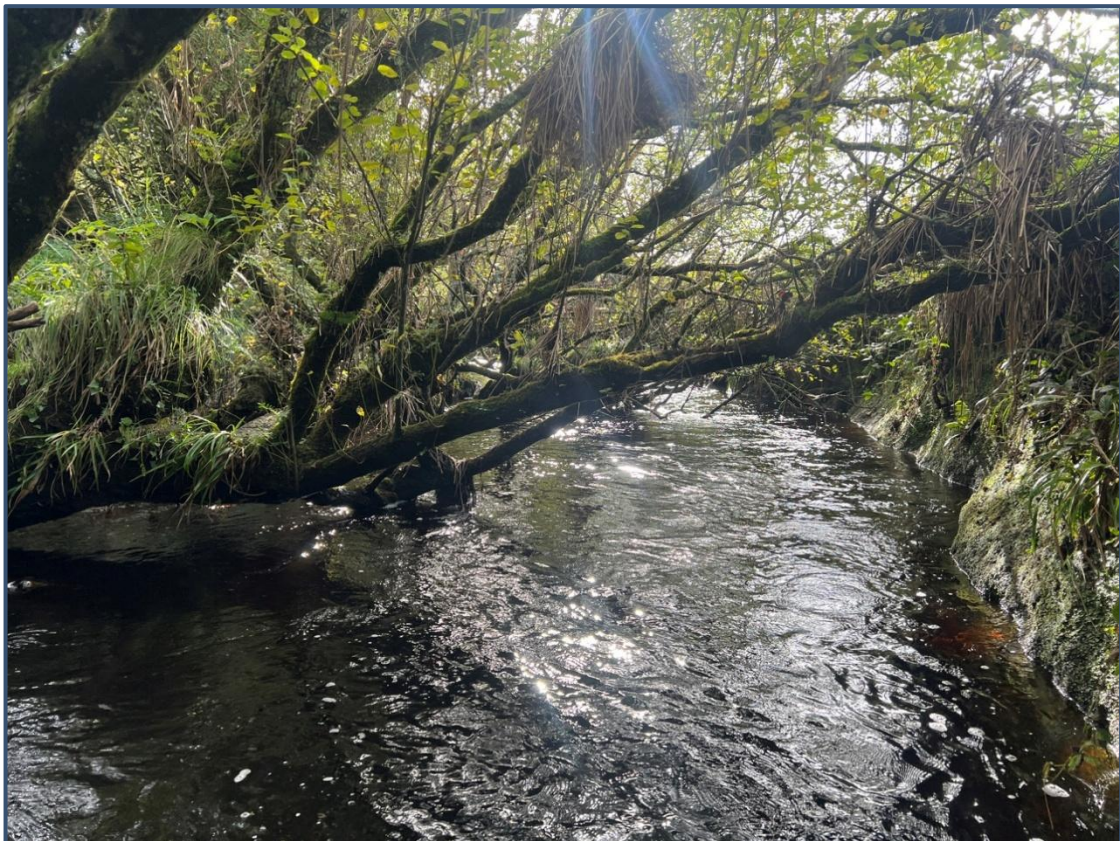


Plate 4-32. The upstream extent of survey site WF14, where encroaching trees and instream LWD were prevalent.

4.1.2 Proposed Grid Connection Site Survey Locations

4.1.2.1 GC Survey Site 1 (GC1)

Survey site GC1 was located on an unnamed tributary of the Knockacarn watercourse within the Inagh subcatchment (EPA Segment code: 28_629, ITM X: 513019 Y: 679588). Properties of the watercourse at this location are presented in Table 4-42, and a representative photograph of the watercourse at this location is presented in Plate 4-34.

Table 4-42. Properties of the watercourse at survey location GC1.

Properties	Record
Average Depth (m)	0.08-0.1
Average Bank Width (m)	0.6
Average Wet Width (m)	0.6-0.8
Bank height (m)	LHB 2.2 RHB 2
Flow	Moderate -fast
Colour	Highly coloured brown humic staining
Clarity	Slightly turbid
Dominant Substrates	Cobble (>32–128mm): 20% Peat & Silt (>2mm): 80%
Substratum Condition	Loose, heavily silted

This stretch of Eroding/Upland River (FW1) was located within the very headwaters of an unnamed stream draining into the Knockacarn watercourse, within the confines of an active wind farm site. Within the wetted area, a peat deposit represented the predominant substratum, with some finer deposits of silt coating the peat in sections. The watercourse was slightly turbid under reference conditions, but when the bed was disturbed thick peat & silt plumes readily remained in suspension and greatly reduced water clarity. Enveloping exposed cobbles within the wetted area was a reddish-orange gelatinous layer, which was characteristic of a iron oxidising bacterial deposit, and similar to the gelatinous coating which enveloped wetted substrate at survey location WF6.

Directly upstream of the survey location, the watercourse passed through a culvert consisting of plastic pipe placed within an embankment, from which the water fell in a chute-like flow. Aside from this fast-flowing section of the watercourse, the flow regime primarily consisted of a continuous pool, however there were some limited areas of riffle.

The immediate riparian zone on both banksides consisted of Wet grassland (GS4) and Conifer Plantation (WD4), with a vegetation profile consisting of yorkshire fog, soft rush, bramble, creeping buttercup, willowherb, young willow trees and occasional stands of the 1st and 3rd schedule invasive rhododendron (*Rhododendron ponticum*). Surrounding land use outside of the immediate riparian zone consisted of a sitka spruce Conifer plantation (WD4), and there was a gravel track consistent with a classification of Buildings and artificial surfaces (BL3) which ran over the culverted section of the watercourse.

Given the extensive peat and silt deposit which occupied much of the wetted area and the culvert which represented a significant barrier to migration, this section of the Knockacarn watercourse was assessed as *Negligible* in terms of fishery habitat, and is unlikely to be suitable for any lifestage of salmonids, lamprey and eel.

Kick-sampling was carried out in areas of pool and riffle, the latter of which being locally limited at this survey location. Total abundance was extremely low relative to typical results of a 2-minute kick sample, with two individuals constituting the entirety of the sample. One Group C 'Pollution Tolerant' taxon and one Group D 'Very Pollution Tolerant' taxon were identified during the macroinvertebrate survey. Given the peat deposit which overlay the wetted bed and the extremely depauperate results of the kick-sample at this survey location, it was deemed inappropriate to assign a Q-value score to this

location. However, the low abundance of taxa as a whole and the pollution tolerant nature of the limited taxa present indicate that water quality at this site is likely of *Poor* quality. Results of the macroinvertebrate survey at this location are presented in Table 4-43.

Table 4-43. Results of macroinvertebrate sampling at survey location GCI.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	-	-
Group B – Moderately Pollution Sensitive	-	-
Group C – Pollution Tolerant	<i>Elmidae</i>	1
Group D – Very Pollution Tolerant	<i>Naididae</i>	1
Group E – Most Pollution Tolerant	-	-



Plate 4-34. A representative image of survey location GCI, facing downstream from atop the culverted section.

4.1.2.2 GC Survey Site 2 (GC2)

Survey location GC2 was located on the Kildeema watercourse, within the Anagh subcatchment (EPA Code: 28K01, ITM X: 511993 Y: 678168). Properties of the watercourse at this location are presented in Table 4-45. Representative photographs of the watercourse at this survey location are presented in Plate 4-35 and Plate 4-36.

Table 4-44. Properties of the watercourse at survey location GC2.

Properties	Record
Average Depth (m)	0.23
Average Bank Width (m)	3
Average Wet Width (m)	2.2
Bank height (m)	LHB 1 RHB 1
Flow	Moderate

Colour	Slight orange staining
Clarity	Slightly turbid
Dominant Substrates	Cobble (>32–128mm): 60% Gravel (8-32mm): 15% Fine gravel (2-8mm): 5% Silt (>2mm): 20%
Substratum Condition	Semi-compacted, slight degree of siltation in areas of low flow.

This surveyed stretch of Eroding/upland river (FW1) was located in the headwaters of the Kildeema watercourse, within the confines of an active wind farm site, at its northern border. The upper extent of the survey site was framed by a single-arch bridge, which was lined with corrugated iron on its underside, beneath which the Kildeema flowed in a south-westerly direction. Substrate was comprised predominantly of cobbles, in which some gravels ranging in size from fine to coarse occupied the interstitial spaces. Microhabitat composition was largely of a cobble riffle-step formation, with some glides occurring within marginal areas extending into slightly undercut banks. Wetted substrates were coated with a reddish-orange gelatinous complex, characteristic of a iron oxidising bacterial deposit. The density of this coating was reduced in areas of higher flow (riffles), and noticeably more prominent in glides and areas of reduced flow, where it formed thick mats over the substrate. A trickling side channel met the Kildeema at its right bankside directly downstream of the bridge, in which a prominent, highly coloured orange gelatinous coating enveloped the soil-like substratum within this marginal channel (4-26). Directly adjacent to the bridge there was evidence of fly tipping.

The channel was moderately shaded by Grey willow which encroached over the channel from the left bankside, and formed a Riparian woodland (WN5) which extended laterally for a considerable distance from the immediate bank. On the right bank, nettle, bramble, bracken, soft rush and yellow iris represented the riparian vegetation of the Scrub (WS1) habitat. Outside of the immediate riparian zone, the surrounding land use was comprised of Wet Grassland (GS4), which was present on both sides of the watercourse at this surveyed location.

The cobble-dominant substrate and the gelatinous complex which constricted the limited available finer gravels at this site limited salmonid and lamprey spawning to *Negligible* status, as it is highly unlikely that sufficient oxygenation would be present within the beds present to support any form of spawning capacity. Lamprey nursery habitat was thus assessed as *Negligible* under an equivalent basis. The presence of riffle-step formations in which the density of the gelatinous complex was reduced had the capability to provide localised *Moderate* salmonid nursery habitat, and similarly undercut glides shaded by encroaching willows had *Moderate* potential in terms of salmonid holding capacity. The cobbles which were present within these areas of glides would likely have created suitable refugia for eels were it not for the thick gelatinous coating which reduced oxygenation and occupied the interstitial space, and thus this location was assessed as *Poor* eel habitat.

Kick-sampling was carried out in areas of riffle and glide. Total abundance was observed to be low, with 12 individuals across 8 taxa constituting the entirety of macroinvertebrates present within the sample. Site GC2 was assigned a water quality status of Q3-4 – Moderate, on the basis that Group A ‘Very Pollution Sensitive’ and Group B ‘Moderately Pollution Sensitive’ taxa were present but only in small numbers, whereas Group C ‘Pollution Tolerant’ taxa were the most abundant, comprising ~66% of the sample. Two taxa of the Group D ‘Very Pollution Tolerant’ grouping were present, representing ~16% of the sample. Results of the macroinvertebrate survey are presented in Table 4-45.

Table 4-45. Results of macroinvertebrate sampling at survey location GC2.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Perlidae</i> sp. (<i>early instar</i>)	1
Group B – Moderately Pollution Sensitive	<i>Glossosomatidae</i>	1
Group C – Pollution Tolerant	<i>Rhyacophile</i> sp.	1

	<i>Chironomidae</i>	3
	<i>Elmidae</i> sp.	1
	<i>Simuliidae</i>	3
Group D – Very Pollution Tolerant	<i>Aselus aquaticus</i>	1
	<i>Glossiphoniidae</i>	1
Group E – Most Pollution Tolerant	-	-



Plate 4-35. A representative image of survey site GC2, where substrate is shown to be coated in a reddish-orange gelatinous film.



Plate 4-36. A highly coloured side channel flowing into the Kildeema from the right bankside at survey location GC2.

4.1.2.3 GC Survey Site 3 (GC3)

Survey site GC3 was located within the headwaters of the Annagh [Clare] watercourse, within the confines of an active wind farm site (EPA Code: 28A03,ITM X: 512388 Y: 677221). Properties of the watercourse at this location are provided for in

Table 4-46, and a representative photograph of the site is presented in Plate 4-37.

Table 4-46. Properties of the watercourse at survey site GC3.

Properties	Record
Average Depth (m)	0.28
Average Bank Width (m)	2
Average Wet Width (m)	2
Bank height (m)	LHB 2 RHB 2
Flow	Low
Colour	Highly coloured
Clarity	Slightly turbid
Dominant Substrates	Boulder (>128mm): 10% Cobble (>32–128mm): 20% Gravel (8-32mm): 40% Fine gravel (2-8mm): 20% Silt (>2mm): 10%
Substratum Condition	Loose with a moderate degree of siltation

This surveyed stretch of Eroding/upland river (FW1) was predominantly comprised of substrates which ranged from fine silts to coarse gravels, with interspersing cobbles and occasional boulders occurring within the wetted channel. Substrate condition was noted as loose, and in some areas of reduced flow moderate siltation was evident, which formed a localized coating over larger substrates. Immediately

upstream of the survey location, the watercourse passed through a clear spanned corrugated culvert (Plate 4-38), which led outward into a reinforced concrete toe that created a notable step in the stream. A reddish-orange gelatinous coating enveloped many of the larger cobbles and boulders, forming plumes which readily remained in suspension when disturbed underfoot. Microhabitat composition was dominated by riffles occurring over cobble and gravels, with some interspersing glides present where larger boulders and enveloping silt deposits were most prominent.

The immediate riparian zone on both banksides consisted of Dry-humid acid grassland (GS3), with a vegetation profile consisting of bilberry, yorkshire fog, bramble, creeping buttercup, willowherb, wild angelica, young willow trees and wood sorrel. Instream, submerged greater water moss and the liverwort *Chiloscyphus polyanthos* coated many larger cobbles and boulders, while the marginal water horsetail (*Equisetum fluviatile*) was marginally present. Surrounding land use consisted of a Conifer plantation (WD4), which was comprised primarily of sitka spruce.

Although there were some localised deposits of suitably sized gravels occurring in areas of oxygenated flow located immediately downstream of the culvert, the gelatinous iron oxidising bacteria coating limited salmonid and lamprey spawning habitat to be of *Poor* quality. The marginal shading and undercut banks had some potential in the provision of salmonid nursery and holding habitat, although the overlying siltation, iron oxidising bacterial coating and generally shallow profile of the watercourse limited the assessment of both lifestage habitat suitability to *Poor*. Similarly, undercut banks and the shading thus provided were assessed as having some potential for eel, and habitat suitability was thus assessed as *Poor* to locally *Moderate*. Given the limited nature of finer sands, and the likely lack of significant oxygenation in silt beds present as a result of the gelatinous precipitate, lamprey nursery habitat was assessed as *Negligible*.

Kick-sampling was carried out in areas of riffle and pool. Total abundance was observed to be extremely low, with five individuals of three different taxonomic groupings constituting the entirety of the sample. One Group C 'Pollution Tolerant' and two Group D 'Very Pollution Tolerant' taxon were identified during macroinvertebrate sampling. In addition to live macroinvertebrates, seven empty casings of the Group B 'Moderately Pollution Sensitive' taxon *Limnephilidae* sp. were identified within the sample. Given that the surrounding habitat was deemed appropriate for supporting macroinvertebrate communities, with microhabitats consisting of riffles occurring over gravels and cobbles comprising the majority of the surveyed location, the depauperate results are unusual. The low diversity and abundance and sole presence of pollution tolerant individuals likely indicate a wider environmental issue present at this location which is affecting macroinvertebrate assemblage composition.

Given the lack of macroinvertebrate abundance present, it was deemed inappropriate to assign survey location GC3 a Q-value scoring. However, these results indicate that water quality at this site is of *Poor* quality, and that an environmental issue which may be distinct from typical enrichment pressures is impacting the macroinvertebrate assemblage at this site. Results of macroinvertebrate sampling at survey location GC3 are presented in Table 4-47.

Table 4-47. Results of macroinvertebrate sampling at survey location GC3.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	-	-
Group B – Moderately Pollution Sensitive	-	-
Group C – Pollution Tolerant	<i>Chironomidae</i> sp.	3
Group D – Very Pollution Tolerant	<i>Asseelus aquaticus</i>	1
	<i>Glossiphoniidae</i>	1
Group E – Most Pollution Tolerant	-	-



Plate 4-37. A representative image of survey site GC3.



Plate 4-38. The culvert at survey location GC3.

4.1.2.4 GC Survey Site 4 (GC4)

Survey site GC4 was located within the headwaters of the Doonsallagh East watercourse, within the confines of an active wind farm site (EPA Code: 28D08, ITM X: 513289 Y: 676729). Properties of the watercourse at this location are provided for in

Table 4-48, and a representative photograph of the site is presented in Plate 4-39.

Table 4-48. Properties of the watercourse at survey location GC4.

Properties	Record
Average Depth (m)	0.15-0.2
Average Bank Width (m)	1.5
Average Wet Width (m)	1.5
Bank height (m)	LHB 1 RHB 1
Flow	Low
Colour	Slight reddish-orange colour
Clarity	Slightly turbid
Dominant Substrates	Boulder (>128mm): 70% Cobble (>32–128mm): 20% Gravel (8-32mm): 5% Fine gravel (2-8mm): 5%
Substratum Condition	Semi compacted with a very slight degree of siltation. Some gravel/boulder cobble deposits arising from the adjacent embankment.

This surveyed stretch of Eroding/upland river (FW1) was boulder-dominant, with some deposits of cobble and gravel. Some deposits of substrate were likely delivered into the channel from the adjacent stone embankment. Substrate condition was observed to be semi-compacted with some very minor silt coverings enveloping substrates in marginal areas of reduced flow. At the time of survey, water level was observed to be low. The upstream extent of the survey area was a raised plastic (~900mm diameter) pipe in which the watercourse was culverted as it flowed beneath a gravel track and stone embankment. Enveloping the wetted surface of the culvert and instream substrata was a reddish-orange gelatinous slime, indicative of iron oxidising bacteria. This precipitate stained the colouration of the water a slight orange, however significant turbidity was not apparent. Microhabitat composition was predominantly comprised of riffle and pool. The flow rate was of a fast velocity owing to the moderate to steep gradient through which the watercourse ran, specially immediately downstream of the culvert.

The immediate bankside was representative of Dry-humid acid grassland (GS3), of which the vegetation profile consisted of yorkshire fog, bramble, soft rush, willowherb spp., creeping buttercup and willow spp. Stands of the third schedule invasive rhododendron were also present throughout the immediate riparian zone. Surrounding land use on both banksides consisted of a Conifer plantation (WD4), which was comprised predominantly of sitka spruce. Instream and marginal vegetation instream was noted as being largely absent at this site.

The boulder-dominant substrate and significant lack of suitable gravels and fine sediments limited spawning habitat of both salmonids and lamprey. Where the limited gravel deposits occurred, they were covered with the aforementioned gelatinous iron oxidising bacterial coating, which likely reduced interstitial oxygenation. Therefore, lamprey and salmonid spawning habitat was assessed as *Negligible* at this location. The lack of finer suitable sediments determined lamprey nursery habitat to be similarly assessed as *Negligible*. The lack of instream vegetation and iron oxidising bacterial deposits provided *Poor* habitat quality for juvenile salmonids, while the lack of deeper pools and lateral confinement of the channel determined this stretch of watercourse to be of *Poor* holding habitat for adult salmonids. Similarly, the lack of deeper pools and limited shading provided little suitable refugia for eels, and as such habitat suitability was assessed as *Poor*.

Kick-sampling was carried out in areas of riffle and glide. Total abundance of macroinvertebrates identified was moderately low, while total richness was moderate, with individuals of seven different taxonomic groups present within the sample. One Group A ‘Very Pollution Sensitive’ taxon was present, while Group B ‘Moderately Pollution Sensitive’ taxa constituted 35% of the sample. Group C ‘Pollution Tolerant’ taxa were the dominant grouping, representing 70% of individuals. Based on the results of the macroinvertebrate survey, location GC4 was thus assigned a Q-value score of **3-4 Moderate**, based on the presence of Group A and B taxa, and the dominance of Group C taxa of which *Baetis rhodani* was the most prolific. Results of the kick-sample at this location are presented in Table 4-49.

Table 4-49. Results of macroinvertebrate sampling at survey location GC4.

Indicator Group	Taxon	Abundance
Group A – Very Pollution Sensitive	<i>Perla</i> sp.	1
Group B – Moderately Pollution Sensitive	<i>Leuctra</i> spp.	2
	<i>Lepistomatidae</i>	4
	<i>Limnephilidae</i>	1
Group C – Pollution Tolerant	<i>Baetis rhodani</i>	8
	<i>Ephemerellidae</i>	1
	<i>Simuliidae</i>	3
Group D – Very Pollution Tolerant	-	-
Group E – Most Pollution Tolerant	-	-



Plate 4-39. A representative image of survey location GC4.

4.2 eDNA Results.

Environmental DNA (eDNA) surveys were undertaken on watercourses at ten locations (Survey sites WF1, WF2, WF4, WF5, WF7, WF9, WF11, WF12, WF13 and WF14). Survey locations were chosen to maximise the chance of detecting eDNA from target species and to estimate the approximate extent of their presence where detected.

Freshwater Pearl Mussel (*Margaritifera margaritifera*) (FPM), White-clawed crayfish (*Austropotamobius pallipes*) (WcC) and Crayfish plague (*Aphanomyces astaci*) were tested for at each location. FPM, WcC and Crayfish plague were not detected at any of the survey locations. eDNA results can be found in Appendix III.

4.3 Otter Survey Results

All surveyed wind farm and grid connection sites were surveyed for signs of otter (*Lutra lutra*) within the immediate vicinity of the survey location, both upstream and downstream. Surveying was conducted for otter spraints and other evidence of potential otter presence/habitat utilisation in the area, including couches, footprints, fish remains, slides, and holts.

No otter signs (including holts) were observed at any of the surveyed wind farm sites and grid connection sites, with the upland nature of many of the watercourses surveyed limiting foraging and commuting suitability for otter. However particularly at the furthest downstream survey locations, and areas of watercourse with good fisheries potential may provide suitable foraging and commuting habitat for otter.

4.4 Kingfisher Survey Results

All surveyed WF sites and GC sites were surveyed for signs of kingfisher (*Alcedo atthis*) within the immediate vicinity of the survey location, both upstream and downstream. Surveying was conducted to detect any kingfisher activity, identify any burrows present, and assess the given location in terms of suitable supporting habitat features (feeding perches, potential rest sites, fishery potential).

No kingfisher signs were observed at any of the surveyed wind farm sites and grid connection sites, and habitat suitability was generally assessed as being of *Negligible- Moderate* throughout the surveyed locations. The occurrence of vegetated banks which often lacked significant height diminished burrowing suitability throughout most surveyed locations within both the Annagh and Inagh catchments. Some supporting habitat features largely consisting of suitable perching locations provided by riparian trees were identified, but in the absence of identified suitable nesting areas are unlikely to be utilised by kingfisher within the study area. However, given the occurrence of said features, it is possible that kingfisher opportunistically utilize the visited watercourses throughout the study area.

Survey location WF14 was the sole site to be assessed as being of *Good-Excellent* suitability for kingfisher. The steep, earthen right-hand bank was of suitable composition to provide burrowing opportunities for kingfisher, and the encroaching ash and willow woodland at the upper extent of the survey location was suitable in providing potential perching locations. However, no kingfisher activity was identified at the time of survey in September 2025.

5. DISCUSSION

5.1 Proposed Wind Farm Site Aquatic Baseline Assessment

Watercourses surveyed within the vicinity of the Proposed Wind Farm Site consisted of Eroding/upland rivers (FW1), surrounded predominantly by agricultural and pastoral land use, which was largely concurrent with habitat classifications of either Wet grassland (GS4) or Improved agricultural grassland (GA1), with some sites being representative of a mosaic of the two habitat types.

Survey sites WF1-WF9 inclusive represent locations within the Annagh[Clare] catchment area, and constituted a diverse range of watercourses spanning a first order stream (WF6) to larger order watercourses located within the lower extent of the catchment (WF3, WF9). The upland sites exhibited a diverse array of substrate and microhabitat characteristics, ranging from a locally dominant bedrock stream occurring over a moderate gradient (WF1) to watercourses traversing pasture on both banksides with a range of riffle-step formations and significant representation of cobbles and gravels (WF2, WF7).

Upland sites on the Annagh catchment typically had semi-compacted substrates which limited fishery potential in terms of spawning and nursery habitat for salmonids and lamprey in particular, however most sites were assessed as having at least *Moderate* fishery potential in some regard, and indeed the capture of brown trout and occasionally eel throughout these sites is representative of their capability in supporting fish populations. Differing in suitability however was WF6, located on the upper extent of the Kildeema watercourse. The gelatinous coating of iron oxidising bacteria and nature of the location as an upland watercourse limited its fishery potential, with one sole eel being observed during electrofishing. Sites in the mid-lower Annagh catchment were again surrounded largely by agricultural pasture and were largely comprised of semi-compacted cobble and gravel, however evidence of cattle access at certain sites (WF3, WF8) created localized silt deposits and coatings. Densities of salmonids captured during electrofishing surveys generally increased with downstream longitudinal movement, as the lateral expansion and increased frequency of deeper glides and pools provided improved habitat for adult salmonids, with the riffles present often hosting juveniles. Juvenile Atlantic salmon fry and parr were captured during electrofishing surveys at sites WF5 and WF9, with WF9 exhibiting the highest densities among all surveyed locations.

Water quality within the WF sites of the Annagh catchment was generally of **Moderate to Good (Q3-4, Q4)** status, with Group A 'Very Pollution Sensitive' taxa occurring in reduced abundance, and Group C 'Moderately Pollution Sensitive' taxa often constituting the dominant grouping within the macroinvertebrate samples. However, survey site WF8 was assigned a water quality status of **Poor (Q3)**, perhaps indicating the watercourse at this site was subject to localised pressures which are largely reduced or absent in the wider catchment.

Survey sites WF10-WF14 were located on headwaters within the upper extent of the Inagh catchment, draining to the north and east of the Proposed Wind Farm Site and the Proposed Grid Connection Site. Although locations varied in their substrate composition, gravels ranging in size from fine to coarse often constituted a significant proportion of the wetted bed. Microhabitat composition was largely typical of the upland location being predominantly comprised of shallow riffles and glides and thus providing generally *Good* suitability in terms of salmonid nursery and spawning habitat. At certain sites (WF12 and WF14), deeper areas of slower flow comprising of glides and riffles were aided by boulders, trailing vegetation and occurrence of instream LWD provided *Good-Excellent* salmonid holding and eel fishery potential where they occurred. Electrofishing surveys were largely concurrent with results expected of the upland location, with juvenile fry/parr and some adult brown trout captured, along with some eel. Despite the fisheries suitability identified at WF14, the electrofishing survey returned one sole individual adult brown trout. The reasons for this reduced density in what appeared to be a watercourse capable of supporting salmonids is unknown, however it could perhaps be related to a recent, high flood in the system which surveyors were informed of by a local landowner.

Water quality throughout the surveyed WF sites within the Inagh catchment was of **Poor to Moderate (Q3, Q3-4)** status, with Group A 'Very Pollution Sensitive' taxa either occurring in reduced abundance or being absent from samples, and Group C 'Moderately Pollution Sensitive' taxa often constituting the dominant grouping within the macroinvertebrate samples.

The 1st and 3rd schedule invasive species Himalayan balsam (*Impatiens glandulifera*) was present at three of the visited WF sites, WF10, WF12 and WF14. All of these survey sites were outside the boundary of the Proposed Project.

Both eDNA surveys and available NPWS records showed no records for Freshwater Pearl Mussel (FPM) or White-clawed Crayfish (WcC) within the extent of the watercourses of the ten assessed WF Survey sites throughout both the Annagh catchment and the upper Inagh catchment. eDNA surveys similarly showed no positive records of Crayfish plague (*Aphanomyces astaci*), which can be inferred as evidence of its absence directly at and upstream of the surveyed sites in which eDNA surveying was completed.

No signs of otter, including spraint, footprints, fish remains, slides, or holts were identified at any of the visited survey sites within the Annagh and the upper Inagh catchments. Given the generally *Moderate* fishery potential, the paucity of suitable commutable riparian zones and the surrounding agricultural pasture, it is unlikely that otter are utilizing the watercourses directly at the surveyed WF sites to a significant degree. However, the watercourses draining and within the Proposed Wind Farm Site likely provide some, commuting and foraging habitat.

No kingfisher signs were observed throughout the surveyed wind farm sites, and burrowing suitability was low-negligible throughout much of the study area. Some surveyed WF sites where encroaching trees were present had the potential to provide supporting habitat features in the form of perches and resting locations. However, given the lack of burrowing potential it is likely that kingfisher may only utilize the surveyed watercourses intermittently and opportunistically, if at all. Survey location WF14 was the sole location assessed as being of *Good-Excellent* suitability for kingfisher, however there were no signs of kingfisher activity recorded at the time of survey.

5.2

Proposed Grid Connection Site Aquatic Baseline Assessment

The watercourses surveyed along the Proposed Grid Connection Site were comprised of moderate gradient Eroding/upland rivers (FW1) located within the headwaters of the Annagh and Inagh catchments. At the surveyed locations, streams were shallow and laterally constricted, with iron oxidising bacteria coating much of the wetted substrate at all surveyed sites. Fishery potential at all sites was limited, in part due to this gelatinous coating which limited oxygenation within interstitial spaces of finer substrates, thus reducing salmonid and lamprey spawning/nursey capacity. The lack of considerable deeper glides and pools throughout the surveyed stretches limited eel and adult salmonid holding habitat, which is expected given the upland location of the grid connection sites.

Throughout the sites there was a diverse array of substrate profiles, ranging from peat-dominant (GC1) to boulder-dominant (GC4), with sites GC2 and GC3 exhibiting a mixed composition of cobbles and gravels primarily. Although the moderate gradient resulted in moderate to fast velocities to be a typical feature of these locations, however GC1 was atypical in this regard, as its microhabitat profile largely consisted of peat-lined pool.

All of the grid connection sites were situated within or adjacent to the boundaries of an active wind farm, of which Conifer plantations (WD4) and Dry-humid acid grassland (GS4) represented the predominant surrounding habitats, with sitka spruce, willow, soft rush and yorkshire fog being common throughout. Stands of the 1st and 3rd schedule invasive species rhododendron (*Rhododendron ponticum*) were present at both sites GC1 and GC4 within the immediate riparian zones of the

surveyed watercourses. Cover of instream and marginal vegetation were low throughout these upland sites, with survey location GC3 being the sole site to have significant coverage of instream macrophytes and submerged bryophytes.

Macroinvertebrate sampling conducted at the surveyed grid connection sites was largely indicative of **Poor** water quality, with location GC4 situated on the Doonsallagh East displaying a relatively improved water quality profile of **Moderate** scoring. At sites GC1 and GC3, designation of water quality through Q-value scoring was deemed inappropriate, due to the depauperate nature of samples both in terms of macroinvertebrate abundance and richness. Given the peat deposit which formed much of the bed substrate at survey site GC1 this is not highly unusual, as such conditions are largely unsuitable for lotic macroinvertebrate assemblages. However, given that the limited taxa which were present were of Q-value groups C and D, it is likely that water quality at this location is of **Poor** quality. In contrast with the substrate and microhabitat conditions of survey site GC1, location GC3 exhibited substrates of varying sizes ranging from marginal silts to boulders, with a flow regime which would be typical of highly-oxygenated water where cobble-gravel riffles occurred. Therefore, the low abundance and diversity observed during the kick-sampling conducted at this site is atypical. It is likely that some environmental stressor is having a significant impact on the macroinvertebrate assemblage at this site, however the distinct cause of which was not identifiable during the time of survey.

No otter signs were identified at any of the grid connection sites. Given the upland location, surrounding conifer plantations, limited suitable riparian transit corridors and the limited fisheries potential, it is unlikely that otter are utilizing the watercourses at the surveyed locations GC1, GC3 and GC4, and as such they received suitability scores of *Negligible-Poor*. Survey location GC2 had a riparian woodland along its left bankside, which was deemed as being potentially suitable opportunistically for commuting otter, and as such GC2 was assessed as *Moderate* in this regard.

No kingfisher signs were identified at any of the grid connection sites. Given the vegetated banks, lack of suitable perching locations and limited fisheries potential, survey locations GC1, GC3 and GC4 were assessed as *Negligible* in terms of kingfisher habitat provision. Given the cover and perching opportunities provided by the encroaching treeline, survey location GC2 was assessed as *Moderate* in terms of opportunistic kingfisher commuting potential, as it could act as an adequate corridor connecting areas of potentially more suitable foraging or burrowing habitat which could be upstream or downstream of survey location GC2.

6. CONCLUSION

This report provides a comprehensive baseline of aquatic habitats in the vicinity of the Proposed Wind Farm Site and the Proposed Grid Connection Site.

Surveyed watercourses within the vicinity of the Proposed Wind Farm Site and the Proposed Grid Connection Site consisted largely of Eroding/upland rivers (FW1) traversing through agricultural pasture, with Improved agricultural grassland (GA1) and Wet grassland (GS4) comprising the predominant land use. Riparian buffers (if present) largely consisted of Scrub (WS1) and Riparian Woodland (WN5), the latter of which was present at numerous sites within the Annagh catchment (WF1, WF2 WF5, WF11, WF14). Siltation pressures were evident at multiple sites, and were likely related to adjacent bankside poaching at location WF3, WF8, WF9 and WF11, where evidence of livestock entry degraded the immediate banksides where such poaching occurred.

Survey location WF9, located on the Kildeema/Annagh watercourses returned the most abundant numbers of Atlantic salmon of all electrofished sites, with 8 juvenile salmon captured during the survey. Survey site WF5 was the only other location where Atlantic salmon were encountered throughout the electrofishing survey, where one juvenile was captured. Fish captured throughout the 5-minute timed electrofishing surveys at all other WF locations were dominated by brown trout, with most surveys seeing trout of various age classes captured. Occuring in less abundance and sporadically throughout surveyed sites were European Eel (*Anguilla anguilla*), which were captured at sites WF1, WF6, WF8, and WF9, all of which were located on watercourses within the Anagh catchment.

Fishery habitat varied considerably throughout surveyed locations. The upland site WF6 was assessed as being of *Negligible* to *Poor* habitat quality, largely owing to lateral constriction and the gelatinous coating of iron oxidising bacteria which enveloped the substrate. Semi-compacted substrates and limited occurrence of finer sediments limited salmonid and lamprey spawning and nursery habitat at many locations, with the absence of lamprey spp. absent from all electrofishing surveys likely reflecting the absence or limited occurrence of suitable lamprey habitat throughout all surveyed WF survey sites. Many of the survey sites were deemed to provide suitable habitat for adult salmonids, as the occurrence of undercut banks, boulders, deeper glides and pools and instream large woody debris were common features which had the potential to act as good refugia for adult brown trout and salmon parr, while the deeper pools which occurred at certain sites (WF9 & WF14) provided adequate holding habitat for larger salmonids.

Biological water quality within the Annagh catchment as indicated by Q-value scores varied from **Q3 - Poor** (WF8) to **Q3.4 - Moderate** (WF1, WF3, WF9) to **Q4 - Good** (WF2, WF4, WF5, WF7), with likely poor water quality at the upland location WF6. Q-value scores of WF survey locations within the Inagh catchment indicate reduced overall quality in comparison, as water quality varied from **Q3 - Poor** (WF10, WF11, WF12), to **Q3.4 - Moderate** (WF13, WF14).

All surveyed Proposed Grid Connection Site survey locations were situated within an upland area of the Anagh (GC2, GC3, GC4) and Inagh (GC1) catchments and were in close proximity to survey location WF6. All surveyed locations within this area were characterised by a coating of iron oxidising bacteria which enveloped the substratum, thus limiting fishery potential. Surrounding land use/habitats in this upland area were comprised of a heath-grassland mosaic and a surrounding Conifer plantation (WD4), which likely imposed a level of acidity on the draining watercourses. Water quality at the GC sites was of reduced quality, with surveyed locations likely of **Poor** (GC3, GC1), and **Moderate** (GC2, GC4) status. No rare or protected macroinvertebrates (according to national red lists) were recorded in the biological water quality samples at any of the WF sites or GC sites surveyed.

No otter or kingfisher signs were observed at any of the WF sites or GC sites. Generally, habitat suitability for otter and kingfisher were low, and opportunistic foraging and commuting potential was limited overall throughout the watercourses at the surveyed locations in the Annagh and Inagh catchments, however was observed to be locally suitable at certain sites.



Environmental DNA (eDNA) surveys were undertaken on watercourses at ten locations. No positive replicates of Freshwater Pearl Mussel, White-clawed Crayfish or Crayfish Plague were observed in the eDNA return at any of the survey locations. Therefore, it is likely that neither of these three species were present directly at or upstream of the sampled locations at the time of sampling in September 2025.

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APPENDIX I

**ELECTROFISHING SPECIES
RECORDS AT ALL PROPOSED WIND
FARM SITE SURVEY LOCATIONS**

Survey Location	Fish Species		
	European Eel	Brown Trout	Atlantic salmon
WF1	Yes	Yes	No
WF2	No	Yes	No
WF3	No	Yes	No
WF4	No	Yes	No
WF5	No	Yes	Yes
WF6	Yes	No	No
WF7	No	Yes	No
WF8	Yes	Yes	No
WF9	Yes	Yes	Yes
WF10	No	Yes	No
WF11	No	Yes	No
WF12	No	Yes	No
WF13	No	Yes	No
WF14	No	Yes	No



APPENDIX II

**Q-VALUES AT ALL SURVEY
LOCATIONS**



Site Name	Watercourse	Q-Value
WF Locations		
WF1	Glendine [Clare]_010	Q3-4 - Moderate
WF2	Glendine [Clare]_010	Q4 - Good
WF3	Glendine [Clare]_010	Q3-4 - Moderate
WF4	Kildeema_010	Q4 - Good
WF5	Kildeema_010	Q4 - Good
WF6	Kildeema_010	Poor (no Q-value)
WF7	Kildeema_010	Q4 - Good
WF8	Kildeema_010	Q3 - Poor
WF9	Annagh [Clare]_010	Q3-4 - Moderate
WF10	Inagh [Ennistymon]_040	Q3 - Poor
WF11	Inagh [Ennistymon]_040	Q3 - Poor
WF12	Inagh [Ennistymon]_040	Q3 - Poor
WF13	Inagh [Ennistymon]_040	Q3-4 - Moderate
WF14	Inagh [Ennistymon]_040	Q3-4 - Moderate
Proposed Grid Connection Site Survey Locations		
GC 1	Inagh [Ennistymon]_040	Poor (no Q-value)
GC 2	Kildeema_010	Q 3-4 - Moderate
GC 3	Annagh[Clare]_010	Poor (no Q-value)
GC 4	Annagh[Clare]_010	Q 3-4 - Moderate



APPENDIX III

PROPOSED WIND FARM SITE eDNA RESULTS



eDNA Site Name	Watercourse	Positive Replicate & Species (if applicable)
WF1	Glendine [Clare]_010	Negative
WF2	Glendine [Clare]_010	Negative
WF4	Kildeema_010	Negative
WF5	Kildeema_010	Negative
WF7	Kildeema_010	Negative
WF9	Annagh [Clare]_010	Negative
WF11	Inagh [Ennistymon]_040	Negative
WF12	Inagh [Ennistymon]_040	Negative
WF13	Inagh [Ennistymon]_040	Negative
WF14	Inagh [Ennistymon]_040	Negative