

Appendix 12.7

Fish Habitat Assessment

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1 Introduction

1.1 General

- 1.1.1 CH2M Fairhurst Joint Venture (CFJV) has completed a fish habitat assessment to inform the Design Manual for Roads and Bridges (DMRB) iterative design and assessment process of the Proposed Scheme.
- 1.1.2 Given the sensitivity of downstream receptors (e.g. Special Areas of Conservation), the fish habitat assessment was focussed on major watercourses crossed by the Proposed Scheme (e.g. as shown on 1:50,000 scale OS map), which are tributaries to either the Allt Dubhaig (River Tay SAC) and River Truim (River Spey SAC).
- 1.1.3 On this basis, the primary objective of the fish habitat assessment is to characterise habitats within the Proposed Scheme that could support Atlantic salmon *Salmo salar* or sea lamprey *Petromyzon marinus* at key stages in their life cycle; with a view to identifying the potential impacts of the Proposed Scheme.

2 Methods

2.1 Survey Extents

- 2.1.1 The surveys were carried out to a maximum of 150m upstream and downstream of major watercourse crossings, adapting the approach agreed through consultation with the Cairngorms National Park Authority and Scottish Natural Heritage (SNH) to the characteristics of watercourses within the upper River Spey and River Tay catchments. The extent of survey was reduced where significant barriers to fish migration were known or encountered.
- 2.1.2 A list of the major watercourses that were surveyed is presented in **Table 2-1**, with a summary of survey dates, personnel, weather and flow conditions for each survey presented in **Table 2-2**.

Table 2-1: Watercourse Crossings Assessed

Hydro ID	Watercourse Name	Chainage
Tay Catchment		
-2	Allt Chaorach Beag	southern tie-in
2	Allt Coire Mhic-sith	ch. 400
8	Allt Ruidh nan Sgoliearan	ch. 1,500
12	Unnamed Watercourse	ch. 1,875
13	Allt Fuar Bheann	ch. 2,000
23	Allt a' Chaorainn	ch. 3,000
Spey Catchment		
31	Allt an Creagach	ch. 3,750
52	Allt Coire Dubhaig	ch. 7,200
57	Unnamed Watercourse	ch. 7,900
59	Allt Coire Chuirn	ch. 8,400
64	Allt Coire Bhotie	ch. 9,300

Table 2-2: Fish habitat assessment survey meta data

Watercourse	Surveyors	Dates	Weather conditions	Flow
Allt Chaorach Beag	J. Thompson, S Mackenzie	25.04.17	Occasional rain/ sleet showers. Wind NW 4. 3-4 deg C	Normal/slightly increased
Allt Coire Mhic-sith	J. Thompson, S Mackenzie	22.02.17	Occasional heavy snow sleet showers with bright spells. Wind NW5-6. 2deg.C	Normal/slightly increased
Allt Ruidh nan Sgoliearan	J. Thompson, S Mackenzie	22.02.17	Occasional heavy snow sleet showers with bright spells. Wind NW5-6. 2deg.C	Normal/slightly increased
Unnamed Watercourse	J. Thompson, S Mackenzie	25.04.17	Occasional rain/ sleet showers. Wind NW 4. 3-4deg. C	Normal/slightly increased
Allt Fuar Bheann	J. Thompson, S Mackenzie	22.02.17	Occasional heavy snow sleet showers with bright spells. Wind NW5-6. 2deg.C	Normal/slightly increased
Allt a' Chaorainn	J. Thompson, S Mackenzie	22.02.17	Occasional heavy snow sleet showers with bright spells. Wind NW5-6. 2deg.C	Normal/slightly increased

Watercourse	Surveyors	Dates	Weather conditions	Flow
Allt an Creagach	J. Thompson, S Mackenzie	22.02.17	Occasional heavy snow sleet showers with bright spells. Wind NW5-6. 2deg.C	Normal/slightly increased
Allt Coire Dubhaig	J. Thompson, S Mackenzie	22.02.17	Occasional heavy snow sleet showers with bright spells. Wind NW5-6. 2deg.C	Normal/slightly increased
Unnamed Watercourse	J. Thompson, S Mackenzie	22.02.17	Occasional heavy snow sleet showers with bright spells. Wind NW5-6. 2deg.C	Normal/slightly increased
Allt Coire Chuirn	J. Thompson, S Mackenzie	22.02.17	Occasional heavy snow sleet showers with bright spells. Wind NW5-6. 2deg. C	Normal/slightly increased
Allt Coire Bhotie	J. Thompson, S Mackenzie	22.02.17	Occasional heavy snow sleet showers with bright spells. Wind NW5-6. 2deg. C	Normal/slightly increased

2.2 Habitat Requirements

2.2.1 The fish habitat assessment focussed on identifying habitat features considered to be important to Atlantic salmon and sea lamprey, as detailed in current professional guidance (Hendry & Cragg-Hine 2003;¹ Maitland 2003²). An overview of habitat requirements are detailed in sub-section 2.2 with a summary detailed in **Table 2-3**.

¹ Hendry K & Cragg-Hine D (2003). Ecology of the Atlantic Salmon. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough.

² Maitland PS (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No.5. English Nature, Peterborough.

Table 2-3: Overview of variables considered

Variable	Rationale – Atlantic Salmon	Rationale – Sea lamprey
Watercourse gradient	Favourable conditions for Atlantic salmon spawning occur where the watercourse gradient is 3% (<2 degrees)	Spawning occurs over gentle gradient watercourses where gradient is approximately 1.9-5.8m km ⁻¹ which is equivalent to c.0.5% or c.0.3°.
Substrate	Salmon select areas comprised of gravel – cobble sized material variable depending on the size of fish creating the redd (boulders are typically absent) which can be moved into a 'redd', but which do not contain fine sediment which may smother eggs or alevin.	Spawning - stony gravels (15–115cm) with substrate small enough to move to create a nest. A proportion of sand and smaller substrate is required to consolidate the nest. Nursery areas – require slower flowing areas in slower sections of watercourses or at the slower edges of high velocity streams. Sandy silt substrates are required.
Channel width	Parameter given to characterise the nature of the watercourse.	Parameter given to characterise the nature of the watercourse.
Channel depth	Salmon typically spawn within water depth of 17-76cm. Fry and young are associate with water <20cm depth,	Spawning 40–60cm Nursery areas - 10cm–50cm or deeper
Bank structure/ vegetation	Bankside vegetation/ structure can be important in providing cover for adult salmon during upstream migration, bankside vegetation and woody debris in the watercourse can provide shelter for juveniles.	Shading does not appear to influence spawning activity.
Presence of barriers	Waterfalls/ man-made structures can impede upstream migration of Atlantic salmon though they are capable of passing some obstacles (max height 3.7m).	Sea lamprey are more heavily affected by barriers to movement than Atlantic salmon by waterfalls, weirs and other structures.

Atlantic salmon

- 2.2.2 Atlantic Salmon habitat characteristics are set out below in accordance with Hendry and Cragg-Hine (2003).
- 2.2.3 Atlantic Salmon form a key feature of this assessment as it is a qualifying feature of the River Spey SAC, which lies in close proximity to the Proposed Scheme, where the River Truim forms part of the designated area. Atlantic salmon also form a primary qualifying feature of the River Tay SAC, which is hydrologically connected to watercourses draining south of the pass of Drumochter within the Proposed Scheme.
- 2.2.4 The Atlantic salmon is an anadromous species (i.e. adults migrate from the sea to breed in freshwater). It is well known for its abilities and persistence to overcome obstacles in its migration up rivers to reach spawning grounds.
- 2.2.5 There are a range of terms to describe the many life stages of the Atlantic salmon (**Table 2-4**). The basic life cycle initiates when an adult female lays eggs, which are then fertilised by the male. The eggs hatch into alevins and stay within the redd, or nest – a shallow excavation found within gravelly areas - for up to two months. Following this stage, they then grow into fry, parr and smolt, during which they first migrate to sea. Salmon remain at the parr stage for around four years, before they return to their natal river as 'smolts' to spawn.

- 2.2.6 Salmon rivers vary considerably in ecological and hydrological characteristics. Generally, salmon require clean, well-oxygenated water to breed, feed and survive. Beyond this, in-stream physical habitat variables that determine suitability are water depth, water velocity, streambed substrate and cover. Favourable locations for salmon spawning are likely to occur where the gradient of a river is 3% or less (equivalent to gradient of $>5^\circ$) with a water depth ranging between 0.17-0.76m. Salmon require an uncompact stream substrate of pebble and small cobble size³. The sites are generally transitional areas between pools and riffles where flow is accelerating, drawing oxygenated water across the eggs, and depth decreasing. At the fry and parr stage, habitat preferences are towards shallow, fast-flowing water with a moderately coarse substrate and cover. At the juvenile stage, suitable cover includes areas of deep water, surface turbulence, loose substrate and large rocks⁴.

Table 2-4: Typical Habitats for Different Life Stages of Salmon

Life Stage	Habitat
Eggs/ alevins	Pebble to small cobble sized substrate
Fry (<1-year-old)	Pebble to small cobble sized substrate, fast flowing, shallow broken water
Parr (>1-year-old)	Small cobble to boulder sized substrate, fast flowing broken water, often slightly deeper water than fry
Adults	Deep pools

Sea lamprey

- 2.2.7 Sea Lamprey habitat characteristics are set out below in accordance with Maitland (2003).
- 2.2.8 Sea lamprey form a key feature of this assessment as it is a qualifying feature of the River Spey SAC which lies in close proximity to the Proposed Scheme where the River Truim forms part of the designated area. Sea lamprey also form a secondary qualifying feature of the River Tay SAC, which is hydrologically connected to watercourses draining south of the Pass of Drumochter within the Proposed Scheme.
- 2.2.9 Sea lamprey is an anadromous species. Sea lampreys need clean gravel for spawning and the scale of gravel beds required is described as ranging from a few square meters to hundreds of square meters in large rivers. Sea lamprey lay eggs in crude nests within the gravel beds. These are comprised of shallow depressions previously created by lifting away small stones with their suckers. Eggs are laid and then sometimes covered with larger stones or vegetation. Once hatched, juvenile lamprey drift downstream and areas of sand or silt (typically comprising 90% sand) are utilised by burrowing juvenile ammocoetes, where they spend several years until transformation into adulthood occurs where they migrate downstream to the sea⁵.

³ Scottish Fisheries Co-ordination Centre (2007). Habitat Surveys Training Course Manual. [pdf] Available at: <http://www.sfcc.co.uk/assets/files/SFCC%20Habitat%20Training%20Manual.pdf>

⁵ SNH (2005). Assessment of sea lamprey distribution and abundance in the River Spey: Phase III

- 2.2.10 Sea lamprey migration upstream is limited by physical barriers in watercourses, and the species is usually unable to migrate upstream of obstacles such as high waterfalls, weirs, dams and severe pollution that other species, such as Atlantic salmon, may be able to pass.

2.3 Limitations

- 2.3.1 No significant constraints to the survey were identified. However, the assessment considered the limitations of the survey due to seasonality whereby any seasonal aquatic macrophyte growth may not have been detected during survey visits in February and April. Given the characteristics and vegetation communities of surrounding habitats, this is not considered to affect the validity of the survey results.
- 2.3.2 Similarly, recording watercourse characteristics during the winter/ early spring is likely to produce higher estimates of water depth/ channel width than a survey undertaken during the summer months. The assessment had regard to normal conditions within the upper River Spey and River Tay catchments, as specified by the closest SEPA water-level gauging station.

3 Results

3.1 Upper River Tay Catchment

- 3.1.1 On the River Tay catchment, a significant barrier to both Atlantic salmon and sea lamprey is present at Struan weir, several kilometres downstream of the Proposed Scheme extent. Upstream of Struan weir the river has been stocked with young salmon and trout and it is understood that there are proposals to remove the weir in the long term.
- 3.1.2 Through consultation, the Tay District Salmon Fisheries Board has stated that there are no adult Atlantic salmon in the upper part of the River Garry around the Proposed Scheme, and that water-levels and flow in this area are prohibitive to fish survival. Given this background information, spawning Atlantic salmon are not considered likely to be present in watercourses between ch.-500 and 3,600. Similarly, the barrier to Atlantic salmon movement is also likely to be prohibitive to all lamprey species.
- 3.1.3 Notwithstanding any consultation information received to date, an overview of the results of the fish habitat assessment is presented in **Appendix 1** and summarised in **Table 3-1**. Within this table it is noted that, of the watercourses within the Proposed Scheme, most of those within the Tay catchment are unsuitable as spawning habitat primarily due to the steep hillside nature and low water-level/ flow of the watercourses under normal conditions.
- 3.1.4 The steep gradients limit the accumulation of suitable spawning substrates. Within the Tay catchment consideration of habitat suitability for both river lamprey (*Lampetra fluviatilis*) and brook lamprey (*Lampetra planeri*) has been included, both of which are similar in nature to the habitat requirements for spawning and nursery areas as sea lamprey. Existing watercourse crossings under the A9 within the Tay catchment are, in many cases, currently prohibitive to upstream fish movement for all species.
- 3.1.5 No habitat suitable as lamprey (any species) nursery areas are identified, due to the absence of substantial deposits of sand or silt within the watercourses.
- 3.1.6 The downstream sections of the Allt Chaorach Beag, Allt Coire Mhic-sith, and Allt a' Chaorainn form suitable habitat for Atlantic salmon parr. Downstream sections of both watercourses also provide substrate which may be suitable for salmonid or lamprey spawning.

3.2 Upper River Spey Catchment

- 3.2.1 Through consultation with SNH, SEPA and Spey Fishery Board (SFB), Atlantic salmon are known to occur throughout the River Truim which forms part of the River Spey SAC, designated in part for its important populations of Atlantic salmon and sea lamprey. In-channel features on the main-stem of the River Truim incorporate fish passage; therefore, Atlantic salmon have been observed as far upstream as the railway crossing of the Allt Coire Fhar at Balsporran (ch.6,800). Given the records of Atlantic salmon along the main body of the River Truim, the entirety of this watercourse is considered suitable for supporting Atlantic salmon.
- 3.2.2 Of those watercourses within the River Spey catchment, it is not possible to rule out use of the watercourses by Atlantic salmon despite some limitations to their suitability noted within **Appendix 1 - Tables 4-5–4-11**. While these watercourses did show a presence of suitable substrates, gradients and channel depth, the absence of a distinct pool/riffle structure in the

watercourses surveyed was noted which, where present, would provide favourable conditions for fish spawning. All channels surveyed lacked deeper 'rest' pools required for adult salmon upstream migration. Similarly, the watercourses are generally exposed, lacking the shade provided by overhanging vegetation, woody debris or undercut banks typically used by adult salmon. Further limitations to suitability are considered on the Allt an Creagach where it cuts a very narrow channel through peat which may be prohibitive/ unattractive to adult salmon on upstream movements.

- 3.2.3 The majority of the watercourses are relatively exposed and provide no cover for adult or juvenile salmonids through the presence of undercut banks, woody debris in channels, or deeper pools. Similarly, an absence of aquatic macrophytes and associated cover was noted throughout all watercourses. Some larger boulder substrate may provide shelter for Atlantic salmon parr where present.
- 3.2.4 Major watercourses present within the Proposed Scheme flowing into the River Spey catchment are generally less steep in gradient to those present within the River Tay catchment and the existing A9 crossings of major watercourses present fewer obstacles to movement.
- 3.2.5 Substrates present within the Allt an Creagach, Allt Coire Dubhaig, Allt Coire Chuirn and Allt Coire Bhotie, all showed some suitability to support spawning conditions for Atlantic salmon, with a mixture of gravel, pebble, and cobble sized substrate present. Boulders were also present in most watercourses within the Spey catchment.
- 3.2.6 Potential sea lamprey spawning habitat was found in similar areas to those highlighted for Atlantic salmon; however, as with watercourses within the Tay catchment, there was generally a lack of fine sediments (e.g. sandy silt) within watercourses surveyed and therefore no lamprey nursery habitat is present.

Table 3-1: Summary of fish habitat assessment

Hydro ID	Watercourse Name	Chainage	Suitability Upstream		Suitability Downstream		Limiting factors
			Salmon	Lamprey	Salmon	Lamprey	
-2	Allt Chaorach Beag	southern tie-in	n/a	n/a	Suitable spawning and juvenile habitat	Suitable spawning habitat	Barrier present upstream
2	Allt Coire Mhic-sith	ch.400	None	None	Suitable for juveniles	None	Barrier present upstream. Boulders dominant in substrate downstream
8	Allt Ruidh nan Sgoliearan	ch.1,500	None	None	None	None	Barrier to upstream movement – steep channel downstream
12	Unnamed Watercourse	ch.1,875	None	None	None	None	Barrier to upstream movement – steep channel downstream
13	Allt Fuar Bheann	ch.2,000	None	None	None	None	Barrier to upstream movement. Steep gradient, substrate unsuitable
23	Allt a' Chaorainn	ch.3,000	None	None	Suitable spawning and juvenile habitat from NCN7 downstream	Suitable spawning habitat from NCN7 downstream	Steep cascade structure upstream. Possible restriction to upstream movement

Hydro ID	Watercourse Name	Chainage	Suitability Upstream		Suitability Downstream		Limiting factors
			Salmon	Lamprey	Salmon	Lamprey	
Spey Catchment							
31	Allt an Creagach	ch.3,750	Suitable - spawning and juvenile habitat	Suitable - spawning and juvenile habitat	Suitable - spawning habitat	Suitable - spawning habitat	Very restricted channel cut through mire, limited distribution of suitable substrate
52	Allt Coire Dubhaig	ch.7,200	Suitable - spawning and juvenile	Suitable - spawning and juvenile habitat	Suitable - spawning habitat	Suitable - spawning habitat	Absence of notable pool-riffle structure limits spawning. Absence of sand particles may limit lamprey nest building
57	Unnamed Watercourse	ch.7,900	Suitable - spawning and juvenile habitat	Suitable - spawning and juvenile habitat	Suitable - spawning habitat	Suitable - spawning habitat	Minor upstream barrier. Possible channel obstructions downstream. High risk of redd washout
59	Allt Coire Chuirn	ch.8,400	Suitable - spawning and juvenile habitat	Suitable - spawning and juvenile habitat	Suitable - spawning habitat	Suitable - spawning habitat	Channel management ongoing upstream of A9 crossing.
64	Allt Coire Bhotie	ch.9,300	Suitable - spawning and juvenile habitat	Suitable - spawning and juvenile habitat	Suitable - spawning habitat	Suitable - spawning habitat	Historically realigned channel absence of pool-riffle structure. Relatively shallow depth.

3.2.7 The presence of habitat suitable for notable fish species will have implications for timings of construction activities, particularly watercourse crossings and in-channel works. This is due to the vulnerability of fish at egg or alevin (for Atlantic salmon) stage where the species are more susceptible to impacts due to river works at times when they are immobile within river sediments. The relevant sensitive timings for Atlantic salmon and lamprey species are summarised below in **Table 3-2**, in line with guidance presented by SNH⁶. Those months presented in green are those where restrictions on in-channel works are lifted with respect to the species concerned.

3.2.8 In line with the results of this habitat assessment, timing restrictions are likely to be applicable to those watercourses within Project 7 which fall within the Spey catchment, while such sensitivities are not as great within the River Tay catchment owing to the absence of suitable spawning habitat.

⁶ Scottish Natural Heritage, (2006). Guidance for Competent Authorities when dealing with freshwater SAC sites. Scottish Natural Heritage, Battleby.

Table 3-2: Overview of spawning/ most sensitive periods for freshwater fish

Species	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Atlantic salmon	Red	Red	Red	Red	Green	Green	Green	Green	Green	Red	Red	Red
Sea lamprey	Green	Green	Green	Green	Green	Red	Red	Green	Green	Green	Green	Green
River lamprey	Green	Green	Red	Red	Red	Red	Green	Green	Green	Green	Green	Green
Brook lamprey	Green	Green	Green	Red	Red	Red	Green	Green	Green	Green	Green	Green

Appendix 1 - Watercourse Crossing Results

Table 4-1: Allt Chaorach Beag fish habitat assessment

Watercourse: Allt Chaorach Beag		Hydro ID: N/A Southern tie in	Chainage: N/A -800	Catchment: Tay	
Upstream		Comments	Downstream		Comments
Channel width		No upstream assessment undertaken due to extensive box culvert considered prohibitive to upstream fish movement and no works noted to crossing or upstream sections.	Channel width	1-2m	Watercourse flows through steep box culvert for 70m. Opportunities for upstream fish migration are limited. Some evidence of erosion on channel sides Plane bed morphology Shallow glide
Channel depth:			Channel depth:	100 – 150mm	
Substrate:			Substrate:	Cobble dominant with boulders, coarse gravel present	
Gradient:			Gradient:	5-10°	
Bank structure/vegetation:			Bank structure/vegetation:	Steep banksides (30°) dominated by gramminoids	
Barriers Y/ N			Barriers Y/ N	Y	
No Upstream assessment					
<p>Overview of suitability for fish</p> <p>The upstream section is separated from downstream by an existing culvert 70m in length where water flows are spread in a shallow current across a flat concrete invert and is considered to represent a barrier to fish access. Downstream the channel appears that it may have been straightened previously and lacks pool/riffle structure, although does support suitable substrates for spawning fish. Discharge of road drainage into downstream section may mean that the watercourse is suboptimal due to water quality. During high flows, there is a risk of wash out as water will accelerate through existing culvert.</p>					

Table 4-2: Allt Coire Mhic-sith fish habitat assessment

Watercourse: Allt Coire Mhic-sith		Hydro ID: 2	Chainage: 400	Catchment: Tay	
Upstream		Comments	Downstream		Comments
Channel width	3-4m	High velocity watercourse heavily modified upstream of culvert structure including a weir >2m in height c 40 upstream of the crossing. Cascade morphology. No fish of any age observed	Channel width	3-4m	Channel appears to have been modified previously. Large step feature downstream of existing arch culvert. Through the culvert, water depth is low <100mm and fast flowing across flat concrete invert, in normal flows may prohibit fish passage. Plane bed/ morphology – deep glide downstream.
Channel depth:	Max 500mm typically 150 – 300mm		Channel depth:	500mm+ deep pool downstream of existing structure	
Substrate:	Bedrock and boulders/ isolated gravel deposits		Substrate:	Boulders dominant boulders – cobbles further downstream	
Gradient:	>10°		Gradient:	Gradient: <10°	
Bank structure/ vegetation:	Engineered banks		Bank structure/ vegetation:	Coniferous plantation to north grassland and scrub to south	
Barriers Y/ N	Y		Barriers Y/ N	Y	
Photograph Upstream:			Photograph Downstream:		
					
<p>Overview of suitability for fish:</p> <p>The Allt Coire Mhic-sith falls off steep ground to the east and generally supports good flows of water at relatively high velocity. Substrates are generally unsuitable for spawning fish comprising of bedrock and boulders, though more cobbles are present further downstream. Barriers to fish movement are present at the downstream end of the culvert and the shallow rapid flow across the culvert base may inhibit movement. A significant weir is also present c 40m upstream of the existing structure. Some deeper pools are present downstream which may present opportunities for rest/ shelter of adult or juvenile fish.</p>					

Table 4-3: Allt Ruidh nan Sgoilearan fish habitat assessment

Watercourse: Allt Ruidh nan Sgoilearan		Hydro ID:8	Chainage: 1,500	Catchment: Tay	
Upstream		Comments	Downstream		Comments
Channel width	1m	Watercourse descends under existing road through a steep pipe culvert (30°) which is considered impassable to fish. Cascade morphology No fish of any age observed	Channel width	1m	Downstream of culvert is a small weir and control structure. At and downstream of the control are significant areas of construction debris. Cascade morphology No fish of any age observed
Channel depth:	100 – 200mm		Channel depth:	100 – 200mm	
Substrate:	Mix of bedrock boulders and cobbles		Substrate:	Bedrock and cobbles dominant. Step features present around bedrock outcrops.	
Gradient:	15°		Gradient:	>15° with further vertical step features	
Bank structure/vegetation:	Steep 45° banksides vegetated with acid grassland and dry heath.		Bank structure/vegetation:	Steep banksides (45°). Acid grassland.	
Barriers Y/ N	Y		Barriers Y/ N	Y	
Photograph Upstream:			Photograph Downstream:		
					
<p>Overview of suitability for fish: Lack of pool/ riffle structure and steep gradient both upstream and downstream makes the watercourse largely unsuitable for fish spawning. Upstream is generally inaccessible due to the steep and stepped nature of the downstream course and the steep set pipe culvert under the existing road. The watercourse is highly unlikely to support spawning salmon or lamprey or other lifestages for those species.</p>					

Table 4-4: Unnamed watercourse Hydro ID 12 fish habitat assessment

Watercourse: Unnamed watercourse		Hydro ID: 12	Chainage: 1,875	Catchment: Tay	
Upstream		Comments	Downstream		Comments
Channel width	1.5m	Recently restored lined channel with geotextile panels on a steep section leading down to the existing road. At the base of the lined channel is a vertical drop of 1.5m before the watercourse enters a concrete pipe culvert. Fine sediment build up following recent restoration works.	Channel width	1 m	20m downstream is a 3m vertical drop over a bedrock outcrop, further cascade features continue downstream to NCN7 route. Presence of steep vertical outcrops and absence of 'rest pools' are considered to mean the watercourse is not accessible to salmon or lamprey. Cascade morphology
Channel depth:	>50mm		Channel depth:	Typically, less than 150mm	
Substrate:	Geotextile lined channel		Substrate:	Bedrock with cobbles and occasional boulder	
Gradient:	>15°		Gradient:	>15°	
Bank structure/vegetation:	Lined channel recently disturbed grassland outside main channel		Bank structure/vegetation:	Steep banksides vegetated with dry heath	
Barriers Y/ N	Y		Barriers Y/ N	Y	
Photograph Upstream:			Photograph Downstream:		
					
<p>Overview of suitability for fish: Substrate and watercourse structure (steep cascade) are considered unsuitable spawning salmon or sea lamprey and other life stages.</p>					

Table 4-5: Allt Fuar Bheann fish habitat assessment

Watercourse: Allt Fuar Bheann		Hydro ID: 13	Chainage: 2,000	Catchment: Tay	
Upstream		Comments	Downstream		Comments
Channel width	1-2m	Recently engineered (naturalised channel). Series of step features though no significant pools. Cascade morphology No fish of any species/ age observed	Channel width	1-2m	Steep section of culverted watercourse which it emerges for a short time between A9 and NCN7 Absence of any notable deep pools Cascade morphology No fish of any species/ age observed
Channel depth:	100 – 250mm		Channel depth:	100-200mm	
Substrate:	Bedrock (artificial) cobbles/ gravels.		Substrate:	Bedrock dominated with some cobble/ gravel.	
Gradient:	15° some steep vertical sections present.		Gradient:	>10°	
Bank structure/ vegetation:	Near vertical rock walls, re-establishing grassland		Bank structure/ vegetation:	Banksides eroded, acid grassland present where vegetated.	
Barriers Y/ N	Y		Barriers Y/ N	Y	
Photograph Upstream:			Photographs Downstream:		
					
<p>Overview of suitability for fish: Lack of pool/riffle structure and steep gradient both upstream and downstream makes the watercourse largely unsuitable for fish spawning. Upstream is generally inaccessible due to the steep and stepped nature of the downstream course and the steep set pipe culvert under the existing road, similarly the upstream section is inaccessible due to the stepped nature of the watercourse which lacks rest/ acceleration pools to enable passage. The watercourse is highly unlikely to support spawning salmon or lamprey or other lifestages for those species.</p>					

Table 4-6: Allt a' Chaorainn fish habitat assessment

Watercourse: Allt a' Chaorainn		Hydro ID: 23	Chainage: 3,000	Catchment: Tay	
Upstream		Comments	Downstream		Comments
Channel width	1.5 – 2m	Rises to very steep ground 200m upstream of crossing. Otter use noted. Cascade morphology – number of minor step features present Solid invert in culvert structure creates shallow rapid flow which will limit permeability.	Channel width	4-5m narrowing	Solid invert in culvert structure extends 21m downstream of culvert creates shallow rapid flow which will limit permeability. Plane bed morphology downstream of NCN7.
Channel depth:	25 cm max in minor pools		Channel depth:	10cm max over solid invert 15cm further downstream	
Substrate:	Bedrock, boulders, cobbles/ gravels		Substrate:	Solid invert to 21m d/ s then cobbles/ gravels	
Gradient:	>10° increasing upstream		Gradient:	<5°	
Bank structure/ vegetation:	Dry heath		Bank structure/ vegetation:	Engineered banks	
Barriers Y/ N	Y minor		Barriers Y/ N	Y minor	
Photograph Upstream:			Photograph Downstream:		
					
<p>Overview of suitability for fish: Little of no suitability for fish spawning where solid invert is present. Upstream channel gradient increases to a point where it is of limited value to spawning fish of any species considered, some minor pools are present between step features. Dowsntream no suitable habitat for any lifestage is present upstream of NCN7 crossing. Shallow glide with cobbles/ gravels downstream of NCN7 may provide some spawning potential for lamprey or salmon and juvenile habitat for salmon.</p>					

Table 4-7: Allt an Creagach fish habitat assessment

Watercourse: Allt an Creagach		Hydro ID: 31	Chainage: 3,750	Catchment: Spey	
Upstream		Comments	Downstream		Comments
Channel width	>1m	Upstream of existing pipe culvert crossing is a concrete lined channel for 20m. Water depth is lower in concrete channel.	Channel width	1.5m reducing to 0.3m	One of few watercourses where shade provided by willow scrub and in places undercut banks in peat.
Channel depth:	<150mm		Channel depth:	100- 200mm to 500mm in peat areas	
Substrate:	Cobble – gravel some fine gravels and sand	Steep ground present <200m upstream	Substrate:	Gravel - cobble	Plane bed morphology
Gradient:	10° slope in concrete channel		Gradient:	<5°	
Bank structure/vegetation:	Low level banks. Plantation woodland upstream dry heath		Bank structure/vegetation:	Bank vegetated with wet heath/ mire occasional willow scrub	No observations of fish of any age group.
Barriers Y/ N	Y		Barriers Y/ N	N	
Photograph Upstream:			Photograph Downstream:		
					
<p>Overview of suitability for fish: Substrate and watercourse gradient downstream are suitable for spawning salmon/ lamprey and are suitable for juvenile life stages of salmon. Presence of pipe culvert and steep concrete lined channel upstream limits likelihood of upstream migration, channel structure and substrate is of low suitability for spawning upstream. Approximately 100m downstream watercourse cuts through and sometimes underneath peat in a narrow (300mm) but deeper (500mm) with the channel dropping below peat in some locations.</p>					

Table 4-8: All Coire Dubhaig fish habitat assessment

Watercourse: Allt Coire Dubhaig		Hydro ID: 52	Chainage: 7,200	Catchment: Spey	
Upstream		Comments	Downstream		Comments
Channel width	2-3m	Watercourse meanders through plantation woodland near Drumochter lodge. Bed plane morphology Shallow glide No fish of any age observed	Channel width	2m	Downstream flow through mire. Very little bank structure. Morphologically active channel with braded channels through mire before confluence with Truim. Plane – riffle morphology
Channel depth:	150-300mm		Channel depth:	150- 300mm	
Substrate:	Cobble –dominated		Substrate:	Cobble – gravel	
Gradient:	<5°		Gradient:	<5°	
Bank structure/vegetation:	Low banks at 45 within conifer plantation		Bank structure/vegetation:	Very low banks through marshy grassland/ mire	
Barriers Y/ N	N		Barriers Y/ N	N	
Photograph Upstream:			Photograph Downstream:		
					
<p>Overview of suitability for fish: Substrate and gradient both downstream and upstream support suitable substrates for spawning salmon, limited presence of sand particulates limit suitability for lamprey. Suitable for juvenile life stages of Atlantic salmon, though have no suitability as lamprey nursery areas. Absence of deep pools and pool/riffle structure limits overall value.</p>					

Table 4-9: Hydro ID 57 fish habitat assessment

Watercourse: Unnamed		Hydro ID: 57	Chainage: 7,900	Catchment: Spey	
Upstream		Comments	Downstream		Comments
Channel width:	1.5m	Lined concrete channel on upstream section on steep gradient likely to restrict upstream movement of fish immediately upstream of pipe culvert (120mm water depth through culvert during survey). Plane – bed morphology.	Channel width:	Narrow channel (<300mm)	Narrow and sometimes shallow channel is likely to prohibit adult upstream migration. Presence of finer sediment downstream may be suitable for juvenile lamprey in some locations. Minor barrier where fence line has trapped debris. Plane bed morphology.
Channel depth:	100 – 300mm		Channel depth:	Variable up to 500mm with shallow (>100mm) sections around gravel deposits	
Substrate:	Cobble – dominant, some gravel deposits		Substrate:	Finer gravels/ pebbles	
Gradient:	<5°		Gradient:	<5°	
Bank structure/vegetation:	heath mire – low banks overhung by heather (both banks)		Bank structure/vegetation:	Channel cuts through peatland habitats including mire and wet earth	
Barriers Y/ N	Y - minor		Barriers Y/ N	Y	
Photograph Upstream:			Photograph Downstream:		
					
<p>Overview of suitability for fish: Hydro ID 57 supports sediment types upstream and downstream which are suitable for spawning. The narrow nature of the watercourse and in some areas shallow depth are likely to limit value to both salmon and lamprey, though some use is possible.</p>					

Table 4-10: Allt Coire Chuirn fish habitat assessment

Watercourse: Allt Coire Chuirn		Hydro ID: 59	Chainage: 8400	Catchment: Spey	
Upstream		Comments	Downstream		Comments
Channel width	5m	Highly active channel – some management (removal of cobbles) to prevent bridge obstruction evident upstream.	Channel width	5m	Downstream section designated as part of River Spey SAC.
Channel depth:	200 – 500mm		Channel depth:	200 – 400mm	
Substrate:	Cobble – boulder (some pebble - gravel)	Wandering morphology and braided channels	Substrate:	Cobble – boulder (some pebble - gravels)	Engineered banks between existing A9 and NCN7 crossing short distance downstream
Gradient:	<5°		Gradient:	<5°	
Bank structure/vegetation:	Heavily disturbed banksides upstream	Otter spraint under crossing.	Bank structure/vegetation:	Acid grassland/ heathland.	Plane – bed morphology
Barriers Y/ N	N		Barriers Y/ N	N	
Photograph Upstream:			Photograph Downstream:		
					
<p>Overview of suitability for fish:</p> <p>The Allt Coire Chuirn at the existing crossing is dominated by larger cobbles and boulders, this may be a result of management to prevent sediment build up upstream of the bridge. Further downstream and upstream are habitats present which are likely to form habitat suitable for spawning Atlantic salmon. The absence of sand particles limits the value to sea lamprey spawning. Watercourse appears to be of high velocity so significant risk of washout of spawning areas. Absence of pools in channel or overhanging vegetation limit the value of the watercourse to adult or parr salmon. No habitat suitable for lamprey nursery areas is present.</p>					

Table 4-11: Allt Coire Bhotie fish habitat assessment

Watercourse: Allt Coire Bhotie		Hydro ID: 64	Chainage: 8400	Catchment: Spey	
Upstream		Comments	Downstream		Comments
Channel width	2-3m	Historical realignment. Gabion baskets on both banks to control flow through A9 bridge upstream Some possible management of sediment build up No aquatic macrophytes Plane bed morphology Shallow glide/ riffle structure, absence of pools	Channel width	2-3m	Straight channel from previous realignment Joined by second watercourse (ID 63) No aquatic macrophytes Erosion on south bank close to confluence with Hydro ID 63 Plane bed morphology Shallow glide/ riffle structure, absence of pools
Channel depth:	100 – 300mm		Channel depth:	100 – 400mm	
Substrate:	Cobble – boulder (some pebble - gravel)		Substrate:	Cobble – boulder (some pebble - gravels)	
Gradient:	>5°		Gradient:	<5°	
Bank structure/vegetation:	Low banks vegetated with dry/ wet heath		Bank structure/vegetation:	Acid grassland on steep banks	
Barriers Y/ N	N		Barriers Y/ N	N	
Photograph Upstream:			Photograph Downstream:		
					
<p>Overview of suitability for fish:</p> <p>The Allt Coire Bhotie at the existing crossing is dominated by larger cobbles and boulders, this may be a result of management to prevent sediment build up upstream of the bridge. Further downstream and upstream are habitats present which have some potential to form habitat suitable for spawning atlantic salmon. Straight realigned channel has no notable pool features limiting spawning habitat potential. The absence of sand particles limits the value to sea lamprey spawning. Absence of pools in channel or overhanging vegetation limit the value of the watercourse to adult or parr salmon. No habitat suitable for lamprey nursery areas is present.</p>					

