

TA6.4 Electrofishing & Habitat Survey



Glenshero Wind Farm
Electrofishing & Habitat Survey
Technical Appendix 6.4

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Prepared For:

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Summary

1. All major water courses draining the site of the proposed Glenshero Wind Farm (the proposed development) were surveyed by electrofishing to assess the fish population present.
2. A habitat survey was completed at each electrofishing site (EIAR Volume 3: Figure 6.9). Notes on habitat quality in each water course were used to produce an assessment of their suitability to support salmonids and other fish species.
3. The Feith Talagain is the major tributary draining the site of the proposed development. Juvenile salmon were present below the large waterfall which is present a short distance above the River Spey. The waterfall is considered to be impassable to migratory salmonids.
4. Upstream of the waterfall the Feith Talagain was found to support a robust and healthy resident trout population, even in the upper reaches which are above numerous other impassable waterfalls.
5. The Allt Coire Iain Oig is the largest tributary of the Feith Talagain. A robust and healthy population of trout was found to be present.
6. The Allt Gilbe is an upper tributary of the Allt Coire Iain Oig. No fish were found in the electrofishing surveys and it may be fishless in its upper reaches. There are several impassable waterfalls below the electrofishing sites and its smaller size may mean it has lacked the critical mass required to sustain a trout population.
7. The Allt Feith a'Mhoraire was the steepest of the burns surveyed. Despite this it supported a robust and healthy trout population.
8. Trout densities ranged from absent to good in the SFCC Moray Firth classification.
9. The trout populations in these upland burns are fragmented; isolated by natural features such as impassable waterfalls and cascades. These populations are resilient but potentially vulnerable to disturbance.
10. No other fish species were found in any of the surveys.
11. The results of this survey and observations on site confirm that the major burns draining the site of the proposed development support sustainable resident brown trout populations, with salmon present in the lower 150m of the Feith Talagain, downstream of an impassable waterfall.
12. In the absence of appropriate mitigation, the construction of the proposed development has the potential to effect water quality and hydrogeomorphology with impacts on the isolated, and vulnerable, resident trout populations. However, as set out in the Outline Construction and Environmental Management Plan (CEMP) (EIAR Volume 4: Technical Appendix 2.1) measures would be adopted to reduce potential effects on water quality and a Water Quality Monitoring Plan would be delivered for the proposed development.

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1. Introduction

The SFB was commissioned by MacArthur Green, who in turn was commissioned by RES Ltd on behalf of Simec Wind One Ltd to carry out an electrofishing and habitat survey of watercourses draining the site of the proposed Glenshero Wind Farm (the proposed development) upstream of Spey Dam. The commission required the completion of baseline electrofishing surveys to establish the nature of the fish populations present within the wind farm, completion of any extended habitat survey and associated reporting.

This report has been produced by Spey Fishery Board (SFB) and in accordance with Scottish Fisheries Coordination Centre (SFCC) guidelines. All staff contributing to this technical appendix have undergraduate and/or postgraduate degrees in relevant subjects, have deep professional fisheries survey experience, and hold professional membership of the SFCC. The report has been reviewed and approved by David MacArthur of MacArthur Green and a copy of his CV is included in EIAR Volume 4: Technical Appendix 1.2.

The aims of the electrofishing and associated habitat survey were:

- To collect baseline data on the fish population present in the major watercourses draining the proposed wind farm site.
- Assess habitat quality and suitability in watercourses draining the proposed wind farm site describing available habitats for all species and age ranges in terms of flow regime, substrate type, cover etc.
- To assess and describe potential physical barriers to migratory fish movement within potentially affected watercourses.
- To report the survey findings and mitigation measures to MacArthur Green.

2. Methods

2.1 Data recording

Research and monitoring of this nature is undertaken by the Spey Foundation for the Spey Fishery Board. The Spey Foundation (SF) is a full member of the SFCC. The SFCC provides protocols for its members including electrofishing data collection and recording. It runs a database for storing electrofishing data in an agreed format. The SFCC also provides electrofishing training to its members, and SF staff are qualified to lead and design electrofishing surveys to SFCC protocols. Wherever possible SF surveys are therefore carried out to the standards required by the SFCC and data are recorded using the agreed format.

The SFCC electrofishing protocol also requires the collection of habitat data at each site. SF staff are certified SFCC Habitat Surveyors.

2.2 Electrofishing Survey technique

Fish populations at each site were assessed using electrofishing. This is a widely used technique to examine freshwater fish communities. The method uses electricity to attract and stun fish, which allows operators to remove them from the water. The fish are transferred to a holding container where they are safely anaesthetised to minimise stress and each individual is then identified and measured. Once recovered, the fish are returned unharmed to the area from which they were captured on completion of the survey.

At all sites battery powered backpack equipment (Efish 500W) was used. Settings were adjusted for each site depending on environmental variables such as conductivity.

A range of survey protocols could have been used including fully quantitative three run surveys, semi quantitative single run sites or timed surveys. Due to the remoteness of many of the sites and the requirement to walk in fully quantitative surveying was ruled out due to equipment which would be required to be carried. At all sites single run semi-quantitative surveys were completed according to SFCC protocol 2.1.2 (SFCC 2007), in preference to a timed protocol, as a national classification scheme was available against which the results could be assessed (Godfrey, 2005).

The survey team commenced at the downstream end of the section and moved backwards and forwards across the channel, with each transect upstream of the previous, so that every part of the bed was covered with the team moving in an upstream direction. The type of capture net used depended on the specific site - at fast flowing sites with small substrate a banner net was used to ensure no stunned fish were carried downstream past the operator. However, in slower flowing water, or where the substrate was made up of many large boulders, a hand net was generally found to be more effective.

All salmonids captured were separated into year classes on the basis of length frequency histograms. As fish grow at very different rates between sites, this was repeated for each site individually. Age classifications were also checked by examining the scales taken from fish of a range of sizes. Fish densities were then separated into fry and parr for the presentation of results. Fry, or 0+, refers to fish less than one year old resulting from spawning at the end of the previous year and parr, or 1++, to older fish.

All salmon referred to in this report belong to the native species *Salmo salar*, whilst the trout are the native brown trout, or its migratory form sea trout (*Salmo trutta*). No other fish species were recorded during this survey.

2.3 Habitat Assessment

The SFCC electrofishing protocol used at all survey sites required that a suite of habitat variables is recorded (SFCC, 2007). These habitat data characterise a range of variables at each site. A subjective assessment of instream cover is also made by staff prior to commencement of the survey. In addition to the site habitat survey the surveyors also recorded the suitability of the stream at each location for juvenile salmonids. Note were on features such as barriers to fish passage, either in the vicinity of the site or downstream, which could prevent the passage of migrating fish.

Stream gradients were calculated using 1:25,000 OS maps to derive elevation with stream lengths derived from Google Earth satellite imagery.

Photographs were taken of each survey site and features of interest observed during the surveys (Annex A).

2.4 Results Classification Density sites

Results are expressed as fish densities (split into fry (0+) or parr (1++)) per 100m² wetted area (i.e. the area within the survey area potentially accessible to fish).

In order to put the results into context reference will be made to the SFCC Scottish National Classification Scheme which included refinements based on regional classifications and river width. This classification scheme provides a system by which the first run results from electrofishing sites can be put into context. The SFCC classification scheme was developed using results from over 1600 electrofishing surveys between 1997 and 2002 (Godfrey 2005).

Table 6.4.1: SFCC Moray Firth region salmonid classes corrected for stream width (density/100m²)

SFCC Moray Firth classification									
Salmon fry/100m ²					Salmon Parr/100m ²				
Width Class	< 4m	4-6m	6-9m	>9m	Width Class	< 4m	4-6m	6-9m	>9m
A - Excellent	86.8+	77.3+	40.4+	32.3+	A - Excellent	30.9+	25.3+	22.8+	16.0+
B - Good	<86.8 - 35.8	<77.3 - 42.6	<40.4 - 26.8	<32.3 - 15.1	B - Good	<30.9 - 18.9	<25.3 - 18.4	<22.8 - 12.4	<16.0 - 12.1
C - Moderate	<35.8 - 22.6	<42.6 - 27.5	<26.8 - 18.7	<15.1 - 9.9	C - Moderate	<18.9 - 11.7	<18.4 - 10.8	<12.4 - 9.2	<12.1 - 6.7
D - Low	<22.6 - 8.6	<27.5 - 7.7	<18.7 - 11.2	<9.9 - 4.0	D - Low	<11.7 - 5.3	<10.8 - 3.7	<9.2 - 4.9	<6.7 - 3.0
E - Very Low	<8.6 - 1.5	<7.7 - 1.0	<11.2 - 0.7	<4.0 - 0.9	E - Very Low	<5.3 - 1.2	<3.7 - 1.0	<4.9 - 0.7	<3.0 - 0.9
Absent	0.0	0.0	0.0	0.0	Absent	0.0	0.0	0.0	0.0
Trout Fry/100m ²					Trout Parr/100m ²				
Width Class	< 4m	4-6m	6-9m	>9m	Width Class	< 4m	4-6m	6-9m	>9m
A - Excellent	39.0+	26.4+	9.3+	5.4+	A - Excellent	18.1+	13.3+	6.1+	2.7+
B - Good	<39.0 - 21.0	<26.4 - 10.4	<9.3 - 6.0	<5.4 - 3.3	B - Good	<18.1 - 13.7	<13.3 - 7.2	<6.1 - 4.0	<2.7 - 1.9
C - Moderate	<21.0 - 14.3	<10.4 - 7.0	<6.0 - 4.5	<3.3 - 1.6	C - Moderate	<13.7 - 9.1	<7.2 - 5.2	<4.0 - 2.3	<1.9 - 1.7
D - Low	<14.3 - 5.9	<7.0 - 2.9	<4.5 - 3.1	<1.6 - 1.2	D - Low	<9.1 - 3.9	<5.2 - 2.3	<2.3 - 1.3	<1.7 - 1.0
E - Very Low	<5.9 - 1.1	<2.9 - 0.5	<3.1 - 0.8	<1.2 - 0.3	E - Very Low	<3.9 - 1.4	<2.3 - 1.0	<1.3 - 0.6	<1.0 - 0.6
Absent	0.0	0.0	0.0	0.0	Absent	0.0	0.0	0.0	0.0

The Spey catchment is highly variable and salmon are able to access a wide range of habitat types. However, some rivers/burns will only naturally support low numbers of fish even if the habitat is pristine, e.g. high altitude burns draining granite geology. Many of the smaller burns in particular are inaccessible to migratory salmonids due to the presence of natural waterfalls or occasionally man-made obstructions such as weirs.

3. Survey Findings

3.1 Site details

Site selection was agreed with MacArthur Green in advance of the surveys. At least two sites were surveyed in each of the major tributaries draining the proposed wind farm location. Sites were selected to provide spatial coverage within each tributary and were selected to be representative of the habitat in that locality. Details of the sites surveyed are presented in Table 6.4.2 below and in EIAR Volume 3: Figure 6.9.

Table 6.4.2: Glenshero Wind Farm electrofishing site details

Watercourse	Site code	Easting	Northing	Site location	Altitude (m)	Area fished (m ²)	Ave width (m)	Conductivity μ Siemens/cm
Feith Talagain	SUB14a	252350	795100	Downstream waterfall	296	184.3	14.4	24.6
Feith Talagain	SUB14b	252333	795449	Downstream confluence with Allt Coire Iain Oig	308	159.5	10.4	26.0
Feith Talagain	SUB14c	254080	797278	Upstream bend	457	147.1	7.28	25.0
Feith Talagain	SUB14d	254133	797627	Grid Ref.	469	156.4	8.06	20.6
Allt Coire Iain Oig	SUB14IOa	251977	797060	Opp. kink in plantation fence	380	88.3	4.46	26.5
Allt Coire Iain Oig	SUB14IOb	251789	797870	At top of plantation	427	106.6	4.96	29.0

Watercourse	Site code	Easting	Northing	Site location	Altitude (m)	Area fished (m ²)	Ave width (m)	Conductivity μ Siemens/cm
Allt Gilbe	SUB14AGa	250658	797278	250m upstream track	473	70.0	2.9	26.0
Allt Gilbe	SUB14AGb	250514	797442	150m upstream right bank tributary	487	89.9	3.34	26.0
Allt Feith a'Mhoraire	SUB17b	247045	796904	150m upstream fenceline	424	174.2	6.6	22.0
Allt Feith a'Mhoraire	SUB17c	247509	797243	300m upstream Allt Luaidhe	459	96.2	3.7	19.0

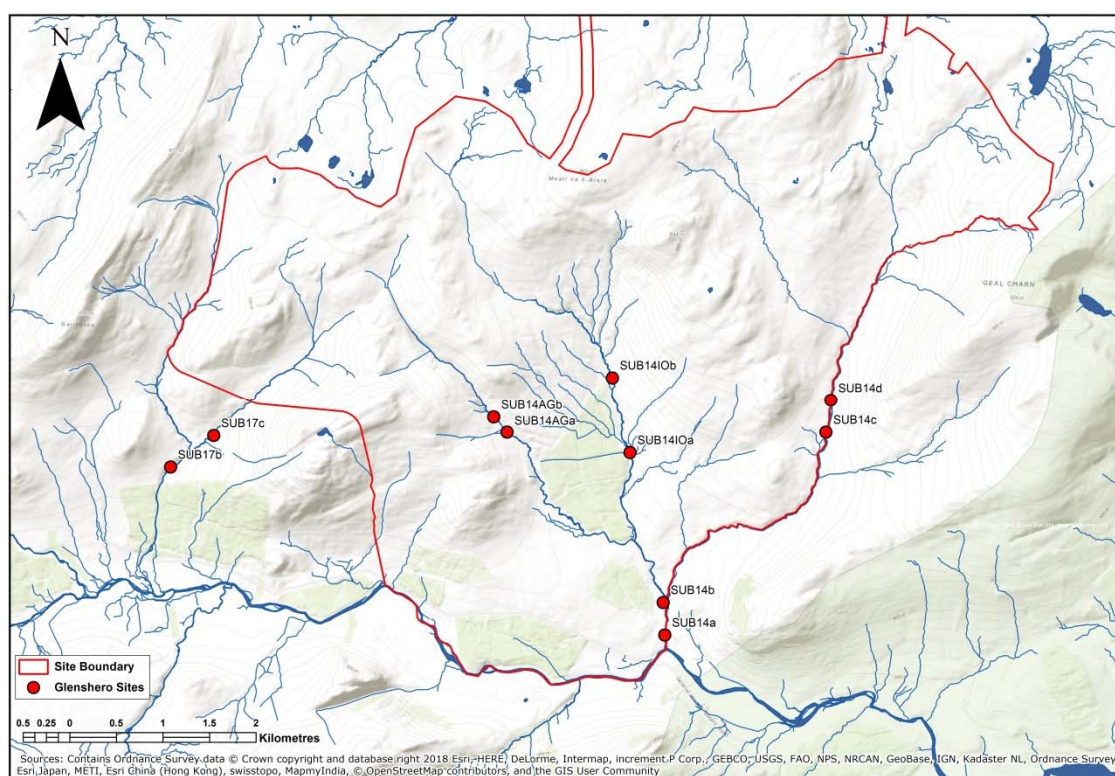


Figure 6.4.1: Locations of Glenshero Wind Farm electrofishing sites

3.2 Survey results

The electrofishing surveys were carried out in September and October 2017 during good weather conditions with good visibility and low water levels. It is considered that the results from the survey provide a good assessment of the fish population present in the sites surveyed. No issues were encountered during the surveys which could materially affect the results.

The results from the site surveys are shown in the Table 3 and 4 below. Table 6.4.3 summarises the densities of salmon and trout captured during each semi-quantitative survey. Table 6.4.4 uses the SFCC Moray Firth classification corrected for stream width, with colour coding to show the fish densities within a national context (see Section 2 above).

Table 6.4.3: Results of the semi-quantitative electrofishing surveys completed for the Glenshero Wind Farm baseline survey. Juvenile salmonid densities are expressed as Number/100m².

Watercourse	Site code	Site location	Salmon fry	Salmon parr	Trout fry	Trout parr	Other fish species
Feith Talagain	SUB14a	Downstream waterfall	3.8	9.8	4.3	2.2	None
Feith Talagain	SUB14b	Downstream confluence with Allt Coire Iain Oig	0.0	0.0	4.4	1.3	None
Feith Talagain	SUB14c	Upstream bend	0.0	0.0	2.7	2.7	None
Feith Talagain	SUB14d	Use Grid Ref and site photos to locate	0.0	0.0	3.8	5.1	None

Allt Coire Iain Oig	SUB14IOa	Opp. kink in plantation fence	0.0	0.0	3.4	1.1	None
Allt Coire Iain Oig	SUB14IOb	At top of plantation	0.0	0.0	0.9	3.7	None
Allt Gilbe	SUB14AGa	250m upstream track	0.0	0.0	0.0	0.0	None
Allt Gilbe	SUB14AGb	150m upstream right bank tributary	0.0	0.0	0.0	0.0	None
Allt Feith a'Mhoraire	SUB17b	150m upstream fenceline	0.0	0.0	1.1	4.6	None
Allt Feith a'Mhoraire	SUB17c	300m upstream Allt Laidhe	0.0	0.0	1.0	2.1	None

Table 6.4.4 : Glenshero Wind Farm baseline electrofishing survey results colour coded according to the SFCC Moray Firth Region classification scheme corrected for stream width.

Watercourse	Site code	Salmon fry	Salmon parr	Trout fry	Trout parr
Feith Talagain	SUB14a	3.8	9.8	4.3	2.2
Feith Talagain	SUB14b	0.0	0.0	4.4	1.3
Feith Talagain	SUB14c	0.0	0.0	2.7	2.7
Feith Talagain	SUB14d	0.0	0.0	3.8	5.1
Allt Coire Iain Oig	SUB14IOa	0.0	0.0	3.4	1.1
Allt Coire Iain Oig	SUB14IOb	0.0	0.0	0.9	3.7
Allt Gilbe	SUB14AGa	0.0	0.0	0.0	0.0
Allt Gilbe	SUB14AGb	0.0	0.0	0.0	0.0
Allt Feith a'Mhoraire	SUB17b	0.0	0.0	1.1	4.6
Allt Feith a'Mhoraire	SUB17c	0.0	0.0	1.0	2.1

Salmon were present in the lower Feith Talagain site (SUB14a) (Plate 1) which was located downstream of the impassable waterfall, but not in any other site. Two year classes of salmon were present at that site.

Trout were present at all sites with the exception of the two Allt Gilbe sites, where no fish were recorded. Multiple year classes of trout were recorded at each site.

The Allt Coire Iain Oig was not walked in its entirety but the gradient of this stream from the upper site to the Feith Talagain confluence (4%) was lower than the gradient in the Feith Talagain to the upper site (4.8%). Between the two survey sites in the Allt Coire Iain Oig (Plate 5 ,6) no impassable features were observed. The Allt Coire Oig, between the upper survey site and the confluence with the Feith Talagain, could potentially be passable for the resident trout population.

The Allt Gilbe (Plate 7, 8) was the only stream where no fish were recorded although the habitat was entirely suitable. The Allt Gilbe was smaller than the other burns surveyed, the average width of the Allt Gilbe in the stretch surveyed was around 3m in width. Impassable waterfalls were observed downstream of the survey sites in the Allt Gilbe.

The gradient of the Allt Feith a'Mhoraire from the upper survey site to the Garva Bridge/Melgarve road is 9.1%, considerably steeper than the Feith Talagain. Despite this a robust, resident, trout population was recorded at each site with a range of size classes present (Plate 9, 10).

The largest trout recorded during the surveys was a fish of 192mm in the Allt Feith a'Mhoraire. The oldest of the fish aged from scale samples (which included the larger fish) were 3+ years old (Plate 11).

The electrofishing was considered to be effective at all sites although in the two upper Feith Talagain sites five fish were missed at site SUB14c and four at SUB14d. This is not unusual in low conductivity waters. At all other sites only one or two fish were missed.

No other fish species were recorded at any of the sites surveyed.

3.3 Habitat assessment

3.1.1 Feith Talagain

The dominant feature in the lower Feith Talagain is the waterfall which is located 150m upstream of the confluence with the Spey (Plate 12). This waterfall was examined in detail although no measurements were taken. The waterfall is a complex structure with an initial fall of approximately 1.8m in height at the downstream end with two subsequent chutes. The overall height of the structure is estimated to be greater than 5m. There is a small, but deep take off pool below the lower falls which could permit a fish to leap at the falls. However, this waterfall is 152km upriver and any salmon, or migratory trout, penetrating this far up the catchment are going to be stale and lacking in the leaping ability of a fresh-run fish. No salmon were found in any of the sites upstream of the waterfall and it is considered impassable.

The Feith Talagain upstream of the waterfall is a fast flowing, boulder stream, which provides good to excellent instream cover for juvenile salmonids (Plate 13). There is heavy grazing pressure along the banks of the Feith Talagain and consequently there are few riparian trees except in the steeper middle section where some trees grow in ledges or other places inaccessible to grazing animals. There were several impassable waterfalls within this middle section. In the upper reaches of the Feith Talagain the gradient lessened and the habitat quality improved with nice mixture of boulder and cobble substrate and run/riffle habitat. The upper survey site in the Feith Talagain (SUB14d) (Plate 4) supported the highest density of trout parr of any of the survey sites.

At the upper survey site, at 470m altitude, the Feith Talagain was still a substantial stream at 7 or 8m wide. The relatively large stream size and good habitat quality were probably factors contributing to the robust, but isolated, trout population recorded in the upper reaches.

3.1.2 Allt Coire Iain Oig

The Allt Coire Iain Oig is a tributary of the Feith Talagain, which it joins 330m upstream of the substation access road. Access to the survey sites was obtained via the new road constructed for the installation of the Stronelaig Wind Farm cable. The Allt Coire Iain Oig was therefore only walked between and in the vicinity of the survey sites.

The Allt Coire Iain Oig is a high energy, boulder stream with extensive exposed lateral gravel and rock deposits (Plate 14). Grazing intensity along the riparian zone was high, possibly due to the proximity of a conifer plantation along close to the right bank, which is likely to provide shelter for deer, indeed there was considerable evidence of deer prints emanating from the plantation.

Instream habitat quality was considered to be good with a high percentage of the substrate consisting of cobble and boulder (70% and 75% respectively) in the lower and upper survey sites (Table B1 and B2, Annex B). The gradient in the vicinity of the survey sites was quite steep and it is likely that suitable spawning substrate for trout is limited and potentially unstable.

3.1.3 Allt Gilbe

The Allt Gilbe was the smallest of the burns surveyed and the only one where no fish were recorded (Plate 14). This was not because of instream habitat quality as this was considered good with the typical range of substrate and flow types present in upland burns throughout. Impassable waterfalls were observed downstream of the survey sites i.e. below the Stronelaig Wind Farm cable road. The gradient of the Allt Gilbe, from its confluence with the Spey to the upper survey site (SUB14AGb) was 5.6%.

The upper Allt Gilbe is therefore isolated from the larger meta-population of trout present in the lower and middle reaches of the Feith Talagain. The upper Allt Gilbe may lack the critical size required to support an isolated trout population considering the range of environmental challenges occurring in such a high gradient upland situation. This probably accounts of the lack of fish at either survey site. It should be noted that whilst these electrofishing surveys, which only covered small sections of the Allt Gilbe recorded no fish, it cannot be said definitively, that the upper Allt Gilbe is entirely fishless, although this is considered to be the most likely scenario (Section 5).

3.1.4 Allt Feith a'Mhoraire

Access to the survey sites in the upper reaches of the Allt Feith a'Mhoraire was by foot, following the course of the burn from the parking site by the Garva Bridge/Melgarve road. Numerous impassable cascades and waterfalls were encountered on the walk in (Plate 15). It was therefore with some surprise that a sustainable population of resident brown trout was recorded in both survey sites. With a gradient of 9% the Allt Feith a'Mhoraire was the steepest of the burns surveyed.

Instream conditions were highly suitable for juvenile salmonids with the typical upland burn mix of cobbles and boulders and run/riffle habitat. Throughout the Allt Feith a'Mhoraire there were several sections where bedrock predominated. As in the Allt Coire Iain Oig stable spawning habitat was limited but there clearly enough stable spawning habitat as at least three year classes of trout were recorded in each site. The conductivity of all the burns surveyed in this study were low, indicative of low general productivity, however, due to their upland situation these burns will be relatively free of negative influences such as siltation which could impact on egg survival. Even though spawning habitat is likely to be limited the hatching success of any trout eggs, or at least those which avoid redd washout, is likely to be high.

4. Discussion

The Spey Fishery Board has an extensive network of electrofishing sites throughout the Spey catchment although often biased towards locations where salmon are present. The SFB network of sites includes many upstream of Spey Dam but prior to this survey there was only one site Feith Talagain and one on the Allt Feith a'Mhoraire, both in the lower reaches.

A surprisingly robust and sustainable resident trout population was recorded in the Feith Talagain sub-catchment, upstream of the impassable waterfall, with multiple year classes present in all sites where trout were present. The survey recorded no fish in the upper reaches of the Allt Gilbe and it is possible that this burn is fishless in its upper reaches; probably a consequence of its small size, steep gradient and isolation due to impassable waterfalls.

Within the lower Feith Talagain sub-catchment, but upstream of the impassable waterfall, there is likely to exist a meta-population of resident trout with connectivity within the lower reaches of the Allt Gilbe, Allt Coire Iain Oig and Feith Talagain. Isolation will increase in an upstream direction due to

the presence of numerous impassable waterfalls, particularly in the Feith Talagain and Allt Gilbe. Downstream migration would be possible but recolonisation in an upstream direction by natural means is not, due to the numerous impassable waterfalls present. However, despite the presence of multiple natural impassable barriers creating isolation, robust, sustainable and healthy trout populations were recorded in the upper Feith Talagain sites.

The Allt Coire Iain Oig was not walked along its whole length but it may be accessible to the resident trout population throughout, or at least as far upstream as the electrofishing sites.

There was a sustainable population of resident trout in the upper reaches of the Feith Talagain, as there was in the Allt Feith a'Mhoraire. There are no lochs of any consequence in either catchment to act as a reservoir and refuge for breeding fish so it must be assumed that the trout populations present have persisted in these upland burns for significant periods of time.

The relatively small size of the trout sampled and the young age suggest that the trout present are short lived but early maturing. Many of the scales sampled exhibited a similar pattern of rapid growth in years one and two followed by a significant slow-down in the growth increment in year three, possibly due to the onset of maturity. Even though no larger trout were captured during these surveys there are likely to be some present in each watercourse, and they could contribute significantly to egg production. However, the size and age profile of the trout sampled suggests that one strategy for survival in these upland, isolated, locations may be based on short lived but early maturing fish. If so, this strategy seems to be successful in maintaining a trout population in isolated upland locations.

SFB have an established survey site in the lower Allt Feith a'Mhoraire. The site is located a short distance below the Garva Bridge/Melgarve road but at a distance of 480m from the confluence with the Spey. The site had been surveyed twice previously, in 2012 and 2015. In 2012 salmon fry and parr were present, albeit in low density whereas they were absent in the 2015 survey. Whilst it would be impossible for salmon to access the upper reaches it should be noted that they are occasionally present in the lower reaches.

There is also an established site in the lower reaches of the Feith Talagain. This site has been surveyed numerous times over the last twenty years by SFB with salmon, and trout, always present, although more often in the very low to moderate categories than good or excellent.

This study confirmed the presence of sustainable, resident trout population in all bar one of the major tributaries draining the location of the proposed Glenshero Wind Farm. These trout populations are isolated from recolonisation from within the wider Spey catchment by impassable waterfalls in the lower reaches. Within the Feith Talagain sub-catchment there is scope for a meta-population of resident trout but in both the upper Feith Talagain, and in the Allt Feith a'Mhoraire, there are further isolated populations of trout above subsequent impassable waterfalls.

These trout populations are resilient and may have existed in isolation for millennia. As such they have considerable biodiversity value. This isolation however leaves them exposed to disturbance, for example changes in hydrology, siltation or sediment transportation. As set out in the Outline Construction and Environmental Management Plan (CEMP) (EIAR Volume 4: Technical Appendix 2.1) measures would be adopted to reduce potential effects on water quality and a Water Quality Monitoring Plan would be delivered for the proposed development. Further information is provided in EIAR Volume 2: Chapter 6: Ecology.

5. Survey Limitations

Electrofishing is a common means of obtaining data on juvenile salmonid populations (SEERAD 2007) however, it is only effective in shallow streams.

The survey sites chosen were selected to be representative of the general habitat type present within each sub-catchment and to include a range of flow and substrate types. The SFCC protocol recommends that the minimum survey length is six times the mean channel width at the site, with a minimum of 20m length (SFCC 2007). If the site selected is representative of the local habitat the survey should provide a robust estimate of local fish populations. However, it is possible that if fish populations are low or have a clumped distribution, the data from an electrofishing site may not adequately sample the full range of fish species present in that area.

All of the results presented in this report are from single runs or the first run from multiple run surveys. Single run electrofishing surveys have no measure of fishing efficiency, which will vary from site to site depending on environmental conditions and equipment used. In order to compensate for variable efficiency at any site, depletion sampling, where fish are removed from a site in a series of successive electrofishing runs, can be used to provide an estimate of the total fish population present. The rate of decline in each run and the total number of fish captured are used to estimate fish stocks. However, this form of surveying is time consuming and would restrict the number of sites which could be surveyed each year. Some of the sites were surveyed using a multiple run methodology providing a more detailed assessment of fish populations.

It is considered that it is impossible to prove the absence of fish by electrofishing, therefore, whilst the failure to capture fish at a site may indicate that the population is low, but it cannot be assumed that fish are necessarily absent.

6. References

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Scottish Fisheries Coordination Centre. Electrofishing Team Leader. Training Course Manual. June 2007

Annex A



Plate 1: Feith Talagain site SUB14a site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 2: Feith Talagain site SUB14b site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 3: Feith Talagain site SUB14c site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 4: Feith Talagain site SUB14d site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 5: Allt Coire Iain Oig site SUB14IOa site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 6: Allt Coire Iain Oig site SUB14IOb site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 7: Allt Gilbe site SUB14AGa site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 8: Allt Gilbe site SUB14AGb site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 9: Allt Feith a'Mhoraire site SUB17b site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 10: Allt Feith a'Mhoraire site SUB17b site photos. Clockwise from top left: upstream view; downstream view; upper site limit and lower site limit.



Plate 11: Some of the fish captured during electrofishing surveys for Glenshero Wind Farm baseline survey. Clockwise from top left: two of the largest trout from SUB17b; mixed age class trout from SUB17c; salmon and trout parr from SUB14a & the catch from SUB17b.



Plate 12: The impassable waterfall complex in the lower reaches of the Feith Talagain. Clockwise from top left: lower fall with pool below; middle chute; view of falls complex from above & upper pool and chute



Plate 13: Some views of the upper Feith Talagain. Clockwise from top left: nice habitat quality in the upper reaches, in the vicinity of the survey sites; example of impassable waterfall in the upper reaches; steep section & sequence of cascades in steep section below survey sites.



Plate 14: Some views of the Allt Coire Iain Oig and Allt Gilbe. Clockwise from top left: Allt Coire Iain Oig, looking downstream; upstream view of Allt Coire Iain Oig; bedrock waterfall in upper Allt Gilbe & example of impassable waterfall in the upper Allt Gilbe.



Plate 15: Some views of the Allt Feith a'Mhoraire. Clockwise from top left: example of the many waterfalls and cascades present in the middle reaches; general view of the upper reaches, old road bridge in lower reaches & steep section within felled conifer plantation.

Annex B

Table B1: Glenshero Wind farm electrofishing sites habitat variables.

Site	Instream cover	Depth						Substrate								Flow type							
		<10	11to20	21to30	31to40	41to50	>50	HO	SI	SA	GR	PE	CO	BO	BE	SM	DP	SP	DG	SG	RU	RI	TO
SUB14a	Excellent	20	25	25	20	5	0	0	0	5	5	5	20	65	0	5	0	0	5	10	60	20	0
SUB14b	Excellent	20	20	20	15	15	10	0	0	0	5	10	15	70	0	5	0	0	5	10	60	20	0
SUB14c	Good	25	20	25	20	10	0	0	0	0	5	10	25	60	0	5	0	0	5	10	65	15	0
SUB14d	Good	35	25	20	15	5	0	0	0	0	5	10	30	55	0	10	0	5	5	10	50	20	0
SUB14IOa	Good	40	45	10	5	0	0	0	0	5	10	15	50	20	0	5	0	0	0	15	65	15	0
SUB14IOb	Good	40	30	20	10	0	0	0	0	5	10	10	35	40	0	5	0	0	0	15	60	20	0
SUB14AGa	Good	40	25	10	10	10	5	0	0	0	5	20	30	40	5	5	5	5	5	5	55	20	0
SUB14AGb	Good	35	50	15	0	0	0	0	0	0	5	20	40	30	5	5	0	10	0	20	50	15	0
SUB17b	Good	25	25	20	25	5	0	0	0	0	5	10	20	60	5	10	5	10	5	5	40	25	0
SUB17c	Good	40	30	25	5	0	0	0	0	0	5	20	30	45	0	10	5	5	0	10	50	20	0

Substrate key: HO = High organic, SI = silt, SA = sand, GR = gravel, PE = pebble Co = cobble, BO = boulder, BE = bedrock.

Flow type key: SM = still marginal, DP = deep pool, SP = shallow pool, DG = deep glide, SG = shallow glide, RU = run, RI = riffle, TO = torrent.

Table B2: Glenshero Wind Farm electrofishing sites fish cover, riparian vegetation and land use

Site	Fish cover		Bankface Veg. %		Banktop Veg.%		Canopy cover %	Land use	
	LB	RB	LB	RB	LB	RB		Primary	Secondary
SUB14a	10	15	Uniform	Simple	Uniform	Simple	0	RP	Road
SUB14b	0	0	Uniform	Uniform	Uniform	Uniform	0	RP	MH
SUB14c	5	10	Uniform	Uniform	Uniform	Uniform	0	RP	MH
SUB14d	15	15	Uniform	Uniform	Uniform	Uniform	0	MH	RP
SUB14IOa	10	0	Uniform	Uniform	Uniform	Uniform	0	RP	CP
SUB14IOb	0	10	Uniform	Uniform	Uniform	Uniform	0	MH	CP
SUB14AGa	20	10	Uniform	Uniform	Uniform	Uniform	0	MH	RP
SUB14AGb	10	10	Uniform	Uniform	Uniform	Uniform	0	MH	RP
SUB17b	30	25	Uniform	Uniform	Uniform	Uniform	0	MH	RP
SUB17c	10	15	Uniform	Uniform	Uniform	Uniform	0	MH	RP

Land use key: RP = rough pasture, MH = moorland/heath, CP = conifer plantation.