

# FEARNA STORAGE

## Fearna Pumped Storage Hydro Scheme CAR Licence Report

### Appendix J – Aquatic Ecology Surveys

September 2025



## Quality Information

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## **APPENDIX J: AQUATIC ECOLOGY SURVEYS**

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## Executive Summary

Gavia Environmental Ltd. was commissioned by Fearna PSH Ltd. to undertake an Aquatic Ecology Assessment in order to determine the status of fish, macroinvertebrate and macrophyte populations at the proposed Loch Fearna Pumped Storage Hydro scheme (the Proposed Development – National Grid Reference NH055030).

For the purposes this survey report, the '**Upper Area**' of the Proposed Development includes Loch Fearna, Coire Glas and Coire Dubh and the upper reaches of the Allt a' Mheil to immediately downstream of the existing hydro scheme. This area is affected by proposed dam infrastructure, proposed access tracks and inundation zones. The '**Lower Area**' of the Proposed Development includes areas of Loch Quoich within the construction footprint and watercourses potentially impacted by proposed access tracks and run off from construction activities taking place within the upper area.

The objectives of this study were to conduct a fish habitat assessment using an adapted SEPA methodology; a fully quantitative fish population assessment using SFCC electrofishing techniques; an in-situ water quality assessment; an aquatic macrophyte (aquatic plants) survey on Loch Fearna using JNCC methodologies; and a macroinvertebrate population assessment using standard kick EA/SEPA kick sampling methodology on watercourses and waterbodies potentially affected by the Proposed Development within the construction footprint. An eDNA assessment to inform on fish populations in Loch Fearna and Loch Quoich was also carried out, and an access and spawning habitat survey of the feeder watercourses of Loch Quoich.

A fish habitat assessment, to identify suitable habitat for salmonids, was conducted within the Upper and Lower Areas of the Proposed Development on the Loch Fearna and Allt a' Mheil catchments. The area (m<sup>2</sup>) of watercourse considered as *Productive: Good* was approximately 1,462.50 m<sup>2</sup> (18.03 %) in total, whereas 1,184.00 m<sup>2</sup> (14.60%) were classified as *Productive: Moderate*. Unproductive sections, due to the presence of steep bedrock channel, were estimated to be 2,154.50 m<sup>2</sup> (26.57 %) and an area of 3,362 m<sup>2</sup> (40.78 %) was classified as Unproductive: Other due to obstacles to migration, steep gradients, underground sections, peat channels and watercourses considered minor in nature.

During electrofishing surveys, an absence of fish was confirmed within all of the Loch Fearna tributaries surveyed despite good brown trout spawning and juvenile habitat present in H\_SL\_4 and H\_SL\_5. This suggests that Loch Fearna is also fishless, further strengthened by eDNA results which detected no brown trout or Arctic charr. An absence of fish was also confirmed within the upper Allt a' Mheil catchment.

The presence of brown trout and common minnow was confirmed at one Survey Location (SL7 – Allt Fearna upstream of Loch Quoich) within the Lower Area of the Proposed Development, an area with fish access from Loch Quoich. Despite the low densities of brown trout at the *fry* stage it does support the fact of a recent recruitment in the population since the previous spawning season. Brown trout fry populations were classified as *Poor* and at parr stage, were classified as *Moderate* on the SFCC Regional Classifications.

Environmental DNA results from testing carried out by Glasgow University in 2023 were inconclusive, detecting no fish species within the samples from Loch Fearna and Loch Quoich. An eDNA survey carried out by the UHI in Loch Quoich in February 2025 established the presence and assessed the relative abundance of Arctic charr, brown trout and common minnow in Loch Quoich. Brown trout were surveyed in all of the feeder streams surveyed, but there was no evidence of Arctic charr.

Water quality parameters presented optimal conditions for salmonid fish across all sampling locations.

The macroinvertebrate population was representative of good watercourse condition. No species of nature conservation interest were noted from the sampling conducted. Species recorded were dominated by common and widespread taxa, typical of a range of habitat types. Within the samples collected, the species composition was that of marginal and lotic environments.

In total 11 species of aquatic macrophyte were identified throughout Loch Fearn: 9 submerged/floating; and 4 emergent/edge species (*Juncus bulbosus* & *Littorella uniflora* were identified in both submerged and emergent communities). All species except *Baldellia ranunculoides* were classified as 'Least Concern' or 'Data deficient' for their conservation value, with *Baldellia ranunculoides* being classed as near threatened according to the IUCN Red List of Threatened Species. No invasive non-native species (INNS) were identified.

The following conclusions can be drawn from the Aquatic Ecology Survey report:

- Sections of riverine habitat within the Upper and Lower Area of the Proposed Development had the potential to support salmonid fish populations.
- Despite suitable habitat conditions to support fish populations, it is unlikely that brown trout are present within the Upper Areas of the Proposed Development (Loch Fearn and Allt a' Mheil catchments).
- Populations of brown trout and common minnow were found within the lower reaches of the Allt Fearn upstream of Loch Quoich which is within the Lower Area of the Proposed Development. The presence of both fry and parr indicate recent recruitment in this area.
- The eDNA survey carried out by the UHI in 2025 established the presence of populations of Arctic charr, brown trout and common minnow in Loch Quoich.
- Water quality parameters presented optimal conditions for salmonid fish across all sampling locations.
- Macroinvertebrate communities recorded were dominated by common and widespread taxa and no species of conservation interest were recorded.
- Aquatic macrophyte communities within Loch Fearn were limited in diversity and no species of conservation interest were recorded.
- Survey of macrophytes within Loch Quoich was not carried out as none are present within the drawdown of the reservoir operational levels, so access for survey was not possible.
- Other than common minnow, no invasive non-native species (INNS) were recorded across any of the surveys.

## 1 Introduction

Gavia Environmental Ltd. was commissioned by Fearna PSH Ltd. to undertake an aquatic ecology assessment to determine the status of fish habitat, fish, macroinvertebrate and macrophyte populations and water quality in relation to the proposed Fearna Pumped Storage Hydro scheme, hereafter 'the Proposed Development' – (Grid Reference NH055030). Loch Fearna is a small and relatively shallow freshwater loch with an area of 10 ha, a catchment area of 1.35 km<sup>2</sup> (included within the River Garry catchment), and a mean depth of 6.6 m. It would form part of the upper reservoir within the Proposed Development and is situated at an elevation of 538 m (Above Ordnance Datum - AOD). The Loch Fearna catchment is composed of a total of seven adjacent tributaries (in- and outflow). Six adjacent tributaries feed into the loch taking their source northward in Coire Glas. An additional tributary taking its source from an area of bog is also present (situated southeast of the Loch – Grid Reference NH055028) but is considered a minor watercourse. The outflow of Loch Fearna is situated southwest via the Allt Fearna which flows south to Loch Quoich.

Loch Quoich forms the lower reservoir (also within the River Garry catchment). Loch Quoich is a large freshwater reservoir and is the third and highest Loch on the Garry system. The basin of Loch Quoich is steep with uniform sides. The surface area is 1,746 ha, the catchment area is 13,221 ha, and the mean depth is 31.9 m, with a maximum depth of 85.6m. Since 1955, a hydroelectric dam has been in operation on the eastern end of Loch Quoich (Grid Reference NH070023) which has an operational level range of between 175.38 m AOD and 201.38 m AOD.

There are no desk records of fish populations within Loch Fearna and its tributaries as well as within the watercourses of Coire Dubh. In Loch Quoich, the presence of the hydroelectric dam at the eastern end, presents a migratory barrier for anadromous migratory species such as Atlantic salmon (*Salmo salar*), Sea trout (*Salmo trutta*), Lamprey (*Petromyzon marinus*) and Eels (*Anguilla anguilla*). Consequently, the presence of anadromous migratory fish species was ruled out via desk-study. However, an extant population of Arctic charr (*Salvelinus alpinus*), Brown trout (*Salmo trutta*) and Common minnow (*Phoxinus phoxinus*) are known to be present within Loch Quoich. The first record of Arctic charr in Loch Quoich was registered in 1913 and the last in 1995 (Maitland and Adams, 2017). It is important to note that there is evidence in literature that Arctic charr occasionally use riverine habitat. There is no evidence of riverine use on the tributaries of Loch Quoich but there is downstream of Quoich dam (Maitland and Adams, 2017). According to the SEPA Water Classification Hub (2022) the macroinvertebrate population in Loch Quoich has been classified *Good*.

During initial survey works carried out to inform scoping, it was recommended that further baseline surveys were needed to be undertaken to inform Ecological Impact Assessment (EcIA). Surveys were carried out predominantly in relation to areas likely to be affected by the construction footprint of the Proposed Development. Study objectives for this aquatic ecology assessment are provided below in **Section 1.1** and the study area is defined in **Section 3.3**.

### 1.1 Study Objectives

The objectives of this study were to conduct:

- a fish habitat assessment;
- a fish population assessment;
- a spawning habitat assessment;
- an in-situ water quality assessment;
- a macrophyte (aquatic plants) survey on Loch Fearna, and;
- a macroinvertebrate population assessment on watercourses and waterbodies potentially affected by the Proposed Development within the construction footprint (see **Section 3.3** Study Area).

Environmental DNA assessments were carried out to inform on fish populations in Loch Fearn and Loch Quoich.

An updated engineering drawing of the Proposed Development was provided by the client on 12/07/2023 (Error! Reference source not found. – **Figure 11.1.1.0**).

The proposed main access track for the Proposed Development is the **Southern Access Route (SAR)**. Aquatic ecology surveys relating to this part of the project are detailed in a separate document (Section 36 Planning Application EIA Report **Appendix 11.2 – Southern Access Route (SAR) Aquatic Ecology Surveys**). These parts of the Proposed Development would only be affected by its construction and not its operation, so are not considered in the CAR licence assessment.

## 2 Project Personnel

The project personnel are listed below in the **Table 1**.

*Table 1: Project Personnel*

| Personnel | Role  |
|-----------|---|
|           | Freshwater Ecologist - Environmental Consultant (Project Manager) |
|           | Freshwater Ecologist – Principal Environmental Consultant         |
|           | Freshwater Ecologist - Environmental Consultant                   |

## 3 Methodology

### 3.1 Legislation, Planning Policy and Guidance

The fish population assessment was conducted by using electrofishing techniques under Marine Scotland licence (Application Reference CSM-23-117). The Ness District Salmon Fishery Board and The Ness and Beaully Fisheries Trust were both notified prior about the intention to survey, as this is a condition of the licence.

### 3.2 Desk Study

A desk study was carried out at the start of the commission and ahead of the field survey. Information sources used for this study are described below:

- AMBER Report of Case Studies Demonstrating the Effects of Barrier Removal, Mitigation and Installation – for information on eDNA data relating to Loch Quoich;
- Bing Maps – aerial imagery was obtained and used to inform the field survey;
- Maitland and Adams (2017) *Arctic Charr in the Lochs of Scotland: An Assessment of Distribution and Status*;
- NatureScot Sitelink – A search was performed to identify sites with relevant (aquatic) interests within 2 km of the development;
- Ordnance Survey Mapping – site mapping was reviewed to inform survey location selection;

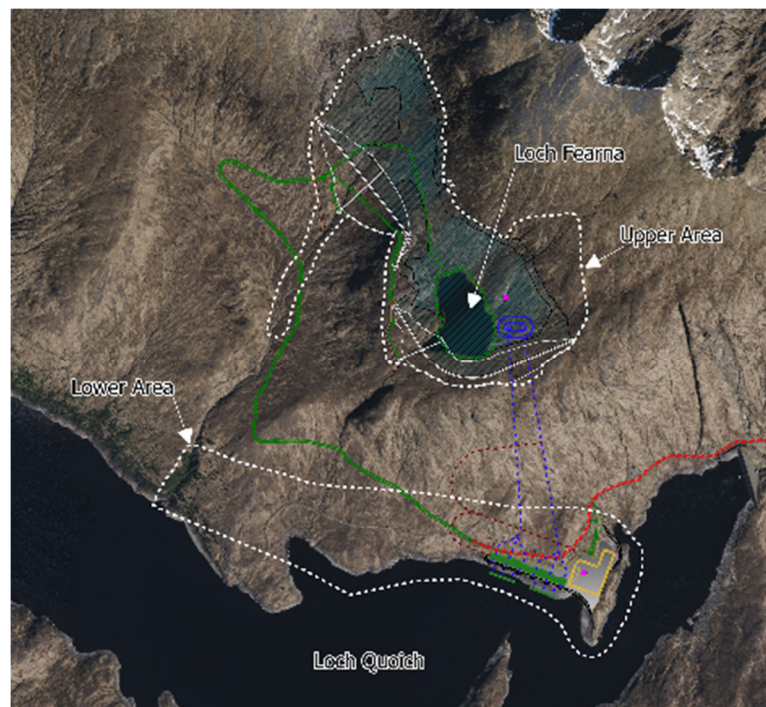
- Scotland’s Environment Web – data on obstacles to fish migration on affected watercourses obtained to guide likely species present; and
- SEPA – the SEPA Water Classification Hub was referred to for information on the classification status of the affected watercourses.

### 3.3 Study Area

#### 3.3.1 Proposed Development

The design of the Proposed Development (**Annex A**) is comprised of an upper reservoir (including the existing Loch Fearn basin) and a lower reservoir (Loch Quoich) connected by a series of tunnels. The inundation zone of the upper reservoir comprises Loch Fearn and areas of Coire Glas and Coire Dubh (**Image 1**) (the latter featuring the source of the Allt a’ Mheil watercourse). For the purposes of this survey report, the ‘**Upper Area**’ of the Proposed Development includes Loch Fearn, Coire Glas and Coire Dubh and the upper reaches of the Allt a’ Mheil to immediately downstream of the existing hydro scheme. This area is affected by proposed dam infrastructure, proposed access tracks and inundation zones. The ‘**Lower Area**’ of the Proposed Development includes areas of Loch Quoich within the construction footprint and watercourses potentially impacted by proposed access tracks and run off from construction activities taking place within the upper area.

Sections of watercourses in between these the Upper and Lower areas were considered too steep to support fish populations and were predominantly inaccessible on the grounds of health and safety therefore were not included within the scope of this assessment.



*Image 1: Loch Fearn, Loch Quoich, Upper and Lower Survey Areas*

#### 3.3.2 Fish Habitat Assessment

The fish habitat assessment was conducted within the Upper and Lower Area of the Proposed Development on watercourses likely to be affected during the construction and operational phases of the project. Fish habitat assessment survey locations with downstream and upstream extents are listed below in **Table 2** and shown in **Annex A – Figures 11.1.2.1-11.1.2.12**. A description and rationale for selection is provided below.

Table 2: Fish Habitat Assessment Survey Locations

| Survey Location | Downstream Easting | Downstream Northing | Upstream Easting | Upstream Northing | Description & Rationale for Selection   |
|-----------------|--------------------|---------------------|------------------|-------------------|---|
| H_SL_1          | 803334             | 205458              | 803392           | 205479            | Unnamed watercourse flowing into the north west of Loch Fearna. Affected by the inundation zone of the Proposed Development. (Upper Area)                             |
| H_SL_2          | 803363             | 205581              | 803398           | 205650            | Unnamed watercourse second eastern tributary of Loch Fearna. Affected by the inundation zone of the Proposed Development (Upper Area).                                |
| H_SL_3          | 803299             | 205632              | 803597           | 205954            | Unnamed watercourse tributary of Loch Fearna. Affected by the inundation zone of the Proposed Development (Upper Area).   |
| H_SL_4          | 803152             | 205693              | 803624           | 206130            | Unnamed watercourse fourth eastern tributary of Loch Fearna. Affected by the inundation zone of the Proposed Development (Upper Area).                                |
| H_SL_5          | 802976             | 205712              | 803200           | 206190            | Unnamed watercourse southeast of Loch Fearna (easternmost tributary). Affected by the inundation zone of the Proposed Development (Upper Area).                       |
| H_SL_6          | 802937             | 205295              | 802985           | 205368            | River Allt a' Fearna (outflow of Loch Fearna). Affected by the Fearna Dam footprint of the Proposed Development (Upper Area).   |
| H_SL_7          | 803675             | 204944              | 803812           | 205506            | Watercourse taking its source east of Coire Dubh. Affected by the inundation zone and the Coire Dubh Dam footprint of the Proposed Development (Upper Area).          |
| H_SL_8          | 803685             | 204955              | 804225           | 205477            | Unnamed watercourse taking its source north of Coire Dubh. Affected by the inundation zone and the Coire Dubh Dam footprint of the Proposed Development (Upper Area). |
| H_SL_9          | 803685             | 204955              | 804579           | 205271            | Unnamed watercourse taking its source west of Coire Dubh. Affected by the inundation zone and the Coire Dubh Dam footprint of the Proposed Development (Upper Area).  |
| H_SL_10         | 803067             | 204599              | 803685           | 204955            | River Allt a' Mheil, downstream of H_SL_7, 8 & 9. Downstream of the Coire Dubh Dam and crossed by the proposed access track (Upper Area).                             |
| H_SL_11         | 802179             | 204036              | 802390           | 204181            | River Allt a' Mheil (confluence with Loch Quoich) (Lower Area).   |
| H_SL_12         | 801984             | 204752              | 802174           | 204855            | River Allt a' Fearna (confluence with Loch Quoich) (Lower Area).  |

### 3.3.3 Fish Population Assessment

#### 3.3.3.1 Electrofishing Survey

The study area comprised the main tributaries of Loch Fearn (EF\_1, EF\_2, EF\_3, EF\_4 – **Table 3**), however, survey locations EF\_1 and EF\_2 were not assessed as on the day of survey, it was decided that they were minor watercourses, not featuring suitable characteristics to undertake an electrofishing survey. It is important to note that the proposed inundation zone was updated in the Proposed Development design and will now be extended towards Coire Dubh. This will affect the Allt a' Mheil and this watercourse was therefore included in the assessment (survey locations EF\_6 and EF\_8). The outflow of Loch Fearn (EF\_5) (source of the Allt Fearn) as well as its confluence with Loch Quoich (EF\_7) were also assessed. The confluence between the Allt a' Mheil and Loch Quoich was inaccessible due to health and safety reasons and therefore was not included within the assessment. This location is not expected to have been suitable for supporting fish populations due to steep gradients and bedrock substrate. At each accessible survey location, in-situ water quality parameters (Temperature (°C), Oxidation Reduction Potential (mV), pH, Dissolved Oxygen (% and mg.l<sup>-1</sup>), Conductivity (µs.cm<sup>-1</sup>), Total Dissolved Solid (mg.l<sup>-1</sup>)) were also recorded. Fish population assessment survey locations are detailed below in **Table 3** and shown in **Annex A – Figure 11.1.3.1-11.1.3.2**.

*Table 3: Fish Population Assessment Survey Locations (including Water Quality Monitoring)*

| Survey Location | Easting | Northing | Description  |
|-----------------|---------|----------|--|
| EF_1            | 205452  | 803333   | North-western tributary of Loch Fearn. Not assessed because of Unproductive Habitat. |
| EF_2            | 205632  | 803299   | Second tributary to the east of EF_1. Not assessed because of Unproductive Habitat.  |
| EF_3            | 205688  | 803158   | Third tributary to the east of EF_2.   |
| EF_4            | 205717  | 802978   | Forth tributary to the east of EF_3.   |
| EF_5            | 205336  | 802965   | Loch Fearn outflow: River Allt Fearn.  |
| EF_6            | 205035  | 803761   | Main eastern affluent of the River Allt a' Mheil taking source in Coire Dubh.        |
| EF_7            | 204787  | 802051   | Confluence between the River Allt Fearn and Loch Quoich.                             |
| EF_8            | 204612  | 803080   | River Allt a' Mheil downstream of existing hydro scheme dam.                         |

#### 3.3.4 Spawning Habitat Assessment

Surveys were conducted on several of the named watercourses appearing on 1:50,000 Ordnance Survey mapping which are tributaries of Loch Quoich, with potential to be used by salmonid fish for spawning. The River Quoich and the Caolie Water were identified to feature much longer riverine sections than was apparent on OS base mapping and therefore required further survey effort. A full list of the watercourses surveyed is provided in **Table 4** below.

Table 4: Spawning habitat assessment surveyed watercourses

| Watercourse                 |                              |
|-----------------------------|------------------------------|
| Allt Coire nan Gall         | Easter Glen Quoich Burn      |
| Allt a' Choire Reidh        | Allt Coire nan Eiricheallach |
| Allt a' Coire Bhuidhe       | Allt Fearna                  |
| Abhainn Chosaidh            | Allt a' Mheil                |
| Allt a' Mhaingir            | Allt Coire Peitireach        |
| Allt Redidh Meall an Eilein | Allt a' Choire Leith         |
| River Quoich                | Caolie Water                 |

### 3.3.5 Environmental DNA (eDNA)

Environmental DNA (eDNA) samples were collected in 2023 at strategic locations in the littoral zone of Loch Fearna and Loch Quoich. Sampling Locations are provided in **Table 5** and shown in **Annex A – Figure 11.1.4.0**.

Additional samples were collected in February 2025 from the littoral zone of Loch Quoich (n = 20) and the associated inflowing rivers (n = 14). Sample Locations are located within the figures of the report and shown in **Annex F – “Gavia\_II- eDNA\_final\_report\_UHI”**.

Table 5: Environmental DNA: Sampling Locations

| Sampling Location | Waterbody   | Easting | Northing |
|-------------------|-------------|---------|----------|
| eDNA_1            | Loch Fearna | 205431  | 803035   |
| eDNA_2            | Loch Feana  | 205443  | 803247   |
| eDNA_3            | Loch Fearna | 205547  | 803361   |
| eDNA_4            | Loch Fearna | 205690  | 803213   |
| eDNA_5            | Loch Fearna | 205723  | 802986   |
| eDNA_6            | Loch Fearna | 205506  | 802937   |
| eDNA_7            | Loch Quoich | 205368  | 801923   |
| eDNA_8            | Loch Quoich | 205177  | 801893   |
| eDNA_9            | Loch Quoich | 204798  | 802019   |
| eDNA_10           | Loch Quoich | 201648  | 803964   |
| eDNA_11           | Loch Quoich | 206182  | 801529   |

### 3.4 Fish Habitat Assessment Methodology

The fish habitat assessment was conducted using an adapted version of SEPA hydropower guidelines on assessing habitat suitability for juvenile salmonids. This guidance has been recommended by the Marine Directorate on similar pumped storage hydro scheme projects.

Using the SEPA approach, habitat types are classified under four main categories; Bedrock channels, Lamprey habitat, Productive habitat and Obstructions to migration. This method was adapted to sub-divide Productive habitat into *Productive: Good* and *Productive: Moderate*. A category for 'Unproductive' was added and sub-divided into *Unproductive: Bedrock* and *Unproductive: Other*. Habitat characteristics such as bankside cover, flow types, depths and riparian habitats were collected on a SFCC habitat form to help inform these assessments at each Survey Location. These amendments to the method allowed for a more informed assessment of the fish habitat present and allowed scope for habitat categories not included under the SEPA method to be recorded e.g. man-made concrete channels or peat laden ditches.

Predominant habitats were recorded within specific sections and the average wetted width of the channel was recorded. Where the habitat characteristics changed, a new section was annotated on the map with grid references of the start and end points noted. It is important to note that not all habitat features (productive or unproductive) are necessarily continuous within a watercourse section; they may often be isolated and too small to map, in this case a target note was recorded or a longer section with a constant succession of impassable features (waterfall or underground channel) were immediately characterised as

Unproductive (Other) until a section with Productive habitat was found. Where spawning gravels were present and accessible, an assessment of their quality in terms of stability, compaction and siltation was made. In addition, the bankside structure and surrounding land use was also recorded. In Survey Locations where the watercourses ceased to have definable features and/or were determined unsuitable to support any fish species the survey was not conducted upstream of this point.

### 3.5 Fish Population Assessment Methodology

#### 3.5.1 Fish Population Survey Method

Assessment of the species composition, abundance and age class structure of fish population was conducted in reasonable accordance with the Scottish Fisheries Coordination Centre guidelines on undertaking and managing electrofishing operations (SFCC, 2007) and British Standards (BS 14011 - Sampling of fish with electricity & BS 14962 Guidance on the scope and selection of fish sampling methods). The survey team comprised of three experienced surveyors. The survey lead was qualified to SVQ Level III (leading electrofishing operations and undertaking fish habitat surveys), both assistants were qualified to SVQ Level II (introduction to electrofishing). The surveys were undertaken using a ©Hans Grassl Electrofishing kit which was battery powered and was set up to drive a single anode. Smooth DC current was applied as this is generally accepted as the least damaging to fish during this type of survey. Fish Population Assessment using electrofishing must be undertaken within the optimal time of the year corresponding to the biology of the targeted species. Juvenile Salmonids usually emerge from *redds* (spawning grounds) early in the spring and take from 5 to 10 weeks (variable according to resource availabilities and water temperature) to reach the *fry* stage and a sufficient size to be safely captured and identified to the species level. Furthermore, water temperature must be comprised within the optimal range for electrofishing (10 – 15°C). Under the SFCC protocol, surveyors should perform a maximum of four electrofishing runs per site. To obtain a fully quantitative estimate and confidence limits of the population present (N.B. a minimum of two electrofishing runs must be performed). Draft guidelines from the European Inland Fisheries Advisory Commission (EIFAC) state that "*Sites must be surveyed at least three times except and unless the second catch is very much smaller than the first and the field estimates of population size indicate (a) that the population size exceeds 200, and (b) that the probability of capture of an individual fish is greater than 0.6. Under these circumstances a third fishing need not be carried out*". However, it is usual that additional electrofishing runs are performed to increase the reliability of the estimate.

#### 3.5.2 Quantitative Electrofishing Survey

A fully quantitative electrofishing survey was conducted. A fully quantitative electrofishing survey is the enumeration of a stock component within a given site. The estimate of the total population is calculated from the number of fish caught over multiple electrofishing runs. In order to calculate the population estimate, the method used is depletion sampling (where fish are removed from a site in a series of successive electrofishing runs). Depletion methods are considered as self-calibrating as the catch data is used to derive the probability of capture (Wyatt and Lacey, 1994). The population estimate is based on the rate at which the number of individuals caught for each catch on successive runs drop off. For the estimation to be valid, the removal method must significantly reduce the population size with each successive sampling run. Each survey was conducted within an approximate 100 m<sup>2</sup> section (the section area was calculated accurately according to the widths and the length of the watercourse).

#### 3.5.3 Fish Processing

Caught individuals were carefully placed in an aerated freshwater container with a small hand net. Fish were then placed in an anaesthetic container (10 ml.l<sup>-1</sup> – Benzocaine) prior to measuring. The fork length (mm) was recorded, and the individuals were placed into a

recovery container (aerated freshwater). At the end of the processing, all individuals were carefully released at the upstream limit of the survey section.

### 3.6 Spawning Habitat Assessment

A rapid walkover survey of the lower reaches of each watercourse was undertaken in April 2025 to characterise the spawning potential for each of the watercourses potentially affected by water level fluctuation as a result of the operation of the Proposed Development.

Habitat was classed as either Optimal, Sub-Optimal or Not Suitable. Different parameters were considered for these categories such as substrate composition, i.e. presence of gravel, compaction of substrate and siltation. Where there was access for fish to watercourses featuring pebble dominated substrate but a lack of gravel, these were typically recorded as Sub-Optimal. Where habitat was either Sub-Optimal or Optimal for spawning, further data on flow types, substrate types, water depths, and wet widths were collected as per SFCC, 2007 descriptions. Photographs and geolocations were also recorded where these habitat types were identified. Where habitat was considered Not Suitable for spawning, target notes and a photographic record was collected on a reach-by-reach basis, but no further habitat data was recorded. Geolocations of the beginning and end of reaches were recorded for GIS mapping purposes. Where the reach started to become steep and unsuitable or there were obvious impassable sections, the survey was ceased. This bespoke methodology was developed following the advice of Professor Colin Adams of Scottish Centre for Ecology & the Natural Environment (SCENE).

### 3.7 Macroinvertebrate Population Assessment

Macroinvertebrates samples were collected using the standard SEPA and Environment Agency kick sampling method. A three-minute kick sample was conducted in riffled areas, moving within the river to account for differences in substrate and habitat types. During each kick sample the net was held down-stream of the surveyor, with its bottom edge in contact with the substrate. The surveyor kicked and dislodged the substrate, moving slowly backwards, and in an upstream direction. Invertebrates dislodged from the substrate were washed downstream and trapped in the net. This was followed by a one-minute manual search in which substrate too large to dislodge during the initial three-minute sample were over-turned and examined. To account for surface macroinvertebrate presence a further one-minute sweep was conducted in the shallow margins and across the surface of the river. In lentic water systems such as Loch Fearn and Loch Quoich, sweep sampling was the preferred method of sampling. This relied on a disturbance of the substrate and then a sweeping like motion in a figure of eight of the pond net through the water column to collect the sample (Chadd, 2010). The macroinvertebrate sample was collected using a standard Freshwater Biological Association Pond net (mesh diameter 1.0 x 1.0mm); which was disinfected with Virkon S prior to and after use. Invertebrates and substrate trapped in the pond net or collected during the manual search were stored in a labelled sample container (with a paper sample identification label also added to the sample container for security) for later extraction.

### 3.8 Environmental DNA (eDNA) Sampling

In 2023, water samples were collected by Glasgow University in the littoral zone and processed through a Sterivex Millipore Sterile filter (0.22 µm) with a manual pumping system. It is important to note that the volumes of water differ according to the Survey Location because of limitations of the pumping system when dealing with different volumes of particulates within the water sample.

In February 2025, further eDNA sampling was carried out during by the UHI in Loch Quoich and the associated inflowing rivers.

### 3.9 Analysis and Statistics

#### 3.9.1 Fish Habitat Assessment

Observations and target notes were recorded to identify optimal habitat (including channel width, channel depth, flow type, substrate composition, instream and bankside cover, riparian canopy cover, fish spawning ground potential; riparian land uses, and associated limiting factors. From this, further analysis was undertaken, and evaluations were made for suitable spawning potential and fish habitat classification along the watercourse. Sections within each survey location were then given a rating for fish habitat quality (**Table 6**).

*Table 6: Adapted SEPA Fish Habitat Classifications*

| Fish Habitat                            | Conditions   |   |
|---|--|---|
| Productive Habitat (Good)               | Salmonid Spawning Ground   | Stable gravel up to 30 cm deep that is not compacted or contains excessive silt. Substrate size predominantly pebbles and cobbles (lower size limit).   |
|   | Salmonid Fry   | <ul style="list-style-type: none"> <li>○ Atlantic salmon: Shallow (&lt;0.2 m) and fast flowing water indicative of riffle and run with a substrate dominated by pebbles and cobbles (lower size limit).</li> <li>○ Brown trout: Slow to medium flowing shallow water with a substrate dominated by pebbles (upper size limit), cobbles (lower size limit), often concentrated at stream margins.</li> </ul> |
|   | Salmonid Parr  | <ul style="list-style-type: none"> <li>○ Atlantic salmon: Riffle and run habitat that is generally faster and deeper than fry habitat (0.2 - 0.4 m). Substrate size range comprise from pebbles (upper size limit), cobbles (lower size limit) to boulder.</li> <li>○ Brown trout: Variety of substrate sizes (from pebble to boulder); undercut banks, tree roots; deeper and slower water.</li> </ul>     |
| Productive Habitat (Moderate)           | Suitable habitat characteristics (i.e., mentioned in the above section 'Productive Habitat (Good)' but with the presence of unsuitable elements (i.e., lack of bankside cover, high variation of water flow, bedrock, silt, and algae).                  |   |
| Unproductive Habitat (Bedrock Channels) | Habitat primarily consists of adverse conditions with the presence of limited suitable elements. (dominated by bedrock).   |   |
| Unproductive Habitat (Other)            | Habitat primarily consists of adverse conditions with the presence of limited suitable elements.   |   |
| Obstructions to Migration               | Impassable waterfalls, weirs, bridge sills.  |   |
| Lamprey Habitat                         | <p>Optimal: Stable fine sediment or sand; ≥15 cm deep with low water velocity and the presence of organic detritus as well as macrophytes.</p> <p>Sub-optimal: Shallow sediment (&lt;15 cm deep), unequal and interspersed among coarser substrates.</p> |   |

#### 3.9.2 Population Estimate

Population estimates were calculated using analysis of depletion catches with a maximum likelihood estimation procedure. The maximum likelihood estimator of Carle and Strub (1978) is a development of the Zippin (1958) method. It has the advantage of being able to produce population estimates and confidence intervals under situations where the Zippin method fails (when the probability of catch varies from run to run, or when the population size is small which was the case in the study). However, despite being more robust than the

Zippin method, it is still susceptible to the same violations mentioned above as the Zippin method is, and the confidence intervals of the data should be considered when the data are interpreted. Statistical analyses were conducted under R studio program (Version 2023.06.1). A removal depletion model from the Carle and Strub (1978) method has been used to calculate population estimates, catching probability and confidence intervals. The package FSA – Fisheries Stock Assessment Methods version 0.9.4 (Ogle and Wheeler, 2023) has been used to conduct the analysis. The number of individuals caught for each of the three runs have been implemented in a removal model using the *removal* function. The population estimate and the confidence interval have been extracted using the *summary* function.

### 3.9.3 SFCC Classification Scheme

The SFCC developed a national river classification scheme for Scottish rivers (Godfrey, 2005). The following classification is based on data collected in the Moray Firth Region and therefore applicable in the catchment (**Table 7**)

*Table 7: SFCC Classification Scheme - N individual/100 m<sup>2</sup> in stream <4m wide*

| Species/Age-class        | A                | B            | C               | D           | E                | F             |
|--------------------------|------------------|--------------|-----------------|-------------|------------------|---------------|
| Brown trout fry 0+       | 39.0+            | 21.0 - <39.0 | 14.3 - <21.0    | 5.9 - <14.3 | <5.9             | 0             |
| Brown trout parr >0+     | 18.1+            | 13.7 - <18.1 | 9.1 - <13.7     | 3.9 - <9.1  | <3.9             | 0             |
| Atlantic salmon fry 0+   | 86.8+            | 35.8 - <86.8 | 22.6 - <35.8    | 8.6 - <22.6 | <8.6             | 0             |
| Atlantic salmon parr >0+ | 30.9+            | 18.9 - <30.9 | 11.7 - <18.9    | 5.3 - <11.7 | <5.3             | 0             |
| <b>Classification</b>    | <b>Excellent</b> | <b>Good</b>  | <b>Moderate</b> | <b>Poor</b> | <b>Very Poor</b> | <b>Absent</b> |

### 3.9.4 Macroinvertebrate Population Assessment

Analysis of macroinvertebrate population was conducted by Gavia Environmental Ltd. approved third-party contractor Riverwood Ecology. Macroinvertebrate samples were classified to species level where it was appropriate to do so. The following scores were calculated for each sample (Interpretation of the Taxonomic level and the scores for BMWP, PSI and CCI are provided in **Table 8 & 9**):

- BMWP - Biological Monitoring Working Party score;
- NTAXA (TL1 and TL2) - Count of BMWP family taxa in the sample;
- ASPT (TL1 and TL2) - Average score per (BMWP/WHPT) taxon;
- LIFE (TL5 and TL2) - Lotic-Invertebrate index for Flow Evaluation;
- PSI (TL5 and TL3) - Proportion of Sediment-sensitive Invertebrates;
- E-PSI (FAM and TL5) - Empirically Weighted Proportion of Sediment-sensitive Invertebrates Index;
- CCI (TL5) - Community Conservation Index (TL5 only) and
- WHPT (TL2) - Whalley-Hawkes-Paisley-Trigg index.

Table 8: Macroinvertebrate Taxonomic Level

| Code | Description  |
|------|--|
| TL1  | Taxonomic Level 1 - The 78 "BMWP family" level taxa in RIVPACS IV  |
| TL2  | Taxonomic Level 2 - The 112 "WHPT family" level taxa in RIVPACS IV   |
| TL3  | Taxonomic Level 3 - 'All Families'   |
| TL5  | Taxonomic Level 5 - The 417 "WFD Species" level taxa in RIVPACS IV (including component members of species groups) |

Table 9: Key and Score interpretation for Macroinvertebrate Analysis.

| BMWP Score Category Interpretation |                                | PSI Score Category Interpretation |                       |
|------------------------------------|--------------------------------|-----------------------------------|-----------------------|
| 0 – 10                             | Very Poor                      | 0 - 20                            | Heavily Sedimented    |
| 11 – 40                            | Poor                           | 21 - 40                           | Sedimented            |
| 41 – 70                            | Moderate                       | 41 - 60                           | Moderately Sedimented |
| 71 – 100                           | Good                           | 61 - 80                           | Slightly Sedimented   |
| > 100                              | Very Good                      | 81 - 100                          | Minimally Sedimented  |
| CCI Score Category Interpretation  |                                |                                   |                       |
| 0 - 5                              | Low Conservation Value         |                                   |                       |
| >5 - 10                            | Moderate Conservation Value    |                                   |                       |
| >10 - 15                           | Fairly High Conservation Value |                                   |                       |
| >15 - 20                           | High Conservation Value        |                                   |                       |
| >20                                | Very High Conservation Value   |                                   |                       |

### 3.9.5 Environmental DNA (eDNA)

#### 3.9.5.1 2023 Sampling

The 2023 samples used primers that were designed to amplify fragments in a range of 101–250 bp to allow for Sanger sequencing in order to be able to validate eDNA detection when necessary. Annealing temperature was validated using Primer Express 3.0 (Life Technologies) and cross- amplification to unrelated species was verified using Primer Blast (Zhao et al., 2012). All designed primers and probes were validated for amplification of targeted species and for cross-amplification with related species using in-house extracted genomic DNA from various tissues for fish, amphibians, molluscs, and crustaceans using a salt DNA extraction protocol (██████████, 1997), and from blood for reptiles using the DNeasy blood and tissue kit (Qiagen). Primer screening was performed with FAST SYBR Green (Life Technologies). Amplifications were performed on a 7,500 Fast Real-Time PCR System (Applied Biosystems) in a final volume of 20 µl: 10 µl of Fast SYBR® Green Master

Mix, 1 µl of each primer (10 µM), 2 µl of DNA (5–10 ng) and 6 µl of UltraPure Distilled Water (DNase, RNase, Free, Invitrogen™) following these conditions: 95°C for 20 s, 40 cycles × [95°C for 3 s, 60°C for 30 s]. The full eDNA report from University of Glasgow is available in **Annex F**.

### 3.9.5.2 2025 Sampling

Samples were taken again in 2025 using a more comprehensive method which meant samples had DNA extracted following the Mu-DNA water extraction protocol (Sellers et al., 2018). Three PCR replicates were carried out for each sample prior to being pooled. Samples were further processed and sequenced following metabarcoding protocols established at UHI Inverness using a vertebrate specific 12S marker (Riaz et al. 2011). Raw sequence data were analysed using Tapirs (<https://github.com/EvoHull/Tapirs>). Sequencing reads from samples underwent taxonomic assignment against a curated UK vertebrate species reference database. Following taxonomic assignment, a noise threshold of 0.1% of total reads per sample was applied to remove low-frequency reads (Hänfling et al., 2016). Reads assigned to positive controls, reads which could not be assigned to any taxon, and samples with no taxonomically assignable reads were also removed from the data set. Data analysis and visualisation was performed in the statistical programming environment R v.4.4.3 (R Core Team, 2025). The full eDNA report from University of the Highlands and Islands Inverness is available in **Annex F**.

### 3.9.6 Macrophytes

The standard approach to biological monitoring of standing water habitats, as recommended by the JNCC was employed for the macrophyte survey (Interagency Freshwater Group, 2015).

Four 100 m transects were conducted on Loch Feana; this is considered representative where the waterbody area is <100 ha. Where waterbodies are small (<5 ha) fewer transects are considered sufficient to characterise the waterbody. Loch Feana is approximately 10ha in size.

Locations of the transects were strategic to characterise macrophyte communities and/or where species of interest are likely to occur (e.g. selection is not random). Where possible, the selection should be based on previous surveys. As historical macrophyte data was not present prior to this survey, transect locations were chosen to represent the potential range of habitats or species within the marginal areas of waterbodies. This was assessed by undertaking an initial walkover of the waterbody perimeter prior to conducting transect surveys. At least one transect should be located in the sheltered part of the shore where plant fragments are likely to accumulate.

The strandline survey was incorporated into each 100 m transect recording the presence / absence of species. This was sub-divided into 5 equal sections with presence of species recorded within each section. This did not comprise a formative part of the assessment but was undertaken as a guide to inform the potential presence of charismatic species. In the event wader and /or boat surveys could not be undertaken this may be used in the assessment.

Wader surveys were conducted over the same 100 m transects with five sections surveyed perpendicular to the main transect line at 20 m intervals each covering an area of 1 m<sup>2</sup> (see **Image 2**). Additional 1 m<sup>2</sup> areas were surveyed at depths of 0.25 m, 0.5 m, 0.75 m and >0.75 m. A bathyscope and/or grapnel hook was used to examine the species present at each sampling point. The following data was recorded from each transect:

- I. All species present;
- II. An estimate of total abundance using the DAFOR scale (see **Table 10**); and
- III. A photograph of a selection of species identified for future reference.

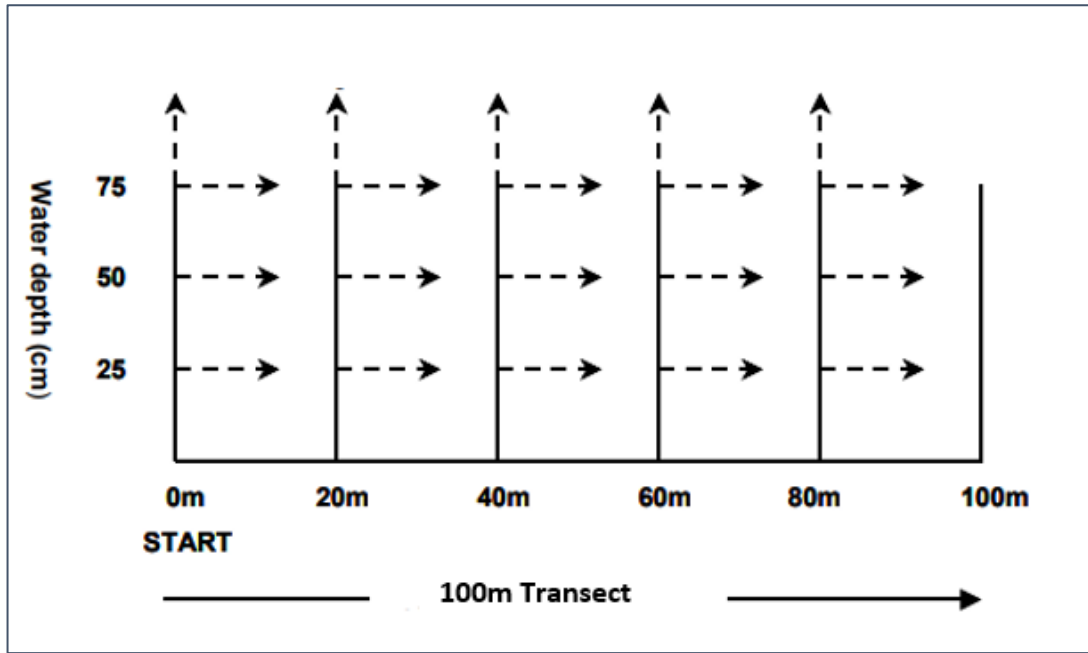


Image 1. The location of Survey Sections Relevant to the 100 m Transect (Interagency Freshwater Group, 2015).

DAFOR abundance categories were given to each species identified based on the percentage coverage within each transect, as shown in **Table 9**. This provides a comparable base for future surveys to identify growth / reduction in species coverage in addition to species present.

Table 10. DAFOR Abundance Category

| Abundance |            | Cover   |
|-----------|------------|---------|
| <b>D</b>  | Dominant   | 50-100% |
| <b>A</b>  | Abundant   | 30-50%  |
| <b>F</b>  | Frequent   | 15-30%  |
| <b>O</b>  | Occasional | 5-15%   |
| <b>R</b>  | Rare       | <5%     |

Boat surveys were not conducted as part of this survey due to the logistical challenges of transporting a boat to Loch Ferna with no access track and extremely steep gradient on approach. Grapnel hooks were used to obtain samples where water depth was >5 m. Conservation statuses for plants was assessed via the Botanical Society of Britain & Ireland (2024) latest 'List of Conservation Statuses for all UK Plants'.

Macrophyte surveys were limited to Loch Ferna. A survey was not conducted on Loch Quoich as during the 2024 optimal survey window, the Loch levels were much higher than normal resulting in marginal areas which are normally dry due to the existing Quoich Power Station operation and devoid of aquatic vegetation were flooded. This would have meant that data collected along transects in marginal areas would have been likely meaningless. JNCC guidance states that 'If on the day of survey, water levels are obviously raised or lowered, survey should be postponed as results are unlikely to be comparable' (JNCC 2015).

## 4 Results

### 4.1 Desk Study

#### 4.1.1 SEPA Water Classification Hub

Loch Quoich is a lake (ID: 100186), in the River Ness catchment of the Scotland river basin district. It is 17.5 square kilometres in area. The water body has been designated as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on water storage for hydroelectricity generation (Quoich Dam). The Loch is classed as *Poor* for Fish and Fish barrier, *Good* for water quality and aquatic plants and has an overall status of *Good Ecological Potential*.

River Garry - Loch Poulary to Loch Quoich is a river (ID: 20256), in the River Ness catchment of the Scotland river basin district. The main stem is approximately 7.3 kilometres in length. The water body has been designated as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on water storage for hydroelectricity generation. This section of river is classed as *Poor* for Fish, Fish Ecology and has an overall status of *Poor Ecological Potential*.

River Garry - Loch Garry to Loch Poulary is a river (ID: 20255), in the River Ness catchment of the Scotland river basin district. The main stem is approximately 4.6 kilometres in length. The water body has been designated as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on water storage for hydroelectricity generation. This section of river is classed as *High* for Fish, Fish Ecology and has an overall status of *Good Ecological Potential*.

No other waterbodies or watercourses potentially affected by the Proposed Development were classified by SEPA on the Water Classification Hub (2023).

#### 4.1.2 Protected Areas

No protected areas with a relevance to aquatic ecology have been identified within the Proposed Development.

Loch Garry is part of the West Inverness-shire Lochs SPA / SSSI is within 5.7 km of the Proposed Development. *The sites are both designated for the following species; black-throated diver and common scoter. As these are considered terrestrial species, Effects on the qualifying interests of these designated sites are covered under Chapter 8: Ecology.*

#### 4.1.3 Records of Arctic charr

██████████ (2017) *Arctic charr in the lochs of Scotland: An Assessment of Distribution and Status* lists records of Arctic charr in Loch Quoich. Most records are now historic (1913-1995) with the previous record being from 1995 and catch data very limited i.e. single catches. 'Note 4' also states '*some evidence of riverine use*' but this was confirmed to be on the mainstem Garry Garry / River Garry downstream of Quoich dam rather than within the tributaries of Loch Quoich.

The AMBER report recorded Arctic charr in Loch Quoich above Quoich Dam in eDNA surveys in 2018.

#### 4.1.4 Barriers to Migration

Within the Proposed Development, no desk records of anthropogenic barriers to migration were identified (Water Classification Hub, 2020). However, a hydroelectric dam is present on the eastern end of Loch Quoich (Grid Reference NH070023). The feature is located approximately 700 m to the east of the Proposed Development and currently operates with no fish pass. Therefore, the presence of migratory species such as Atlantic salmon and Sea trout has not been considered. Furthermore, a hydroelectric dam has been identified on the

River Allt a' Mheil (situated at the end of an existing access track - Grid Reference NH046031).

## 4.2 Fish Habitat Assessment

A total of 12 Survey Locations with defined sections have been surveyed within upper and lower areas of the Proposed Development. A total of 1462.50 m<sup>2</sup> of habitat was classified as *Productive: Good*. Those sections feature within the following Survey Locations; H\_SL\_4 and H\_SL\_5 (the lower reaches of unnamed tributaries of Loch Fearnna), taking their source in Coire Glass and H\_SL\_9 (a short section of the westernmost tributary of the River Allt a' Mheil), taking its source in Coire Dubh. All of these sections were within the upper area of the Proposed Development.

A total area of 1184 m<sup>2</sup> of habitat was classified as *Productive: Moderate*. Those sections correspond to the following Survey Locations; H\_SL\_5 (a very short section of unnamed watercourse which is a tributary of Loch Fearnna) H\_SL\_6 (the very upper reaches of the Allt Fearnna at the out flow from Loch Fearnna), H\_SL\_9 (immediately upstream of the confluence with the Allt a' Mheil), H\_SL\_10 (four short sections on the Allt a' Mheil) spread between sections of unsuitable bedrock) and H\_SL\_12 (the lower reaches of the Allt Fearnna upstream of the confluence with Loch Quoich).

A total area of 2154.50 m<sup>2</sup> of habitat was classified as *Unproductive: Bedrock*. Those sections correspond to the following Survey Locations; H\_SL\_9 (a short, steep section of the westernmost tributary of the River Allt a' Mheil), H\_SL\_10 (several short sections and one long continuous section on steep gradient of the Allt a' Mheil), H\_SL\_11 (a short section of the Allt a' Mheil upstream of the confluence with Loch Quoich) and H\_SL\_12 (a section of the Allt Fearnna on steeper gradient crossed by the main public road).

A total area of 3306.50 m<sup>2</sup> of habitat was classified as *Unproductive: Other*. Those sections correspond to the following Survey Locations; H\_SL\_1, H\_SL\_2, H\_SL\_3, H\_SL\_4 and H\_SL\_5 watercourses flowing into Loch Fearnna featuring sections with steep gradients, underground sections and peat channels), H\_SL\_7 and H\_SL\_8 (tributaries of the Allt a' Mheil which were steep and minor in nature) and H\_SL\_10 (the upper reaches of the Allt a' Mheil, downstream of confluences).

A map of the fish habitat assessment classification is available in **Annex A – Figures 11.1.2.1-11.1.2.12**.

Total areas and percentages for each habitat category are shown in **Table 11** below.

*Table 11: Area and Percentage of Fish Habitat Classification.*

| Classification               | Area (m <sup>2</sup> ) | Percentage   |
|------------------------------|------------------------|--------------|
| <b>Productive: Good</b>      | 1462.50                | 18.03 %      |
| <b>Productive: Moderate</b>  | 1184.00                | 14.60 %      |
| <b>Unproductive: Bedrock</b> | 2154.50                | 26.57 %      |
| <b>Unproductive: Other</b>   | 3306.50                | 40.78 %      |
| <b>Total</b>                 | <b>8,107.50</b>        | <b>100 %</b> |

## 4.3 Fish Population Assessment

Brown trout and common minnow were recorded at the confluence between the Allt Fearnna and Loch Quoich (survey location EF\_7, within the 'Lower Area'). Notably, the common minnow population were harbouring colour sexual dimorphism such that individuals were mature, and ready to spawn (for both male and female). No fish were found in any of the other survey locations, including within the Loch Fearnna catchment (EF\_3, EF\_4, EF\_5 and

EF\_6) and the Allt a' Mheil Catchment (EF\_6 and EF\_8). Therefore all of the survey locations within the 'Upper Area' had an absence of fish.

At survey location EF\_7, the fully quantitative population estimate for brown trout was  $19.00 \pm 2.00$  (CI = [15.07; 22.92]). Within the brown trout population, the estimate relating to the percentage of brown trout fry was  $8.00 \pm 0.76$  (CI = [6.49; 9.50]) and brown trout parr was  $10.00 \pm 1.11$  (CI = [7.81; 12.18]). SFCC regional classifications were categorised as *Low* for brown trout fry and *Moderate* for brown trout parr (this is based on the first run of the electrofishing survey only as per Godfrey, 2005). Fully quantitative population estimates and SFCC regional classifications are shown in **Table 12** below.

Table12: Fully Quantitative Population Estimates and SFCC Regional Classification.

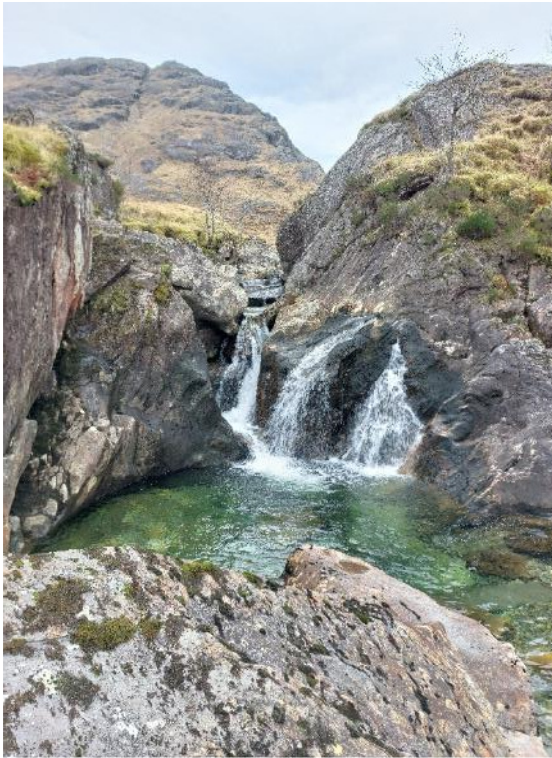
| Survey Location           | Survey Technique and Sample Area          | Population Estimate |                  | sd              |                  | CI                 |                     | SFCC Regional Classification |                  |
|---------------------------|---|---------------------|------------------|-----------------|------------------|--------------------|---------------------|------------------------------|------------------|
|                           |   | Brown trout fry     | Brown trout parr | Brown trout fry | Brown trout parr | Brown trout fry    | Brown trout parr    | Brown trout fry              | Brown trout parr |
| EF_1                      | Not surveyed                              |                     |                  |                 |                  |                    |                     |                              |                  |
| EF_2                      | Not surveyed                              |                     |                  |                 |                  |                    |                     |                              |                  |
| EF_3                      | Fully Quantitative (~100 m <sup>2</sup> ) | N/A                 | N/A              | N/A             | N/A              | N/A                | N/A                 | <b>Absent</b>                | <b>Absent</b>    |
| EF_4                      | Fully Quantitative (~100 m <sup>2</sup> ) | N/A                 | N/A              | N/A             | N/A              | N/A                | N/A                 | <b>Absent</b>                | <b>Absent</b>    |
| EF_5                      | Fully Quantitative (~100 m <sup>2</sup> ) | N/A                 | N/A              | N/A             | N/A              | N/A                | N/A                 | <b>Absent</b>                | <b>Absent</b>    |
| EF_6                      | Fully Quantitative (~100 m <sup>2</sup> ) | N/A                 | N/A              | N/A             | N/A              | N/A                | N/A                 | <b>Absent</b>                | <b>Absent</b>    |
| EF_7                      | Fully Quantitative (~100 m <sup>2</sup> ) | <b>8.00</b>         | <b>10.00</b>     | <b>0.76</b>     | <b>1.11</b>      | <b>[6.49;9.50]</b> | <b>[7.81;12.18]</b> | <b>Poor</b>                  | <b>Moderate</b>  |
| EF_8                      | Fully Quantitative (~100 m <sup>2</sup> ) | N/A                 | N/A              | N/A             | N/A              | N/A                | N/A                 | <b>Absent</b>                | <b>Absent</b>    |
| <b>Classification Key</b> |   |                     | <b>Excellent</b> | <b>Good</b>     | <b>Moderate</b>  | <b>Poor</b>        | <b>Very Poor</b>    | <b>Absent</b>                |                  |



#### 4.4 Spawning Habitat Assessment



Watercourses were generally low at the time of survey in April 2025 after a very dry early spring period. The AOD water level of Loch Quoich when surveys were conducted, was estimated to be around 193 – 194 m AOD. Surveys were conducted under dry, clear weather conditions.




Results of the rapid walkover survey are presented in Table 13 below. Reaches are displayed in Annex G.




*Table 13: Survey Results*




| Water-course        | Section | Spawning Habitat Quality | Description and Limiting Factors  | Photographs   |
|---------------------|---------|--------------------------|---|---|
| Allt Coire nan Gall | .1      | Not Suitable             | <p>The reach featured predominantly large cobble and boulder substrate and a lack of spawning gravels. There were some patches of pebble adjacent to the foot of the waterfall but this was within the margins and not receiving much flow.</p> <p>There was an impassable waterfall at NM 93140 98984. This may be passable for fish if the level of Loch Quoich was at its spill level, anecdotal evidence from the boatman on Loch Quoich suggests this would be very unlikely / rare. Loch level data from SSE suggests that the spill level has only been breached once between 2006-2020. No further variables were recorded.</p> |  |




| Water-course         | Section | Spawning Habitat Quality | Description and Limiting Factors  | Photographs   |
|----------------------|---------|--------------------------|---|---|
| Allt Coire nan Gall  | .2      | Not Suitable             | <p>Above the waterfall, there was good mixed juvenile salmonid habitat with excellent instream cover. Spawning gravels were limited and the reach featured predominantly coarser substrates such as pebble, cobble and boulder. No further variables were recorded.</p>   |    |
| Allt a' Choire Reidh | .1      | Sub-Optimal              | <p>From confluence with Loch Quoich to NM 95235 99116.</p> <p>Wet width ranges from 12 - 16 m. Depths range from &lt;10 – 20 cm. Flow types are predominantly shallow glide, still marginal and run. Substrate is predominantly uncompacted pebble and cobble with a lack of gravel, offering sub-optimal spawning habitat. The gradient is shallow and the reach is accessible for fish.</p> <p>Photograph elevation is 195 m AOD.</p> |  |



| Water-course         | Section | Spawning Habitat Quality | Description and Limiting Factors   | Photographs  |
|----------------------|---------|--------------------------|--|--|
| Allt a' Choire Reidh | .2      | Optimal                  | <p>From NM 95235 99116 to NM 95227 99083.</p> <p>Wet width ranges from 6 - 10 m. Depths range from &lt;10 – 20 cm. Flow types are predominantly shallow glide, still marginal and run. Substrate is predominantly uncompact pebble and cobble with several patches of gravel, offering optimal spawning habitat. The gradient is shallow and the reach is accessible for fish.</p> <p>Photograph elevation is 195 m AOD.</p> |   |
| Allt a' Choire Reidh | .3      | Not Suitable             | <p>From NM 95227 99083 to NM 95223 99074.</p> <p>The reach featured predominantly bedrock and a lack of spawning habitat.</p> <p>There is a waterfall at NM 95223 99074 which will pose an obstacle to fish migration. No further variables recorded.</p> <p>Photograph elevation is 200 m AOD.</p>  |  |




| Water-course          | Section                               | Spawning Habitat Quality | Description and Limiting Factors  | Photographs  |
|-----------------------|---------------------------------------|--------------------------|---|--|
| Allt a' Coire Bhuidhe | 15.1<br><br>14 on the aerial is wrong | Sub-Optimal              | NG 98596 00752 to NG 98599 00750. Some deposits of uncompacted gravel and pebble were present at the confluence with Loch Quoich.   |   |
| Allt a' Coire Bhuidhe | 15.2                                  | Not Suitable             | Immediately upstream of the confluence with Loch Quoich, the channel became a bedrock chute with deposits of larger cobbles and boulder and a lack of gravel. No suitable spawning habitat was present within this reach. No further variables recorded.  |  |
| Abhainn Chosaidh      | .1                                    | Not Suitable             | NG 96589 01482<br><br>Bedrock chute upon confluence with Loch Quoich. Predominantly bedrock substrate with boulders. No suitable spawning habitat was present within this reach. No further variables recorded.<br><br>Photograph elevation is 194 m AOD. |  |



| Water-course                | Section | Spawning Habitat Quality | Description and Limiting Factors  | Photographs  |
|-----------------------------|---------|--------------------------|---|--|
| Abhainn Chosaidh            | .2      | Not Suitable             | <p>NG 96589 01482</p> <p>Predominantly boulder and cobble substrate. No spawning suitable habitat was present. No further variables recorded.</p>   |   |
| Allt a' Mhaingir            | 3.1     | Not Suitable             | <p>Very steep bedrock channel upon confluence with Loch Quoich. Predominantly bedrock substrate with very large boulders. No suitable spawning habitat is present within this reach. No further variables recorded.</p> |  |
| Allt Redidh Meall an Eilein | .1      | Not Suitable             | <p>Very steep bedrock channel upon confluence with Loch Quoich. Predominantly bedrock substrate with very large boulders. No suitable spawning habitat is present within this reach. No further variables recorded.</p> |  |




| Water-course | Section | Spawning Habitat Quality | Description and Limiting Factors  | Photographs  |
|--------------|---------|--------------------------|---|--|
| River Quoich | .1      | Optimal                  | <p>From NH 02095 06017 to NH 02104 06020.</p> <p>A short 13 m reach at the tail of a deep pool. Wet width ranged from 12 – 14 m. Depths ranged from &lt;10 – 20 cm. Flow types were predominantly shallow glide, still marginal and run. Substrate was predominantly uncompacted pebble and cobble with several patches of gravel, offering optimal spawning habitat. The gradient was shallow and the reach was accessible for fish.</p> <p>Photograph elevation is 193 m AOD.</p>                       |    |
| River Quoich | .2      | Not Suitable             | <p>From NH 02104 06020 to NH 02123 06049. Deep pool. No spawning suitable habitat was present. No further variables recorded.</p>   | No photograph taken.   |
| River Quoich | .3      | Sub-Optimal              | <p>From NH 02123 06049 to NH 02104 06155.</p> <p>Wet width ranges from 12 - 16 m. Depths range from &lt;10 – 30 cm. Flow types were predominantly shallow glide, still marginal and run. Substrate was predominantly uncompacted pebble and cobble with a lack of gravel, offering sub-optimal spawning habitat. The gradient is shallow and the reach was accessible for fish.</p> <p>Photograph elevation is 191 m AOD.</p>   |  |
| River Quoich | .4      | Optimal                  | <p>From NH 02104 06155 to NH 02066 06179.</p> <p>A 25 m reach at the tail of a deep pool on a braided channel. Total wetted width was approximately 10 m. Depths ranged from &lt;10 – 20 cm. Flow types were predominantly shallow glide, riffle and run. Substrate was predominantly uncompacted pebble and cobble with patches of gravel interspersed, offering optimal spawning habitat. The gradient was shallow and the reach was accessible for fish.</p> <p>Photograph elevation is 191 m AOD.</p> |  |



| Water-course | Section | Spawning Habitat Quality | Description and Limiting Factors  | Photographs  |
|--------------|---------|--------------------------|---|--|
| River Quoich | .5      | Not Suitable             | <p>From NH 02066 06179 to NH 01904 06189.</p> <p>Upstream of the braided channel, the substrate became dominated by cobble before a section of bedrock and deep pool. No spawning suitable habitat was present. No further variables recorded.</p> <p>Photograph elevation is 193 m AOD.</p>  |    |
| River Quoich | .6      | Sub-Optimal              | <p>From NH 01904 06189 to NH 01890 06330.</p> <p>Wet width ranged from 12 - 16 m. Depths ranged from &lt;10 – 30 cm. Flow types were predominantly shallow glide, still marginal and run. Substrate was predominantly uncompacted pebble and cobble with pockets of gravel, offering overall sub-optimal spawning habitat. The gradient was shallow and the reach was accessible for salmonid fish.</p> <p>Photograph elevation is 192 m AOD.</p> |   |
| River Quoich | .7      | Not Suitable             | <p>From NH 01890 06330 to NH 01963 06709.</p> <p>This section of river featured steeper gradient, deep pools and predominantly bedrock substrate with limited spawning substrate. No further variables recorded.</p> <p>Photograph elevation is 198 m AOD.</p>  |  |




| Water-course            | Section | Spawning Habitat Quality | Description and Limiting Factors   | Photographs  |
|-------------------------|---------|--------------------------|--|--|
| River Quoich            | .8      | Sub-Optimal              | <p>From NH 01963 06709 to confluence with Easter Glen Quoich Burn</p> <p>Wet width ranged from 5 - 10 m. Depths ranged from &lt;10 – 40 cm. Flow types were predominantly shallow glide, still marginal and run. Substrate was predominantly uncompact pebble and cobble with limited gravel, offering overall sub-optimal spawning habitat. The gradient was shallow and the reach was accessible for salmonid fish.</p>                                |   |
| Easter Glen Quoich Burn | .1      | Optimal                  | <p>From NH 01927 06740 to NH 01930 06754.</p> <p>Wet width ranged from 4 – 6 m. Depth ranged from &lt;10 – 20 cm. Flow types were a mixture of run, riffle and shallow glide. Substrate was a mixture of sand, gravel, pebble and cobbles. The gradient of the section was shallow and accessible to salmonids.</p> <p>No further sections were surveyed on this watercourse as this was well beyond the limit where maximum inundation would reach.</p> |  |

| Water-course                 | Section | Spawning Habitat Quality | Description and Limiting Factors   | Photographs  |
|------------------------------|---------|--------------------------|--|--|
| Allt Coire nan Eiricheallach | .1      | Optimal                  | <p>From NG 99737 02847 to NG 99722 03041</p> <p>From confluence with Caolie Water up to an arch bridge.</p> <p>Wet width ranged from 4 - 5 m. Depths ranged from &lt;10 – 20 cm. Flow types were predominantly shallow glide, still marginal and run. Substrate was predominantly pebble and cobble with pockets of gravel, offering optimal spawning habitat for salmonids. The gradient was shallow and allowed access for fish at all loch levels.</p> <p>Photograph elevation is 193 m AOD.</p>  |   |
| Allt Coire nan Eiricheallach | .1      | Not Suitable             | <p>From NG 99722 03041 to NG 99777 03239.</p> <p>From bridge up to bedrock chute.</p> <p>Habitat became dominated by larger pebbles and cobbles and unsuitable for spawning. Upstream of this reach became dominated by bedrock and was also unsuitable for spawning. No further variables were recorded.</p> <p>Photograph elevation is 202 m AOD.</p>  |   |
| Allt Fearna                  | .1      | Not Suitable             | <p>At confluence with Loch Quoich. Wet width ranged from 2 – 5 m, however the channel was braided and fans out over a larger area. Depth was predominantly &lt;10 cm. Flow types are predominantly run and riffle.</p> <p>Substrate was dominated by pebbles, cobbles and boulder with some gravel pockets but there was very limited spawning potential. Access for fish is likely to be restricted during periods of low flows. The section became steeper totally unsuitable for spawning further up the section. No further variables were recorded.</p> |  |

| Water-course          | Section | Spawning Habitat Quality | Description and Limiting Factors  | Photographs  |
|-----------------------|---------|--------------------------|---|--|
| Allt a' Mheil         | .1      | Not Suitable             | <p>NH 04039 02178</p> <p>At confluence with Loch Quoich. Immediately onto steep gradient with a predominantly bedrock and boulder substrate. No spawning suitable habitat was present, with limited access for fish. No further variables were recorded.</p>  |    |
| Allt Coire Peitireach | 11.1    | Not Suitable             | <p>From the confluence with Loch Quoich to NH 02843 02909.</p> <p>The channel gradient was steep and the watercourse was predominantly unsuitable for spawning.</p> <p>Wet width was approximately 2 m, however the channel was braided and fans out over a larger area. Depth was predominantly &lt;10 cm. Substrate was predominantly boulder and cobble with some gravel is present at the confluence with Loch Quoich. The channel became dominated by bedrock and boulder upstream of this section. No further variables recorded.</p> |  |

| Water-course         | Section | Spawning Habitat Quality | Description and Limiting Factors   | Photographs  |
|----------------------|---------|--------------------------|--|--|
| Allt a' Choire Leith | .1      | Sub-Optimal              | <p>From confluence with Loch Quoich to NH 02120 01532. Wet width ranged from 1.5 - 2 m, however the channel was braided and fans out over a larger area. Depth was predominantly &lt;10 cm.</p> <p>Substrate was a mixture of gravel, pebble and cobble. Flow types were predominantly run, riffle and still marginal.</p> <p>Access for fish is likely to be restricted during periods of low flows. Only the lower reaches offered potential habitat for spawning The reach became steeper and less suitable the further up the section.</p>   |   |
| Allt a' Choire Leith | .2      | Not Suitable             | <p>The channel gradient became steeper, with obstacles to migration and coarser substrates including boulder and cobble which did not provide suitable spawning habitat.</p>   |  |
| Caolie Water         | .1      | Sub-Optimal              | <p>From NG 99736 02843 to NG 99676 02851.</p> <p>Wet width ranged from 4 - 6 m. Depths ranged from &lt;10 - 20 cm. Flow types were predominantly shallow glide, shallow pool still marginal and run. Substrate was predominantly pebble and cobble with pockets of gravel, offering sub-optimal spawning habitat for larger salmonids. The gradient was shallow and the section was accessible to fish. There was a ford crossing at the top of the section but looked to be rarely used as there are no issues with substrate compaction.</p> <p>Photograph elevation is 190 m AOD.</p> |  |

| Water-course | Section | Spawning Habitat Quality | Description and Limiting Factors   | Photographs  |
|--------------|---------|--------------------------|--|--|
| Caolie Water | .2      | Not Suitable             | <p>From NG 99676 02851 to NG 98881 03522.</p> <p>A large continuous section featuring very deep, slow moving water across an area of peat bog. Macrophyte growth indicated sedimented substrate. Very low gradient across area of peatland and features deep pools with limited sediment transport. No suitable spawning habitat was recorded.</p> <p>There was one shallower area where the substrate changed to sand and compacted gravel in a shallow pool which was not suitable for spawning. No further variables were recorded.</p> <p>Photograph elevation is 192 m AOD.</p> |   |
| Caolie Water | .3      | Optimal                  | <p>From NG 98876 03535 to NG 98888 03529.</p> <p>There was a slight change in gradient at this section, promoting a change in flow type and greater sediment transport.</p> <p>Wet width ranged from 6 - 7 m. Depths were &lt;10 cm. Flow types were predominantly riffle and run. Substrate was predominantly uncompacted gravel and pebble offering optimal spawning habitat. The gradient was still relatively shallow, and the reach was accessible for fish.</p> <p>Photograph elevation is 190 m AOD.</p>  |  |

| Water-course | Section | Spawning Habitat Quality | Description and Limiting Factors   | Photographs   |
|--------------|---------|--------------------------|--|---|
| Caolie Water | .4      | Sub-Optimal              | <p>From NG 98888 03529 to NG 98922 03548.</p> <p>Upstream of the previous reach, the flow type changed to deep pool and deep glide, with less gravels present. Wet width ranged from 3 - 4 m. Depths ranged from &lt;10 cm to &lt; 40 cm. Substrate was dominated by pebble with some peat deposits in the channel. Flow types ranged from deep pool, deep glide with some run / riffle at the top of the reach.</p> |     |
| Caolie Water | .5      | Optimal                  | <p>From NG 98922 03548 to NG 98924 03564.</p> <p>Wet width ranged from 4 - 5 m. Depths were &lt;10 - 20 cm. Flow types were predominantly riffle and run. Substrate was predominantly uncompacted pebble and cobble with some gravel offering optimal spawning habitat. The gradient was still relatively shallow, and the reach was accessible for fish.</p> <p>Photograph elevation is 194 m AOD.</p>              |    |
| Caolie Water | .5      | Not Suitable             | <p>Upstream of the previous reach, the watercourse is dominated by bedrock substrate and there is a series of impassable waterfalls at NG 98864 03649. No further sections were recorded beyond here.</p>  |  |

#### 4.5 Water Quality Sampling

The water quality results are shown in **Table 14**. Temperature ranged from 10.80°C (SL6) to 13.03 °C (SL5), with an average of 12.08 °C. The dissolved oxygen concentration (DO as %) was at total saturation and consistent throughout the sampling locations and ranged from 101.20% (SL2) to 107.50% (SL6), with an average of 105.2%. Dissolved oxygen (DO as mg.l<sup>-1</sup>) ranged from 10.19 mg.l<sup>-1</sup> (SL5) to 11.75 mg.l<sup>-1</sup> (SL2), with an average of 10.90 mg.l<sup>-1</sup>. pH was consistent throughout the survey locations, ranging from 7.31 (SL6) to 7.90 (SL5), with an average of 7.61. Conductivity (EC) was consistent and relatively low across the sampling locations, ranging from 14 µs.cm<sup>-1</sup> (SL4) to 24 µs.cm<sup>-1</sup> (SL1), with an average of 19 µs.cm<sup>-1</sup>. Total Dissolved Solids (EC) was also consistent and relatively low across the sampling locations, ranging from 10.00 mg.l<sup>-1</sup> (SL5) to 14.50 mg.l<sup>-1</sup> (SL2) with an average of 12.36 µs.cm<sup>-1</sup>. Oxidation Reduction Potential (ORP) ranged from 87.2 mV (SL4) to 280.7 mV (SL7) with an average of 152.2 mV.

Table 14: Water Quality Monitoring Sampling Locations

| Sampling Location | Temperature (°C) | ORP (mV) | pH (units) | DO (%) | DO (mg.l <sup>-1</sup> ) | EC (µs.cm <sup>-1</sup> ) | TDS (mg.l <sup>-1</sup> ) |
|-------------------|------------------|----------|------------|--------|--------------------------|---------------------------|---------------------------|
| EF_1              | 11.60            | 169.00   | 7.64       | 106.90 | 10.84                    | 24.00                     | 14.00                     |
| EF_2              | 11.40            | 172.00   | 7.50       | 101.20 | 11.75                    | 23.00                     | 14.50                     |
| EF_3              | 10.70            | 99.40    | 7.63       | 105.00 | 10.96                    | 19.00                     | 12.00                     |
| EF_4              | 13.00            | 87.20    | 7.70       | 107.30 | 10.67                    | 14.00                     | 12.00                     |
| EF_5              | 13.03            | 129.00   | 7.90       | 102.10 | 10.19                    | 16.00                     | 10.00                     |
| EF_6              | 10.80            | 128.30   | 7.31       | 107.50 | 11.19                    | 17.00                     | 11.00                     |
| EF_7              | 14.00            | 280.70   | 7.62       | 106.20 | 10.71                    | 20.00                     | 13.00                     |
| EF_8              | 11.10            | 127.00   | 7.42       | 106.90 | 11.12                    | 19.00                     | 12.00                     |

#### 4.6 Macroinvertebrate Population Assessment

The macroinvertebrate population assessment indices scores are presented in **Table 15**. Three Sampling Locations (FE1, FE2 and FE 4) were classed with the BMWP (TL1) analysis score as *Very Good*, with one significantly above the >100 threshold at 120 (FE1). Four Sampling Locations (FE3, FE6, FE7 and FE9) were classed as *Good*. Sampling Location FE5 was classed as *Moderate* and FE8 as *Poor*.

Regarding the PSI (TL5) analysis score, six Sampling Locations (FE1, FE2, FE3, FE6, FE7 and FE8) were classed as *Minimally Sedimented*. Two Sampling Locations (FE4 and FE5) as *Slightly Sedimented* and one Sampling Location (FE9) as *Sedimented*. Furthermore, on the PSI (FAM) (TL3) analysis score, five Sampling Locations (FE1, FE3, FE5, FE6 and FE8) were classed as *Minimally Sedimented* and the remaining Sampling Locations (FE2, FE4, FE7 and FE9) were classed as *Slightly Sedimented*. The Sampling Locations FE1, FE2, FE3, FE4, FE5, FE6, FE7 and FE8 were classed as *Minimally Sedimented* for the E-PSI (FAM) analysis score and Sampling Location FE9 was classed as *Slightly Sedimented*. The results are the same for the E-PSI (TL5) analysis scores except Sampling Locations FE5 and FE9 were classed as *Slightly Sedimented*.

One Sampling Location (FE8) was classed as *High Conservation Value* on the Community Conservation Index (CCI) analysis score however this score is skewed by a low number of taxa present (5). Two Sampling Locations (FE1 and FE5) were classed as *Fairly High*

Conservation Value and the remaining six Sampling Locations (FE2, FE3, FE4, FE6, FE7 and FE9) were classed as *Moderate Conservation Value*.

WHPT scores ranged from 27.1 (FE8) to 150 (FE1). A full list of species is presented in **Appendix E**.

Table 15: Results of the Macroinvertebrate Population Assessment: Indices Scores

| Biotic Index           | Spring            |                   |                   |                   |                   |                   |                   |                      |                     |
|------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------|---------------------|
|                        | FE1               | FE2               | FE3               | FE4               | FE5               | FE6               | FE7               | FE8<br>(Loch Quoich) | FE9<br>(Loch Fearn) |
|                        | 24/05/2023        | 24/05/2023        | 24/05/2023        | 24/05/2023        | 24/05/2023        | 24/05/2023        | 24/05/2023        | 24/05/2023           | 24/05/2023          |
| <b>Grid Reference</b>  | NH 05474<br>03367 | NH 05674<br>03332 | NH 05719<br>03147 | NH 05761<br>02974 | NH 05349<br>02955 | NH 04847<br>02076 | NH 05468<br>01994 | NH 05922<br>01729    | NH 05717<br>03133   |
| <b>BMWP (TL1)</b>      | 120               | 104               | 89                | 103               | 45                | 95                | 95                | 24                   | 82                  |
| <b>NTAXA (TL1)</b>     | 18                | 17                | 13                | 15                | 9                 | 14                | 15                | 5                    | 13                  |
| <b>ASPT (TL1)</b>      | 6.67              | 6.12              | 6.85              | 6.87              | 5.00              | 6.79              | 6.33              | 4.80                 | 6.31                |
| <b>LIFE (TL5)</b>      | 8.81              | 8.50              | 8.67              | 8.08              | 8.17              | 8.77              | 8.36              | 8.00                 | 7.20                |
| <b>LIFE(FAM) (TL2)</b> | 7.56              | 7.27              | 7.83              | 7.43              | 7.29              | 8.00              | 7.14              | 7.00                 | 6.64                |
| <b>PSI (TL5)</b>       | 97.44             | 97.14             | 100.00            | 80.77             | 72.00             | 96.77             | 84.38             | 100.00               | 30.43               |
| <b>PSI(FAM) (TL3)</b>  | 85.29             | 76.67             | 95.65             | 79.17             | 81.25             | 96.00             | 70.37             | 100.00               | 61.54               |
| <b>E-PSI (FAM)</b>     | 97.12             | 97.07             | 100.00            | 93.65             | 84.81             | 99.14             | 91.99             | 100.00               | 61.98               |
| <b>E-PSI (TL5)</b>     | 95.54             | 95.54             | 100.00            | 91.86             | 80.65             | 100.00            | 90.82             | 100.00               | 75.44               |
| <b>CCI (TL5)</b>       | 10.88             | 8.75              | 9.62              | 9.23              | 12.86             | 9.23              | 5.57              | 15.00                | 5.00                |

|                    |      |       |      |       |      |      |       |      |      |
|--------------------|------|-------|------|-------|------|------|-------|------|------|
| <b>WHPT (TL2)</b>  | 150  | 130.2 | 98.5 | 117.9 | 55.1 | 114  | 117.8 | 27.1 | 91.9 |
| <b>NTAXA (TL2)</b> | 20   | 19    | 13   | 15    | 10   | 15   | 17    | 5    | 14   |
| <b>ASPT (TL2)</b>  | 7.50 | 6.85  | 7.58 | 7.86  | 5.51 | 7.60 | 6.93  | 5.42 | 6.56 |

#### 4.7 Environmental DNA (eDNA) Sampling

The results of the 2023 and 2025 eDNA analysis are included within **Annex F**.

The main conclusions of the 2023 report were:

- Presence or absence cannot be determined in either loch system due to being lower than the limit of detection/quantification as stated by the qPCR standard curve. Furthermore, both Loch samples were indistinguishable from the negative control.
- Melt-curve analysis (Appendix 3) indicates that Loch sample background amplicons are unlikely to be Charr in origin.
- To improve sensitivity and determine the presence or absence of *S. alpinus*, it is suggested an increase in water be pumped through the filter during eDNA sampling to improve the potential of a positive detection. Blocking of the filter could be avoided by coarse pre-filtration of the water sample prior to pumping.
- Metabarcoding of Loch Fearn samples revealed 12S rRNA to be a 100% match to *Salmo salar* (Atlantic salmon) and are unlikely to be *S. alpinus* (97.65% match when Blasted through NCBI).

The main conclusions of the 2025 report were:

- eDNA sampling of Loch Quoich confirmed the detection of Arctic charr, brown trout and common minnow within the samples, however, no Arctic charr were detected in the inflowing rivers.
- Arctic charr were detected at 5 out of the 20 sampling locations around Loch Quoich, broadly located from the central to the western reaches of the Loch.

Discussion on the *Salmo salar* result in the Loch Fearn samples is discussed in Section 5.5 below.

#### 4.8 Macrophytes

In total 11 species were identified throughout Loch Fearn: 9 submerged/floating; and 4 emergent/edge species (*Juncus bulbosus* & *Littorella uniflora* were identified in both submerged and emergent communities). All species except *Baldellia ranunculoides* were classified as 'Least Concern' or 'Data deficient' for their conservation value, with *Baldellia ranunculoides* being classed as near threatened according to the IUCN Red List of Threatened Species. A full species list is provided in **Table 16**.

No invasive non-native species were identified in any of the lochs sampled.

National Vegetation Communities (NVC) around the loch are generally dominated by wet heath M15 *Scirpus cespitosum-Erica tetralix* wet heath, with the aquatic communities largely split between A22 *Littorella uniflora-Lobelia dortmanna* community and A24 *Juncus bulbosus* community.

Table 16: Macrophyte Species List

| Transect | Waterbody   | Transect Start Coordinates |          | Transect End Coordinates |          | Submerged / Floating              | DAFOR | Emergent / Edge             | DAFOR | Dominant Type   | Substrate |
|----------|-------------|----------------------------|----------|--------------------------|----------|-----------------------------------|-------|-----------------------------|-------|---|-----------|
|          |             | Easting                    | Northing | Easting                  | Northing |                                   |       |                             |       |   |           |
| T1       | Loch Fearna | 205453                     | 803151   | 205483                   | 803111   | <i>Lobelia dortmanna</i>          | A     | <i>Juncus bulbosus</i>      | O     | Boulders, Pebble, Gravel, Sand, Silt                  |           |
|          |             |                            |          |                          |          | <i>Juncus bulbosus</i>            | A     |                             |       |   |           |
|          |             |                            |          |                          |          | <i>Potometon filiformis</i>       | F     |                             |       |   |           |
|          |             |                            |          |                          |          | <i>Sublaria aquatica</i>          | O     |                             |       |   |           |
|          |             |                            |          |                          |          | <i>Glyceria fluitans</i>          | O     |                             |       |   |           |
|          |             |                            |          |                          |          | <i>Baldellia ranunculoides</i>    | R     |                             |       |   |           |
| T2       | Loch Fearna | 205372                     | 802978   | 205434                   | 802944   | <i>Baldellia ranunculoides</i>    | R     | <i>Juncus bulbosus</i>      | O     | Pebble, Gravel, Sand, Silt                            |           |
|          |             |                            |          |                          |          | <i>Juncus bulbosus</i>            | O     |                             |       |   |           |
|          |             |                            |          |                          |          | <i>Lobelia dortmanna</i>          | F     |                             |       |   |           |
|          |             |                            |          |                          |          | <i>Myriophyllum alterniflorum</i> | F     | <i>Succisa pratensis</i>    | R     |   |           |
| T3       | Loch Fearna | 205707                     | 802938   | 205739                   | 803060   | <i>Baldellia ranunculoides</i>    | R     | <i>Juncus bulbosus</i>      | O     | Sand dominated with Gravel and Silt beyond 0.5m depth |           |
|          |             |                            |          |                          |          | <i>Juncus bulbosus</i>            | O     |                             |       |   |           |
|          |             |                            |          |                          |          | <i>Lobelia dortmanna</i>          | A     |                             |       |   |           |
|          |             |                            |          |                          |          | <i>Potomageton filiformis</i>     | O     | <i>Litorea uniflora</i>     | R     |   |           |
|          |             |                            |          |                          |          | <i>Potomageton polygonifolius</i> | O     |                             |       |   |           |
| T4       | Loch Fearna | 205730                     | 803128   | 205694                   | 803208   | <i>Glyceria fluitans</i>          | O     | <i>Equisetum fluviatile</i> | R     | Gravel, Sand, Silt, Peat                              |           |

| Transect | End Coordinates |          | Submerged / Floating              | DAFOR | Emergent / Edge            | DAFOR | Dominant Type | Substrate |
|----------|-----------------|----------|-----------------------------------|-------|----------------------------|-------|---------------|-----------|
|          | Easting         | Northing |                                   |       |                            |       |               |           |
|          |                 |          | <i>Littorella uniflora</i>        | O     | <i>Littorella uniflora</i> | R     |               |           |
|          |                 |          | <i>Lobelia dortmanna</i>          | A     |                            |       |               |           |
|          |                 |          | <i>Potamogeton filiformis</i>     | F     |                            |       |               |           |
|          |                 |          | <i>Potamogeton polygonifolius</i> | O     |                            |       |               |           |

## 5 Discussion

### 5.1 Fish Habitat Assessment

A fish habitat assessment was conducted on watercourses within the Upper and Lower Areas of the Proposed Development potentially affected by the construction footprint in order to forecast on the presence of suitable habitat for salmonid fish including brown trout.

The Upper Area of the Proposed Development included the Loch Fearna catchment (Loch Fearna tributaries and outflow) as well as the source of the Allt a' Mheil watercourse in Coire Dubh to the existing run of river hydro scheme dam on the Allt a' Mheil.

The Lower Area included the confluence of the Allt a' Mheil and the Allt Fearna with Loch Quoich. The obvious steep geomorphology separating the Upper and Lower areas, included a succession of impassable waterfalls.

Within the Upper Area, the Loch Fearna catchment was regarded as potentially suitable habitat for Brown trout, notably Survey Locations H\_SL\_4, H\_SL\_5, H\_SL\_6 and these featured sections over shallower gradients which were classified as *Productive: Good* (H\_SL\_4 and H\_SL5) and *Productive: Moderate* (H\_SL\_5 and H\_SL6). The remainder of the Loch Fearna tributaries (H\_SL\_1, H\_SL\_2 and H\_SL\_3) including the upper reaches of H\_SL\_4 and H\_SL\_5 were classified as *Unproductive: Other*. This was due to the presence of steep gradients, underground sections and peat substrate within channels with some sections of watercourse considered minor in nature and unlikely to support fish populations.

The Upper Area also included Coire Dubh (a basin north-west of Loch Fearna) and the Allt a' Mheil catchment. The habitat quality across this catchment was highly variable due to steep gradient and sections of bedrock. Three main tributaries showing on OS mapping feed the upper Allt a' Mheil. Only the furthest west tributary (H\_SL\_9) featured *Productive: Good / Productive: Moderate habitat*. This habitat typically featured across plateau areas where the gradient was less steep and instream substrates and flow types were more optimal. Survey locations H\_SL\_7 and H\_SL\_8 featured exclusively *Unproductive: Other* habitat due to the presence of steep gradients, underground sections and peat substrate within channels with some sections of watercourse considered minor in nature and unlikely to support fish populations. Survey location H\_SL\_10 featured predominantly *Unproductive: Bedrock* habitat across sections of extensive steep gradient and a succession of falls which would likely pose a barrier to fish migration. The lower reaches of H\_SL\_10 did however feature sections of *Productive: Moderate* habitat interspersed between sections of sheet bedrock.

Within the Lower Area, two watercourses were considered for habitat assessment (confluences of the Allt a' Mheil and the Allt Fearna with Loch Quoich). The lower reaches of the Allt a' Mheil (H\_SL\_11) was classified as *Unproductive: Bedrock* habitat due to the presence of steep bedrock channels as well as a succession of impassable waterfalls. The lower reaches of the Allt Fearna (H\_SL\_12) was classified as *Productive: Moderate* habitat and the presence of Brown trout in electrofishing surveys validates this. Upstream where the watercourse becomes steeper, the habitat classification changed to *Unproductive: Bedrock*. It is likely that some areas of the riverine habitat in the lower reaches of H\_SL\_11 and H\_SL\_12 become flooded given the operational regime of the existing Quoich Dam, this was also evident from reviewing different sets of aerial mapping.

In summary, due to the steepness of the gradient of watercourses across both the Upper and Lower Areas, Productive habitat for fish tended to be on areas of shallower sloping gradient where flow speed was less rapid and depth increased with a more diverse range of instream substrates available. *Productive: Good* habitat made up 18.03 %, *Productive: Moderate* habitat made up 14.60 %, *Unproductive: Bedrock* made up 26.57 % and *Unproductive: Other* made up 40.78 % of the total habitat surveyed.

## 5.2 Fish Population Assessment

A fish population assessment was conducted within the Upper and Lower Area of the Proposed Development. Electrofishing survey locations were chosen in areas where *Productive* fish habitat had been previously identified during the fish habitat assessment.

Watercourses within the Loch Fearn catchment were surveyed including unnamed inflowing tributaries (EF\_3 and EF\_4) and the Allt Fearn which is the outflow of the loch (EF\_5). No fish were recorded within any of these locations despite *Productive* habitat for brown trout being present. This indicates an absence of brown trout in Loch Fearn given the likelihood that these burns would be used for fish spawning and subsequent nursery habitat for juvenile trout. Watercourses within the Allt a' Mheil catchment were also surveyed including the western most tributary in Coire Dubh (EF\_6) and the Allt a' Mheil itself downstream of an existing run of river hydro scheme (EF\_8), however despite these watercourses featuring areas of *Productive* habitat, fish were again absent from the survey locations. Therefore, all of the survey locations within the 'Upper Area' had an absence of fish species.

Within the Lower Area, fish populations were found on the lower reaches of the Allt Fearn near Loch Quoich (EF\_7). Common minnows captured at the confluence with the loch were harbouring breeding sexual dimorphism colour, were mature and ready to spawn, therefore the electrofishing transect was moved upstream of their spawning zone. A population of brown trout was found at this location. The density of brown trout fry was categorised as *Poor* and brown trout parr as *Moderate* (relating to the SFCC Moray Firth regional classifications). This survey location was relatively steep for an electrofishing site but was the best available habitat for surveying. The presence of brown trout could indicate access for spawning brown trout from Loch Quoich under certain water level conditions. It is worth noting that the confluence between the Allt a' Mheil and Loch Quoich could not be assessed because of unsafe access conditions however the fish habitat was classified as unproductive and unlikely to harbour fish populations.

In summary, despite suitable habitat conditions to support fish populations, it is unlikely that brown trout are present within the Upper Areas of the Proposed Development (Loch Fearn and Allt a' Mheil catchments). The steep gradient of these catchments, especially the geomorphology between the Upper and Lower Area present a complete barrier to fish migration. Relic populations of brown trout are commonly present above impassable barriers in the Scottish Highlands, but this does not appear to be the case in this instance. High numbers of palmate newt were observed within Loch Fearn on the days of surveying, indicating they may be a top predator in the loch in the absence of fish populations<sup>1</sup>.

## 5.3 Spawning Habitat Assessment

### 5.3.1 Spawning Habitat Suitability

Salmonid spawning habitat was limited due to the majority of watercourses featuring steep gradients and coarser substrates such as cobbles and boulders or bedrock and a lack of gravel. Where there was access to watercourses, featuring pebble dominated substrate but a lack of gravel, these were typically recorded as Sub-Optimal.

Spawning habitat was also limited on the majority of the Caolie water which lies on very low gradient across an area of peatland and features deep pools with limited sediment transport. Sections of Optimal spawning habitat was recorded on sections of the River Quoich, Easter Glenquoich Burn, Allt a' Choire Reidh, Allt Coire nan Eiricheallach and Caolie Water.

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<sup>1</sup> Wester Ross Fisheries Trust (2008) Trout lochs, (charr lochs) and fishless lochs. *In*: Arctic charr populations in NW Scotland (and other areas): their conservation and management requirements pp. 4 [Online] Available: [wrft.org.uk/files/WRFT Arctic charr discovery week 2008 workshop report.pdf](http://wrft.org.uk/files/WRFT%20Arctic%20charr%20discovery%20week%202008%20workshop%20report.pdf) [Last Accessed 11/02/2025]

### 5.3.2 Access to Spawning Habitats

During instances when the Proposed Development is in pumping mode, drawing water from Loch Quoich, there may be a risk that some sections watercourses on steeper gradient may temporarily become inaccessible to spawning fish. This would occur where receding water levels in the loch present obstacles which cut off access for fish migration within the inflowing watercourses. The effect may be worsened when this coincides with lower water levels in the watercourse. The time duration for this effect is expected to be short-lived i.e. hours / days rather than weeks at a time. The relatively short duration of any drawdown resulting from this development is thus unlikely to impact materially upon spawning success. Access to watercourses on shallower gradients is unlikely to be affected by these drawdown effects because of the low gradient at the point of entry from Loch Quoich and water depth should remain sufficient for passage. Therefore, access for spawning fish will be maintained. Optimal spawning habitat was only found on watercourses on relatively shallow gradient, with watercourses on steeper gradient featuring Suboptimal at best spawning habitat, typically occurring in lower reaches near the confluence with Loch Quoich.

### 5.3.3 Inundation

It is likely that some of the sections surveyed have the potential to be inundated during periods when the level of Loch Quoich is high, particularly those at lower elevations. The maximum operational level of Loch Quoich is 201.4 m AOD, however looking at historical loch level data, this level is rarely (i.e. once in 18 years). The operational regime of Loch Quoich was altered by SSE during 2015/16, with the reservoir now operated at lower typical levels than was historically the case. Loch levels of above 190 m AOD are typically met on an annual basis, throughout the early part of the year. However, during the peak spawning activity period (September – November), levels are typically lower than this. Large areas of the Caolie water surveyed and the lower reaches of the River Quoich likely become inundated when the level of Loch Quoich is above 190 m AOD.

The operation of the existing hydro scheme has a maximum operational range of between 175.38 and 201.4 m AOD. During the operation of the Proposed Development, there will be 'stop pumping' and 'stop generating' levels applied via the CAR licence. The Proposed Development will operate between the levels of 181 m AOD and 196 m AOD.

It is considered unlikely that the inundation caused by the Proposed Development will result in Optimal spawning habitats being adversely affected. Inundation as a result of the Proposed Development is very unlikely to affect access to potential river and stream spawning sites for salmonids and due to the short duration of these effects, siltation of substrate is also unlikely. Due to the fluctuating nature of the operation of pumped storage hydro schemes, the water levels will quickly recede to present riverine conditions for spawning in a matter of hours. Brown trout (and Arctic Charr) are also known to be capable of littoral zone spawning in lentic habitats, therefore the still water conditions presented on riverine habitats during inundation may not necessarily be a barrier to spawning.

## 5.4 Water Quality Sampling

The water quality parameters in an aquatic environment are essential to assess if a habitat is suitable to support populations of salmonid fish. Throughout the sampling locations, the temperature ranged from 10.70 to 14.00 °C. Dissolved oxygen ranged from 10.19 to 11.75 mg/l<sup>-1</sup>. Therefore, temperatures and dissolved oxygen were in the optimal range for salmonids which is 6-20 °C, however, no values were within the range of 16-17 °C where maximal growth occurs in salmonids (Fisheries Management Scotland, 2023). This is not unexpected given the elevation of the drainage basin may contribute colder water on average. All values of dissolved oxygen fell within the assessment criteria, 8-15 mg/l<sup>-1</sup> and were considerably higher than hypoxic levels, <6 mg/L (Alver *et al.*, 2022) However, it is important to note that as temperature rises the capacity of the water to hold oxygen reduces. Results are only representative of a singular sampling event. The pH range

observed throughout the sampling locations were between 7.31 to 7.90 and therefore are ranging within the optimal pH level for salmonids (pH 6.5 – 8.0) (Staurnes et al., 1995). The electrical conductivity was low (EC 14.00 to 24.00  $\mu\text{s.cm}^{-1}$ ) and this is indicative of pure water, and this is likely due to the elevation and geomorphology of the area. Interestingly, no brown trout population was recorded in the watercourses situated in the Upper Area of the Proposed Development (Coire Dubh and Coire Glas), which included the Loch Fearna and Allt a' Mheil catchments. An absence of fish in these areas is likely due to other factors such as barriers to migration as the water quality conditions, fish habitat and availability of food (macroinvertebrates) were all suitable for supporting salmonid fish.

## 5.5 Macroinvertebrate Population Assessment

No species of high nature conservation interest (i.e. vulnerable, endangered or critically endangered) were noted from the sampling conducted. Species recorded were dominated by common and widespread taxa, typical of a range of habitat types. Within the samples collected, the species composition was that of marginal and lotic environments. A large variation of family groups was present across the sampling locations.

The taxa representing the highest abundances were the following: *Elmis aenea* (Coleoptera – Elmidae – FE1), Chironomidae (Diptera – Chironomidae FE5), *Simulium* sp (Diptera – Simuliidae – FE5), *Baetis muticus* (Ephemeroptera – Baetidae - FE1) and *Polycentropus flavomaculus* (Tricoptera – Polycentropidae – FE5).

The Loch Quoich sample (FE8) contained the lowest number of taxa (5) of all the sampling locations. This result is not unexpected due to the Loch Quoich featuring an operational hydro dam causing the littoral zone of the loch to be impacted by regular drawdown and water level fluctuation. FE8 incidentally gave the highest Community Conservation Index (CCI) score however the low number of taxa in this sample also caused the Community Conservation Index (CCI) score to be skewed to a higher value.

Macroinvertebrates observed are categorised by a diverse range of environmental tolerances and preferences, consequently communities are likely to exhibit both qualitative and quantitative responses to the range of environmental changes (for example: water depth; water temperature; water quality changes) (Sykes *et al.*, 1999).

Altering the water level of Loch Fearna is likely to alter the profiles of the shoreline. Existing marginal habitat is dominated by shallow shelves and/or gently sloping margins, this is predicted to become steeper in light of water level changes reducing the area of suitable habitat and therefore the diversity within these areas. Re-profiling or changes to marginal areas can negatively affect macroinvertebrates (Buglife, 2023). Due to this change, and increased rates of water level changes in drawdown zones, benthic communities are likely to shift to a dominance of mobile groups, e.g. beetles and water boatmen, that are able to track water levels or profundal communities better adapted to predicted future conditions. Loch Quoich will be less affected by water level changes as the Proposed Development will work within the limits of an existing hydro scheme.

## 5.6 Environmental DNA (eDNA) Sampling

A presence/absence Arctic charr-specific survey was conducted by the University of Glasgow<sup>2</sup> in July 2023. Metabarcoding confirmed the absence of Arctic charr in the Loch Fearna samples but indicated the presence of *Salmo salar* (Atlantic salmon) which due to markers could be *Oncorhynchus mykiss* (rainbow trout). After further discussion with the lab, it was decided that contamination within the lab was the most likely reason for these readings, given that the loch is inaccessible to migratory fish and is not a recreational rainbow trout fishery. Given the absence of juvenile trout in any of the inflowing watercourses which contained supporting habitat, it is very unlikely that there is a fish

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<sup>2</sup> ██████████ M. S. (2023). Detection of Arctic charr (*Salvelinus alpinus*) utilising eDNA, molecular approaches and metabarcoding to determine the presence of absence in Scottish loch systems. University of Glasgow.

population present. This is further supported by anecdotal feedback from local land managers and the RSPB, who have advised that they do not believe there is a fish population in Loch Fearn. NDSFB were also satisfied that Loch Fearn is fishless during consultations. Local land managers also confirmed that the loch has never been stocked with rainbow trout. The combination of existing hydroacoustic data and eDNA is considered sufficient to advise on likely distribution of Arctic charr in the water column in Loch Quoich.

The full eDNA report from University of Glasgow is available in **Annex F**.

A fish community survey was conducted by the University of Highlands and Islands<sup>3</sup> within Loch Quoich and the associated inflowing rivers in February 2025. Metabarcoding confirmed a total of three fish species in the Loch samples. Brown trout (*Salmo trutta*) were detected in 100% of the samples (n = 20) and had the highest average reads of the three species, suggesting that brown trout are the main component of the fish community. Despite this, minnow (*Phoxinus phoxinus*) were detected in 75% of samples. Notably, Arctic charr (*Salvelinus alpinus*) were detected in this loch in 25% of samples and with an average read count of 435, suggesting a significant population is present. It should be noted that Arctic charr were detected broadly from the central to the western reaches of the Loch. Given the absence of clear detection of charr in the eDNA sampling from 2023 and the more comprehensive sampling in 2025 which detected Arctic charr in the loch at only 5 of the 20 sampling sites, this could speculatively indicate towards a modest population size within the Loch.

However, it also should be noted that only two fish species were detected in the River samples. Brown trout (*Salmo trutta*) were detected in 86% of samples (n = 14) and had by far the highest average reads, suggesting that brown trout are the primary fish species utilising these rivers. While minnow (*Phoxinus phoxinus*) were also detected, this was only in a single river sample. No Arctic charr (*Salvelinus alpinus*) were detected in river samples.

The full eDNA report from University of the Highlands and Islands is available in **Annex F**.

## 5.7 Macrophytes

In total, 11 macrophyte species were identified throughout Loch Fearn: 9 submerged/floating; and 4 emergent/edge species (*Juncus bulbosus* & *Littorella uniflora* were identified in both submerged and emergent communities). All transects undertaken indicated species with little conservation value, designated as 'Least Concern' or 'Data Deficient' with the exception of *Baldellia ranunculoides* which is classified as Near Threatened (Botanical Society of Britain & Ireland, 2024).

Emergent communities contributed four species. Each transect displayed fewer species counts when compared to the submergent communities, however, similar species were identified within each transect. Of the species identified within Loch Fearn the majority displayed relatively high abundance on the DAFOR scale with the majority of species being recorded as 'Frequent', 'Abundant' or 'Occasional'. Three species were categorised as 'Rare', three emergent (*Equisetum fluviatile*, *Littorella uniflora* & *Succisa pratensis*) and one submerged (*Baldellia ranunculoides*). No species were recorded to be in 'Dominant' abundance.

No invasive non-native species (INNS) were identified in the surveyed waterbody. Therefore, there is no risk of the proposed development facilitating the transfer of INNS between Loch Fearn and waterbodies further down the catchment.

The limited species present in Loch Fearn is consistent with those found in a 1993 survey on the same loch by Olivia Lassiere (1993) and those found in the nearest Loch of similar altitude and size, Loch a' Mhaoil Dhisnich, that recorded a dominance of *Juncus bulbosus*, *Littorella uniflora* and *Lobelia dortmanna* in association with *Myriophyllum alterniflorum* (Steele, 1989). The overall low macrophyte diversity and abundance is consistent with

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<sup>3</sup> [REDACTED] (2025). Fearn Pumped Storage Hydro Scheme – eDNA assessment of the fish community in Loch Quoich and inflowing rivers. University of the Highlands and Islands.

nutrient poor oligotrophic status Lochs (Smith *et al.*, 1987). This is further supported by the large presence of indicator species including: *Juncus bulbosus*, *Lobelia dortmanna* and *Subularia aquatica* which support the characterisation of oligotrophic status within Loch Fearn.

Studies of upper lochs utilised for Pump Storage Hydro (e.g. Cruachan Reservoir) have displayed negligible or reduced macrophyte communities during the operational period (no baseline surveys available) (Smith *et al.*, 1987). Within Loch Fearn, some of the more abundant species identified, e.g. *Juncus bulbosus*, have been shown to tolerate moderate water level changes but are absent if those fluctuations are too large. However, less robust species identified within the loch such as *Littorella uniflora*, have been documented to uncouple from the littoral zone as a result of changing water levels affecting shore substrate composition and slope angle (Bill, 2020). While the effect of current impoundments cannot be accurately concluded at this time, comparisons with other nutrient poor oligotrophic lochs suggest that a minimal effect is likely to occur due to a reduced baseline abundance/diversity (Smith *et al.*, 1987).

The frequency at which the maximum and minimum water levels will be reached for the proposed Pump Storage Hydro during operation is not known, however, water levels of Scottish lochs are known to fluctuate naturally around magnitudes of 1-3 m, with regulated Scottish reservoirs fluctuating between 0.3 m to 30 m (Smith *et al.*, 1987). Extreme changes in environmental conditions such as light, temperature and nutrient availability are likely to occur with major water fluctuations resulting in reduced macrophyte community assemblages and a less diverse and abundant macrophyte community. This decline is likely to further impact local macroinvertebrate communities, reducing overall diversity and abundance in the marginal zones (Beckett *et al.*, 1992). Submergent macrophyte communities are also critical for maintaining sediment stability on loch margins. Any loss of species diversity and abundance as a result of the Proposed Development may contribute to deterioration and erosion of marginal substrate with consequent effects on water quality (Salgado *et al.*, 2010).

## 6 Conclusion

The following conclusions can be drawn from the Aquatic Ecology Survey report:

- Sections of riverine habitat within the Upper and Lower Area of the Proposed Development had the potential to support salmonid fish populations.
- Despite suitable habitat conditions to support fish populations, it is unlikely that brown trout are present within the Upper Areas of the Proposed Development (Loch Fearn and Allt a' Mheil catchments).
- Populations of brown trout and common minnow were found within the lower reaches of the Allt Fearn upstream of Loch Quoich which is within the Lower Area of the Proposed Development. The presence of both fry and parr indicate recent recruitment in this area.
- The eDNA survey carried out by the UHI in 2025 established the presence of populations of Arctic charr, brown trout and common minnow in Loch Quoich.
- Water quality parameters presented optimal conditions for salmonid fish across all sampling locations.
- Macroinvertebrate communities recorded were dominated by common and widespread taxa and no species of conservation interest were recorded.
- Aquatic macrophyte communities within Loch Fearn were limited in diversity and no species of conservation interest were recorded.

- Survey of macrophytes within Loch Quoich was not carried out as none are present within the drawdown of the reservoir operational levels, so access for survey was not possible.
- Other than common minnow, no invasive non-native species (INNS) were recorded across any of the surveys.

## 7 References

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## 8 Annexes

## **Annex A: Figures [See Separate Documents]**

### List of Figures

Figure 11.1.1.0 – The Proposed Development

Figure 11.1.2.0 – Fish Habitat Assessment Overview

Figures 11.1.2.1 – 11.1.2.12 – Fish Habitat Assessment

Figure 11.1.3.1 – Fish Population Assessment Brown Trout Fry

Figure 11.1.3.2 – Fish Population Assessment Brown Trout Parr

Figure 11.1.4.0 – eDNA Sampling Locations 2023

Figure 11.1.5.0 – Macroinvertebrate Sampling Locations

Figure 11.1.6.0 – eDNA Sampling Locations 2025

Figure 11.1.7.0 – Spawning Habitat Assessment

## Annex B: Habitat Type Classification.

Table 17: Fish Habitat Type Classification (source: SEPA and SFCC)

| Habitat Type                      | Classification   |
|-----------------------------------|--|
| Atlantic Salmon - Spawning Gravel | Stable gravel up to 30 cm deep that is not compacted or contains excessive silt. Substrate size predominantly pebbles and cobbles (lower size limit).  |
| Brown Trout - Spawning Gravel     | Stable gravel up to 30 cm deep that is not compacted or contains excessive silt. Substrate size varies from gravels, pebbles, and cobbles (lower size limit).  |
| Atlantic Salmon Fry Habitat       | Shallow (< 0.2 m) and fast flowing water indicative of riffle and run with a substrate dominated by pebbles and cobbles (lower size limit).  |
| Atlantic Salmon Parr Habitat      | Riffle and run habitat that is generally faster and deeper than fry habitat (0.2 - 0.4 m). Substrate size range comprise from pebbles (upper size limit), cobbles (lower size limit) to boulder.   |
| Brown Trout Fry Habitat           | Slow to medium flowing shallow water with a substrate dominated by pebbles and cobbles (lower size limit), often concentrated at stream margins.   |
| Brown Trout Parr Habitat          | Variety of substrate sizes (from pebble to boulder); undercut banks, tree roots; deeper and slower water.  |
| Lamprey Spawning Habitat          | Stable gravel up to 30 cm deep that is not compacted or contains excessive silt (may contain sand). Substrate size varies from gravels to pebbles.   |
| Juvenile Lamprey Habitat          | Optimal: Stable fine sediment or sand; ≥ 15 cm deep with low water velocity and the presence of organic detritus as well as macrophytes.<br>Sub-optimal: Shallow sediment (< 15 cm deep), unequal and interspersed among coarser substrates. |
| Eel - Habitat                     | Frequently burrow into mud substrate, cover from larger instream substrate and bankside crevices (gaps in bank modifications such as walls and log revetments).  |
| Glides                            | Smooth laminar flow with little surface turbulence. Shallow glide (≤ 0.3 m, deep glide > 0.3 m).   |
| Pools                             | No perceptible flow. Shallow pool (≤ 0.3 m, deep pool > 0.3 m).  |
| Flow Constriction                 | Where flows are accelerated between narrow banksides (usually combined with deep fast flows and bedrock substrates).   |

\*Gravel (2-16mm), pebble (16-64mm), cobble (64-256mm), boulder (>256mm)

\*\* If significant amounts of different habitat types were found to co-exist in the same section, these habitat classifications were adequately described. For example, in the case of salmonids, fry and parr habitat is classified as juvenile habitat. Where parr habitat is mentioned, this refers to habitat that has principally been identified as habitat more suited to parr than fry, however, habitually contains a lower quantity of fry habitat than habitat which is suited to both fry and parr. Salmonid definitions in the table are adapted from SFCC Habitat Manual (2007) and [REDACTED] (1997), lamprey from Maitland (2003).

## Annex C: Substrates and Flow Types

Table 18: Substrates and Flow Types (source: SFCC)

| Substrate | Definitions   | Flow Type | Definitions  |
|-----------|---|-----------|--|
| SI        | Silt: Fine, mostly inorganic material, individual particles visible           | SM        | Still Marginal: <10 cm deep, water still or eddying, no waves form behind a 2-3 cm wide rule placed in the current, smooth surface appearance, water flow is silent.     |
| SA        | Sand: Fine, inorganic particles, <2 mm diameter, individual particles visible | DP        | Deep Pool: >=30 cm deep, water flow slow, eddying, no waves form behind a 2-3 cm wide rule placed in the current, smooth surface appearance, water flow is silent.       |
| GR        | Gravel: Inorganic particles 2-16 mm diameter                                  | SP        | Shallow Pool: <30 cm deep, water flow slow, eddying, no waves form behind a 2-3 cm wide rule placed in the current, smooth surface appearance, water flow is silent.     |
| PE        | Pebble: Inorganic particles 16-64 mm diameter                                 | DG        | Deep Glide: >=30 cm deep, water flow moderate/fast; waves form behind a 2-3 cm wide rule placed in the current, smooth surface appearance, water flow is silent.         |
| CO        | Cobble: Inorganic particles 64-256 mm diameter                                | SG        | Shallow Glide: <30 cm deep, water flow moderate to fast; waves form behind a 2-3 cm wide rule is placed in the current, smooth surface appearance, water flow is silent. |
| BO        | Boulder: Inorganic particles >256 mm diameter                                 | RU        | Run: water flow fast, unbroken standing waves at surface; water flow is silent.  |
| BE        | Bedrock: Continuous Rock Surface  | RI        | Riffle: water flows fast, broken standing waves at surface; water flow is audible.   |
| OB        | Obstruction: Roots, wood, sheets of iron, barrels etc.                        | TO        | Torrent: white water, chaotic and turbulent flow, water flow is noisy, difficult to distinguish substrate.   |

## Annex D: Fish Habitat Assessment

*Table 19: Fish Habitat Assessment Results*

| FID | Survey Location | Watercourse  | Section | Classification        |
|-----|-----------------|--|---------|-----------------------|
| 1   | H_SL_1          | Unnamed watercourse west of Loch Fearnna (First tributary of Loch Fearnna) | 1       | Unproductive: Other   |
| 2   | H_SL_2          | Unnamed watercourse second eastern tributary of Loch Fearnna               | 1       | Unproductive: Other   |
| 3   | H_SL_3          | Unnamed watercourse third eastern tributary of Loch Fearnna                | 1       | Unproductive: Other   |
| 4   | H_SL_4          | Unnamed watercourse fourth eastern tributary of Loch Fearnna               | 1       | Productive: Good      |
| 5   | H_SL_4          | Unnamed watercourse fourth eastern tributary of Loch Fearnna               | 3       | Unproductive: Other   |
| 6   | H_SL_4          | Unnamed watercourse fourth eastern tributary of Loch Fearnna               | 2       | Unproductive: Other   |
| 7   | H_SL_5          | Unnamed watercourse southeast of Loch Fearnna (easternmost tributary)      | 1       | Productive: Good      |
| 8   | H_SL_5          | Unnamed watercourse southeast of Loch Fearnna (easternmost tributary)      | 2       | Productive: Moderate  |
| 9   | H_SL_5          | Unnamed watercourse southeast of Loch Fearnna (easternmost tributary)      | 3       | Unproductive: Other   |
| 10  | H_SL_6          | River Allt a' Fearnna (outflow of Loch Fearnna)                            | 1       | Productive: Moderate  |
| 11  | H_SL_7          | Unnamed watercourse taking its source east of Coire Dubh                   | 1       | Unproductive: Other   |
| 12  | H_SL_7          | Unnamed watercourse taking its source east of Coire Dubh                   | 2       | Unproductive: Other   |
| 13  | H_SL_8          | Unnamed watercourse taking its source north of Coire Dubh                  | 2       | Unproductive: Other   |
| 14  | H_SL_8          | Unnamed watercourse taking its source north of Coire Dubh                  | 1       | Unproductive: Other   |
| 15  | H_SL_9          | Unnamed watercourse taking its source west of Coire Dubh                   | 1       | Productive: Moderate  |
| 16  | H_SL_9          | Unnamed watercourse taking its source west of Coire Dubh                   | 2       | Unproductive: Bedrock |
| 17  | H_SL_9          | Unnamed watercourse taking its source west of Coire Dubh                   | 3       | Productive: Good      |
| 18  | H_SL_9          | Unnamed watercourse taking its source west of Coire Dubh                   | 4       | Unproductive: Other   |
| 19  | H_SL_9          | Unnamed watercourse taking its source west of Coire Dubh                   | 5       | Productive: Good      |
| 20  | H_SL_9          | Unnamed watercourse taking its source west of Coire Dubh                   | 6       | Unproductive: Other   |
| 21  | H_SL_10         | River Allt a' Mheil  | 1       | Unproductive: Bedrock |
| 22  | H_SL_10         | River Allt a' Mheil  | 2       | Productive: Moderate  |
| 23  | H_SL_10         | River Allt a' Mheil  | 3       | Productive: Moderate  |

|    |         |   |    |                       |
|----|---------|---|----|-----------------------|
| 24 | H_SL_10 | River Allt a' Mheil                                 | 4  | Unproductive: Bedrock |
| 25 | H_SL_10 | River Allt a' Mheil                                 | 5  | Unproductive: Bedrock |
| 26 | H_SL_10 | River Allt a' Mheil                                 | 6  | Unproductive: Other   |
| 27 | H_SL_10 | River Allt a' Mheil                                 | 7  | Productive: Moderate  |
| 28 | H_SL_10 | River Allt a' Mheil                                 | 8  | Productive: Moderate  |
| 29 | H_SL_10 | River Allt a' Mheil                                 | 9  | Unproductive: Bedrock |
| 30 | H_SL_10 | River Allt a' Mheil                                 | 10 | Productive: Moderate  |
| 31 | H_SL_10 | River Allt a' Mheil                                 | 11 | Unproductive: Bedrock |
| 32 | H_SL_10 | River Allt a' Mheil                                 | 12 | Productive: Moderate  |
| 33 | H_SL_10 | River Allt a' Mheil                                 | 13 | Unproductive: Bedrock |
| 34 | H_SL_10 | River Allt a' Mheil                                 | 14 | Unproductive: Other   |
| 35 | H_SL_11 | River Allt a' Mheil                                 | 1  | Unproductive: Bedrock |
| 36 | H_SL_12 | River Allt a' Fearnna (confluence with Loch Quoich) | 1  | Productive: Moderate  |
| 37 | H_SL_12 | River Allt a' Fearnna (confluence with Loch Quoich) | 2  | Unproductive: Bedrock |

**Annex E: Macroinvertebrate Population Assessment: Inventory**



**TAXA LIST**

|            | FE1         | FE2                           | FE3        | FE4        | FE5        | FE6        | FE7        | FE8 Loch Quoich | FE9 Loch Fearn |    |
|------------|-------------|-------------------------------|------------|------------|------------|------------|------------|-----------------|----------------|----|
|            | 24/05/2023  | 24/05/2023                    | 24/05/2023 | 24/05/2023 | 24/05/2023 | 24/05/2023 | 24/05/2023 | 24/05/2023      | 24/05/2023     |    |
| Order      | Family      | Taxa Name                     | Abundance  | Abundance  | Abundance  | Abundance  | Abundance  | Abundance       | Abundance      |    |
| BIVALVIA   | SPHAERIIDAE | <i>Euglesa hibernica</i>      |            |            |            | 1          |            |                 |                |    |
| BIVALVIA   | SPHAERIIDAE | <i>Euglesa sp.</i>            |            |            |            | 39         | 2          |                 | 1              |    |
| COLEOPTERA | DYTISCIDAE  | <i>Agabus guttatus</i>        | 2          | 3          |            | 2          |            |                 |                |    |
| COLEOPTERA | DYTISCIDAE  | <i>Dytiscidae</i>             |            |            |            |            | 4          |                 | 1              |    |
| COLEOPTERA | DYTISCIDAE  | <i>Hydroporinae</i>           |            |            |            |            |            |                 | 1              |    |
| COLEOPTERA | DYTISCIDAE  | <i>Platambus maculatus</i>    |            |            |            |            |            |                 | 1              |    |
| COLEOPTERA | ELMIDAE     | <i>Elmis aenea</i>            | 140        | 21         | 80         | 48         | 10         | 84              | 1              | 2  |
| COLEOPTERA | ELMIDAE     | <i>Limnius volckmari</i>      |            | 1          | 1          |            |            |                 |                | 1  |
| COLEOPTERA | ELMIDAE     | <i>Oulimnius sp.</i>          |            |            |            | 6          | 1          |                 |                | 14 |
| COLEOPTERA | ELMIDAE     | <i>Oulimnius tuberculatus</i> |            |            |            | 5          | 4          | 1               |                | 5  |
| COLEOPTERA | HYDRAENIDAE | <i>Hydraena gracilis</i>      | 9          | 2          |            |            |            |                 |                |    |

|               |                 |   |     |    |    |    |     |    |    |   |
|---------------|-----------------|---|-----|----|----|----|-----|----|----|---|
| COLEOPTERA    | HYDROPHILIDAE   | <i>Anacaena globulus</i>                        | 1   | 4  |    | 7  |     |    | 2  |   |
| COLEOPTERA    | SCIRTIDAE       | <i>Elodes sp.</i>                               | 2   | 8  | 32 | 9  |     |    | 10 | 1 |
| DIPTERA       | CHIRONOMIDAE    | <i>Chironomidae</i>                             | 7   | 4  | 17 | 1  | 135 | 10 | 6  |   |
| DIPTERA       | CHIRONOMIDAE    | <i>Tanypodinae</i>                              | 2   | 5  |    |    | 12  | 2  | 2  | 4 |
| DIPTERA       | CHIRONOMIDAE    | <i>Tanytarsini</i>                              | 4   |    | 3  |    |     | 25 | 3  | 1 |
| DIPTERA       | EMPIDIDAE       | <i>Chelifera sp.</i>                            |     |    |    |    |     | 1  |    | 1 |
| DIPTERA       | EMPIDIDAE       | <i>Clinocera sp.</i>                            |     |    |    |    | 1   |    | 1  |   |
| DIPTERA       | LIMONIIDAE      | <i>Eloeophila sp.</i>                           | 1   | 2  |    |    |     |    |    |   |
| DIPTERA       | PEDICIIDAE      | <i>Dicranota sp.</i>                            | 2   | 2  |    | 3  | 3   |    |    |   |
| DIPTERA       | PEDICIIDAE      | <i>Pedicia sp.</i>                              |     | 1  |    |    |     |    |    | 1 |
| DIPTERA       | SIMULIIDAE      | <i>Simulium argyreatum/variegatum</i>           |     |    | 1  |    |     |    |    |   |
| DIPTERA       | SIMULIIDAE      | <i>Simulium rostratum</i>                       |     |    | 1  |    | 25  |    |    | 2 |
| DIPTERA       | SIMULIIDAE      | <i>Simulium sp.</i>                             |     |    |    |    | 189 | 2  |    |   |
| EPHEMEROPTERA | AMELETIDAE      | <i>Ameletus inopinatus</i>                      | 2   |    |    |    |     |    |    |   |
| EPHEMEROPTERA | BAETIDAE        | <i>Baetidae</i>                                 |     |    |    |    |     |    | 31 |   |
| EPHEMEROPTERA | BAETIDAE        | <i>Baetis muticus</i>                           | 152 | 33 | 2  |    |     | 43 | 9  |   |
| EPHEMEROPTERA | BAETIDAE        | <i>Baetis rhodani/atlanticus</i><br><i>agg.</i> | 10  | 14 | 15 | 15 |     | 49 | 4  |   |
| EPHEMEROPTERA | HEPTAGENIIDAE   | <i>Electrogena lateralis</i>                    | 1   | 17 | 1  | 2  |     |    | 4  | 1 |
| EPHEMEROPTERA | HEPTAGENIIDAE   | <i>Rhithrogena semicolorata</i>                 |     |    |    |    |     | 70 |    |   |
| EPHEMEROPTERA | LEPTOPHLEBIIDAE | <i>Leptophlebia sp.</i>                         |     |    |    |    |     |    |    | 2 |





**Annex F: eDNA Report 2023 & 2025 (See Separate Documents)**

2023 – “*Appendix 11.1.1 eDNA survey Report 2023*”

2025 – “*Gavia\_II- eDNA\_final\_report\_UHI*”

2025 Figures: “*Gavia\_II\_map\_charr\_v2*” and “*Gavia\_II\_map\_v2*”

## **Annex G: Spawning Habitat Assessment Figures [See Separate Documents]**

See attached file "*Figure 1 Spawning Habitat Assessment Loch Quoich*"