# APPENDIX 6-4

## AQUATICS AND FISHERIES SURVEY REPORT

# Aquatic baseline report for Seven Hills wind farm, Co. Roscommon


Prepared by Triturus Environmental Ltd. for McCarthy Keville O' Sullivan Ltd.

**October 2021**

---

Please cite as:

Triturus (2021). Aquatic baseline report for Seven Hills wind farm, Co. Roscommon. Report prepared by Triturus Environmental Ltd. for McCarthy Keville O' Sullivan Ltd. October 2021.

# Table of contents

# 1. Introduction

## 1.1 Background

The following report provides a baseline assessment of the aquatic ecology, including fisheries and biological water quality, as well as protected aquatic species and habitats, in the vicinity of the proposed Seven Hills Wind Farm, located near Dysart, Co. Roscommon.

Undertaken on a catchment-wide scale, the baseline surveys focused on aquatic habitats in relation to fisheries potential (including both salmonid and lamprey habitat), white-clawed crayfish (*Austropotamobious pallipes*), macrophytes and aquatic bryophytes, aquatic invasive species, and fish of conservation value which may use the watercourses in the vicinity of the proposed project. Aquatic surveys were undertaken in September 2021.

The *n*=6 total aquatic survey sites were located within the Suck_SC_090 and Shannon[Upper]_SC_100 river sub-catchments. Whilst not located within a European site, the Proposed Development site shared (via the Ballyglass River) downstream hydrological connectivity with the River Suck Callows SPA (004097) and (via 4 no. watercourses) the River Shannon Callows SAC (000216) and Middle Shannon Callows SPA (004096). No survey sites were located within a European site.

## 1.2 Project description

The Proposed Development comprises:

- 20 no. wind turbines with an overall ground to blade tip height of 180 metres, a rotor dimeter of 162m and a hub height of 99m, associated foundations, hard-standing areas
- 15 no. spoil storage areas at hardstands of turbines no. 1, 2, 3, 4, 5, 6 and 7 (in the townlands of Turrock, Gortaphuill, Cronin, and Tullyneeny) and turbines no. 8, 10, 11, 13, 14, 17, 19 and 20 (in the townlands of Milltown, Cuilleenoolagh, Cloonacaltry, Feacle and Tawnagh)
- Provision of 1 no. permanent meteorological mast with a maximum height of 100 metres for a period of 30 years from the date of commissioning of the entire wind farm
- Provision of 1 no. 110kV onsite substation in the townland of Cam, along with associated control buildings, MV switchgear building, associated electrical plant, associated security fencing, and equipment and wastewater holding tank
- All underground electrical and communication cabling connecting the proposed wind turbines to the proposed onsite substation and associated control buildings and plant
- All works associated with the connection of the proposed wind farm to the national electricity grid via underground 110kV cabling from the site to the existing Athlone 110kV substation located in the townland of Monksland. Cabling will be placed within the public road corridor of the R362, R363 and L2047, or on private land
- Upgrade works to the existing 110kV Athlone substation consisting of the construction of an additional dedicated bay to facilitate connection of the cable
- Provision of 2 no. new site accesses north and south from the R363 and upgrade of 1 no. junction south of the R363
- Provision of new access tracks/roads and upgrade of existing access tracks/roads
- 7 no. overburden storage areas

- 2 no. temporary construction compounds
- Site drainage works
- Operational stage site signage
- All associated site development works, apparatus and signage

A full description of the Proposed Development is provided in Chapter 4 of the EIAR.

# 2. Methodology

## 2.1 Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the Proposed Development site, including those crossed by the Grid Connection route (GCR), were considered as part of the current assessment. A total of *n*=6 sites were selected for detailed aquatic assessment (see **Table 2.1, Figure 2.1** below). The nomenclature for the watercourses surveyed is as per the Environmental Protection Agency's (EPA) online map viewer.

Aquatic survey sites were present on the Ballyglass River (EPA code: 26B15), Ratawragh Stream (26R39), Barr's Drain (26B34) and the Cross River (26C10) and an unnamed drainage channel tributary (**Table 2.1**; **Figure 2.1**).

Surveys at each of these sites included a fisheries assessment (electro-fishing on riverine sites) (**Figure 2.2**), white-clawed crayfish (sweep netting & hand searching) surveys were also undertaken at each site, in addition to macrophyte and aquatic bryophyte surveys. This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed wind farm project.

Please note this aquatic report should be read in conjunction with the final Environmental Impact Assessment Report (EIAR) prepared for the proposed project. More specific aquatic methodology is outlined below and in the appendices of this report.

## 2.2 Aquatic site surveys

Surveys of the watercourses within the vicinity of the Proposed Development site were conducted in September 2021. Survey effort focused on both instream and riparian habitats approx. 150m upstream and 150m downstream of each sampling point (**Figure 2.1**). The watercourses at each survey site were described in terms of the important aquatic habitats and species. This helped to evaluate species and habitats of ecological value in the vicinity of each site. The aquatic baseline prepared would inform mitigation for the Proposed Development site.

A broad aquatic habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's *'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003'* (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e., width, depth etc.)
- Substrate type, listing substrate fractions in order of dominance (i.e., bedrock, boulder, cobble, gravel, sand, silt etc.)
- River profile in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition

**Table 2.1** Location of *n*=6 aquatic survey sites in the vicinity of Seven Hills wind farms, Co. Roscommon

| Site no. | Watercourse | EPA code | Location | X (ITM) | Y (ITM) |
|---|---|---|---|---|---|
| A1 | Ratawragh Stream | 26R39 | R363 road crossing | 594318 | 744329 |
| A2 | Barr's Drain | 26B34 | R363 road crossing | 596453 | 743348 |
| A3 | Drainage channel | n/a | R363 road crossing | 598085 | 741970 |
| A4 | Cross River | 26C10 | R363 road crossing | 599342 | 741770 |
| B1 | Ballyglass River | 26B15 | R363 road crossing | 588454 | 745655 |
| B2 | Ballyglass River | 26B15 | Ballyglass Bridge | 585639 | 743487 |

## 2.3 Catchment-wide electro-fishing

A catchment-wide electro-fishing (CWEF) survey of the watercourses within the vicinity of the Proposed Development site (*n*=6 riverine sites, **Figure 2.1**) was conducted in September 2021, under the conditions of a Department of Communications, Climate Action & Environment (DCCAE) licence. The survey was undertaken in accordance with best practice and Section 14 licencing requirements.

Furthermore, a fisheries habitat appraisal of the watercourses and waterbodies in the vicinity of the proposed wind farm project (**Figure 2.1**) was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment also considered the quality of spawning, nursery and holding habitat for salmonids and lamprey within the vicinity of the survey sites.

For detailed survey methodology, please refer to accompanying fisheries assessment report in **Appendix A.**

## 2.4 White-clawed crayfish survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey sites in September 2021 under a National Parks and Wildlife (NPWS) open licence (no. C145/2021), as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2021), to capture and release crayfish to their site of capture, under condition no. 6 of the licence. As per Inland Fisheries Ireland recommendations, the crayfish licence sampling started at the uppermost site(s) of the wind farm catchment/sub-catchments in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). Trapping of crayfish was not undertaken. An appraisal of white-clawed crayfish habitat at each site was conducted based on physical channel attributes, water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider Seven Hills wind farm survey area was completed.

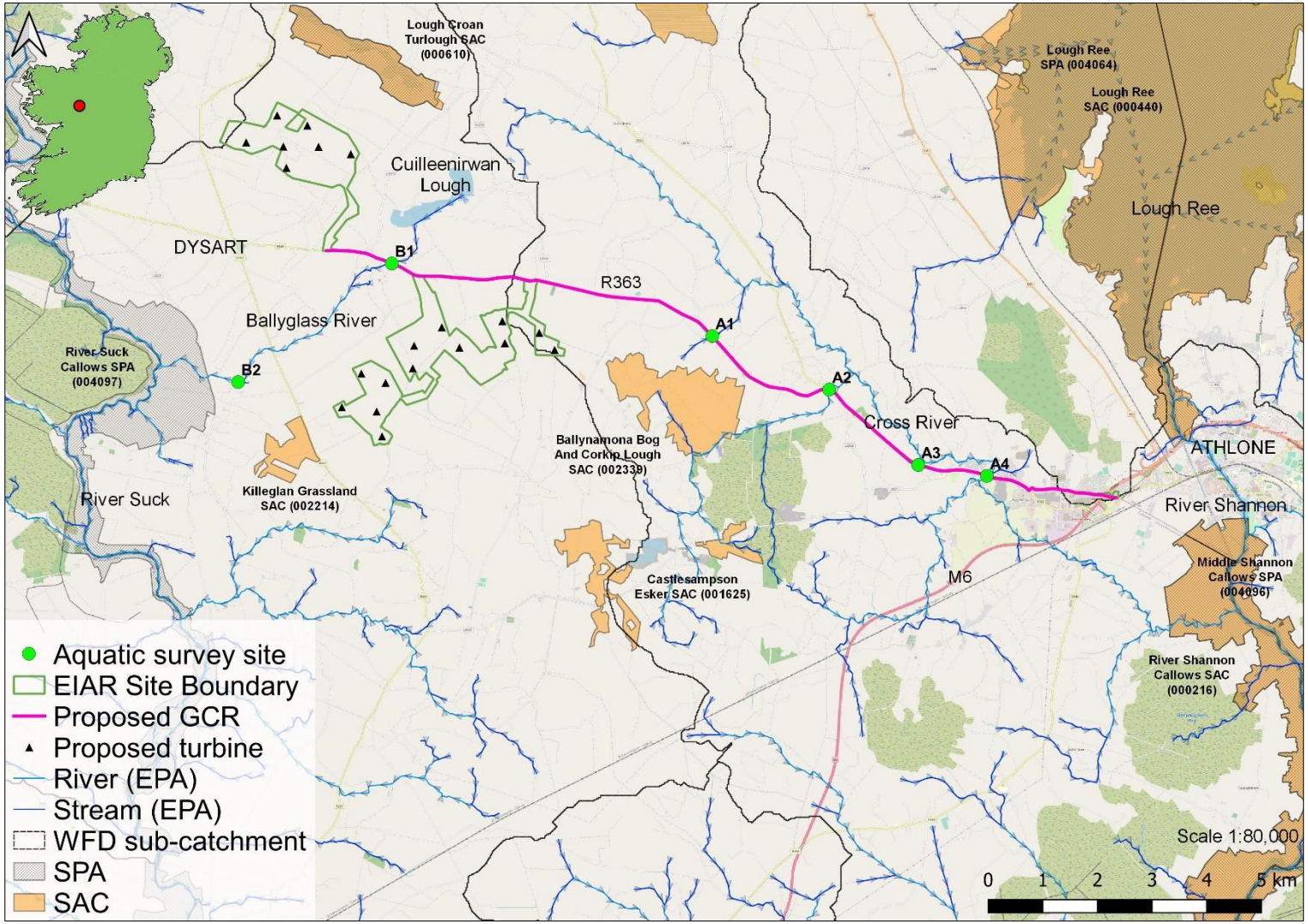


**Figure 2.1** Overview of the *n*=6 aquatic survey site locations for the proposed Seven Hills Wind Farm, Co. Roscommon

## 2.5 Aquatic ecological evaluation

The evaluation of aquatic ecological receptors contained within this report uses the geographic scale and criteria defined in the '*Guidelines for Assessment of Ecological Impacts of National Road Schemes*' (NRA, 2009).

## 2.6 Biosecurity

A strict biosecurity protocol including the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Particular cognisance was given towards preventing the spread or introduction of crayfish plague (*Aphanomyces astaci*) given the known distribution of white-clawed crayfish (*Austropotamobius pallipes*) in the wider survey area. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced.

# 3. Receiving environment

## 3.1 Sensitive species data request

A sensitive species data request was submitted (13/10/21) to the National Parks and Wildlife Service for the 10km grid squares containing and adjoining the Proposed Development (i.e., M83, M84, M94, N03 & N04) and was received on the 21st October 2021. Records for a low number of rare or protected aquatic species were available, although most did not overlap directly with the survey area.

Within the wider survey area, a low number of records for white-clawed crayfish (*Austropotamobius pallipes*) were available for Cross River and a tributary, the Mihanboy River (**Figure 3.1**). These records spanned from 1984 to 2006. However, additional records were available for the Cross River (bridge south of Doyle's Bridge) from 2011 and 2014, and for the Mihanboy River (same location as above) in 2014 (NBDC data).

## 3.2 Seven Hills wind farm catchment and survey area description

The proposed Seven Hills wind farm is located in an agriculturally-dominated area near Dysart, Co. Roscommon (**Figure 2.1**). The proposed wind farm site is located within the Suck_SC_090 and Shannon[Upper]_SC_100 river sub-catchments. There were no watercourses directly draining the proposed wind farm site (**Figure 2.1**). However, the Ballyglass River (EPA code: 26B15) drained the land intermediate to the proposed wind farm boundaries. The proposed Grid Connection route (GCR) crossed the Ratawragh Stream (26R39), Barr's Drain (26B34) and the Cross River (26C10) and an unnamed drainage channel tributary.

The watercourses and aquatic surveys sites in the vicinity of Seven Hills Wind Farm were typically small, lowland depositing watercourses (FW2; Fossitt, 2000) and agricultural drainage ditches (FW4) (see **section 4** for more details). Land use practices in the wider survey area were dominated by pastures (CORINE 231), with localised areas of peat bogs (412). The watercourses flowed over Carboniferous limestone and calcareous shale (Geological Survey of Ireland data).

## 3.3 EPA water quality data (existing data)

The following outlines the available water quality data for the watercourses in context of the Proposed Development. Only recent water quality (i.e., since 2015) is summarised below. There were no existing EPA biological monitoring data available for the Ratawragh Stream (26R39), Barr's Drain (26B34), Ballyglass River (26B15) and an unnamed drainage channel tributary of the Cross River.

### 3.3.1 Cross River

The Cross River (26C10) is a low-lying limestone watercourse that rises approximately 1km east of Cuilleenirwan Lough, Co. Roscommon. It flows in a south-westerly direction for approximately 21km until it joins the River Shannon, 2km south of Athlone.

There are a total of four EPA biological monitoring stations on the river. Water quality at all of these locations (i.e., stations RS26C100060, RS26C100200, RS26C100300, & RS26C100400) achieved Q3-4 (moderate status) in 2020.

The WFD status (2013-2018 period) was varied along the Cross River. In the upper reaches (Cross (Roscommon)_010 river water body), the river was of poor status in the 2013-2018 period. Downstream, the Cross (Roscommon)_020 was of good status. However, this declined to moderate status in the lower reaches (i.e., Cross (Roscommon)_030 and Cross (Roscommon)_040). The upper and lowermost reaches (Cross (Roscommon)_010 and Cross(Roscommon)_040) were considered 'at risk' at the time of report drafting, primarily due to agricultural, peat escapement and historical drainage pressures (EPA data). The Cross (Roscommon)_020 and Cross (Roscommon)_030 were under review at the time of reporting.

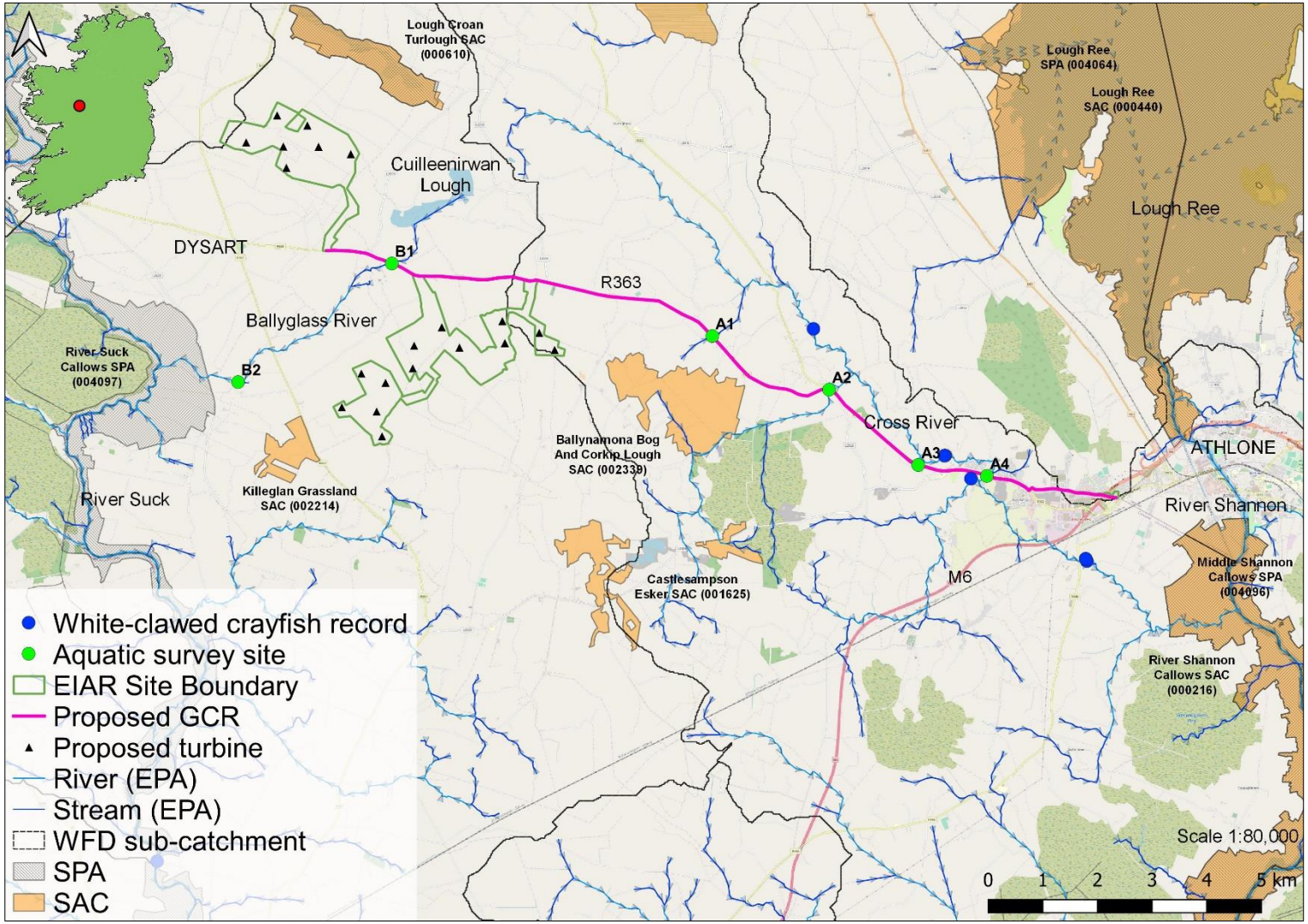


**Figure 3.1** White-clawed crayfish records in the vicinity of the proposed Seven Hills wind farm (source: NPWS & NBDC data, 1986-2014 period)

# 4. Results of aquatic surveys

The following section summarises each of the *n*=6 survey sites in terms of aquatic habitats, physical characteristics and overall value for fish, white-clawed crayfish and macrophyte/aquatic bryophyte communities. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Sites were surveyed in September 2021. Please refer to **Appendix A** (fisheries assessment report) for more detailed fisheries results. An evaluation of the aquatic ecological importance of each survey site based on these aquatic surveys is provided and summarised in **Table 4.1**.

## 4.1 Aquatic survey site results

### 4.1.1 Site A1 – Ratawragh Stream, R363 road crossing

Site A1 was located on the Ratawragh Stream (26R39) at the R363 road and proposed GCR crossing. The stream had been extensively straightened and deepened historically, with steep (often vertical) bankfull heights of 1.5-2m. The stream was semi-dry at the time of survey, with no flows and pools of standing water only to a maximum depth of 0.1m. The stream was likely non-perennial at this location. The substrata were dominated heavily-silted and compacted gravels, with occasional boulder and cobble. The site supported abundant growth of fool's watercress (*Apium nodiflorum*) (>95% coverage), with localised water mint (*Mentha aquatica*). No aquatic bryophytes were recorded. The banks were largely open and supported bramble (*Rubus fruticosus* agg.) scrub (WS1) with scattered grey willow (*Salix cinerea*) and hawthorn (*Crataegus monoygna*). The site was bordered by improved agricultural grassland (GA1) and dry meadows and grass verges (GS2) habitat.

No fish were recorded via electro-fishing at site A1. The stream was semi-dry at this location during the time of survey (stagnant pools only) and was considered likely to convey water flows only during wetter/flood periods (i.e., a non-perennial watercourse). The site had very poor fisheries or aquatic value given its semi-dry nature. However, fisheries value improved in the downstream-connecting Cross River, approx. 1.1km downstream. The non-perennial site was not suitable for white-clawed crayfish and none were recorded.

Given the absence of fish and aquatic species or habitats of high conservation value, the aquatic ecological evaluation of site A1 was of **local importance (lower value)** (**Table 4.1**).

**Plate 4.1** Representative image of site A1 on the Ratawragh Stream, September 2021 (semi-dry channel)

### 4.1.2 Site A2 – Barr's Drain, R363 road crossing

Site A2 was located on Barr's Drain (26B34) at the R363 road and proposed GCR crossing. The river crossed under the road via large pipe culvert (passable by fish). The lowland depositing watercourse (FW2, with some spate characteristics) had been straightened and deepened historically although the river showed some good instream and riparian recovery. The channel averaged 2.5-3m wide and 0.2-0.5m deep, with locally deeper glide and pool to 1m. The river flowed in a deep U-shaped channel with bankfull heights of 2-3m. The profile comprised slow-flowing glide with only localised riffle and pool with peat-stained water. The banks were invariably undercut/scoured, indicating spate tendencies. The substrata were dominated by medium to coarse gravels and sand with small cobble and frequent boulder. However, the bed was relatively compacted. Siltation was moderate with large plumes underfoot. However, very few depositional areas were present (superficial and sand-dominated where present). The river was very heavily shaded by ash (*Fraxinus excelsior*) and willow (*Salix* sp.) treelines and dense bramble scrub. As a result, macrophytes were limited to only very occasional fool's watercress and water mint in more open areas of channel. Ivy-leaved duckweed (*Lemna trisulca*) was occasional) with common duckweed (*Lemna minor*) also present (both indicating enrichment). However, aquatic bryophyte coverage was high, with frequent long-beaked water feather-moss (*Platyhypnidium riparoides*) and occasional river moss (*Fontinalis antipyretica*). The calcicolous liverwort *Pellia endiviifolia* was also occasional and frequent on muddy banks. The site was bordered by improved agricultural grassland (GA1).

Brown trout (*Salmo trutta*) and *Lampetra* sp. were the only fish species recorded via electro-fishing at site A2 (**Appendix A**). Mixed-cohorts of trout were present, with moderate densities of juveniles and low numbers of adults. A low density of *Lampetra* sp. (both ammocoetes and transformers) were also

recorded (1.5 per $m^2$). The site was evidently a valuable salmonid nursery with good quality holding habitat present in areas of deeper glide/pool, undercut banks etc. Spawning habitat, whilst present, was localised and compromised by siltation and bed compaction. Lamprey larval habitat was sparse and sub-optimal where present, only supporting a very low density of ammocoetes. Despite some good suitability, no European eel or white-clawed crayfish were recorded. Otter spraint recorded at the pipe culvert did not contain any crayfish remains.

Given the presence of *Lampetra* sp., the aquatic ecological evaluation of site A2 was of **local importance (higher value)** (**Table 4.1**).

**Plate 4.2** Representative image of site A2 on Barr's Drain, September 2021

### 4.1.3 Site A3 – unnamed drainage channel, R362 road crossing

Site A3 was located on an unnamed drainage channel (FW4) at a proposed GCR crossing point on the R362 road. The channel had been straightened and deepened historically, with very low flow rates present at the time of survey. The channel crossed under the road via a small pipe culvert. The channel averaged 1.5m wide and 0.3m deep in a steep U-shaped channel. The channel comprised 100% slow-moving glide. The substrata were 100% clay-dominated soft sediment (Indicative of historical drainage works). The channel was heavily vegetated with near 100% cover of macrophytes. These included abundant water mint and branched bur-reed (*Sparganium erectum*), with frequent patches of common reed (*Phragmites australis*) and high levels of terrestrial plant encroachment. The channel was fenced-off with narrow riparian zones supporting isolated trees only and common herbaceous species. The site was bordered by improved agricultural grassland (GA1).

Three-spined stickleback (*Gasterosteus aculeatus*) was the only fish recorded via electro-fishing from site A3 (**Appendix A**). Apart from low densities of this species, the heavily vegetated site was not of fisheries value given gross siltation, shallow depth and low flow rates (i.e., a drainage ditch habitat).

There was no suitability for salmonids, lamprey, European eel or other fish species at the time of survey. Fisheries value was significantly improved in the downstream-connecting Cross River, approx. 100m downstream. The site was unsuitable for white-clawed crayfish and none were recorded.

Given the absence of fish and aquatic species or habitats of high conservation value, the aquatic ecological evaluation of site A3 was of **local importance (lower value)** (**Table 4.1**).

**Plate 4.3** Representative image of site A3 on an unnamed drainage channel, September 2021

### 4.1.4 Site A4 – Cross River, R362 road crossing

Site A4 was located on the Cross River (26C10) at the R362 road and proposed GCR crossing. Situated approx. 7km upstream of the River Shannon confluence, the Cross River was a fast-flowing lowland depositing watercourse (FW2). The site had been historically straightened and deepened (flood embankments present) but good instream recovery was evident. The river flowed in a deep trapezoidal channel with bankfull heights of 3-4m. Downstream of the road crossing, the river averaged 5-8m wide and 0.5-1m deep, with locally deeper glide and pool to 1.3m. The site was typified by very fast-flowing glide with only localised riffles and pool. The substrata were dominated by medium to coarse gravels and cobble, with frequent large boulder. Patches of sand and finer gravels were present in association with slacks and pool tailings but these were localised. Some calcification of the bed was observed. Given the high flow rates, soft sediment areas were largely absent and shallow where present. The site supported a diverse range of aquatic vegetation. The submerged form of lesser water parsnip (*Berula erecta*) was frequent, with emergent *B. erecta* and fool's watercress along channel margins. Broad-leaved pondweed (*Potamogeton natans*), fennel pondweed (*Stuckenia pectinatus*) and curled pondweed (*Potamogeton crispus*) were all present but rare. Branched bur reed was occasional. The cover of aquatic bryophytes was high with frequent *Fontinalis antipyretica* and *Platyhypnidium riparoides*. The semi-aquatic liverwort *Chiloscyphus polyanthos* was occasional. Given

the presence of more than three indicator species (EC, 2013; Devaney et al., 2013), the site's aquatic vegetation community was considered representative of the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and aquatic mosses [3260]'. Ivy-leaved duckweed and filamentous green algae (*Cladophora* sp.) was present (<1% cover), indicating enrichment. The riparian zones were dominated by reed canary grass (*Phalaris arundinacea*) and common riparian nitrophilous species such as nettle (*Urtica dioica*), hedge bindweed (*Calystegia sepium*) and great willowherb (*Epilobium hirsutum*), with localised grey willow. Some of these trees provided highly valuable cover for fish and created pool habitat for adult salmonids. The site was bordered by a residential area (BL3) and a rank grassy area (GS2).

A total of three fish species were recorded via electro-fishing from site A4 (**Appendix A**). The site supported a high density of adult brown trout, with moderate numbers of juvenile brown trout and low numbers of Atlantic salmon (*Salmo salar*). A low density of stone loach (*Barbatula barbatula*) was also recorded. The lowland river site was of high value as a salmonid nursery and holding habitat, with some locally excellent-quality spawning (mostly good-quality, however, due to compaction). The scoured banks with overhanging vegetation also provided some high-quality adult salmonid holding habitat. Faster-flowing glide and riffle areas supported low numbers of Atlantic salmon. Some good-quality lamprey spawning habitat was present but the high-energy site was largely unsuitable as a lamprey nursery (no sediment accumulations) and none were recorded. Despite some high suitability, no European eel or white-clawed crayfish were recorded.

Given the presence of Atlantic salmon and the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and aquatic mosses [3260]', the aquatic ecological evaluation of site A4 was of **local importance (higher value)** (**Table 4.1**).

**Plate 4.4** Representative image of site A4 on the Cross River, September 2021

### 4.1.5 Site B1 – Ballyglass River, R363 road crossing

Site B1 was located on the upper reaches of the Ballygass River (26B15) at the R363 road crossing, approx. 2km downstream from its source at Cuileenirwan Lough (turlough). The river had been extensively straightened and over-deepened historically, with bankfull heights of 5-6m in a very steep V-shaped (near vertical) channel. The river averaged 1.5-2m wide and <0.2m deep with very low flows at the time of survey. The channel evidently conveyed significantly more water during wetter periods. The profile comprised shallow, slow-flowing glide with only very occasional shallow pools. These were often associated with instream debris dams (woody vegetation originating from overhanging riparian treelines). The site was grossly silted, with deposits >0.3m deep, locally. Small boulder, cobble and some medium to coarse gravels were present but these were heavily bedded in silt/organic debris. Some cleaner finer gravels and sands were located on the pipe culvert apron. Given high shading, macrophytes and aquatic bryophytes were absent. The river was bordered by mature treelines of beech (*Fagus sylvatica*), elder (*Sambucus nigra*), ash and hawthorn with bramble and ivy-dominated scrub. The site was bordered by residential properties and improved agricultural grassland (GA1).

Three-spined stickleback was the only fish recorded via electro-fishing from site B1 (**Appendix A**). With the exception of low densities of this species (*n*=6), the site in the upper reaches of the Ballyglass River was not of fisheries value given gross siltation, shallow depth and low flow rates at the time of survey (possibly non-perennial at this location). There was very poor suitability for salmonids, lamprey, European eel or other fish species at the time of survey. Fisheries value was significantly improved downstream (see 3.1.6 below).

Given the absence of fish and aquatic species or habitats of high conservation value, the aquatic ecological evaluation of site B1 was of **local importance (lower value)** (**Table 4.1**).

**Plate 4.5** Representative image of site B1 on the Ballyglass River, September 2021

### 4.1.6 Site B2 – Ballyglass River, Ballyglass Bridge

Site B2 was located on the lower reaches of the Ballyglass River at Ballyglass Bridge, approx. 4km downstream of site B1. The lowland depositing watercourse (FW2) had been historically deepened (excavated to clay base in many areas), with localised straightening also. However, some natural sinuosity remained. The small, shallow river averaged 2-2.5m wide and 0.1-0.2m deep, with only localised deeper pool to 0.3m. A larger deeper pool (1m deep) was present immediately downstream of the bridge crossing. Shallow glide predominated, with frequent riffle and only very localised pool. The substrata were dominated by well-mixed gravels and sand, with frequent small cobble and occasional small boulder. However, siltation was heavy overall, with frequent shallow depositional areas present along channel margins. The soft sediment had a high clay and sand fraction. Despite this, localised areas of mobile gravels were present but these were heavily silted. The banks were open upstream of the bridge and livestock poaching was evident (**Plate 4.6**). Macrophyte growth was limited to (grazed) fool's watercress along the channel margins, with occasional water mint. At the Ardcolman Stream (26A54) confluence, iris (*Iris psuedacorus*) growth was dense instream and flows were much reduced. Aquatic bryophytes were limited to occasional *Leptodictyum riparium*. Common duckweed was abundant in pool areas. The site was bordered by improved agricultural grassland (GA1) with no trees and narrow riparian zones supporting meadowsweet (*Filipendula ulmaria*) and rank grasses.

A total of three fish species were recorded via electro-fishing at site B3 (**Appendix A**). The site supported a low density of juvenile and small adult brown trout, with moderate densities of three-spined stickleback. Low densities of *Lampetra* sp. ammocoetes were present (3 per $m^2$). The site was of moderate value only to salmonids given heavy siltation (primarily derived from livestock poaching). Salmonid and lamprey spawning habitat was present but compromised by siltation. Salmonid nursery habitat was present but relatively poor-quality given the shallow depth. Some good holding habitat was present but supported only low densities of adult trout. Lamprey nursery habitat was present but sub-optimal given a high proportion of sand and clay, in addition to compaction and the shallow nature of deposits (invariably <5cm). Despite some low suitability, no European eel or white-clawed crayfish were recorded (few accessible refugia or deeper pool areas). Otter spraint recorded underneath the bridge (ITM 585640,743488) did not contain crayfish remains.

Given the presence of *Lampetra* sp., the aquatic ecological evaluation of site B2 was of **local importance (higher value)** (**Table 4.1**).

**Plate 4.6** Representative image of site B2 on the Ballyglass River, September 2021 (facing upstream from bridge)

## 4.2 Aquatic ecological evaluation

An aquatic ecological evaluation of each survey site (*n*=6) was based on the results of electro-fishing, fisheries habitat appraisal, white-clawed crayfish and macrophyte/aquatic bryophyte surveys (**Table 4.1**).

None of the aquatic survey sites were evaluated as greater than **local importance (higher value)**. The **local importance (higher value)** sites were present on Barr's Drain (site A2), Cross River (A4) and Ballyglass River (B2). This evaluation was due to the presence of salmonids, *Lampetra* sp. and or other aquatic species or habitats of conservation value.

The remaining three survey sites on the Ratawragh Stream (A1), unnamed Cross River tributary channel (A3) and Ballyglass River (B1) were evaluated as **local importance (lower value)** in terms of their aquatic ecology, primarily due to low/absent flows and poor fisheries habitat at the time of survey.

**Table 4.1** Aquatic ecological evaluation summary of the aquatic survey sites according to NRA (2009) criteria

| Site no. | Watercourse | EPA code | Evaluation of importance | Rationale summary |
|---|---|---|---|---|
| A1 | Ratawragh Stream | 26R39 | Local importance (lower value) | Very poor fisheries and overall aquatic value due to non-perennial nature of stream (site semi-dry at time of survey); no fish recorded via electro-fishing; no aquatic species or habitats of high conservation value |
| A2 | Barr's Drain | 26B34 | **Local importance (higher value)** | Good-quality salmonid nursery & holding habitat with moderate-quality spawning habitat; moderate-quality lamprey spawning & nursery habitat; brown trout & *Lampetra* sp. recorded via electro-fishing; no other aquatic species or habitats of high conservation value |
| A3 | Drainage channel | n/a | Local importance (lower value) | Poor fisheries or aquatic value due to heavily-silted, heavily-vegetated nature of drainage channel; three-spined stickleback recorded via electro-fishing; no aquatic species or habitats of high conservation value |
| A4 | Cross River | 26C10 | **Local importance (higher value)** | Excellent-quality salmonid nursery & holding with good-quality spawning; good-quality lamprey spawning habitat but poor nursery due to high flow rates; Atlantic salmon, brown trout & stone loach recorded via electro-fishing; Annex I 'floating river vegetation [3260]' present; no other aquatic species or habitats of high conservation value |
| B1 | Ballyglass River | 26B15 | Local importance (lower value) | Poor fisheries or aquatic value due to heavily-silted, nature of drainage channel; three-spined stickleback recorded via electro-fishing; no aquatic species or habitats of high conservation value |
| B2 | Ballyglass River | 26B15 | **Local importance (higher value)** | Moderate-quality salmonid spawning, nursery & holding habitat (impacted by siltation); moderate-quality lamprey spawning & nursery habitat; brown trout, *Lampetra* sp. & three-spined stickleback recorded via electro-fishing; no aquatic species or habitats of high conservation value |

*** Conservation value:** Atlantic salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*), brook lamprey (L*ampetra planeri*), river lamprey (*Lampetra fluviatilis*), white-clawed crayfish (*Austropotamobius pallipes*) are listed under Annex II of the Habitats Directive [92/42/EEC]. Atlantic salmon, river lamprey and white-clawed crayfish are also listed under Annex V of the Habitats Directive [92/42/EEC]. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Fisheries Acts 1959 to 2019, brown trout have no legal protection in Ireland.

# 5. Discussion

## 5.1 Most valuable areas for aquatic ecology

None of the aquatic survey sites were evaluated as greater than **local importance (higher value)**. The higher value sites were present on Barr's Drain (A2), Cross River (A4) and lower reaches of the Ballyglass River (B2). Primarily, this evaluation was due to the presence of salmonids and or Annex II *Lampetra* sp. The remaining survey sites on the Ratawragh Stream (A1), unnamed drainage channel (A3) and Ballyglass River (B1) were evaluated as **local importance (lower value)** in terms of their aquatic ecology given the absence of aquatic species or habitat of high conservation value.

Annex II Atlantic salmon were recorded in low numbers from site A4 on the Cross River, which provided excellent-quality salmonid habitat. Due to downstream migration barriers (such as hydroelectric dams and weirs; AMBER Consortium, 2020), Atlantic salmon distribution is highly restricted in the upper Shannon catchment and the river is only achieving 5% of its conservation limit above Parteen weir in recent years (Gargan et al., 2021). Therefore, the occurrence of small numbers (*n*=3) of 1+ Atlantic salmon parr in the Cross River (approx. 7km upstream of the River Shannon confluence) is particularly noteworthy.

Brown trout were recorded from sites on Barr's Drain (A2), Cross River (A4) and Ballyglass River (B2). Annex II *Lampetra* sp. ammocoetes were recorded in low densities from Barr's Drain (A2) and Ballyglass River (B2) (1.5 & 3.0 per $m^2$, respectively). Both of these sites provided sub-optimal conditions for *Lampetra* sp. due to siltation of spawning substrata and shallow soft sediment deposits. Despite some moderate to good suitability at surveys sites A2, A4 and, to a lesser extent B2, Red-listed European eel (King et al., 2011) were not recorded. Sites A3 and B1 were found to only support low densities of three-spined stickleback. Site A1 did not support fish at the time of survey given very low flows (i.e. non-perennial watercourse).

Despite suitability at sites on the Cross River (A4) and, to a lesser extent, Barr's Drain (A2) and Ballyglass River (B2), no white-clawed crayfish were recorded during the survey (sweep netting and hand-searching of refugia). No crayfish remains were identified in otter spraint recorded at site B2 on the Ballyglass River. Within the wider survey area, crayfish are only known from the Cross River and a small tributary, the Mihanboy River (NPWS & NBDC data; see **Figure 3.1**), with the most recent record available from 2014. An outbreak of the highly-infectious crayfish plague (*Aphanomyces astaci*) - a pathogen which causes 100% mortality in white-clawed crayfish populations - was confirmed on the River Al in Athlone in 2018 (DCHG, 2018) and this may have impacted populations throughout the wider Upper Shannon catchment, including the Cross River.

The Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and aquatic mosses [3260] was recorded from site A4 on the Cross River (proposed GCR crossing). This was considered given the presence of indicator species *Berula erecta* (extensive heterophyllous stands), *Potamogeton* spp. and several aquatic bryophytes, including *Fontinalis antipyretica* (EC, 2013; Devaney et al., 2013). No other survey sites supported this Annex I habitat.

In summary, none of the watercourses in the vicinity of the proposed Seven Hills Wind Farm were of greater than **local importance (higher value)** in terms of their aquatic ecology. The only watercourse draining the area in the vicinity of the proposed wind farm boundaries is the Ballyglass River. In its lower reaches, the river supports species of higher conservation value such as *Lampetra* sp. lamprey (and also otter). However, the upper reaches evidently suffer from low seasonal flows (typical of karstic limestone catchments), which significantly reduces the aquatic and fisheries value of the river. Further downstream, significant agricultural pressures (e.g., historical drainage, enrichment, siltation) were evident. Of those watercourses crossed by the proposed GCR, the Cross River can be considered of particular importance given that site A4 was found to support excellent-quality salmonid habitat, Annex II Atlantic salmon (rare in the upper Shannon catchment) and examples of the Annex I Habitat, 'Watercourses of plain to montane levels with the *Ranunculion-flutantis* and *Callitricho-Batrachion* vegetation' [3260].

# 6. References


AMBER Consortium (2020). The AMBER Barrier Atlas. A Pan-European database of artificial instream barriers. Version 1.0 June 29th 2020. https://amber.international/european-barrier-atlas/

Byrne, A. W., Moorkens, E. A., Anderson, R., Killeen, I. J., & Regan, E. (2009). Ireland Red List no. 2: non-marine molluscs. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government.

DCHG (2018). Crayfish Plague outbreak on Al River, Athlone. Press Release issued 09/11/2018 by Dept. Culture, Heritage and the Gaeltacht. Available at: https://biodiversityireland.ie/crayfishplague-al-river/

Devaney, F. M., Martin, J. R., O'Neill, F. H., & Delaney, A. (2013). Irish semi-natural grasslands survey (No. 4). Annual Report.

EA (2003). River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003. Environment Agency, UK.

EC (2013). Interpretation Manual of European Union Habitats, version EUR 28. European Commission. Available at: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

Feeley, H. B., Baars, J. R., Kelly-Quinn, M., & Nelson, B. (2020). Ireland Red List No. 13: Stoneflies (Plecoptera). National Parks and Wildlife Service.

Fossitt, J. (2000) A Guide to Habitats in Ireland. The Heritage Council, Ireland.

Foster, G. N., Nelson, B. H. & O Connor, Á. (2009) Ireland Red List No. 1 – Water beetles. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Gargan, P., Fitzgerald, C., Kennedy, R., Maxwell, H., McLean, S. & Millane, M. (2021). The Status of Irish Salmon Stocks in 2020 with Catch Advice for 2021. Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries. 53 pp.

Kelly-Quinn, M. & Regan, E.C. (2012). Ireland Red List No. 7: Mayflies (Ephemeroptera). National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Nelson, B., Ronayne, C. & Thompson, R. (2011). Ireland Red List No.6: Damselflies & Dragonflies (Odonata). National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes. Revision 2, 1st June 2009. National Roads Authority, Dublin.

# 7. Appendix A – fisheries assessment report

Please see accompanying fisheries assessment report

# Fisheries assessment of Seven Hills wind farm, Co. Roscommon

Prepared by Triturus Environmental Ltd. for McCarthy Keville O' Sullivan Ltd.

**October 2021**

---

Please cite as:

Triturus (2021). Aquatic baseline report for Seven Hills wind farm, Co. Roscommon. Report prepared by Triturus Environmental Ltd. for McCarthy Keville O' Sullivan Ltd. October 2021.

# Table of contents

# 1. Introduction

## 1.1 Background

Triturus Environmental Ltd. were contracted by McCarthy Keville O' Sullivan Ltd. to undertake a baseline fisheries assessment of numerous watercourses in the vicinity of the proposed Seven Hills Wind Farm, located near Dysart, Co. Roscommon (**Figure 2.1**).

The survey was undertaken to establish baseline fisheries data used in the preparation of the EIAR for the Proposed Development. In order to gain an accurate overview of the existing and potential fisheries value of the riverine watercourses within the vicinity of the proposed wind farm, a catchment-wide electro-fishing survey across *n*=6 sites was undertaken (**Table 2.1; Figure 2.1**). Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey and European eel (*Anguilla anguilla*), as well as other species, and helped to further inform impact assessment and any subsequent mitigation for the project.

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake a catchment-wide electro-fishing survey in the vicinity of the proposed Seven Hills wind farm. Permission was granted on 6th September 2021 and the survey was undertaken on 23rd and 24th September 2021.

## 1.2 Fisheries asset of the survey area

The proposed survey sites were located within the Suck_SC_090 and Shannon[Upper]_SC_100 river sub-catchments. Whilst not located within a European site, the proposed wind farm site shared (via the Ballyglass River) downstream hydrological connectivity with the River Suck Callows SPA (004097) and the River Shannon Callows SAC (000216) (via the Cross River). No survey sites were located within a European site.

Fisheries survey sites were present on the Ballyglass River (EPA code: 26B15), Ratawragh Stream (26R39), Barr's Drain (26B34) and the Cross River (26C10) and an unnamed drainage channel tributary (**Table 2.1**; **Figure 2.1**).

The Cross River (26C10) is a low-lying limestone watercourse that rises approximately 1km east of Cuilleenirwan Lough, Co. Roscommon. It flows in a south-westerly direction for approximately 21km until it joins the River Shannon, 2km south of Athlone. The Cross River is a renowned recreational brown trout (*Salmo trutta*) fishery although historical drainage works (as recent as 2001) have impacted the fisheries habitat (O'Reilly, 2009). In addition to brown trout, the river is known to support perch (*Perca fluviatilis*), pike (*Esox lucius*), gudgeon (*Gobio gobio*), roach (*Rutilus rutilus*) and roach x bream hybrids (*R. rutilus* x *Abramis brama*) (Kelly et al., 2010; 2017).

Fisheries data for the other watercourses within the survey area was not available at the time of survey.

# 2. Methodology

## 2.1 Fish stock assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on watercourses in the vicinity of the proposed Seven Hills Wind Farm in September 2021, following notification to Inland Fisheries Ireland and under the conditions of a Department of Communications, Climate Action & Environment (DCCAE) licence. Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank.

Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e. salmonids, lamprey, and eel, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel can be surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g. CFB, 2008).

The catchment-wide electro-fishing (CWEF) survey was undertaken across *n*=6 sites (see **Table 2.1, Figure 2.1**).

**Table 2.1** Location of *n*=6 electro-fishing survey sites in the vicinity of Seven Hills Wind Farm, Co. Roscommon

| Site no. | Watercourse | EPA code | Location | X (ITM) | Y (ITM) |
|---|---|---|---|---|---|
| A1 | Ratawragh Stream | 26R39 | R363 road crossing | 594318 | 744329 |
| A2 | Barr's Drain | 26B34 | R363 road crossing | 596453 | 743348 |
| A3 | Drainage channel | n/a | R363 road crossing | 598085 | 741970 |
| A4 | Cross River | 26C10 | R363 road crossing | 599342 | 741770 |
| B1 | Ballyglass River | 26B15 | R363 road crossing | 588454 | 745655 |
| B2 | Ballyglass River | 26B15 | Ballyglass Bridge | 585639 | 743487 |

### 2.1.1 Salmonids and European eel

For salmonid species and European eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of approx. 50-100m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages. At certain, more minor watercourse sites or sites with limited access (i.e. sits A3 & B2), it was more feasible to undertake electro-fishing for a 5-minute CPUE (**Table 3.1**).

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the moderate to high conductivity waters of the sites (most draining calcareous geologies) a voltage of 220-275v, frequency of 30-35Hz and pulse duration of 3-3.5ms was utilised to draw fish to the anode without causing physical damage.

### 2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted box quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approx. 10-15 cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

## 2.2 Fisheries habitat

### 2.2.1 General fisheries habitat

A broad appraisal of the upstream and downstream habitat at each site was also undertaken to evaluate the wider contribution to salmonid and lamprey spawning and general fisheries habitat. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (EA, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e. channel profiles, substrata etc.).

## 2.3 Biosecurity

A strict biosecurity protocol following the Check-Clean-Dry approach was employed during the survey. Equipment and PPE used was disinfected with Virkon® between survey sites to prevent the transfer of pathogens and/or invasive species between survey areas. Particular cognisance was given to preventing the introduction or spread of crayfish plague (*Aphanomyces astaci*) given the known presence of white-clawed crayfish in the wider survey area (e.g. Cross River). As per best practice, surveys were undertaken at sites in a downstream order (i.e. uppermost site surveyed first etc.) to prevent the upstream mobilisation of invasive propagules and pathogens.

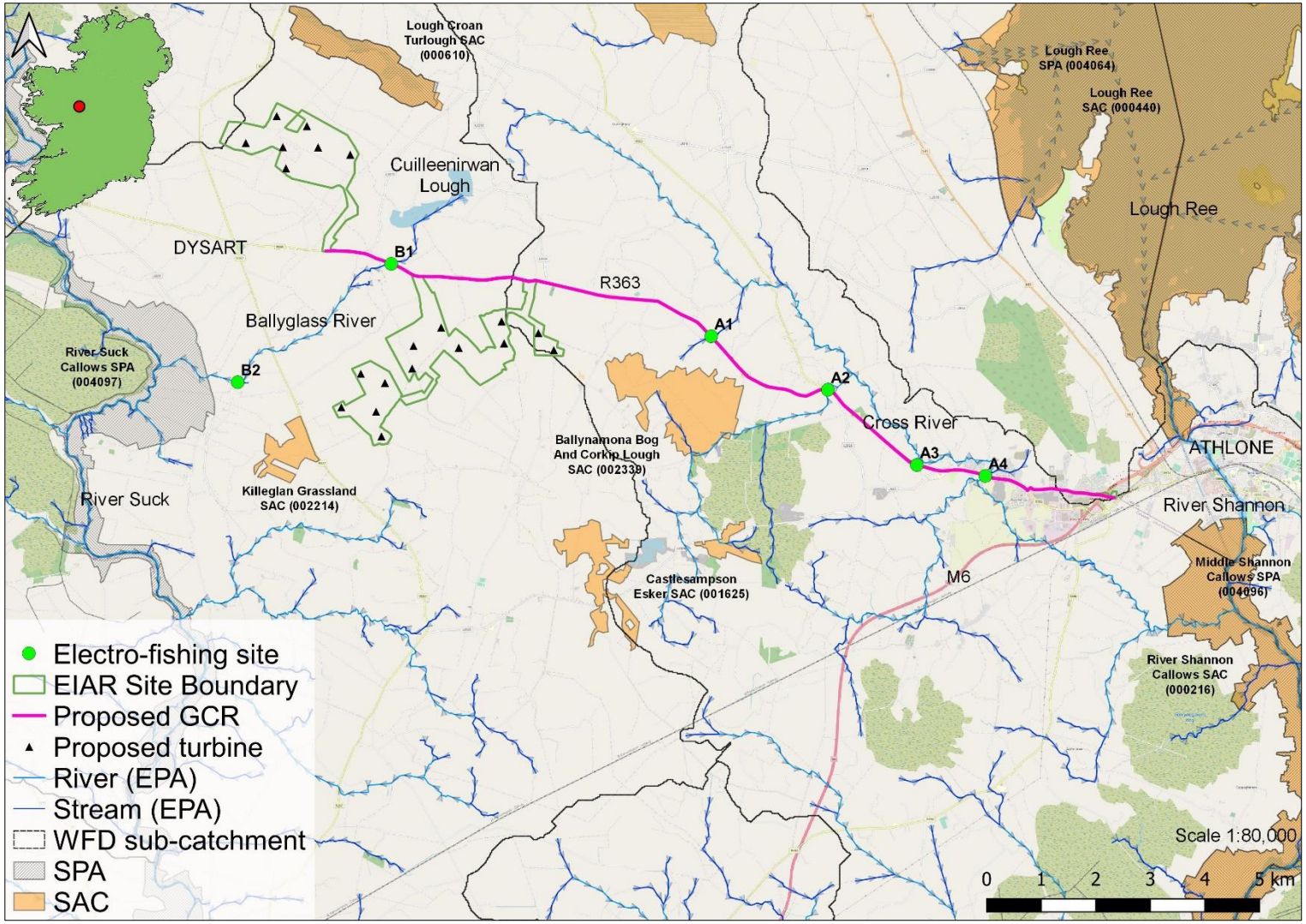


**Figure 2.1** Location overview of the *n*=6 electro-fishing sites in vicinity of the proposed Seven Hills wind farm, Co. Roscommon

# 3. Results

A catchment-wide electro-fishing survey of *n*=6 sites in the vicinity of the proposed Seven Hills Wind Farm was conducted on the 23rd and 24th September 2021 following notification to Inland Fisheries Ireland. The results of the survey are discussed below in terms of fish population structure, population size and the suitability and value of the surveyed areas as nursery and spawning habitat for salmonids, European eel and lamprey species. Scientific names are provided at first mention only.

## 3.1 Fish stock assessment (electro-fishing)

### 3.1.1 Site A1 – Ratawragh Stream, R363 road crossing

No fish were recorded via electro-fishing at site A1. The stream was semi-dry at this location during the time of survey (stagnant pools only) and was considered likely to convey water flows only during wetter/flood periods (i.e. a non-perennial watercourse). The site had very poor fisheries or aquatic value given its semi-dry nature. However, fisheries value improved in the downstream-connecting Cross River, approx. 1.1km downstream.

**Plate 3.1** Representative image of site A1 on the Ratawragh Stream, September 2021 (semi-dry channel)

### 3.1.2 Site A2 – Barr's Drain, R363 road crossing

Brown trout (*Salmo trutta*) and *Lampetra* sp. were the only fish species recorded via electro-fishing at site A2 (**Figure 3.1**). Mixed-cohorts of trout were present, with moderate densities of juveniles and low numbers of adults (*n*=45 total). A low density of *Lampetra* sp. (both ammocoetes and transformers) were recorded (1.5 per $m^2$).

The site was evidently a valuable salmonid nursery, with moderate densities of juvenile brown trout recorded. Holding habitat was also of good-quality (deeper glide/pool, undercut banks etc.). Spawning habitat, whilst present, was localised and compromised by siltation and bed compaction. Lamprey larval habitat was sparse and sub-optimal where present, only supporting a very low density of ammocoetes. Despite some good suitability, no European eel were recorded.

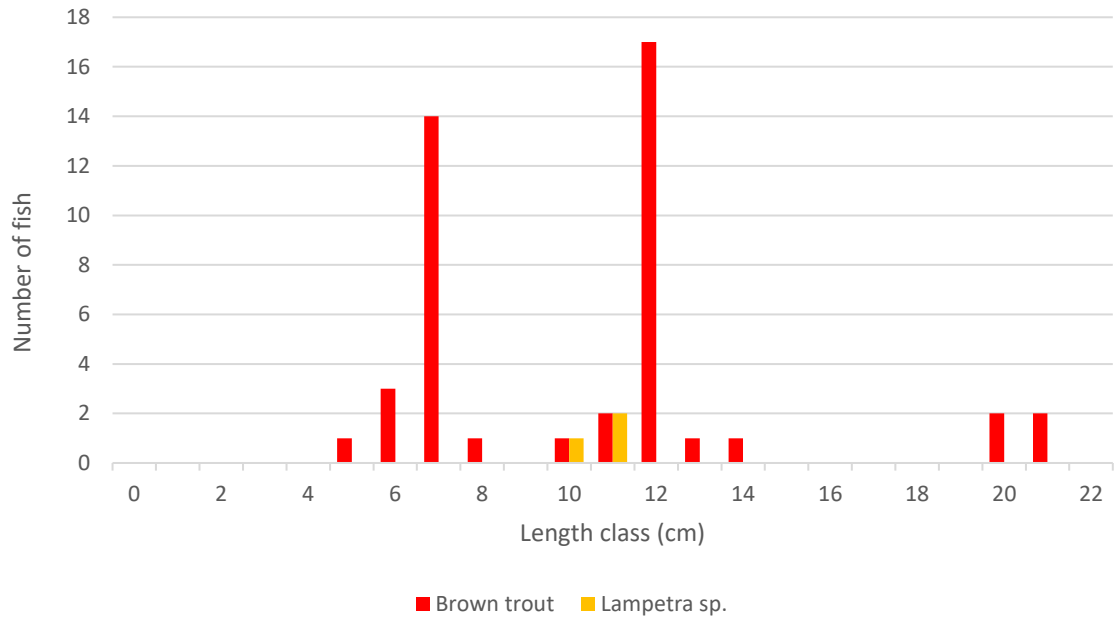


**Figure 3.1** Length frequency distribution recorded via electro-fishing at site A2 on Barr's Drain, September 2021


**Plate 3.2** *Lampetra* sp. transformer recorded from site A2 on Barr's Drain, September 2021

### 3.1.3 Site A3 – unnamed drainage channel, R363 road crossing

Three-spined stickleback (*Gasterosteus aculeatus*) was the only fish recorded via electro-fishing from site A3 (**Figure 3.2**). With the exception of low densities of this species (*n*=7), the heavily-vegetated site was not of fisheries value given gross siltation, shallow depth and low flow rates (i.e. a drainage ditch habitat). There was no suitability for salmonids, lamprey, European eel or other fish species at the time of survey. Fisheries value was significantly improved in the downstream-connecting Cross River, approx. 100m downstream.

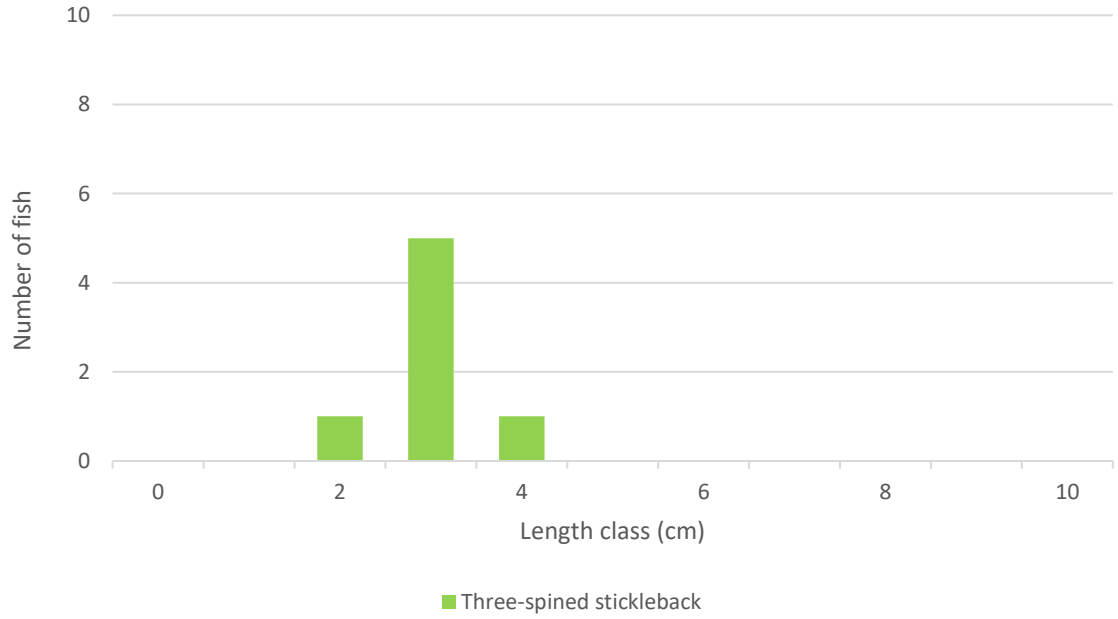


**Figure 3.2** Length frequency distribution recorded via electro-fishing at site A3, September 2021


**Plate 3.3** Three-spined stickleback recorded from site A3 on an unnamed drainage channel, September 2021

### 3.1.4 Site A4 – Cross River, R363 road crossing

A total of three fish species were recorded via electro-fishing from site A4 (**Figure 3.3**). The site supported a high density of adult brown trout, with moderate numbers of juvenile brown trout (*n*=43 total) and low numbers of Atlantic salmon (*Salmo salar*) (*n*=3). A low density of stone loach (*Barbatula barbatula*) was also recorded (*n*=2).

The lowland river site was of high value as a salmonid nursery and holding habitat, with some locally excellent-quality spawning (mostly good-quality, however, due to compaction). The scoured banks with overhanging vegetation also provided some high-quality adult salmonid holding habitat. Faster-flowing glide and riffle areas supported low numbers of Atlantic salmon. Some good-quality lamprey spawning habitat was present but the high-energy site was largely unsuitable as a lamprey nursery (no sediment accumulations) and none were recorded. Despite some high suitability, no European eel were recorded.

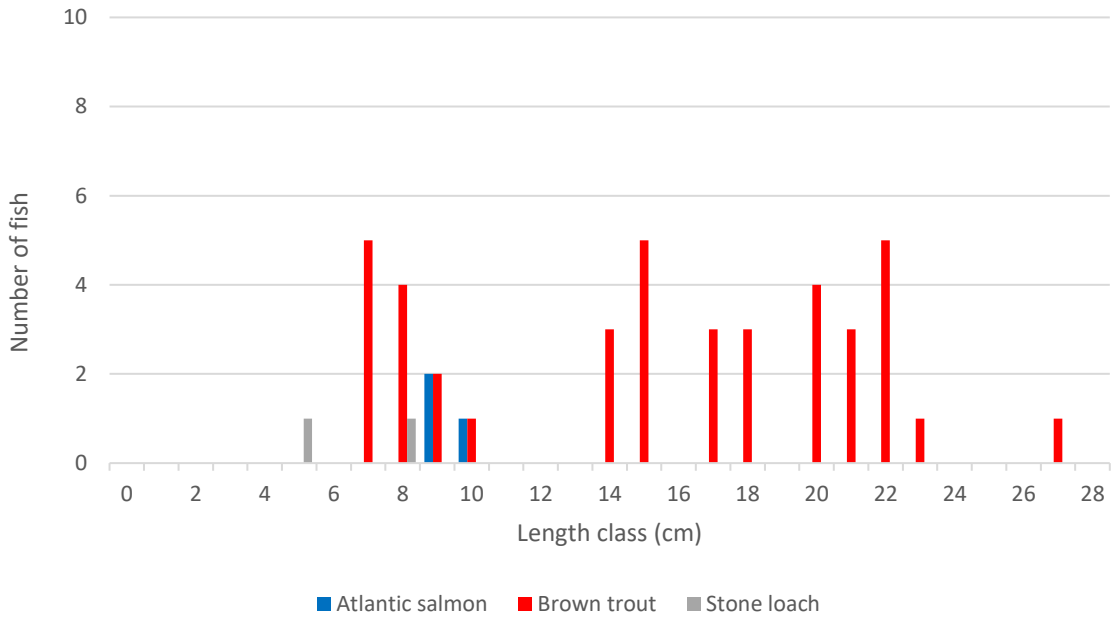


**Figure 3.3** Length frequency distribution recorded via electro-fishing at site A4 on the Cross River, September 2021


**Plate 3.4** Juvenile Atlantic salmon (top) and brown trout (bottom) recorded at site A4 on the Cross River, September 2021

### 3.1.5 Site B1 – Ballyglass River, R363 road crossing

Three-spined stickleback was the only fish recorded via electro-fishing from site B1 (**Figure 3.4**). With the exception of low densities of this species (*n*=6), site B1 in the upper reaches of the Ballyglass River was not of fisheries value given gross siltation, shallow depth and low flow rates at the time of survey (possibly non-perennial at this location). Overall, there was very poor suitability for salmonids, lamprey, European eel or other fish species at the time of survey. Fisheries value was significantly improved in downstream (see 3.1.6 below).

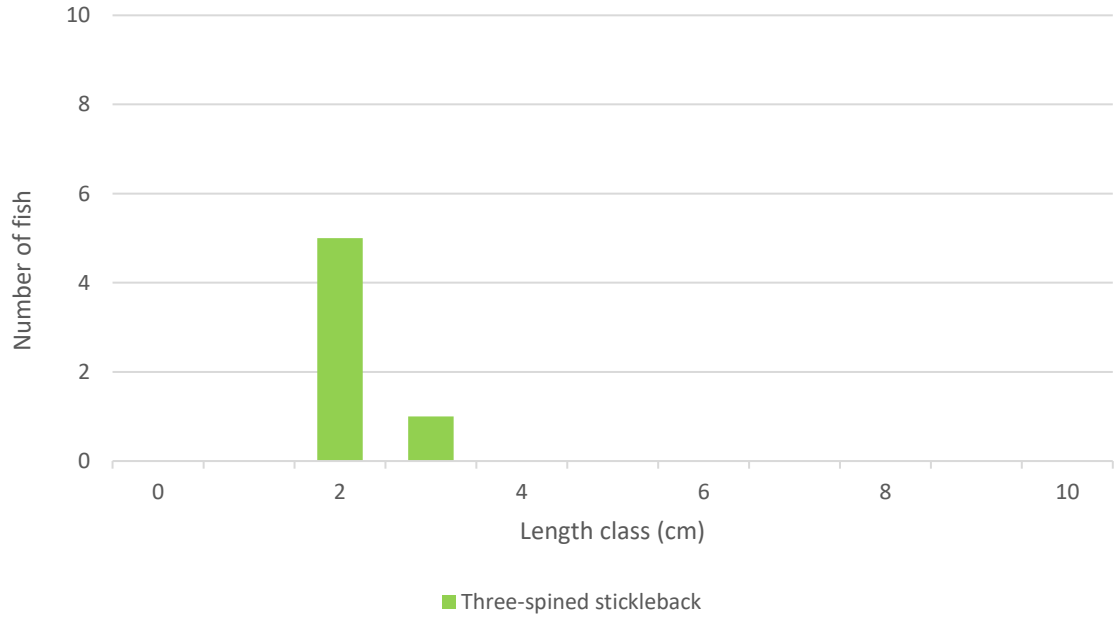


**Figure 3.4** Length frequency distribution recorded via electro-fishing at site B1, September 2021

**Plate 3.5** Representative image of site B1 on the Ballyglass River, September 2021

### 3.1.6 Site B2 – Ballyglass River, Ballyglass Bridge

A total of three fish species were recorded via electro-fishing at site B3 (**Figure 3.5**). The site supported a low density of juvenile and small adult brown trout (*n*=6 total), with moderate densities of three-spined stickleback (*n*=16). Low densities of *Lampetra* sp. ammocoetes were present (3 per $m^2$). However, most ammocoetes were at a late stage of development and large (>14cm).

The site was of moderate value only to salmonids given heavy siltation (primarily derived from livestock poaching). Salmonid and lamprey spawning habitat was present but compromised by siltation. Salmonid nursery habitat was present but relatively poor-quality given the shallow depth. Some good holding habitat was present but supported only low densities of adult trout. Lamprey nursery habitat was present but sub-optimal given a high proportion of sand and clay, in addition to compaction and the shallow nature of deposits (invariably <5cm). Despite some low suitability, no European eel were recorded (few accessible refugia or deeper pool areas).

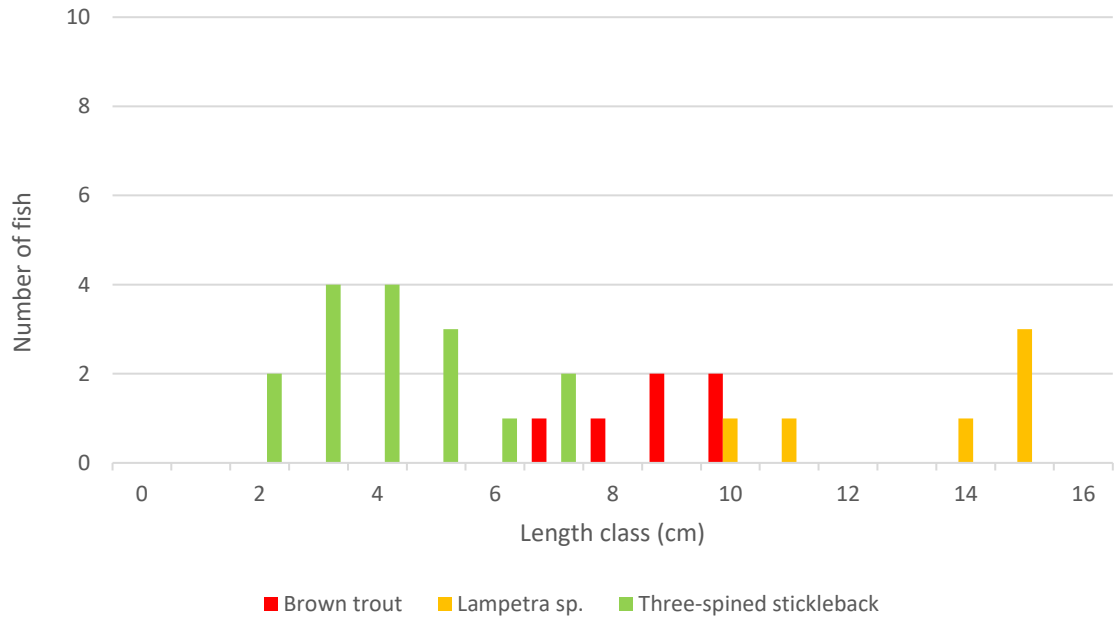


**Figure 3.5** Length frequency distribution recorded via electro-fishing at site B2 on the Ballyglass River, September 2021


**Plate 3.6** Juvenile brown trout recorded from site B2 on the Ballyglass River, September 2021

**Table 3.1** Fish species densities per $m^2$ recorded at sites in the vicinity of Seven Hills wind farm via electro-fishing in September 2021. Values in bold represent the highest densities recorded for each species, respectively. * = no. ammocoetes per $m^2$ of targeted habitat fished. Greyed out values indicate no fish recorded during the survey.

| Site | Watercourse | CPUE (elapsed time) | Approx. area fished ($m^2$) | Fish density (number fish per $m^2$) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Atlantic salmon | Brown trout | *Lampetra* sp. | Stone loach | Three-spined stickleback |
| A1 | Ratawragh Stream | 5 | 60 | 0.000 | 0.000 | 0.000 | 0.000 | 0.100 |
| A2 | Barr's Drain | 10 | 180 | 0.000 | 0.039 | 2* | 0.000 | 0.089 |
| A3 | Drainage channel | n/a | dry channel | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| A4 | Cross River | 10 | 175 | 0.000 | **0.257** | 1* | 0.000 | 0.000 |
| B1 | Ballyglass River | 5 | 60 | 0.000 | 0.000 | 0.000 | 0.000 | **0.117** |
| B2 | Ballyglass River | 10 | 210 | **0.014** | 0.205 | 0.000 | **0.010** | 0.000 |

# 4. Discussion

## 4.1 Most valuable sites

### 4.1.1 Salmonids

Atlantic salmon were recorded in low numbers from site A4 on the Cross River, which provided excellent-quality salmonid habitat. Brown trout were recorded from sites on Barr's Drain (A2), Cross River (A4) and Ballyglass River (B2).

The only watercourse draining the area in the vicinity of the proposed EIAR Site Boundary is the Ballyglass River. In its upper reaches, the river was historically straightened and deepened, heavily silted, suffered from low flows during the survey period and did not support salmonids. However, a population of mixed-cohort brown trout were present in the vicinity of Ballyglass Bridge at site B2. Here, salmonid habitat was also impacted by historical drainage pressures (as with upstream), low seasonal flows, siltation and eutrophication (primarily from agriculture). The same pressures also reduced the quality of habitat in Barr's Drain. Sites on the Ratawragh Stream (A1), unnamed drainage channel (A3) and Ballyglass River (B1) were not capable of supporting salmonids due to intermittent flows and or heavy siltation pressures.

The best quality salmonid habitat, and highest salmonid density (**Table 3.1**), was present on the Cross River (A4) which provided excellent-quality nursery and spawning habitat for salmonids, including Atlantic salmon. Due to downstream migration barriers (such as hydroelectric dams and weirs), Atlantic salmon distribution is highly restricted in the upper Shannon catchment and the river is only achieving 5% of its conservation limit above Parteen weir in recent years (Gargan et al., 2021). Therefore, the occurrence of small numbers (*n*=3) of 1+ Atlantic salmon parr in the Cross River (approx. 7km upstream of the River Shannon confluence) is particularly noteworthy.

### 4.1.2 Lamprey

*Lampetra* sp. ammocoetes were recorded in low densities from Barr's Drain (A2) and Ballyglass River (B2) (1.5 & 3.0 per $m^2$ of targeted habitat, respectively). Both of these sites provided sub-optimal conditions for *Lampetra* sp. due to siltation of spawning substrata and shallow soft sediment deposits. A single transformer (mature adult; **Plate 3.2**) was recorded at site A2. Given downstream barriers in the wider Upper Shannon catchment, all *Lampetra* sp. recorded were considered likely to be brook lamprey (*Lampetra planeri*).

Suitability for lamprey was typically poor across the survey sites given low flows (sites A1, A3, B1) and or historical drainage and siltation pressures (A2, B2). Site A4 on the Cross River, whilst providing some very good quality spawning habitat (abundant clean gravels), did not support soft sediment areas suitable for ammocoete burial given very high flow rates and a lack of depositional areas. Owing to their relatively small morphologies, *Lampetra* species such as brook lamprey require clean, fine gravels in which to dig their redds (Lasne et al., 2010; Rooney et al., 2013; Aronsuu & Virkkala, 2014; Dawson et al., 2015) although areas may also include fractions of sand, larger gravels, and cobble (Nika & Virbickas, 2010).

### 4.1.3 European eel

On both a global and Irish scale, the European eel is listed as 'critically endangered' (Pike et al., 2020; King et al., 2011). Despite some moderate to good suitability at surveys sites on Barr's Drain (A2), Cross River (A4) and, to a lesser extent the Ballyglass River (B2), eel were not recorded. As outlined above, this limited distribution was considered primarily as a result of poor/low seasonal flows across the wider survey area, as well as instream migration barriers in the wider Shannon catchment (AMBER Consortium, 2020).

# 5. References


AMBER Consortium (2020). The AMBER Barrier Atlas. A Pan-European database of artificial instream barriers. Version 1.0 June 29th 2020. https://amber.international/european-barrier-atlas/

APEM (2004). Assessment of sea lamprey distribution and abundance in the River Spey: Phase II. Scottish Natural Heritage Commissioned Report No. 027 (ROAME No. F01AC608).

Aronsuu, K. & Virkkala, P. (2014). Substrate selection by subyearling European river lampreys (*Lampetra fluviatilis*) and older larvae (*Lampetra* spp.). Ecology of Freshwater Fish, 23: 644–655.

CEN (2003). Water Quality - Sampling of Fish with Electricity. Document CEN EN 14011:2000.

CFB (2008). Methods for the Water Framework Directive. Electric Fishing in Wadeable Reaches. Central Fisheries Board, Dublin. Unpublished report.

EA (2003). River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual: 2003 Version. Forest Research. Environment Agency, UK.

Gardiner, R. (2003). Identifying lamprey. A field key for sea, river and brook lamprey. Conserving Natura 2000 Rivers, Conservation techniques No. 4. Peterborough. English Nature.

Gargan, P., Fitzgerald, C., Kennedy, R., Maxwell, H., McLean, S. & Millane, M. (2021). The Status of Irish Salmon Stocks in 2020 with Catch Advice for 2021. Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries. 53 pp.

Goodwin, C.E., Dick, J.T.A. & Elwood, R.W. (2008). A preliminary assessment of the distribution of the sea lamprey (*Petromyzon marinus* L), river lamprey (*Lampetra fluviatilis* (L.)) and brook lamprey (*Lampetra planeri* (Bloch)) in Northern Ireland. Biology and Environment: Proceedings of the Royal Irish Academy 109B, 47-52.

Harvey, J. & Cowx, I. (2003). Monitoring the River, Sea and Brook Lamprey, *Lampetra fluviatilis, L. planer*i and *Petromyzon marinus*. Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough.

Kelly, F., Matson, R., Wightman, G., Connor, L., Feeney, R., Morrissey, E., O'Callaghan, R., Hanna, G., Rocks, K. & and Harrison, A. (2010). ShRFB Rivers: Sampling fish for the Water Framework Directive – Rivers 2008. Central and Regional Fisheries Boards, Dublin.

Kelly, F.L., Matson, R., Delanty, K., Connor, L., O'Briain, R., Gordon, P., Corcoran, W., McLoone, P., Connor, L., Coyne, J., Morrissey, E., Cierpal, D., Rocks, K., Buckley, S., Kelly, K., McWeeney, D. &Puttharee, D. (2017). Sampling Fish in Rivers 2016. National Research Survey Programme. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland.

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011). Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Matson, R., Delanty, K., Shephard, S., Coghlan, B., & Kelly, F. (2018). Moving from multiple pass depletion to single pass timed electrofishing for fish community assessment in wadeable streams. Fisheries Research, 198, 99-108.

Nika, N. & Virbickas, T. (2010). Brown trout *Salmo trutta* redd superimposition by spawning *Lampetra* species in lowland stream. Journal of Fish Biology 77: 2358–2372.

Niven, A.J. & McCauley, M. (2013). Lamprey Baseline Survey No2: River Faughan and Tributaries SAC. Loughs Agency, 22, Victoria Road, Derry.

O'Grady, M.F. (2006). Channels and challenges: enhancing Salmonid rivers. Irish Fresh- water Fisheries Ecology and Management Series: Number 4. Central Fisheries Board, Dublin.

Pike, C., Crook, V. & Gollock, M. (2020). *Anguilla anguilla*. The IUCN Red List of Threatened Species 2020: e.T60344A152845178. https://dx.doi.org/10.2305/IUCN.UK.20202.RLTS.T60344A152845178.en

Potter, I. C., & Osborne, T.S. (1975). The systematics of British larval lampreys. Journal of Zoology, 176(3), 311-329.


Triturus Environmental Ltd.

42 Norwood Court,

Rochestown,

Co. Cork,

T12 ECF3.