Environmental Impact Assessment Report

Teindland Wind Farm

Volume 3

TA A6.4: Fish Habitat Survey Report

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Technical Appendix 6.4: Fish Habitat Survey Report

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1 Introduction

1.1 Background

This Technical Appendix has been prepared to accompany Chapter 10 'Ecology' of the Teindland Wind Farm Environmental Impact Assessment Report (EIAR). It presents detailed methodologies and results of desk studies and field surveys completed in 2024 to establish baseline conditions with regards to fisheries. In addition, opportunities for enhancements for fish fauna are also considered.

The following species of conservation significance are considered:

- European eel *Anguilla anguilla* - Council Regulation (EC) No 1100/ 2007) establishing measures for the recovery of the stock of European eel; listed by IUCN as Critically Endangered, Scottish Biodiversity List (SBL) (Watching Brief Only) and UK Biodiversity Action Plan (BAP) Priority Species;
- Atlantic salmon *Salmo salar* – Annex II of Habitats Directive, Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003, SBL (Conservation Action Needed & Avoid Negative Impacts) and UK BAP Priority Species;
- Brown trout/sea trout *Salmo trutta* - SBL (Conservation Action Needed) and UK BAP Priority Species;
- Freshwater pearl mussel *Margaritifera margaritifera* – Schedule 5 of the Wildlife and Countryside Act (1981) and Annex II of Habitats Directive SBL (Conservation Action Needed) and UK BAP Priority Species;
- River lamprey *Lampetra fluviatilis* - Annex II of Habitats Directive, SBL (Avoid Negative Impacts) and UK BAP Priority Species;
- Brook lamprey *Lampetra planeri* - Annex II of Habitats Directive, SBL (Avoid Negative Impacts); and,
- Sea lamprey *Petromyzon marinus* - Annex II of Habitats Directive, SBL (Avoid Negative Impacts) and UK BAP Priority Species.

1.2 Site Overview

The term 'site' in this report refers to the land within the developable area as illustrated on Figure 6.4. The fish habitat survey area encompassed all watercourses within 100m of the developable area. Some of the sample points illustrated on Figure 6.4 are outwith the survey area, due to accessibility. These sample points were all downstream of the development and therefore remain within its zone of influence.

The proposed development lies within the administrative boundary of Moray Council and is located approximately 2km north of Rothes (hereinafter referred to as 'the Site'). The land within the site largely comprises coniferous plantation forestry.

A number of minor watercourses tribute through the site. The locations of all watercourses subject to fish habitat survey (FHS) are illustrated on Figure 10.4. There are two SEPA classified watercourses that lie partially within the survey area and further detail on those is provided in the desk study below.

2 DESK STUDY

2.1 Methodology

A desk study was undertaken in 2024 to identify any classified waterbodies and existing fisheries records within the site and surrounding area.

The following key sources were consulted:

- NatureScot's Site Link Website https://sitelink.nature.scot/site/8363;
- SEPA's River Basin Management Plan (https://www.sepa.org.uk/data-visualisation/water-environment-hub);
- JNCC's distribution of the Freshwater Pearl Mussel (https://sac.jncc.gov.uk/species/S1029/); and
- River Spey Catchment Management Plan: 2023-2030. Spey Catchment Initiative (https://speycatchment.org/spey-catchment-management-plan/).

2.2 Results

The European Water Framework Directive (WFD) requires that surface waterbodies in member states are classified according to ecological status. SEPA's River Basin Management Plan website (https://www.sepa.org.uk/data-visualisation/water-environment-hub) confirms there are two classified watercourses or waterbodies within the survey area.

Part of the Broad Burn lies in the south western extent of the FHS survey area and is classified as having an overall status of 'good' and there are no known barriers to fish migration. The Spey Fisheries Board noted that a distillery weir which represented a barrier to fish passage had been removed from the Broad Burn in recent years.

The second SEPA classified watercourse is the Red Burn which lies partially within the north of the FHS survey area. The Red Burn is classified as having an overall status of 'moderate' and, similarly, 'moderate' in terms of access for fish migration. Both of these watercourses tribute into the River Spey which lies outwith and to the east of the FHS survey area. The Spey is designated as a Special Area of Conservation (SAC) and a Site of Special Scientific Interest (SSSI) on account of its Atlantic salmon, freshwater pearl mussel, sea lamprey and otter *Lutra lutra* populations.

3 FIELD SURVEY

3.1 Methodology

A Fish Habitat Survey was completed on 5th and 6th December 2024. The survey was undertaken by Colin Nisbet. Colin is a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM) and is fully trained on Fish Habitat Survey as part of his Level 3 Management of Electrofishing Operations qualification as accredited by the Scottish Fisheries Coordination Centre (SFCC). He has been undertaking Fish Habitat Surveys for 18 years.

The survey area comprised sections of each watercourse within a 100m of the footprint of the developable area.

The survey aimed to identify any areas of critical fish habitat (i.e. spawning, nursery areas, juvenile and adult holding areas, juvenile lamprey Lampetra spp. Habitat and freshwater pearl mussel habitat).

All stretches of watercourses with a gradient of ≥6 % are considered to be unsuitable or non-productive fish habitat for Atlantic salmon and brown/sea trout. Mills (1973) found that gradients of <3 % were favourable for Atlantic salmon; whilst sea trout were found to spawn in streams with gradients up to 4 %. Most populations of lamprey occur where the average stream gradient is 1.9 – 5.7 m/km, being rarely found where gradients exceed 7.8 m/km or 0.78 % (Maitland and Campbell, 1992). However, lamprey are rare in the Scottish islands and on Skye are only known to be present on the River Broadford (Skye Rivers Trust, 2010). Whilst gradients of ≥6 % are considered to be typically unsuitable for fish fauna, it is recognised that small, isolated, populations of brown trout may occur in locally suitable habitat in stretches with steeper gradients.

The watercourses within the site were systematically walked (including in-stream inspections where required) and the habitats mapped according to the classifications presented in Table 3.1 below.

Specifically, the habitat survey focused on the identification of the following:

- Spawning habitat for salmonid and lamprey species;
- Nursery habitat for lamprey species;
- Areas of habitat important for juvenile salmonids (fry and parr);
- Areas of habitat important for adult holding areas; and
- Areas of suitable substrate and flow conditions for supporting freshwater pearl mussel.

The habitat classification used in this study is based on the Scottish Fisheries Co-ordination Centre's Habitat Surveys Training Course Manual (SFCC 2007), the Environment Agency's Restoration of Riverine Salmon Habitats Guidance Manual (Hendry & Cragg-Hine, 1997), a review of key habitat requirements for other species of conservation significance including lamprey, salmonids and freshwater pearl mussel (e.g. Maitland, 2003; Hendry & Cragg-Hine, 2003; Skinner et al. 2003).

Detailed analysis was undertaken at sample points within any diverse geomorphological and hydrological conditions within each watercourse. Samples were taken at each of the

representative sections of each watercourse. The following information was collected at each sample location: channel gradient; substrate composition (% bedrock, boulders >256 mm, cobbles 65-256 mm, pebbles 4-64 mm, gravel 2-4 mm, coarse sand 0.5-2 mm and fine sand/silt/peat <0.5 mm); average wetted channel width (m); average depth (m) and turbidity (1 [clear] – 3 [turbid]). Any potential barriers to fish movement within watercourses were also recorded. A photograph was taken at each watercourse.

Table 3-1: Fish River Habitat Classifications

Category	Habitat Type	Description	Species Suitability
1 1a 1b 1c	Unsuitable Steep > 10% gradient 6-10% gradient Other – ephemeral, shallow drains, dry beds	Usually 1st – 2nd order watercourses with steep gradient, >6% slopes (often substantially greater), abundant bedrock, lack of fixed substrates, high velocity (e.g. headwaters/rivulets). Also includes less steep ephemeral stretches (e.g. headwater sources), shallow drains and modified watercourses with dry beds.	No productive fish habitat, although some species may migrate through these areas (also refer to 7. Rapids) depending on whether they represent a migration barrier.
2 2a 2b	Spawning Habitat Salmonids Lamprey	Stable "gravels" of minimum 15-30 cm depth, optimal 20-30 mm, not compacted or with excessive silt/sands (<20% by weight) for salmonids. Lamprey spawning habitat where "gravels" include sands. Often at tail end of pools or upstream ends of riffle-runs ensuring oxygenated substrate. Can also be found at end of weir pools.	Spawning habitat - Atlantic salmon (c. 9 m^2 per pair) and sea/brown trout; lamprey.
3	Riffle	Shallow (< 20 cm) and fast flowing, with upstream-facing wavelets which are unbroken (although often some broken water), with substrate dominated by gravel and cobbles.	Fry (0+) habitat – Atlantic salmon/ brown trout/sea trout.
4 4a 4b	Run Shallow (< 0.5 m deep) Deep (>0.5 m deep)	Generally deeper (20-40 cm) and less steep bed compared to riffle, with substrate of boulders, cobbles and gravels. Usually disturbed, rippled surface. Often located immediately downstream of riffle.	Mixed salmonid juvenile habitat. Fry (0+) & Par (1+) habitat - Atlantic salmon/ brown trout/sea trout.
5 5a 5b	Glide Shallow (<0.5 m deep) Deep (> 0.5 m deep)	Shallow gradient stretches with smooth laminar flow with little surface turbulence and generally > 30 cm deep; water flow is silent. Often located below pool.	European eel; non-productive salmonid habitat, although may provide some shelter for adults.
6 6a 6b 6c	Pool Plunge/Scour pool Meander pool Weir/bridge pool	No perceptible flow, eddying and usually > 100 cm deep. Substrate with high proportion of sand and silts. Often located on the outside of meanders, but includes natural scour or plunge pools and artificial weir pools.	Adult refugia Atlantic salmon, sea/brown trout, European eel.
7 7a 7b 7c	Rapids Steep - >10% gradient Moderate - 6-10% gradient Low - <6% gradient	Sections of relatively steep gradient with fast currents and turbulence, with mixed flow types, including free-fall, chutes and broken, with obstructions such as large boulders, rock outcrops and falls.	Negative feature for migratory species and may pose a migratory barrier; elvers and eels limited to velocity of <0.5 m/sec and 2.0 m/sec respectively; lamprey to 2 m/sec.
8 8a 8b	Banks of fine sediment of silts and sands Optimal Sub-optimal	Limited flow (sometimes back-flow) allowing deposition of silts/sands, not anoxic, with/without riparian trees. Optimal habitat is stable fine sediment and sand >15 cm deep with some organic detritus. Sub-optimal habitat includes small areas of deposited silts/sands behind boulders.	Lamprey ammocoete nursery and adult refuge.
9 9a 9b 9c 9d	Vegetation features Riparian trees (tunnel) Flow constriction Aquatic macrophytes	Closed woodland canopy forming tunnel vegetation. In-stream emergent, boulders Stands of aquatic and floating vegetation Stands of emergent (usually marginal) vegetation. LWD forming dams, etc.	Tunnel riparian trees may be negative feature for salmonids, although tree roots and fallen trees may provide refugia for Atlantic salmon/ brown trout/sea trout and

Category	Habitat Type	Description	Species Suitability
9e	Emergent macrophytes Large woody debris		European eel. Aquatics/emergents provide cover for fish, particularly juveniles.
10	Obstructions to migration	Impassable waterfalls, rapids, flow constrictions, weirs, bridge sills, culverts, shallow braided river sections, pollution preventing upstream migration.	All migratory species; impassability varies between species. Leaping ability: <3.7 m Atlantic salmon; <1.81 m trout; European eel and lamprey none.
11 11a 11b 11c	Other features Side channel Backwater Artificial channel	Includes other channel features, with side channel (connected to main channel) and backwaters. Artificial channels may comprise either man-made banks and/or beds.	Side channel/backwater often important refugia for juveniles. Artificial channels have limited diversity and are often non-productive fish habitat.

3.2 Results

Fish suitability at each of the watercourses within the survey area is summarised below. Environmental data from watercourses including channel dimensions, gradient and substrate composition, are presented in Annex 1. Photographs from the watercourses are given in Annex 2.

3.2.1 W1 and W10 - W15 – Unnamed Watercourses

All of these watercourses comprise very minor headwaters, which are likely to be ephemeral in nature and are considered to be of limited suitability for fish fauna.

3.2.2 W2, W3, W6 – W9, W20, W22 and W23 – Carra Burn and Tributaries

The Carra Burn (sample points W2 and W8), is a minor watercourse and largely contains a run and riffle flow type through the survey reach, but also contains some minor rapid sections, where the channel flows through steeper gradients. Although, they are still considered to be passable by fish fauna. The channel has been straightened in the past in its lower reaches. The substrate within the channel is dominated with larger cobbles, but there are also smaller proportions of pebbles and gravels present. The Carra Burn is considered to be suitable for small numbers of both migratory fish fauna. The habitats present are of limited suitability for freshwater pearl mussel due to the minor nature of the watercourse and there were no areas of marginal silt (favoured by lamprey) recorded.

The Cara Burn tributaries covered by sample points W3, W6 and W7 are all of a very similar nature and scale to the Cara Burn itself. By contrast the tributaries covered by sample points W9, W20, W22 and W23 are all minor peaty headwaters, which are likely to be ephemeral in nature and are considered to be of negligible suitability for fish.

3.2.3 W4 – Unnamed tributary of the River Spey

W4 is another very minor watercourse, which lies downstream of the site and tributes into the River Spey. The channel is very silted and is also completely overshaded from its marginal vegetation. It is considered to be of negligible suitability for salmonid fish fauna and for freshwater pearl mussel, but the silt beds have the potential to support juvenile lamprey.

3.2.4 W5 and W24 – W33 Burn of Garbity and Tributaries

The Burn of Garbity (sample point W5), comprises a run, riffle flow type in its lower reaches, but there are waterfalls further upstream which will restrict access to migratory fish. There is a largely cobble substrate type within the channel, but small proportions of sand, gravel and

pebble are also present. The Burn of Garbity is suitable for small numbers of migratory and non-migratory fish in its lower reaches and small numbers of non-migratory fish upstream. Only two of the tributaries of the Burn of Garbity (W25 and W29) are considered to have any suitability for fish and this is limited by the steepness of the gradients over which these channels lie. The remainder are all peaty headwaters and likely to be ephemeral.

3.2.5 W16 – Red Burn

The Red Burn (sample point W16), along with the Cara Burn, is one of the more substantial watercourses within the FHS survey area, but is still a relatively minor watercourse. It flows over a shallow gradient and comprises a range of run, riffle and glide flow conditions throughout the survey reach. The substrates recorded in the channel within the survey reach, were once again dominated by cobbles, but with smaller areas of pebble, gravel and sand also recorded. There are no known barriers downstream and this watercourse is considered to be suitable for both migratory and non-migratory fish fauna. Habitats for freshwater pearl mussel are sub-optimal and none were noted during the FHS survey. Furthermore, there was also a lack of suitable habitat for lamprey recorded.

3.2.6 W17 - W19 and W21 Cushley Burn and Tributaries

The Cushley Burn (sample point W17) is a minor watercourse that tributes into the Red Burn. It has a largely run/riffle flow and comprises substrate proportions very similar to the Red Burn as described above. It is also considered to be suitable for both migratory and non-migratory fish fauna, albeit in small numbers due to its minor nature. Its tributaries (see sample points W18, W19 and W21) are all peaty headwaters with negligible suitability for fish.

3.2.7 W34 – W38 – Headwaters of the Broad Burn

The headwaters of the Broad Burn all comprise peaty headwaters with negligible suitability for fish.

4 SUMMARY AND ENHANCEMENT OPPORTUNITIES

The watercourses within the survey area all eventually drain into the River Spey SAC and SSSI. None of the watercourses within the survey area are designated, but two are SEPA classified watercourses. The Broad Burn is classified as having good overall ecological status and high access for fish migration. The Red Burn is classified as having moderate overall ecological status and moderate access for fish migration.

No freshwater pearl mussels or sea lamprey were recorded during the survey and due to the lack of suitable habitat it is unlikely that this species is present in the survey area.

Among impacts to fish fauna identified in the River Spey Catchment Management Plan, those considered to be particularly relevant at the site level is riparian habitat management – bankside habitat is either bare, over comprised of commercial conifer forestry over almost the entire watercourse stretches within the survey area resulting a lack of cover for fish fauna, or overshading.

It is advised the Habitat Management Plan (HMP) for the project includes target areas for new riparian habitat management and consultation with the Kyle of Sutherland Fisheries Trust and landowner should also consider suitable locations for new riparian planting, to provide areas of bankside cover, but not overshading. This would be best provided by planting of local broadleaved species of local provenance, such as oak *Quercus* spp, alder *Alnus glutinosa*, hazel *Corylus avellana*, rowan *Sorbus aucuparia*, willow *Salix* spp. or birch *Betula* spp. This would benefit areas previously surrounded by commercial conifer plantation once the current coups are scheduled for felling.

It is also advised that prior to any instream works a fish rescue exercise is undertaken, whereby the section of the watercourse is netted off and fish removed from the works area via an electrofishing exercise. Nets should then be left in situ and the watercourse over pumped with works then undertaken in a dry section of channel. Once instream works have been completed the nets should be removed immediately to allow the continuation of fish passage.

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Annex 1: Environmental Data

Location			Substrate Composition (%)							Channel Information				Habitat Type
Easting	Northing	Photo/ Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 – 2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
331001	854981	1				30	70			0.5	20	1	1-2	1a
331363	854657	2			60	20	20			2	20	1	1-2	3, 4
331400	854503	3				30	20	50		1	20	1	1-2	4
331439	853499	4							100	1	30	1	1-2	1a
331206	852025	5			60	20	10	10		1	20	1	1-2	3, 4
330724	854584	6			50	30	20			1	10	1	5	3, 4, 7
330441	854554	7				30	10	60		1	10	1	5	3, 4
330504	854735	8		20	30	20	20	10		1	30	1	5	3, 4, 7
330311	853893	9							100	1	10	1	1-2	1a
330595	853710	10			20	50	30			1	10	1	1-2	1a
330821	853701	11			40	20	10	10		2	10	1	>10	1a
330912	853801	12							100	0.5	10	1	>10	1a
330932	853692	13			30	10	10	20	30	0.5	10	1	>10	1a
330983	853648	14							100	0.5	10	2	>10	1a
330799	853887	15							100	1	10	1	>10	1a
329642	857187	16			50	20	20	10		2	30	2	1-2	3, 4, 5
328485	855263	17			20	60	20			0.5	10	1	3-4	3, 4
328548	855261	18							100	0.5	20	1	3-4	1a
329213	854734	19							100	0.5	10	1	3-4	1a
329705	854744	20							100	1	10	1	3-4	1a
329367	854770	21							100	1	10	1	6-10	1a, 7
328974	854170	22							100	1	20	2	3-4	1a
329183	853940	23							100	0.5	10	1	3-4	1a
330551	852883	24							100	0.5	10	1	6-10	1a
330581	852812	25			30	10	20		40	1	10	1	6-10	7
330356	852725	26							100	1	20	1	>10	1a
330456	852425	27							100	0.5	10	1	>10	1a
330193	852502	28							100	1	10	1	>10	1a
329941	852592	29			20	30	20	10	20	1	20	1	>10	3, 7
329108	853704	30							100	0.5	10	1	3-5	1a
328973	853536	31							100	0.5	20	2	3-5	1a
328897	853439	32							100	0.5	10	1	3-5	1a
328656	853492	33							100	0.5	10	2	3-5	1a
327953	853731	34							100	1	20	2	3-5	1a
327340	853813	35							100	1	30	1	6-10	1a
327743	852327	36							100	0.5	10	1	>10	1a

Location			Substrate Composition (%)							Channel Information				Habitat Type
Easting	Northing	Photo/ Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 – 2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
327501	851197	37							100	0.5	10	1	6-10	1a
327045	853223	38							100	4	10	1	5	1a

Annex 2: Watercourse Photographs

W1

W2

W3

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