

*Loch Kemp Storage - EIA Report*

*Appendix 12.1: Loch Kemp Baseline Aquatic Surveys*

*November 2023*

**ash**

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## **APPENDIX 12.1 - LOCH KEMP BASELINE AQUATIC SURVEYS**

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17/11/2023

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**Project number**

P22214

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**Revision History**

Revision	Date	Prepared By	Reviewed By	Approved By	Comments
1.0	16/11/23	AG	DM	MH	

**Quality Assurance**

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## Executive Summary

Gavia Environmental Ltd ('GEL') was commissioned by Ash Design + Assessment ('the Client') to undertake aquatic ecology surveys including fish habitat surveys, fish population assessments and macro invertebrate surveys at the proposed Loch Kemp Pumped Storage Hydro Scheme (PSH), ('the site') which is located at Grid Reference NH 47226 15998, approximately 1.3 kilometres (km) west of Dell Lodge, Whitebridge in the Scottish Highlands.

Riverine Fish habitat surveys were carried out at survey locations across 5.2km of river on Allt a Chinn Mhonaich, Allt Leachd Gowerie, Allt an t-Sluichd and tributaries and outfalls of the lochs on the site; using a combination approach. Observations were made in the context of methods developed by Hendry and Cragg-Hine (1997), and those developed for river/fish habitat surveying (EA, 2003 and SFCC, 2007).

A broad habitat assessment of the littoral zone was undertaken at Loch Kemp, Loch Ness, Loch Cluanie, Loch Pàiteag and Lochan a' Choin Uire. This was mapped and divided into transects, with surveyors making notes on substrate composition and assigning a rating of *optimal*, *sub-optimal* or *unsuitable* for salmonid spawning habitat to each transect. Additionally, perpendicular boat transects were conducted. The habitat assessment was based on that for Vendace (*Coregonus albula*) developed by Coyle and Adams (2011).

Assessment of the species composition, abundance and age class structure of fish population was carried out in reasonable accordance with SFCC 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). Fish population surveys by electrofishing were carried out at survey locations rated as *Moderate* or above for fish habitat quality.

Riverine fish habitat quality ranged from *Poor* (KP2, KP3, KP4, KP5, LCU1 and LCU2) to *Low* (KP8, LG6, LG7 and LG8) to *Moderate* (TS1, KP1, KP6, KP7, KP9, KP10, LG1, LG3, LG4, LG5, LCM1, LCM2 and LCM3) to *Good* (TS2, LG2 and LCM4). None of the survey locations were classified as *High* for fish habitat quality. Of the total riverine fish habitat quality surveyed (5.2km), *Poor* made up 18.2%, *Low* made up 18.9%, *Moderate* made up 50.1% and *Good* made up 12.8%.

Riverine fish habitat quality rated as *Good* was mostly out with the proposed area of maximum inundation relating to the Proposed Development (LCM4 and TS2).

Riverine salmonid spawning potential ranged from *Unsuitable* (KP2, KP3, KP4, KP6, KP7, KP8, KP10, LG1, LG4, LG6, LG7, LG8, LCU1, LCU2, LCM1, LCM2, LCM3) to *Sub-Optimal* (TS1, TS2, KP1, KP9, LG2, LG3, LG5 and LCM4) within the instream sections. None of the survey locations were rated as having *Optimal* salmonid spawning potential. Of the total riverine spawning habitat potential surveyed (5.2km), *Unsuitable* made up 70.8% and *Sub-Optimal* made up 29.2%.

Optimal spawning habitats within the littoral zones of the inland lochs on the site was mainly restricted to one area of Loch Kemp (LKS26) and a small section of a boat transect at Lochan a'Choin Urie (LCB1.10-1.11) (which is out with the area of maximum inundation). Loch Ness featured optimal spawning habitat within the development boundary (LNS8,9,12-13) however to put this result into context, the shoreline transects out with the planning boundary to the north east were also predominantly optimal (LNS16-19).

Loch Kemp shoreline transects for ranged from *Unsuitable* (LKS2, LKS6, LKS9, LKS10, LKS11, LKS14, LKS17, LKS18, LKS19, LKS20, LKS21, LKS22, LKS23, LKS25, LKS27, LKS28, LKS31, LKS32, and LKS33) to *Sub-Optimal* (LKS1, LKS3, LKS4, LKS5, LKS7, LKS8, LKS, LKS12, LKS13, LKS16, LKS24, LKS29 and LKS30) to *Optimal* (LKS26) for salmonid spawning. *Unsuitable* spawning habitat made up 64.6% of the shoreline, *Sub-Optimal* spawning habitat made up 32.1% of the shoreline and *Optimal* spawning habitat made up 3.3% of the shoreline.



Loch Kemp boat transects ranged from *Unsuitable* (LKB1.1-1.5, LKB2.1-2.4, LKB3.1-3.5, LKB4.1-4.4, LKB5.1-5.5, LKB6.1-6.3, LKB7.3-7.6, LKB8.1-8.4, LKB9.1-9.6, LKB10.1-10.5 and LKB11.1-11.4) to *Sub-Optimal* (LKB1.6, LKB2.5) to *Optimal* (LKB7.1 - LKB7.2) for salmonid spawning.

The Loch Cluanie shoreline transect was recorded as 100% *Unsuitable* (LCLS1) for salmonid spawning.

Loch Ness shoreline transects ranged from *Unsuitable* (LNS1, LNS2, LNS3, LNS4, LNS7, LNS10 and LNS14) to *Sub-Optimal* (LNS5, LNS6, LNS11 and LNS15) to *Optimal* (LNS8, LNS9, LNS12, LNS13, LNS16, LNS17, LNS18 and LNS19) for salmonid spawning. *Unsuitable* spawning habitat made up 40.5% of the shoreline, *Sub-Optimal* spawning habitat made up 16.4% of the shoreline and *Optimal* spawning habitat made up 43.1% of the shoreline.

For context, of the *Optimal* spawning habitat recorded at Loch Ness, 73.9% was out with the development boundary, with the remaining 27.1% inside the red line development boundary.

Loch Ness Boat transects ranged from *Unsuitable* (LNB1.1-1.5, LNB2.3-2.5, LNB3.5-3.6, LNB4.1-4.10, LNB5.4-5.7, LNB6.2-6.6, LNB7.1-7.7, LNB8.2-8.6, LNBC1.1-1.3, LNBC6.3-6.5, LNB7.1, LNBC7.4-7.7, LNBC8.1, LNBC8.3-8.7, LNBC9.1-9.4) to *Sub-Optimal* (LNB2.2, LNB3.1-3.4, LNB5.2-5.3, LNB6.1, LNB8.1, LNBC6.1-6.2, LNBC7.3, LNBC8.2, LNBC10.1-10.4) and *Optimal* (LNB2, LNB5 and LNBC7.2) for salmonid spawning.

Lochan a' Choin Urie shoreline transects ranged from *Unsuitable* (LCS2, LCS3, LCS4, LCS, LCS6, LCS7) to *Sub-Optimal* (LCS1 and LCS8) for salmonid spawning. None of the shoreline transects were recorded as *Optimal*. *Unsuitable* spawning habitat made up 82.1% of the shoreline and *Sub-Optimal* spawning habitat made up 17.9% of the shoreline.

Lochan a' Choin Urie boat transects ranged from *Unsuitable* (LCB1.1-1.8, LCB2.1-2.3, LCB3.1-3.5), *Sub-Optimal* (LCB1.9, LCB1.12 and LCB2.4) *Optimal* (LCB1.10-1.11) for salmonid spawning.

Loch Paiteag shoreline transects ranged from *Unsuitable* (LPS1, LPS2, LPS3, LPS4, LPS5, LPS6, LPS8 and LPS9) to *Sub-Optimal* (LPS7 and LPS10) for salmonid spawning. None of the shoreline transects were recorded as *Optimal*. *Unsuitable* spawning habitat made up 77.1% of the shoreline and *Sub-Optimal* spawning habitat made up 22.9% of the shoreline.

Loch Paiteag boat transects ranged from *Unsuitable* (LPB1.1-1.5, LPB2.1-2.4, LPB3.1-3.4 and LPB4.2-4.6) to *Sub-Optimal* (LPB4.1) for salmonid spawning. None of the boat transects were recorded as *Optimal*.

The fish population surveys were dominated by brown trout which were present at all of the survey locations. In the presence of barriers to upstream migration, the fish captured will be from self-sustaining resident brown trout. Trout fry (0+) were not present at survey locations K\_EF1, K\_EF2, K\_EF3. Trout parr (1++) were present at all survey locations. No other fish species were captured across the site.

Analysing the fish population assessment results against the SFCC Regional Classification Scheme for the Moray Firth, trout fry densities ranged from *Very Low* (K\_EF2 and K\_EF3) to *Good* (K\_EF1) and trout parr densities ranged from *Very Low* (K\_EF2 and K\_EF3) to *Low* (K\_EF1). Survey location K\_EF1 lies out with the area of maximum inundation.

Macro invertebrate surveys conducted throughout July 2022 and September 2022 were fairly uniform throughout all survey locations. Both family groups *Oligochaeta* and *Chironomidae* were found in high abundance across the majority of sites. This large abundance of *Oligochaeta* is likely due to the high amount of organic silt present across the survey locations. No species of nature conservation interest were noted from the sampling conducted. Of the species recorded, they were common and widespread taxa, typical of a range of habitat types.

## 1 Introduction

Gavia Environmental Ltd. ('GEL') was commissioned by Ash Design + Assessment ('the Client') to undertake aquatic ecology surveys at the proposed Loch Kemp Pumped Storage Hydro Scheme (PSH), ('the site') (Planning Reference 22/00655/PREMAJ), which is located at Grid Reference NH 47226 15998, approximately 1.3 kilometres (km) west of Dell Lodge, Whitebridge in the Scottish Highlands. A red line development boundary of 'the site' which includes the site infrastructure is included in Figure 1.0 (Appendix A).

The site will operate a new up to 600 MW pumped storage scheme utilising the existing Loch Kemp as the upper storage reservoir and Loch Ness as the lower reservoir. Loch Kemp would be raised by approximately 28 m from its existing 177 m and several dams will be constructed around the new perimeter. This will potentially result in a loss of juvenile fish habitat and spawning habitat within inflowing / outflowing watercourses to and from Loch Kemp and Loch Cluanie as well as the shorelines of both lochs. There is also a potential impact caused by the inserted underground tunnelled waterway system on Lochan a' Choin Uire and runoff impact to watercourses such as the Allt a'Chinn Mhonaich via new access tracks. A new shaft type powerhouse would be constructed on the shore of Loch Ness as well as a quayside constructed adjacent to the powerhouse building and outlet area. A tailrace structure would be located on the shore of Loch Ness integral with the powerhouse building. This infrastructure could also result in a loss of fish habitat and salmonid fish spawning habitat along a section of the shore of Loch Ness.

The construction phase of the project also has the potential to impact on the fish habitat, fish populations and water quality on Loch Kemp, Loch Ness, Loch Cluanie, Allt a Chinn Mhonaich, Allt an t-Sluichd, Loch Pàiteag, Lochan a'Choin Uire and its outflow.

### 1.1 Study Objectives

- Determine baseline condition of salmonid fish spawning habitats on Loch Kemp, Loch Cluanie, Loch Ness, Lochan a' Choin Uire and Loch Paiteag by using a boat based spyball camera and wading with a bathyscope;
- Determine baseline fish habitat quality on potentially affected watercourses including the Allt a Chinn Mhonaich, Allt an t-Sluichd and tributaries and outfalls of the lochs on the site;
- Determine baseline salmonid fish populations on potentially affected watercourses by electrofishing; and
- Determine baseline aquatic invertebrate status via sampling on affected watercourses and lochs / lochans.

## 2 Project Personnel

A list of all project and survey personnel is available in Table 1.

*Table 1. Project personnel*

Personnel	Role
Matthew Hopkins	Technical Director
Donald Morrison	Principal Consultant & Aquatic Team Lead
Amy Green	Environmental Consultant
Rowan Smith	Environmental Consultant

### 3 Methodology

#### 3.1 Desk Study

A desk study was undertaken to provide up to date ecological information on current and potential impacted ecological features on watercourses within the development boundary and those with hydrological connectivity. The following sources were used:

- Scotland Environment Web – a review of barriers to fish migration were searched for using Scotland’s Environment Web on stretches of watercourses potentially affected by the Site;
- SEPA Classified Waterbodies – a review of classified waterbodies was undertaken using SEPA water classification hub on watercourses potentially affected by the Site; and
- Google Earth and Ordnance Survey analysis on the Site, a review of site mapping to determine potential impacted locations, tributaries, and lochs;

#### 3.2 Survey Locations

The site is located on an upland area of moorland. Adjacent land uses include forestry, rough grazing, fishing and game bird rearing operations. All watercourses on the site drain towards the western side of the site layout into Loch Ness.

The existing access route from the east runs in a westerly direction, running along the northern bankside of Loch Kemp and crosses a ford system on the Allt an t-Sluichd at the outlet of Loch Kemp. The access route continues around the easterly side of Lochan a’Choin Uire passing the eastern side of Allt a’Chinn Mhonaich before continuing down to the shore of Loch Ness. Loch Kemp, Lochan a’Choin Uire and Lochan a’Chinn Mhonaich tributaries on the site all feed into Loch Ness.

Survey locations were selected for the baseline riverine fish habitat assessment, salmonid spawning assessment and fish population assessment. British grid references are given at the start and end of each of the survey location transects. A detailed site layout (including new access tracks and infrastructure) was provided by the client (Figure 1), which helped to inform survey location selection. A rationale for survey locations is provided in Table 2 below.

*Table 2. Survey Locations and Rationale for Selection*

Survey Location	Watercourse / Survey Type	Grid Reference	Rationale
KP1	Outflow from Loch Cluanie	NH 47235 16414 – NH 47311 16418	Within the site of proposed infrastructure and maximum inundation.
KP2	Outflow from Loch Cluanie	NH 47311 16418 – NH 47471 16428	Within the site of proposed infrastructure and maximum inundation.
KP3	Outflow from Loch Pàiteag	NH 47558 16355 - NH 47658 16294	Within the site of proposed infrastructure and maximum inundation.
KP4	Outflow from Loch Pàiteag	NH 47658 16294 - NH 47772 16227	Within the site of proposed infrastructure and maximum inundation.
KP5	Outflow from Loch Pàiteag	NH 47772 16227 - NH 47850 16131	Within the site of proposed infrastructure and maximum inundation.
KP6	Outflow from Loch Pàiteag	NH 47843 16121 – NH 47764 15924	Within the site of proposed infrastructure and maximum inundation.

Survey Location	Watercourse / Survey Type	Grid Reference	Rationale
KP7	Outflow from Loch Pàiteag	NH 47764 15924 – NH 47798 15710	Within the site of proposed infrastructure and maximum inundation.
KP8	Outflow from Loch Pàiteag	NH 47804 15705 – NH 47797 15559	Upstream of proposed site infrastructure. Within site boundary.
KP9	Outflow from Loch Pàiteag	NH 47612 15442 - NH 47597 15440	Upstream of proposed site infrastructure. Within site boundary.
KP10	Outflow from Loch Pàiteag	NH 47597 15440 – NH 47415 15409	Upstream of proposed site infrastructure. Within site boundary.
LPS1	Loch Pàiteag Shoreline	NH 47449 15636 – NH 47394 15591	Upstream of proposed site infrastructure. Within site boundary.
LPS2	Loch Pàiteag Shoreline	NH 47394 15591 – NH 47355 15582	Upstream of proposed site infrastructure. Within site boundary.
LPS3	Loch Pàiteag Shoreline	NH 47355 15582 – NH 47318 1556	Upstream of proposed site infrastructure. Within site boundary.
LPS4	Loch Pàiteag Shoreline	NH 47318 1556 – NH 47290 15560	Upstream of proposed site infrastructure. Within site boundary.
LPS5	Loch Pàiteag Shoreline	NH 47290 15560 – NH 47263 15547	Upstream of proposed site infrastructure. Within site boundary.
LPS6	Loch Pàiteag Shoreline	NH 47263 15547 – NH 47420 15447	Upstream of proposed site infrastructure. Within site boundary.
LPS7	Loch Pàiteag Shoreline	NH 47420 15447 – NH 47446 15541	Upstream of proposed site infrastructure. Within site boundary.
LPS8	Loch Pàiteag Shoreline	NH 47446 15541 – NH 47467 15570	Upstream of proposed site infrastructure. Within site boundary.
LPS9	Loch Pàiteag Shoreline	NH 47467 15570 – NH 47484 15598	Upstream of proposed site infrastructure. Within site boundary.
LPS10	Loch Pàiteag Shoreline	NH 47484 15598 – NH 47449 15636	Upstream of proposed site infrastructure. Within site boundary.
LG1	Inflow into Loch Kemp: Allt Leachd Gowerie	NH 46980 16068 – NH 46874 15892	Within the site of proposed infrastructure and maximum inundation.
LG2	Inflow into Loch Kemp: Allt Leachd Gowerie	NH 46874 15892 – NH 46732 15712	Within the site of proposed infrastructure and maximum inundation.
LG3	Inflow into Loch Kemp: Allt Leachd Gowerie	NH 46698 15497- NH 46732 15712	Within the site of proposed infrastructure and maximum inundation.
LG4	Inflow into Loch Kemp: Allt Leachd Gowerie	NH 46802 15372 – NH 46698 15497	Within the site of proposed infrastructure and maximum inundation.
LG5	Inflow into Loch Kemp: Allt Leachd Gowerie	NH 46935 15272 – NH 46802 15372	Within the site of proposed infrastructure and maximum inundation.
LG6	Inflow into Loch Kemp: Allt Leachd Gowerie	NH 46949 15090 – NH 46935 15272	Within the site of proposed infrastructure (operational access) but upstream of maximum inundation. Within site boundary.

Survey Location	Watercourse / Survey Type	Grid Reference	Rationale
LG7	Inflow into Loch Kemp: Allt Leachd Gowerie	NH 46935 15272 - NH 46930 14977	Upstream of proposed site infrastructure and maximum inundation. Outwith site boundary.
LG8	Inflow into Loch Kemp: Allt Leachd Gowerie	NH 46930 14977 - NH 47027 14727	Within the site of proposed infrastructure. Within site boundary.
LCS1	Lochan a' Choin Uire	NH 46134 16461 – NH 46144 16402	Downstream of an existing access track and proposed site infrastructure. Within project boundary but outside maximum inundation area.
LCS2	Lochan a' Choin Uire	NH 46144 16402 – NH 46106 16335	Downstream of an existing access track and proposed site infrastructure. Within site boundary but outside maximum inundation area.
LCS3	Lochan a' Choin Uire	NH 46106 16335 – NH 45979 16402	Downstream of an existing access track and proposed site infrastructure. Within site boundary but outside maximum inundation area.
LCS4	Lochan a' Choin Uire	NH 45979 16402 – NH 46134 16461	Downstream of an existing access track and proposed site infrastructure. Within site boundary but outside maximum inundation area.
LCS5	Lochan a' Choin Uire	NH 46035 16423 – NH 46065 16424	Downstream of an existing access track and proposed site infrastructure. Within site boundary but outside maximum inundation area.
LCS6	Lochan a' Choin Uire	NH 46065 16424 – NH 46080 16430	Downstream of an existing access track and proposed site infrastructure. Within site boundary but outside maximum inundation area.
LCS7	Lochan a' Choin Uire	NH 46080 16430 - NH 46106 16448	Downstream of an existing access track and proposed site infrastructure. Within site boundary but outside maximum inundation area.
LCS8	Lochan a' Choin Uire	NH 46106 16448 – 46130 16461	Downstream of an existing access track and proposed site infrastructure. Within site boundary but outside maximum inundation area.
LCU1	Outflow from Lochan a'Choin Uire	NH 45914 16599 - NH 45961 16620	Downstream of an existing access track and proposed site infrastructure. Within site boundary but outside maximum inundation area. Impact potential from planned underground tunnelling.
LCU2	Outflow from Lochan a'Choin Uire	NH 46017 16626 - NH 46156 16456	Downstream of an existing access track and proposed site infrastructure. Within site boundary but outside maximum inundation area. Impact potential from planned underground tunnelling.
TS1	Outflow from Loch Kemp: Allt an t-Sluichd	NH 46770 16854 - NH 46819 17093	Downstream of an existing access track and proposed site infrastructure. Within site boundary.
TS2	Outflow from Loch Kemp: Allt an t-Sluichd	NH 46819 17093 - NH 46918 17317	Downstream of an existing access track and proposed site infrastructure. Out with the site boundary
LCM1	Allt na Chinn Mhonaich	NH 45934 15702 - NH 45810 15844	Upstream of proposed infrastructure. Within site boundary.
LCM2	Allt na Chinn Mhonaich	NH 45809 15843 – NH 45788 15880	Upstream of proposed infrastructure. Within site boundary.

Survey Location	Watercourse / Survey Type	Grid Reference	Rationale
LCM3	Allt na Chinn Mhonaich	NH 45572 16057 – NH 45528 16044	Adjacent of an existing access track and to proposed site infrastructure. Within the site boundary. Potential runoff impact.
LCM4	Allt na Chinn Mhonaich	NH 45143 16184 – NH 45087 16220	Adjacent of an existing access track and to proposed site infrastructure. Adjacent to the site boundary. Potential runoff impact.
LKS1	Loch Kemp shoreline transect	NH 46752 16845 – NH 46728 16821	Within the site of proposed infrastructure. Within site boundary.
LKS2	Loch Kemp shoreline transect	NH 46728 16821 – NH 46714 16777	Within the site of proposed infrastructure. Within site boundary.
LKS3	Loch Kemp shoreline transect	NH 46714 16777 – NH 46700 16702	Within the site of proposed infrastructure. Within site boundary.
LKS4	Loch Kemp shoreline transect	NH 46700 16702 – NH 46687 16659	Within the site of proposed infrastructure. Within site boundary.
LKS5	Loch Kemp shoreline transect	NH 46687 16659 – NH 46678 16581	Within the site of proposed infrastructure. Within site boundary.
LKS6	Loch Kemp shoreline transect	NH 46678 16581 – NH 46627 16565	Within the site of proposed infrastructure. Within site boundary.
LKS7	Loch Kemp shoreline transect	NH 46627 16565 – NH 46590 16468	Within the site of proposed infrastructure. Within site boundary.
LKS8	Loch Kemp shoreline transect	NH 46590 16468 – NH 46605 16390	Within the site of proposed infrastructure. Within site boundary.
LKS9	Loch Kemp shoreline transect	NH 46605 16390 – NH 46592 16366	Within the site of proposed infrastructure. Within site boundary.
LKS10	Loch Kemp shoreline transect	NH 46592 16366 – NH 46661 16271	Within the site of proposed infrastructure. Within site boundary.
LKS11	Loch Kemp shoreline transect	NH 46661 16271 – NH 46713 16315	Within the site of proposed infrastructure. Within site boundary.
LKS12	Loch Kemp shoreline transect	NH 46713 16315 – NH 46721 16255	Within the site of proposed infrastructure. Within site boundary.
LKS13	Loch Kemp shoreline transect	NH 46721 16255 – NH 46946 16123	Within the site of proposed infrastructure. Within site boundary.
LKS14	Loch Kemp shoreline transect	NH 46752 16845 - NH 46792 16846	Within the site of proposed infrastructure. Within site boundary.
LKS15	Loch Kemp shoreline transect	NH 46792 16846 – NH 46799 16794	Within the site of proposed infrastructure. Within site boundary.
LKS16	Loch Kemp shoreline transect	NH 46799 16794 - NH 46825 16780	Within the site of proposed infrastructure. Within site boundary.
LKS17	Loch Kemp shoreline transect	NH 46825 16780 - NH 46839 16748	Within the site of proposed infrastructure. Within site boundary.

Survey Location	Watercourse / Survey Type	Grid Reference	Rationale
LKS18	Loch Kemp shoreline transect	NH 46839 16748 – NH 46859 16641	Within the site of proposed infrastructure. Within site boundary.
LKS19	Loch Kemp shoreline transect	NH 46859 16641 - NH 46907 16615	Within the site of proposed infrastructure. Within site boundary.
LKS20	Loch Kemp shoreline transect	NH 46907 16615 - NH 46926 16598	Within the site of proposed infrastructure. Within site boundary.
LKS21	Loch Kemp shoreline transect	NH 46926 16598 – NH 47025 16538	Within the site of proposed infrastructure. Within site boundary.
LKS22	Loch Kemp shoreline transect	NH 47025 16538 - NH 47062 16535	Within the site of proposed infrastructure. Within site boundary.
LKS23	Loch Kemp shoreline transect	NH 47062 16535 – NH 47143 16495	Within the site of proposed infrastructure. Within site boundary.
LKS24	Loch Kemp shoreline transect	NH 47143 16495 – NH 47174 16469	Within the site of proposed infrastructure. Within site boundary.
LKS25	Loch Kemp shoreline transect	NH 47174 16469 - NH 47199 16454	Within the site of proposed infrastructure. Within site boundary.
LKS26	Loch Kemp shoreline transect	NH 47199 16454 – NH 47227 16393	Within the site of proposed infrastructure. Within site boundary.
LKS27	Loch Kemp shoreline transect	NH 47227 16393 - NH 47189 16344	Within the site of proposed infrastructure. Within site boundary.
LKS27	Loch Kemp shoreline transect	NH 47189 16344 - NH 47218 16285	Within the site of proposed infrastructure. Within site boundary.
LKS28	Loch Kemp shoreline transect	NH 47218 16285 - NH 47226 16253	Within the site of proposed infrastructure. Within site boundary.
LKS29	Loch Kemp shoreline transect	NH 47226 16253 – NH 47142 16173	Within the site of proposed infrastructure. Within site boundary.
LKS30	Loch Kemp shoreline transect	NH 47142 16173 – NH 47091 16165	Within the site of proposed infrastructure. Within site boundary.
LKS31	Loch Kemp shoreline transect	NH 47091 16165 - NH 47066 16173	Within the site of proposed infrastructure. Within site boundary.
LKS32	Loch Kemp shoreline transect	NH 47066 16173 - NH 47024 16103	Within the site of proposed infrastructure. Within site boundary.
LKS33	Loch Kemp shoreline transect	NH 47024 16103 - NH 46972 16104	Within the site of proposed infrastructure. Within site boundary.
LKB1	Loch Kemp boat transects	NH 46764 16745 – NH 46767 16860	Within the site of proposed infrastructure. Within site boundary.
LKB2	Loch Kemp boat transects	NH 46809 16786 – NH 46711 16766	Within the site of proposed infrastructure. Within site boundary.
LKB3	Loch Kemp boat transects	NH 46691 16699 – NH 46845 16675	Within the site of proposed infrastructure. Within site boundary.

Survey Location	Watercourse / Survey Type	Grid Reference	Rationale
LKB4	Loch Kemp boat transects	NH 46610 16569 – NH 46672 16473	Within the site of proposed infrastructure. Within site boundary.
LKB5	Loch Kemp boat transects	NH 46618 16294 – NH 46659 16348	Within the site of proposed infrastructure. Within site boundary.
LKB6	Loch Kemp boat transects	NH 46718 16255 – NH 46813 16287	Within the site of proposed infrastructure. Within site boundary.
LKB7	Loch Kemp boat transects	NH 47130 16389 – NH 47225 16425	Within the site of proposed infrastructure. Within site boundary.
LKB8	Loch Kemp boat transects	NH 47156 16259 – NH 47238 16272	Within the site of proposed infrastructure. Within site boundary.
LKB9	Loch Kemp boat transects	NH 47107 16423 – NH 47186 16466	Within the site of proposed infrastructure. Within site boundary.
LKB10	Loch Kemp boat transects	NH 46998 16500 – NH 47030 - 16545	Within the site of proposed infrastructure. Within site boundary.
LKB11	Loch Kemp boat transects	NH 46816 16551 – NH 46881 16632	Within the site of proposed infrastructure. Within site boundary.
LN B1	Loch Ness boat transects	NH 45086 16236 - NH 45064 16262	Within the site of proposed infrastructure. Within site boundary.
LN B2	Loch Ness boat transects	NH 45148 16314 - NH 45095 16290	Within the site of proposed infrastructure. Within site boundary.
LN B3	Loch Ness boat transects	NH 45215 16384 - NH 45200 16410	Within the site of proposed infrastructure. Within site boundary.
LN B4	Loch Ness boat transects	NH 45291 16476 - NH 45235 16463	Within the site of proposed infrastructure. Within site boundary.
LN B5	Loch Ness boat transects	NH 45336 16542 - NH 45299 16540	Within the site of proposed infrastructure. Within site boundary.
LN B6	Loch Ness boat transects	NH 45421 16593 - NH 45402 16620	Within the site of proposed infrastructure. Within site boundary.
LN B7	Loch Ness boat transects	NH 45496 16652 - NH 45469 16676	Within the site of proposed infrastructure. Within site boundary.
LN B8	Loch Ness boat transects	NH 45551 16723 - NH 45524 16737	Within the site of proposed infrastructure. Within close proximity to site boundary.
LNBC1	Loch Ness boat transects	NH 45004 16168 - NH 45000 16171	Control site out with the site of proposed infrastructure to provide context to the habitat within the site.
LNBC6	Loch Ness boat transects	NH 45625 16813 - NH 45571 16825	Control site outwith the site of proposed infrastructure to provide context to the habitat within the site.
LNBC7	Loch Ness boat transects	NH 45679 16899 - NH 45652 16915	Control site outwith the site of proposed infrastructure to provide context to the habitat within the site.



Survey Location	Watercourse / Survey Type	Grid Reference	Rationale
LNBC8	Loch Ness boat transects	NH 45732 16937 - NH 45705 16957	Control site outwith the site of proposed infrastructure to provide context to the habitat within the site.
LNBC9	Loch Ness boat transects	NH 45811 17053 - NH 45802 17053	Control site outwith the site of proposed infrastructure to provide context to the habitat within the site.
LNBC10	Loch Ness boat transects	NH 45926 17196 - NH 45906 17190	Control site outwith the site of proposed infrastructure to provide context to the habitat within the site.
K_EF1	Allt an Chinn Mhonaich fish population survey	NH 45096 16197	Adjacent of an existing access track and to proposed site infrastructure. Adjacent to the site boundary. Potential runoff impact.
K_EF2	Outflow from Loch Cluanie fish population survey	NH 47244 16411	Within the site of proposed infrastructure and maximum inundation.
K_EF3	Inflow into Loch Kemp: Allt Leachd Gowerie fish population survey	NH 46733 15559	Within the site of proposed infrastructure and maximum inundation.

S = Shoreline Transect | B = Boat Transect | C = Control Site | EF = Electrofishing

### 3.3 Limitations

Within the Site, some areas were scoped out for survey for health and safety reasons. For the shoreline habitat surveys, Loch Ness shoreline west of NH 45054 16202 was deemed inaccessible on foot and the boat survey confirmed this where water depths dropped to 70m depth in areas immediately off the shore. Loch Kemp (LK2S12-LKS13), Loch Pàiteag and Loch a' Choin Urie were inaccessible to wade due to high organic substrate, boat surveys confirmed that these areas should be scoped out for further survey as the habitat was all largely unsuitable for salmonid spawning. Loch Cluanie was scoped out for further spawning habitat assessment (boat transects) as the shoreline assessment found substrate was dominated by high organic material across the whole loch. Additionally, some areas of the riverine sections were deemed inaccessible. The Allt a Chinn Mhonaich, Allt an t-Sluichd, and the outflow Lochan a'Choin Uire all had sections that were considered too steep and/or dangerous to access for survey. These sections are not expected to provide suitable habitat for salmonids in any case due to the steep gradient.

Availability of electrofishing site selection was limited due to water levels being too low due to particularly dry weather incurred between July to September 2022. As a result, some of the watercourses could not be surveyed due to concerns on fish welfare as well as survey effectiveness. During September, the outflow from Loch a' Choin Urie was completely dry and the outflow from Loch Kemp had very little flow. Some trout were observed to be struggling and/or dead within Allt an t-Sluichd at the outflow from Loch Kemp.

### 3.4 Fish Habitat Surveys

#### 3.4.1 Riverine Fish Habitat Survey Fieldwork

During the field surveys a combination approach was adopted and observations were made in the context of methods developed by Hendry and Cragg-Hine (1997), and those developed for river/fish habitat surveying (EA, 2003 and SFCC, 2007). Predominant habitat was recorded within specific stretches (~200 m in length) by two experienced environmental consultants, and the habitat was classified using the criteria presented in Table 3. Each transect was

designated to particular changes in substratum when observed. The habitats described are regarded as definable parts of a spectrum of habitats commonly found in watercourses. 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 described where appropriate.

*Table 3. Salmonid Habitat Classification Index*

Habitat Type	Classification
Salmon spawning gravel	Stable gravel up to 30 cm deep that is not compacted or contains excessive silt. Substrate size predominantly pebbles and smaller cobbles depending on fish size.
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 smaller cobbles depending on fish size.
Salmon fry habitat	Shallow (<0.2 m) and fast flowing water indicative of riffles and runs with a substrate dominated by pebbles and smaller cobbles.
Salmon parr habitat	Riffle/run habitat that is generally faster and deeper than fry habitat (0.2 - 0.4 m). Substrate size* from large pebbles/smaller cobbles to boulder.
Trout fry habitat	Slow to medium flowing shallow water with a substrate dominated by pebbles and smaller cobbles, often concentrated at stream margins.
Trout parr habitat	Variety of substrate sizes; undercut banks, tree roots, big rocks; deeper, slower water.
Lamprey spawning habitat	Stable gravel up to 30 cm deep that is not compacted or contains excessive silt (but may contain some sand). Substrate size varies from gravels to pebbles.
Juvenile lamprey habitat	Optimal: Stable fine sediment or sand $\geq 15$ cm deep with low water velocity and the presence of organic detritus/plant material. Sub-optimal: Shallow sediment (<15cm deep), often patchy and interspersed among coarser substrate.
Eel Habitat	Frequently burrow into mud and utilise cover from larger instream substrate and bankside crevices (e.g. gaps in bank modifications such as walls and log revetments).
Glides	Smooth laminar flow with little surface turbulence. Shallow glide $\leq 0.3$ m, deep glide $> 0.3$ m.
Pools	No perceptible flow. Shallow pool $\leq 0.3$ 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 Table 3 are adapted from SFCC Habitat Manual (2007) and Hendry & Cragg-Hine (1997), lamprey from Maitland (2003).

### 3.4.2 Analysis

During the fish habitat survey, observations were made, and target notes were recorded in the context of varying fish habitat types including; channel width, channel depths, flow types, substrate composition, instream and bankside cover, riparian canopy cover, fish spawning potential, riparian land uses and associated limiting factors. From this, further analysis was

undertaken, and evaluations were made for modifications and utilisation potential (juvenile and adult fish), and fish habitat quality along the watercourse. Each survey location was then given a rating for fish habitat quality and fish utilisation potential (poor, low, moderate, good, or high).

### 3.4.3 Loch Fish Habitat Spawning Assessment Fieldwork

A broad habitat assessment of the littoral zone was undertaken at Loch Kemp, Loch Ness, Loch Cluanie, Loch Pàiteag and Lochan a' Choin Uire. This was mapped and divided into transects, with surveyors making notes on substrate composition and assigning a rating of *optimal*, *sub-optimal* or *unsuitable* for salmonid spawning habitat to each transect. Wave washing of the substrate and whether the gravels were free from fines was taken into account whilst deciding on spawning potential rating.

Additionally, perpendicular boat transects were conducted. The boat-based transects extended until depths exceeded 10m (the assumed maximum depth at which salmonids have been known to spawn) and/or a distance of over 100m from the shore was reached. The habitat assessment was based on that for Vendace (*Coregonus albula*) developed by Coyle and Adams (2011). Depth and substrate composition was recorded at intervals along the transects until a depth of 10 m had been exceeded, or the deepest point along the transect had been reached. New transect points were taken where there was either a change in depth or in substrate composition. Habitat was observed and recorded (live footage) using a Submerteck HD spyball camera, and depths were obtained via a Speedtach Instruments handheld echo sounder. For areas too shallow for the boat to access, perpendicular wading surveys were carried out from the shore with the surveyor using a bathyscope to observe the substrate. Similar to the shoreline assessment, a rating of *optimal*, *sub-optimal* or *unsuitable* for salmonid spawning habitat was assigned to each perpendicular transect point.

#### 3.4.3.1 Loch Ness

Perpendicular boat transects (LNB1-LNB8) were selected in the vicinity of the red line development boundary, spaced at 100 m intervals along the shore. Control transects (Transects LNBC1-LNBC10) were also selected along the shore to the south west and north east of the development boundary to provide a context to the results of the area which could be impacted by the Site.

During the initial site walkover, it was confirmed that transects LNBC2, LNBC3, LNBC4 and LNC5 should be scoped out for further survey as the shoreline was inaccessible with mainly steep cliff and the boat survey confirmed that this stretch featured steep drop offs to >70 m, making conditions unsuitable for spawning salmonid fish.

#### 3.4.3.2 Loch Kemp

Perpendicular boat transects (LKB1-LKB10) were selected to provide coverage of the loch. During the initial shoreline survey, it was confirmed that an area (LKS13 and LK33) should be scoped out for further boat survey as this area was inaccessible by wading with mud / high organic substrate dominant. A boat survey of the loch confirmed this was the case up to 10m depth in these areas, making conditions unsuitable for spawning salmonid fish.

#### 3.4.3.3 Lochan a' Choin Uire

Perpendicular boat transects (LCB1-LCB3) were selected to provide coverage of the loch. During the initial walkover it was confirmed that areas perpendicular to transects (LCS3 and LCS4) should be scoped out for further boat survey as this area was inaccessible by wading with mud / high organic matter substrate dominating the area making conditions unsuitable for spawning salmonid fish. A boat survey of the loch confirmed this was the case up to 10m depth in these areas, making conditions unsuitable for spawning salmonid fish.

## 3.5 Fish Population Surveys

### 3.5.1 Sampling

Assessment of the species composition, abundance and age class structure of fish fauna was carried out in reasonable accordance with SFCC 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).

All works were administered under Marine Scotland Licence (issued in line with the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 – Sections 27 & 28) and all terms & conditions were adhered to.

Before any fish fauna sampling was carried out specific risk assessments were prepared and followed during the works and updated daily accordingly. The risk assessments covered other issues such as fish handling protocols for minimising stress, proper use of equipment to minimise potential for damage to fish and other species, biosecurity protocols for disinfection of nets/equipment and numbers of species likely to be present.

The baseline electrofishing surveys were carried out during a September 2022. This is within the optimal time of year for survey as salmonid young of year have emerged from spawning redds and reached a sufficient size to be safely captured and identified to species level. Water temperatures will also generally be within the optimal range for capture by electrofishing (10 – 15 °C).

The survey team comprised three experienced surveyors. The survey lead was qualified to SVQ Level III (leading electrofishing operations and undertaking fish habitat surveys), the first assistant was qualified to SVQ Level II (introduction to electrofishing), and the second assistant was experienced in assisting with electrofishing surveys. The surveys were undertaken using a Hans Grassl Electrofishing kit which is battery powered and was set up to drive a single anode. Smooth DC current was utilised as this is generally accepted as the least damaging to fish during this type of survey.

Fully-quantitative sampling was the preferred methodology for all sites as it allows for enumeration of a stock, or stock component, within a given site and provides a reasonably accurate estimate of a given population.

### 3.5.2 Analysis

Species data collected from fully-quantitative survey methods were assessed using a statistical model to identify a population estimate for each watercourse. Fish densities were expressed as fish per 100m<sup>2</sup> and densities were presented separately for fry (0+, young of the year) and parr (1++, fish older than 1 year). The statistical model used for relevant population estimation was Removal Sampling 2 (Seaby and Henderson, 2008), and this was linked to the following method: Constant probability of capture – developed by Zippin (1956). This method takes into account the likelihood that the capture of different individuals within a population is constant. The calculation of the estimated population uses maximum likelihood estimates. The model is less accurate when dealing with low densities of fish.

#### SFCC Classification Scheme

The Scottish Fisheries Coordination Centre (SFCC) developed a national river classification scheme for Scottish rivers (Godfrey, 2005). The SFCC classification is based on single-run electrofishing events rather than fully-quantitative sampling (density based on number of fish captured during a single electrofishing run at each survey location). The classifications are based on data sets held by SFCC. The data held for the Moray Firth Region allows the fish abundance to be analysed in a regional context. Different classifications are provided for different stream width. The classifications presented in this report are based on stream widths of less than 4m and between 4-6m.

The SFCC single-run classification methodology produces a survey with a lower level of precision than that required to produce a full Environmental Impact Assessment (EIA), where

baseline information on fish populations prior to the Site will need to be collected, often for a number of years. When providing information for EIAs the SFCC recommends that fully-quantitative sampling is performed whenever possible.

The relevant classifications for the Loch Kemp survey locations fall within the Moray Firth region and are presented below (Table 4) for streams of <4m wide and streams of 4-6m wide

*Table 4. SFCC Fisheries Classification Scheme (Moray Firth Region – no. fish/100m<sup>2</sup> in streams <4m wide)*

Species/Age-class	A	B	C	D	E	F
Trout fry 0+	39.0+	21.0 - <39.0	14.3 - <21.0	5.9 - <14.3	<5.9	0
Trout parr >0+	18.1+	13.7 - <18.1	9.1 - <13.7	3.9 - <9.1	<3.9	0
Salmon fry 0+	86.8+	35.8- <86.8	22.6 - <35.8	8.6 - <22.6	<8.6	0
Salmon parr >0+	30.9+	18.9 - <30.9	11.7 - <18.9	5.3 - <11.7	<5.3	0
<b>Description</b>	<b>Excellent</b>	<b>Good</b>	<b>Moderate</b>	<b>Low</b>	<b>Very Low</b>	<b>Absent</b>

### 3.6 Macroinvertebrate Surveys

#### 3.6.1 Sampling

To collect aquatic macro-invertebrates, a combination of 'kick' sampling and 'sweep' sampling were deployed. Kick sampling was utilised on watercourses identified which had the potential to be affected by the Site. This is the standard method used when working in lotic water systems such as rivers less than 1m in depth, as the flow of water carries the invertebrates into the samplers' pond net after disturbance of the substratum. In lentic water systems such as those found in Loch Kemp, Loch Ness, Loch Cluanie, Loch Pàiteag and Lochan a' Choin Uire, sweep sampling is the preferred method of aquatic macro-invertebrate sampling. This relies 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).

Riverine samples were collected using the standard Scottish Environment Protection Agency / Environment Agency kick sample 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 pond 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. Loch samples were collected in a similar manner by kicking up the substrate and sweeping in a figure of eight motion to collect dislodged macroinvertebrates.

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 bucket (with a paper sample identification label also added to the sample container for security) for later extraction. The sample was fixed with bioethanol prior to sampling.

### 3.6.2 Analysis

The use of macro-invertebrates as indicators of water quality is an established technique and the standard method employed by Environmental Regulators such as the Scottish Environmental Protection Agency (SEPA) and the Environment Agency in England and Wales. The method is based on niche habitat requirements of different macro-invertebrate groups and their tolerance of pollution, and therefore changes in the chemical and physical nature of loch edge habitat or riverine will be reflected by changes in the composition of aquatic macro-invertebrate populations. The method is most commonly used to assess / monitor pollution levels in rivers and streams and is also used for the sampling of the shoreline of loch margins. The pollution tolerance of each invertebrate family is largely reflected in its presence or absence. A typical example is a tolerance of the crustacean (*Asellus aquaticus*) water hog-louse to organic pollution, such that it can populate locations unsuitable for other species such as another crustacean species, *Gammarus pulex*. These differences in the sensitivity of different groups to environmental perturbation mean that by annually monitoring the invertebrate population composition at a site of interest, it is possible to infer deterioration or improvement in water quality.

To simplify the analysis, a widely accepted scoring system has been devised whereby each family of aquatic macro-invertebrates is allocated a score based on its pollution tolerance. For a given population at a given time, the scores can be used to calculate a single index that summarises the composition of a macroinvertebrate population. By establishing this index annually for a given site, it is possible to monitor changes in water quality.

BMWP Scores (Biological Monitoring Working Party) were assigned to taxa defined by Maitland (1977), so each taxa is allocated a value from 1 to 10 depending on its known tolerance to organic pollution, the high the score indicates lower tolerance. ASPT (Average Score Per Taxon) is calculated by summing the BMWP scores for all taxa present at the survey site and dividing it by the total number of BMWP taxa present. All macro invertebrate summary tables for surveyed sites can be found in Tables 15 and 16.

The use of macro-invertebrate populations to monitor water quality is often preferable to monitoring changes in water chemistry as invertebrates integrate the effects of changes in water quality over time, whereas the chemical composition of a watercourse may fluctuate widely according to the timing of external influences.

In interpreting the causes of changes in invertebrate populations, it is important to separate the potential effects of anthropogenic changes, such as pollution, from the naturally arising effects of changes in the physical nature of watercourses such as water levels, flow rates, and substrate type, all of which are important factors determining the composition of aquatic invertebrate populations.

## 4 Results

### 4.1 Desk Study

#### 4.1.1 Review of Mapping

##### Scotland's Environment Web

Within the desk study, barriers to fish migration were searched for using Scotland's Environment Web on stretches of watercourses potentially affected by the Site. No natural impassable barriers were identified on Allt a Chinn Mhonaich, Allt an t-Sluichd, and the outflow Lochan a' Choin Uire. However, steep gradients were identified on OS mapping on each of these three tributaries which will create impassable barriers for migratory fish. Steep gradients and waterfall structures were also encountered at the time of surveying.

The watercourses within the site boundary are therefore unlikely to have migratory salmonids present. There are expected to be isolated populations of resident fish such as wild brown trout *Salmo trutta* throughout the site and rainbow trout *Oncorhynchus mykiss* which are stocked within Loch Pàiteag for recreational fishing.

#### 4.1.2 Classified Waterbodies

Loch Kemp, Lochan a' Choin Uire, Loch Pàiteag and the surrounding tributaries on the site are not classified waterbodies under the SEPA's aquatic classification mapping source.

Loch Ness (ID 100156) is classified by SEPA. It is 55.3 square kilometres in area. SEPA classified Loch Ness in 2020 as having an overall status of *Good*, an overall ecology status of *Good*, a macroinvertebrate status of *High*, a fish status of *High* and a fish barrier status of *High*.

#### 4.1.3 Designated Sites

Within the desk study, protected areas and designated conservation sites were searched for using NatureScot Sitelink on stretches of watercourses potentially affected by the Site. Search findings proclaim Allt a Chinn Mhonaich, Allt an t-Sluichd, and the outflow Lochan a' Choin Uire which all flow into the Loch Ness are within the boundary of a Special Area of Conservation (SAC) for the Ness Woods and a site of special scientific interest for the Easter Ness Forest. Neither of these designated sites however have aquatic qualifying interests.

The River Moriston SAC is within 2km of the site, first designated in 2005. Qualifying interests for which the site is designated include freshwater pearl mussel *Margaritifera margaritifera* (primary reason for selection) and Atlantic salmon *Salmo salar*. The freshwater pearl mussel population is considered in an unfavourable condition (no change) (last updated in 2018). Salmon are in an unfavourable condition (no change) (last updated in 2011). The River Moriston SAC in proximity to the Proposed Development is shown in **Appendix A - Figure 1.2**.

### 4.2 Fish Habitat Assessment

#### 4.2.1 Riverine Fish Habitat Assessment

Table 5 presents a summary of the fish habitat characteristics recorded in July 2022 within the riverine survey locations (**Table 2**). Associated figures (**Figures 2.1 – 2.9**) are presented in **Appendix A**.

Table 5. Riverine Fish Habitat Assessment (July 2022)

Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
TS1 Allt an t-Sluichd	NH 46770 16854 - NH 46819 17093	<p>The channel wet width was ~1.3 – 2.7 m. The flow types were predominantly a sequence of still marginal/ deep pool/ shallow pool/ shallow glide/ run/ riffle. The water depth was predominantly &lt;10 – 40 cm. The substrate was predominately gravel, pebble, cobbles, boulder and bedrock. These substrates provided good instream cover especially for trout fry. The bankside cover was low with limited bank undercutting and draping vegetation. Bare bank was observed on both banks (80%). There was 80% canopy cover present with 75% over hanging boughs along both banks.</p> <p>Suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles. This area was deemed sub-optimal due to reduced flow therefore, reducing well oxygenated patches throughout the transect.</p> <p>The adjacent land use was largely moorland heath, broadleaved woodland and road. This stretch of river had various factors which may affect its suitability to support fish, namely potential run off from an upstream ford, poaching from livestock, lack of bankside coverage, rock jams and impassable falls further down the catchment.</p>	Moderate	Sub-Optimal
TS2 Allt an t-Sluichd	NH 46819 17093 - NH 46918 17317	<p>The channel wet width was ~2.6 – 2.7 m. The flow types were predominantly a sequence of still marginal/ deep pool/ shallow glide/ run/ riffle. The water depth was predominantly &lt;10 – 30 cm. The substrate was predominately gravel, pebble, cobble and boulder. These substrates provided good instream cover especially for trout fry. The bankside cover was poor with limited bank undercutting and predominantly bare bank faces. Total fish cover was deemed low across both banks. There was 40% canopy cover present with 40-60% over hanging boughs along both banks present.</p> <p>Suitable substrate for salmonid spawning was present in areas where there was a combination of uncompacted gravels and pebbles though this only made up a small proportion of the survey location. This area was also deemed sub-optimal for salmonid spawning potential due to reduced flow therefore, reducing oxygenation of the substrate.</p> <p>The adjacent land use was largely moorland heath and broadleaved woodland. This stretch of river had limiting factors which would affect its suitability to support fish, namely impassable falls further down the catchment, poaching from livestock, increased leaf litter and high organic matter build-up and impassable falls further down the catchment.</p>	Good	Sub-Optimal
KP1 Unnamed Tributary	NH 47235 16414 - NH 47311 16418	<p>The channel wet width was ~1.3 – 1.6 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ run / riffle. The water depth was predominantly &lt;10 – 20 cm. The substrate was predominately sand, limited gravel, pebble and cobbles. These substrates provided good instream cover especially for trout fry. Lack of water depth was however a limiting factor for instream cover.</p>	Moderate	Sub-Optimal



Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
		<p>Both banks provided good bankside cover through draping vegetation and undercut banks, especially on the right bank. There was no canopy cover present.</p> <p>Suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles. This area was deemed sub-optimal due to reduced flow therefore, reducing well oxygenated patches throughout the transect. There was good connectivity with Loch Kemp.</p> <p>The adjacent land use was largely moorland heath and open water (Loch Kemp). This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of flow and high organic matter build-up.</p>		
KP2 Unnamed Tributary	NH 47311 16418 – NH 47471 16428	<p>The channel wet width was ~0.5 - 1.0 m. The flow types were predominantly a sequence of still marginal/ deep pool/ shallow pool. The water depth was predominantly &lt;10 – 40 cm. The substrate was predominately high organic matter. This substrate did not provide good instream cover for any fish species. The bankside cover was relatively good with both banks presenting with high coverage through draping vegetation. There was no canopy cover present.</p> <p>No suitable substrate for salmonid spawning was present in this survey location area due to 80% high organic matter and 20% sand coverage. This area was deemed unsuitable for salmonid spawning due to the reduction in oxygenated water and no suitable spawning substrates present.</p> <p>The adjacent land use was largely moorland heath and a small section of open water (Loch Cluanie). This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of flow and the high organic matter substrate offering no instream cover or spawning potential.</p>	Poor	Unsuitable
KP3 Unnamed Tributary	NH 47555 16368 – NH 47804 16200	<p>The channel wet width was ~0.5 – 0.9 m. The flow types were predominantly a sequence of still marginal/ deep pool/ deep glide. The water depth was predominantly &lt;10 - &gt;50 cm. The substrate was predominately high organic matter/ sand. This substrate did not provide good instream cover for any fish species. The bankside cover was relatively good with both banks presenting with high coverage through undercut and some draping vegetation. There was no canopy cover present.</p> <p>No suitable substrate for salmonid spawning was present in this survey location area due to 80% high organic matter and 20% sand coverage. This area was deemed unsuitable for salmonid spawning due to the reduction in oxygenated water and no suitable spawning substrates present.</p> <p>The adjacent land use was largely moorland heath and a small section of open water (Loch Cluanie). This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of flow and the high organic matter substrate.</p>	Poor	Unsuitable
KP4	NH 47804 16200 –	<p>The channel wet width was ~0.35 – 0.75 m. The flow types were predominantly a sequence of still marginal/ deep pool/ deep glide. The water depth was</p>	Poor	Unsuitable

Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
Unnamed Tributary	NH 47843 16121	<p>predominantly &lt;10 - &gt;50 cm. The substrate was predominately high organic matter/ sand. This substrate did not provide good instream cover for any fish species. The bankside cover was relatively good with both banks presenting with high coverage through undercut and some draping vegetation. There was no canopy cover present.</p> <p>No suitable substrate for salmonid spawning was present in this survey location area due to 80% high organic matter and 20% sand coverage. This area was deemed unsuitable for salmonid spawning due to the reduction in oxygenated water and no suitable spawning substrates present.</p> <p>The adjacent land use was largely moorland heath and a small section of open water (Loch Cluanie). This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of flow and the high organic matter substrate.</p>		
KP5 Unnamed Tributary	NH 47809 16203 – NH 47828 16125	<p>The channel wet width was ~0.35 – 0.75 m. The flow types were predominantly a sequence of still marginal/ deep pool/ deep glide. The water depth was predominantly &lt;10 - &gt;50 cm. The substrate was predominately high organic matter/ sand. This substrate did not provide good instream cover for any fish species. The bankside cover was relatively good with both banks presenting with high coverage through undercut and some draping vegetation. There was no canopy cover present.</p> <p>No suitable substrate for salmonid spawning was present in the transect area due to 80% high organic matter and 20% sand coverage. This survey location was deemed unsuitable for salmonid spawning due to the reduction in oxygenated water and no suitable spawning substrates present.</p> <p>The adjacent land use was largely moorland heath and conifer plantation. This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of flow, low light penetration and the high organic matter substrate.</p>	Poor	Unsuitable
KP6 Unnamed Tributary	NH 47843 16121 – NH 47764 15924	<p>The channel wet width was ~0.3 – 0.8 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ riffle. The water depth was predominantly &lt;10 – 30 cm. The substrate was predominately high organic matter, gravel, pebble, cobbles and boulder. These substrates provided moderate instream cover especially for trout fry.</p> <p>Both banks provided good bankside cover through high draping vegetation and undercut banks. There was 70% canopy cover present.</p> <p>Only limited sub-optimal spawning substrate was present in areas where there was a combination of uncompacted gravels and pebbles though this made up a very small proportion of the survey area. The survey location was deemed unsuitable for spawning due to lack of flow, reducing the availability of well oxygenated patches of substrate.</p> <p>The adjacent land use was largely moorland heath and conifer plantation. This stretch of river had limiting factors which would affect its suitability to</p>	Moderate	Unsuitable

Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
		support fish, namely lack of flow and increased leaf litter and high organic matter build-up.		
KP7 Unnamed Tributary	NH 47764 15924 – NH 47798 15710	<p>The channel wet width was ~0.4 – 0.95 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ shallow glide/ run/ riffle. The water depth was predominantly &lt;10 - 20cm. The substrate was predominately high organic matter, sand, gravel, pebble, cobbles, and boulder. These substrates provided moderate instream cover especially for trout fry. The bankside cover was poor along both banks presenting large sections of bare areas along the banks. (75-80%). Small area sections of undercut banks were present along the left (20%) and right (15%) bank. Additionally, there was limited vegetation draping, reducing fish coverage considerably (20-25%). There was 45% canopy cover present with 20-55% over hanging boughs along both banks present.</p> <p>Unsuitable substrate for salmonid spawning was present in areas where there were a combination of high organic matter, cobbles and boulders. However, sub-optimal substrate was present in areas where there was a combination of uncompacted gravels and pebbles though this made up a very small proportion of the survey area. The survey location was deemed unsuitable for spawning due to lack of flow, reducing the availability of well oxygenated patches of substrate.</p> <p>The adjacent land use was largely moorland heath and conifer plantation. This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of flow and increased leaf litter and high organic matter build-up.</p>	Moderate	Unsuitable
KP8 Unnamed Tributary	NH 47804 15705 – NH 47797 15559	<p>The channel wet width was ~0.3 – 0.45 m. The flow types were predominantly a sequence of still marginal/ deep pool/ shallow pool/ shallow glide/ run/ riffle. The water depth was predominantly &lt;10 – 40 cm. The substrate was predominately high organic matter with sand, gravel, pebble and cobbles. These substrates provided moderate instream cover especially for trout fry. The bankside cover was poor along both banks with large sections of bare areas along both banks. Limited cover was provided by undercut banks and draping vegetation along both banks. There was 30% canopy cover present with 30-35% over hanging boughs along both banks present.</p> <p>Unsuitable substrate for salmonid spawning was predominately present in areas where there were a combination of high organic matter and sand. However, sub-optimal substrate was present in areas where there was a combination of uncompacted gravels and pebbles though this made up a very small proportion of the survey area. The survey location was also deemed unsuitable for spawning habitat due to reduced flow therefore, reducing well oxygenated patches throughout and also due to lack of suitable substrate. The adjacent land use was largely moorland heath and conifer plantation. This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of flow and increased leaf litter and high organic matter build-up.</p>	Low	Unsuitable

Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
KP9 Unnamed Tributary	NH 47612 15442 – NH 47597 15440	<p>The channel wet width was ~0.4 – 0.6 m. The flow types were predominantly a sequence of still marginal/shallow pool/ shallow glide/run /riffle. The water depth was predominantly &lt;10 – 30 cm. The substrate was predominately sand, gravel, pebble and cobbles. These substrates provided good instream cover especially for trout fry.</p> <p>Moderate bankside cover was provided by undercut along both banks and limited draping and marginal vegetation, with the remainder of the bankside recorded as bare. There was 75% canopy cover present.</p> <p>Suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles. This survey location was however deemed sub-optimal for salmonid spawning due to reduced flow, therefore, reducing well oxygenated patches throughout the survey area.</p> <p>The adjacent land use was largely moorland heath and conifer plantation. This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of flow and build up of organic matter.</p>	Moderate	Sub-Optimal
KP10 Unnamed Tributary	NH 47597 15440 – NH 47415 15409	<p>The channel wet width was ~0.5 – 3.0 m. The flow types were predominantly a sequence of still marginal/ riffle. The water depth was predominantly &lt;10 – 20 cm. The substrate was predominately high organic matter, sand, gravel, pebble, cobbles, and boulder. These substrates provide moderate to good instream cover especially for trout fry. The bankside cover was good with undercut and draping vegetation present along both banks. There was 90% canopy cover present.</p> <p>Limited suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles though this made up a very small proportion of the survey area. Unsuitable substrate such as high organic matter, cobbles and boulders were observed. This survey location was also deemed unsuitable for salmonid spawning due to reduced flow therefore, reducing well oxygenated patches throughout the survey area and also due to lack of available suitable substrate.</p> <p>The adjacent land use was largely moorland heath conifer plantation and open water (Loch Pàiteag). This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of flow, increased leaf litter and high organic matter build-up.</p>	Moderate	Unsuitable
LG1 Allt Leachd Gowerie	NH 46980 16068 – NH 46874 15892	<p>The channel wet width was ~1.9 – 5.0 m. The flow types were predominantly a sequence of still marginal/ deep pool/ shallow pool/ deep glide/ riffle. The water depth was predominantly &lt;10 - &gt;50 cm. The substrate was predominately high organic matter, silt, pebble, cobble, and boulder. This substrate provided moderate instream cover especially for trout parr and adults. The bankside cover was relatively good with both banks presenting with high coverage through draping vegetation and sections of undercut bank. The remainder of the</p>	Moderate	Unsuitable

Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
		<p>banksides were recorded as bare. There was limited canopy cover present (20%).</p> <p>The survey location was deemed unsuitable for salmonid spawning due to reduced flow therefore, reducing well oxygenated patches throughout the transect and also due to high organic and larger substrates providing a lack of suitable substrate for spawning across the survey area.</p> <p>The adjacent land use was largely moorland heath and open water (Loch Kemp). This stretch of river had various factors which would affect its suitability to support fish, namely lack of suitable spawning substrates and lack of substrate to support juvenile salmonids.</p>		
LG2 Allt Leachd Gowerie	NH 46874 15892 – NH 46732 15712	<p>The channel wet width was ~0.80 – 1.9 m. The flow types were predominantly a sequence of still marginal/ deep pool/ shallow pool/ deep glide. The water depth was predominantly &lt;10 - 50 cm. The substrate was predominately high organic matter, sand, gravel, pebble, cobble, and boulder. This substrate provides moderate to good instream cover for juvenile and adult trout. The bankside cover was relatively good with both banks presenting with high coverage through draping vegetation and undercut banks. There was no canopy cover present.</p> <p>Suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles. Unsuitable substrate such as high organic matter, silt, cobbles and boulders were however present. The survey location was deemed sub-optimal for spawning based on low flow the lack of availability of suitable substrate present.</p> <p>The adjacent land use was largely moorland heath and coniferous plantation. This stretch of river had limiting factors which would affect its suitability to support fish, namely potential impacts on water quality from plantations and limited spawning substrates.</p>	Good	Sub-Optimal
LG3 Allt Leachd Gowerie	NH 46698 15497 – NH 46732 15712	<p>The channel wet width was ~1.25 – 2.20 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ shallow glide/ run/ riffle. The water depth was predominantly &lt;10 - 30 cm. The substrate was predominately high organic matter, sand, gravel, pebble, cobble, boulder and bedrock. This substrate provided moderate instream cover for salmonids.</p> <p>Limited bankside cover was provided by undercut and marginal vegetation on both banks. There was limited canopy cover present (30%).</p> <p>Suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles though this made up a small proportion of the survey area. Unsuitable substrate such as high organic matter, cobbles, boulders and bedrock were also observed. This survey location was deemed sub-optimal for salmonid spawning due to reduced flow therefore, reducing well oxygenated patches throughout the survey area and also due to lack of available suitable substrate.</p>	Moderate	Sub-Optimal

Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
		The adjacent land use was largely moorland heath, conifer plantations and broadleaved woodland. This stretch of river had limiting factors which would affect its suitability to support fish, namely potential impacts on water quality from forestry, erosion of the bankside over time and overall substratum coverage.		
LG4 Allt Leachd Gowerie	NH 46802 15372 – NH 46698 15497	<p>The channel wet width was ~1.0 – 1.5 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ shallow glide/ run/ riffle. The water depth was predominantly &lt;10 - 30 cm. The substrate was predominately high organic matter, sand, gravel, pebble, cobble, and boulder. This substrate provides moderate to good instream cover for juvenile trout.</p> <p>The bankside cover was low to moderate with both banks presenting with bare bank sections with limited undercut bank and marginal vegetation. There was limited canopy cover present (15%).</p> <p>Limited suitable salmonid spawning habitat was present. Unsuitable substrate such as high organic matter, cobbles and boulders were observed. The survey location was deemed unsuitable due to reduced flow therefore, reducing well oxygenated patches throughout the transect and due to lack of suitable substrate for spawning across the survey area.</p> <p>The adjacent land use was largely moorland heath and conifer plantation. This stretch of river had limiting factors which would affect its suitability to support fish, namely potential impacts on water quality from plantations and limited salmonid spawning habitats.</p>	Moderate	Unsuitable
LG5 Allt Leachd Gowerie	NH 46935 15272 – NH 46802 15372	<p>The channel wet width was ~1.0 – 1.9 m. The flow types were predominantly a sequence of still marginal/ deep pool/ shallow pool/ shallow glide/ run/ riffle. The water depth was predominantly &lt;10 - 40 cm. The substrate was predominately high organic matter, sand, gravel, pebble, cobble, boulder and bedrock. This substrate provides moderate to good instream cover for juvenile trout.</p> <p>The bankside cover was low to moderate with both banks presenting with bare bank sections (60-65%). Limited undercutting provided some cover on both banks. There was no canopy cover present.</p> <p>Suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles. Unsuitable substrate such as high organic matter, cobbles, boulders and bedrock were also observed. The survey location was deemed sub-optimal due to suitable spawning habitats being present though in small quantities. Additionally low flow was observed during the survey and reduced flow has the ability to impact on potential spawning sites displaying a reduction in high oxygen richness which is required.</p> <p>The adjacent land use was largely moorland heath and conifer plantations. This stretch of river had limiting factors which would affect its suitability to support fish, namely potential impacts on water quality from plantations.</p>	Moderate	Sub-Optimal

Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
LG6 Allt Leachd Gowerie	NH 46949 15090 – NH 46935 15272	<p>The channel wet width was ~0.6 – 1.5 m. The flow types were predominantly a sequence of still marginal/ deep pool/ shallow pool/ shallow glide/ run/ riffle. The water depth was predominantly &lt;10 - &gt;50 cm. The substrate was predominately high organic matter with some sand, gravel, pebble, cobble and boulder. This substrate provides low instream cover for juvenile trout.</p> <p>Moderate bankside cover was provided on both banks by undercut and some draping vegetation. The remainder of the banksides were recorded as bare. There was limited canopy cover present (10%).</p> <p>The survey location was deemed unsuitable for salmonid spawning due to reduced flow therefore, reducing well oxygenated patches throughout the survey area and also due to predominantly high organic and larger substrates providing a lack of suitable substrate for spawning across the survey area.</p> <p>The adjacent land use was largely moorland heath and conifer plantations. This stretch of river had limiting factors which would affect its suitability to support fish, namely potential impacts on water quality from plantations and the proportion of high organic substrate.</p>	Low	Unsuitable
LG7 Allt Leachd Gowerie	NH 46935 15272 – NH 46930 14977	<p>The channel wet width was ~0.3 – 0.9 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ shallow glide. The water depth was predominantly &lt;10 - 20 cm. The substrate was predominately high organic matter, with some sand, gravel and pebble. This substrate provides low to moderate instream cover for trout fry.</p> <p>Poor bankside cover was provided on both banks with predominantly bare bank faces present. There was high canopy cover present (90%).</p> <p>The survey location was deemed unsuitable for salmonid spawning due to reduced flow therefore, reducing well oxygenated patches throughout the survey area and also due to predominantly high organic matter providing a lack of suitable substrate for spawning across the survey area.</p> <p>The adjacent land use was largely moorland heath and conifer plantations. This stretch of river had limiting factors which would affect its suitability to support fish, namely potential impacts on water quality from plantations and the proportion of high organic substrate.</p>	Low	Unsuitable
LG8 Allt Leachd Gowerie	NH 46930 14977 – NH 47027 14727	<p>The channel wet width was ~0.3 – 0.9 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ shallow glide. The water depth was predominantly &lt;10 - 20 cm. The substrate was predominately high organic matter with some sand, gravel and pebble. This substrate provides low to moderate instream cover for trout fry.</p> <p>Poor bankside cover was provided on both banks with predominantly bare bank faces present. There was high canopy cover present (90%).</p> <p>The survey location was deemed unsuitable for salmonid spawning due to reduced flow therefore,</p>	Low	Unsuitable

Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
		<p>reducing well oxygenated patches throughout the survey area and also due to predominantly high organic matter providing a lack of suitable substrate for spawning across the survey area.</p> <p>The adjacent land use was largely moorland heath and conifer plantations. This stretch of river had limiting factors which would affect its suitability to support fish, namely potential impacts on water quality from plantations, lack of light penetration and the proportion of high organic substrate.</p>		
LCU1 Outflow from Lochan a' Choin Uire	NH 46156 16456 – NH 46017 16626	<p>The channel wet width was ~0.4 – 1.6 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ run/ riffle. The water depth was predominantly &lt;10cm. The substrate was predominately high organic matter with sand, gravel, pebble and cobbles. These substrates provided poor instream cover for juvenile trout. The bankside cover was poor with limited bank undercutting predominantly bare bank observed. There was 5% canopy cover present.</p> <p>The survey location was deemed unsuitable for salmonid spawning due to reduced flow therefore, reducing well oxygenated patches throughout the survey area and also due to predominantly high organic matter resulting in compaction of the substrate.</p> <p>The adjacent land use was largely moorland heath and rough pasture. This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of light penetration, lack of flow, high organic matter build-up and impassable barriers further down the catchment. A rock jam was also identified near the outlet of Lochan a' Choin Urie and this stretch of river was noted as dry in September 2022.</p>	Poor	Unsuitable
LCU2 Outflow from Lochan a'Choin Uire	NH 46017 16626 - NH 45914 16599	<p>The channel wet width was ~0.4 – 1.0 m. The flow types were predominantly a sequence of still marginal/ run/ riffle. The water depth was predominantly &lt;10 – 20 cm. The substrate was predominately high organic matter, pebble, cobble, boulder and bedrock. Both gravel and pebble provide some limited instream cover for trout fry. The bankside cover was low to moderate with some undercut present on both banks. There was no canopy cover present.</p> <p>The survey location was deemed unsuitable for salmonid spawning due to reduced flow therefore, reducing well oxygenated patches throughout the survey area and also due to predominantly high organic matter resulting in compaction of the substrate.</p> <p>The adjacent land use was largely moorland heath and rough pasture. This stretch of river had limiting factors which would affect its suitability to support fish, namely lack of light penetration, lack of flow, high organic matter build-up, impassable barriers further down the catchment and this stretch of river was noted as dry in September 2022.</p>	Poor	Unsuitable
LCM1	NH 45934 15702 -	The channel wet width was ~0.8 – 1.0 m. The flow types were predominantly a sequence of still	Moderate	Unsuitable



Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
Allt a' Chinn Mhonaich	NH 45810 15844	<p>marginal/ shallow pool/ run/ riffle. The water depth was predominantly &lt;10 - 20 cm. The substrate was predominately high organic matter, sand, gravel, pebble, cobble, boulder and bedrock. This substrate provided moderate instream cover for trout fry.</p> <p>Moderate bankside cover was provided by undercut, especially on the right bank with undercut providing limited bankside cover on the left bank.</p> <p>Limited areas of suitable substrate for salmonid spawning were present. Unsuitable substrate such as high organic matter, cobbles, boulders and bedrock were observed. The survey location was also deemed unsuitable due to low flows which has the ability to impact on potential spawning sites.</p> <p>The adjacent land use was largely moorland heath and road (ford present). This stretch of river had a limiting factors which would affect its suitability to support fish, namely poaching from livestock, part-compaction of the substrate from high organic matter and impassable falls further down the catchment. Good access for fish is available to Lochan a' Chinn Mhonaich which may be used as a refuge during periods of low flow.</p>		
LCM2 Allt a'Chinn Mhonaich	NH 45809 15843 – NH 45788 15880	<p>The channel wet width was ~0.8 – 1.5 m. The flow types were predominantly a sequence of still marginal/ deep pool/ shallow pool/ run/ riffle. The water depth was predominantly &lt;10 - 50cm. The substrate was predominately gravel, pebble, cobble and boulder. This substrate provided moderate instream cover for juvenile trout.</p> <p>Moderate bankside cover was provided on both banks through undercutting. There was no canopy cover present.</p> <p>Limited suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles. This area was deemed unsuitable however due to the gradient of the transect.</p> <p>The adjacent land use was largely moorland heath and rough pasture. This stretch of river had limiting factors which would affect its suitability to support fish, namely steep gradient and impassable falls immediately downstream.</p>	Moderate	Unsuitable
LCM3 Allt a' Chinn Mhonaich	NH 45572 16057 – NH 45528 16044	<p>The channel wet width was 1.3 - 1.5 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ run/ riffle. The water depth was predominantly &lt;10 - 20cm. The substrate was predominately gravel, pebble, cobble, boulder and bedrock. This substrate provided moderate instream cover for juvenile trout. Bankside cover was limited. There was &lt;5% canopy cover present.</p> <p>Limited suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles. This area was deemed unsuitable however due to the steepness of the gradient.</p> <p>The adjacent land use was largely moorland heath and rough pasture. This stretch of river had limiting factors which would affect its suitability to support</p>	Moderate	Unsuitable

Survey Location	Grid Reference	Reach Description and Limiting Factors	Fish Habitat Quality	Spawning Habitat Potential
		fish, namely steep gradient and impassable falls immediately downstream.		
LCM4 Allt a' Chinn Mhonaich	NH 45143 16184 – NH 45087 16220	<p>The channel wet width was ~ 1.1 - 1.6 m. The flow types were predominantly a sequence of still marginal/ shallow pool/ shallow glide/ run/ riffle. The water depth was predominantly &lt;10 – 30 cm. The substrate was predominately pebble, cobble, boulder, and bedrock. This substrate provides excellent instream cover for juvenile salmonids. The bankside cover was poor with total fish cover 10% across both banks. There was 30% canopy cover present.</p> <p>Limited suitable substrate for salmonid spawning was present in areas where there were a combination of uncompacted gravels and pebbles. There is a large impassable waterfall immediately upstream. It is possible that migratory fish could use this site when water levels are higher and fish can enter from Loch Ness.</p>	Good	Sub-Optimal

#### 4.2.1 Loch Fish Habitat Assessment

The below tables summarise the fish habitat characteristics recorded within Loch Kemp, Loch Ness, Lochan a' Choin Uire and Loch Pàiteag (July 2022) from both the shorelines and boat transects. Associated figures (**Figures 3.1 – 3.5**) are presented in **Appendix A**.

*Table 6. Loch Kemp Shoreline Fish Habitat Survey*

Transect	Grid Reference	Substrate Type %										Spawning Habitat Potential
		BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
LKS1	NH 46752 16845 – NH 46728 16821	0	<5	<5	5	60	35	0	0	0	0	Sub-Optimal
LKS2	NH 46728 16821 – NH 46714 16777	0	<5	5	<5	65	25	0	0	0	0	Unsuitable
LKS3	NH 46714 16777 – NH 46700 16702	0	5	10	15	60	15	0	0	0	0	Sub-Optimal
LKS4	NH 46700 16702 – NH 46687 16659	0	5	10	20	55	10	0	0	0	0	Sub-Optimal
LKS5	NH 46687 16659 – NH 46678 16581	0	10	55	20	10	5	0	0	0	0	Sub-Optimal
LKS6	NH 46678 16581 – NH 46627 16565	90	5	5	0	0	0	0	0	0	0	Unsuitable
LKS7	NH 46627 16565 – NH 46590 16468	0	10	30	30	15	15	0	0	0	0	Sub-Optimal
LKS8	NH 46590 16468 – NH 46605 16390	5	10	60	10	10	5	0	0	0	0	Sub-Optimal
LKS9	NH 46605 16390 – NH 46592 16366	60	5	5	10	10	10	0	0	0	0	Unsuitable
LKS10	NH 46592 16366 – NH 46661 16271	0	5	10	15	10	50	5	0	0	5	Unsuitable
LKS11	NH 46661 16271 – NH 46713 16315	5	5	0	0	5	10	50	0	0	25	Unsuitable
LKS12	NH 46713 16315 – NH 46721 16255	0	5	35	40	15	5	0	0	0	0	Sub-Optimal
LKS13	NH 46721 16255 – NH 46946 16123	0	0	0	0	0	0	0	0	100	0	Sub-Optimal
LKS14	NH 46752 16845 – NH 46792 16846	0	0	10	20	30	40	0	0	0	0	Unsuitable

Transect	Grid Reference	Substrate Type %										Spawning Habitat Potential
		BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
LKS15	NH 46792 16846 - NH 46799 16794	0	0	25	40	15	20	0	0	0	0	Unsuitable
LKS16	NH 46799 16794 - NH 46825 16780	0	30	30	20	0	20	0	0	0	0	Sub-Optimal
LKS17	NH 46825 16780 - NH 46839 16748	0	0	10	30	40	20	0	0	0	0	Unsuitable
LKS18	NH 46839 16748 - NH 46859 16641	5	15	40	40	0	0	0	0	0	0	Unsuitable
LKS19	NH 46859 16641- NH 46907 16615	20	50	20	0	0	10	0	0	0	0	Unsuitable
LKS20	NH 46907 16615 - NH 46926 16598	0	0	30	20	10	40	0	0	0	0	Unsuitable
LKS21	NH 46926 16598 - NH 47025 16538	10	80	10	0	0	0	0	0	0	0	Unsuitable
LKS22	NH 47025 16538 - NH 47062 16535	0	20	70	0	10	0	0	0	0	0	Unsuitable
LKS23	NH 47062 16535 - NH 47143 16495	0	20	70	0	10	0	0	0	0	0	Unsuitable
LKS24	NH 47143 16495 - NH 47174 16469	0	5	10	10	25	50	0	0	0	0	Sub-Optimal
LKS25	NH 47174 16469 - NH 47199 16454	10	80	10	0	0	0	0	0	0	0	Unsuitable
LKS26	NH 47199 16454 - NH 47227 16393	0	5	5	5	70	15	0	0	0	0	Optimal
LKS27	NH 47227 16393 - NH 47189 16344	0	50	40	10	0	0	0	0	0	0	Unsuitable
LKS28	NH 47189 16344 - NH 47218 16285	0	50	40	10	0	0	0	0	0	0	Unsuitable
LKS29	NH 47218 16285 - NH 47226 16253	0	10	10	10	30	40	0	0	0	0	Sub-Optimal
LKS30	NH 47226 16253 - NH 47142 16173	0	20	30	50	0	0	0	0	0	0	Sub-Optimal
LKS31	NH 47142 16173 - NH 47091 16165	0	5	25	60	10	0	0	0	0	0	Unsuitable
LKS32	NH 47091 16165 - NH 47066 16173	70	10	10	10	0	0	0	0	0	0	Unsuitable
LKS33	NH 47066 16173 - NH 47024 16103	0	10	10	25	10	20	0	0	0	25	Unsuitable

Table 7. Loch Kemp Boat Transect, Fish Habitat Survey

Transect	Transect Point	Grid Reference	Depth	Substrate Type %										Spawning Habitat Potential
				BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
LKB1	1.1	NH 46764 16745	6.3	0	0	0	10	0	90	0	0	0	0	Unsuitable
	1.2	NH 46768 16764	4.3	0	0	0	0	10	90	0	0	0	0	Unsuitable
	1.3	NH 46765 16783	2.7	0	0	0	0	10	90	0	0	0	0	Unsuitable
	1.4	NH 46760 16809	1.6	0	0	0	0	0	60	0	0	20	20	Unsuitable
	1.5	NH 46769 16811	1.4	0	0	10	10	0	40	0	0	20	20	Unsuitable
	1.6	NH 46767 16842	0.8	0	0	10	20	30	40	0	0	0	0	Sub-Optimal
LKB2	2.1	NH 46793 16783	0.9	0	30	30	0	0	20	0	0	20	0	Unsuitable
	2.2	NH 46787 16780	2.7	0	0	0	10	10	50	0	0	30	0	Unsuitable
	2.3	NH 46764 16773	2.5	0	0	0	0	10	60	0	0	30	0	Unsuitable
	2.4	NH 46742 16775	2.8	0	0	0	0	10	60	0	0	30	0	Unsuitable
	2.5	NH 46727 16766	0.8	0	0	10	70	5	10	0	0	5	0	Sub-Optimal
LKB3	3.1	NH 46713 16697	1.2	0	0	40	20	5	20	0	0	15	0	Unsuitable
	3.2	NH 46740 16695	6.6	0	0	0	0	10	50	10	0	30	0	Unsuitable
	3.3	NH 46780 16679	7.5	0	0	0	0	10	50	10	0	30	0	Unsuitable
	3.4	NH 46824 16679	2.7	0	0	0	0	10	50	10	0	30	0	Unsuitable
	3.5	NH 46839 16682	0.8	0	0	60	30	10	0	0	0	0	0	Unsuitable
LKB4	4.1	NH 46619 16553	1.6	0	0	50	30	0	20	0	0	0	0	Unsuitable
	4.2	NH 46631 16529	3.7	0	0	0	5	15	60	10	0	0	10	Unsuitable

Transect	Transect Point	Grid Reference	Depth	Substrate Type %										Spawning Habitat Potential
				BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
	4.3	NH 46650 16512	6.5	0	0	0	5	5	70	10	0	10	10	Unsuitable
	4.4	NH 46672 16473	8.1	0	0	0	5	5	70	10	0	10	10	Unsuitable
LKB5	5.1	NH 46618 16294	0.4	0	0	0	0	0	0	0	0	50	50	Unsuitable
	5.2	NH 46638 16310	1.3	0	0	0	0	0	20	0	0	40	40	Unsuitable
	5.3	NH 46643 16332	7.2	0	0	0	0	0	20	0	0	40	40	Unsuitable
	5.4	NH 46659 16348	9.5	0	0	0	0	0	20	0	0	40	40	Unsuitable
	5.5	NH 46657 16345	10	0	0	0	0	0	20	0	0	40	40	Unsuitable
LKB6	6.1	NH 46814 16288	7.8	0	0	0	0	0	20	0	0	40	40	Unsuitable
	6.2	NH 46786 16287	6.5	0	0	0	0	10	10	0	0	40	40	Unsuitable
	6.3	NH 46758 16271	1.4	0	0	0	10	10	20	0	0	20	40	Unsuitable
LKB7	7.1	NH 47235 16428	0.4	0	0	0	30	40	30	0	0	0	0	Optimal
	7.2	NH 47220 16423	0.6	0	0	25	40	20	15	0	0	0	0	Optimal
	7.3	NH 47200 16416	1.8	0	0	0	30	20	50	0	0	0	0	Unsuitable
	7.4	NH 47178 16404	5.1	0	0	0	0	0	50	0	25	0	25	Unsuitable
	7.5	NH 47150 16388	7.9	0	0	0	0	0	50	0	25	0	25	Unsuitable
	7.6	NH 47130 16390	9.9	0	0	0	0	30	50	0	10	0	10	Unsuitable
LKB8	8.1	NH 47156 16259	9.8	0	0	0	0	10	10	0	20	40	20	Unsuitable
	8.2	NH 47186 16276	6.6	0	0	0	0	10	20	0	20	30	20	Unsuitable
	8.3	NH 47201 16270	2.3	0	0	0	0	10	30	0	0	40	20	Unsuitable
	8.4	NH 47223 16269	1.6	0	0	0	0	5	80	0	0	15	0	Unsuitable

Transect	Transect Point	Grid Reference	Depth	Substrate Type %										Spawning Habitat Potential
				BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
LKB9	9.1	NH 47115 16402	9.8	0	0	0	0	0	40	0	0	0	60	Unsuitable
	9.2	NH 47137 16438	8.9	0	0	0	0	0	40	0	0	0	60	Unsuitable
	9.3	NH 47150 16448	7	0	0	0	0	0	40	0	0	0	60	Unsuitable
	9.4	NH 47157 16451	4.5	0	0	0	0	20	40	0	0	0	40	Unsuitable
	9.5	NH 47162 16454	2.2	0	0	0	0	20	40	0	0	0	40	Unsuitable
	9.6	NH 47168 16457	1.5	0	60	30	0	0	10	0	0	0	0	Unsuitable
LKB10	10.1	NH 46995 16502	8.4	0	0	0	0	0	40	0	0	0	60	Unsuitable
	10.2	NH 47010 16510	6.9	0	0	20	20	0	50	0	0	0	10	Unsuitable
	10.3	NH 47014 16517	5.1	0	0	40	0	0	60	0	0	0	0	Unsuitable
	10.4	NH 47015 16525	2.7	0	0	0	5	5	90	0	0	0	0	Unsuitable
	10.5	NH 47016 16532	0.5	0	40	40	0	0	20	0	0	0	0	Unsuitable
LKB11	11.1	NH 46816 16551	4	0	0	0	15	0	85	0	0	0	0	Unsuitable
	11.2	NH 46858 16599	5	0	0	0	0	0	40	0	0	0	60	Unsuitable
	11.3	NH 46869 16614	3	0	0	0	0	10	45	0	0	0	45	Unsuitable
	11.4	NH 46871 16625	1.8	0	40	50	0	0	10	0	0	0	0	Unsuitable

Table 8. Loch Ness Shoreline Transects Fish Habitat Survey

Transect	Grid Reference	Substrate Type %										Spawning Habitat Potential	
		BE	BO	CO	PE	GR	SA	SI	CL	HO	MU		
LNS1*	NH 44786 15826 - NH 44964 16107	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Unsuitable
LNS2	NH 44964 16107 - NH 45009 16171	10	50	40	0	0	0	0	0	0	0	0	Unsuitable
LNS3	NH 45009 16171 - NH 45033 16187	5	30	60	5	0	0	0	0	0	0	0	Unsuitable
LNS4	NH 45033 16187 - NH 45055 16203	0	30	60	10	0	0	0	0	0	0	0	Unsuitable
LNS5	NH 45055 16203 - NH 45076 16243	0	10	50	30	10	0	0	0	0	0	0	Sub-Optimal
LNS6	NH 45076 16243 - NH 45097 16264	0	0	60	20	20	0	0	0	0	0	0	Sub-Optimal
LNS7	NH 45097 16264 - NH 45129 16303	0	0	90	5	5	0	0	0	0	0	0	Unsuitable
LNS8	NH 45129 16303 - NH 45142 16326	20	10	20	25	25	0	0	0	0	0	0	Optimal
LNS9	NH 45142 16326 - NH 45172 16336	5	0	5	50	40	0	0	0	0	0	0	Optimal
LNS10	NH 45172 16336 - NH 45209 16398	80	5	5	5	5	0	0	0	0	0	0	Unsuitable
LNS11	NH 45209 16398 -	0	10	40	40	10	0	0	0	0	0	0	Sub-Optimal



Transect	Grid Reference	Substrate Type %										Spawning Habitat Potential
		BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
	NH 45314 16505											
LNS12	NH 45314 16505 - NH 45340 16550	0	5	5	15	70	5	0	0	0	0	Optimal
LNS13	NH 45340 16550 - NH 45405 16600	0	5	5	5	80	5	0	0	0	0	Optimal
LNS14	NH 45405 16600 - NH 45508 16702	0	50	50	0	0	0	0	0	0	0	Unsuitable
LNS15	NH 45508 16702 - NH 45573 16748	5	5	20	70	0	0	0	0	0	0	Sub-Optimal
LNS16	NH 45573 16748 - NH 45643 16871	0	10	5	20	65	0	0	0	0	0	Optimal
LNS17	NH 45643 16871 - NH 45747 16971	0	10	5	20	65	0	0	0	0	0	Optimal
LNS18	NH 45747 16971 - NH 45872 17127	20	0	10	10	60	0	0	0	0	0	Optimal
LNS19	NH 45872 17127 - NH 45929 17204	0	10	20	25	30	15	0	0	0	0	Optimal

\*N/A – shoreline inaccessible

Table 9. Loch Ness Boat Transect, Fish Habitat Survey

Transect	Survey Location	Grid Reference	Depth (m)	Substrate type %										Spawning Habitat Potential
				BO	BE	CO	PE	GR	SA	SI	CL	HO	MU	
LNB1	1.1	NH 45086 16236	0.4	0	5	60	10	20	5	0	0	0	0	Unsuitable
	1.2	NH 45081 16238	1	0	20	60	20	0	0	0	0	0	0	Unsuitable
	1.3	NH 45071 16258	8	0	0	20	20	0	60	0	0	0	0	Unsuitable
	1.4	NH 45068 16253	7.4	0	0	20	20	0	60	0	0	0	0	Unsuitable
	1.5	NH 45064 16262	10	0	0	0	10	0	80	0	0	0	10	Unsuitable
LNB2	2.1	NH 45148 16314	0.4	15	0	10	5	70	0	0	0	0	0	Optimal
	2.2	NH 45142 16314	1	0	0	25	60	15	0	0	0	0	0	Sub-Optimal
	2.3	NH 45118 16310	8.5	0	0	10	10	0	80	0	0	0	0	Unsuitable
	2.4	NH 45114 16307	7.8	0	10	0	10	0	80	0	0	0	0	Unsuitable
	2.5	NH 45095 16290	10	0	10	0	10	0	80	0	0	0	0	Unsuitable
LNB3	3.1	NH 45215 16384	0.4	10	0	25	50	15	0	0	0	0	0	Sub-Optimal
	3.2	NH 45208 16387	1.5	0	0	30	60	10	0	0	0	0	0	Sub-Optimal
	3.3	NH 45195 16402	2.8	0	0	0	80	0	20	0	0	0	0	Sub-Optimal
	3.4	NH 45191 16399	3.5	0	0	0	80	0	20	0	0	0	0	Sub-Optimal
	3.5	NH 45184 16397	5.5	0	0	0	20	0	80	0	0	0	0	Unsuitable
	3.6	NH 45200 16410	8	0	0	0	20	0	80	0	0	0	0	Unsuitable
LNB4	4.1	NH 45291 16476	0.4	0	5	40	45	0	10	0	0	0	0	Unsuitable
	4.2	NH 45282 16475	1	0	40	40	0	0	20	0	0	0	0	Unsuitable
	4.3	NH 45278 16476	1.2	0	0	80	10	0	10	0	0	0	0	Unsuitable
	4.4	NH 45267 16473	4	0	0	0	10	10	80	0	0	0	0	Unsuitable
	4.5	NH 45253 16472	2	0	0	0	10	10	80	0	0	0	0	Unsuitable
	4.6	NH 45246 16469	7.2	0	0	0	10	10	80	0	0	0	0	Unsuitable
	4.7	NH 45244 16468	7.5	90	0	0	5	5	0	0	0	0	0	Unsuitable
	4.8	NH 45240 16465	8.3	0	0	10	0	0	90	0	0	0	0	Unsuitable
	4.9	NH 45239 16464	9	0	0	0	0	20	80	0	0	0	0	Unsuitable
	4.10	NH 45235 16463	10	0	0	0	0	20	80	0	0	0	0	Unsuitable
LNB5	5.1	NH 45336 16542	0.4	0	5	5	50	50	0	0	0	0	0	Optimal
	5.2	NH 45329 16543	1	0	0	10	80	10	0	0	0	0	0	Sub-Optimal
	5.3	NH 45315 16544	1.9	0	0	30	30	30	10	0	0	0	0	Sub-Optimal
	5.4	NH 45312 16543	4	0	20	60	10	10	0	0	0	0	0	Unsuitable
	5.5	NH 45309 16541	6	0	0	10	10	0	80	0	0	0	0	Unsuitable

	5.6	NH 45307 16540	8	0	0	10	0	0	90	0	0	0	0	Unsuitable
	5.7	NH 45299 16540	10	0	0	10	0	0	90	0	0	0	0	Unsuitable
LNB6	6.1	NH 45421 16593	0.4	15	15	10	15	40	5	0	0	0	0	Sub-Optimal
	6.2	NH 45417 16595	0.6	0	25	40	20	0	15	0	0	0	0	Unsuitable
	6.3	NH 45415 16615	1.7	0	10	30	30	0	30	0	0	0	0	Unsuitable
	6.4	NH 45406 16618	6	0	0	0	0	0	100	0	0	0	0	Unsuitable
	6.5	NH 45403 16618	6.7	0	0	0	0	0	100	0	0	0	0	Unsuitable
	6.6	NH 45402 16620	10	0	0	0	0	0	100	0	0	0	0	Unsuitable
	LNB 7	7.1	NH 45496 16652	0.4	0	0	35	30	10	25	0	0	0	0
7.2		NH 45489 16655	0.6	0	25	40	10	0	25	0	0	0	0	Unsuitable
7.3		NH 45481 16671	3.8	0	20	5	5	0	70	0	0	0	0	Unsuitable
7.4		NH 45475 16673	5.8	0	15	15	0	0	70	0	0	0	0	Unsuitable
7.5		NH 45473 16674	6.7	0	0	20	0	0	80	0	0	0	0	Unsuitable
7.6		NH 45471 16675	8.9	0	0	20	0	0	80	0	0	0	0	Unsuitable
7.7		NH 45469 16676	10	0	0	0	10	0	90	0	0	0	0	Unsuitable
LNB8	8.1	NH 45551 16723	0.4	0	10	10	70	0	10	0	0	0	0	Sub-Optimal
	8.2	NH 45550 16724	0.7	0	0	50	40	0	0	10	0	0	0	Unsuitable
	8.3	NH 45537 16734	1.8	0	0	15	45	0	40	0	0	0	0	Unsuitable
	8.4	NH 45534 16735	5	0	0	50	0	0	50	0	0	0	0	Unsuitable
	8.5	NH 45530 16736	8.3	0	0	50	0	0	50	0	0	0	0	Unsuitable
	8.6	NH 45524 16737	10	0	0	50	0	0	50	0	0	0	0	Unsuitable
LNBC1	C1.1	NH 45004 16168	2	0	20	40	20	0	20	0	0	0	0	Unsuitable
	C1.2	NH 45001 16170	8	0	10	10	20	0	60	0	0	0	0	Unsuitable
	C1.3	NH 45000 16171	10	0	30	40	0	0	30	0	0	0	0	Unsuitable
LNBC6	C6.1	NH 45625 16813	0.4	0	20	5	70	5	0	0	0	0	0	Sub-Optimal
	C6.2	NH 45616 16812	1	0	5	40	40	15	0	0	0	0	0	Sub-Optimal
	C6.3	NH 45599 16834	4.1	0	10	40	10	0	40	0	0	0	0	Unsuitable
	C6.4	NH 45596 16834	6.5	0	0	0	10	0	90	0	0	0	0	Unsuitable
	C6.5	NH 45571 16825	10	0	0	0	0	0	100	0	0	0	0	Unsuitable
LNBC7	C7.1	NH 45679 16899	0.4	40	0	0	20	30	10	0	0	0	0	Unsuitable
	C7.2	NH 45676 16902	0.6	0	0	0	40	40	20	0	0	0	0	Optimal
	C7.3	NH 45674 16901	0.7	0	0	0	10	80	10	0	0	0	0	Sub-Optimal
	C7.4	NH 45665 16915	1.9	0	0	0	30	0	70	0	0	0	0	Unsuitable
	C7.5	NH 45661 16915	3.9	0	0	40	30	0	30	0	0	0	0	Unsuitable
	C7.6	NH 45657 16915	6	0	10	20	0	0	70	0	0	0	0	Unsuitable

	C7.7	NH 45652 16915	10	0	0	10	20	0	70	0	0	0	0	Unsuitable
LNBC8	C8.1	NH 45732 16937	0.4	20	10	0	10	30	30	0	0	0	0	Unsuitable
	C8.2	NH 45727 16938	0.9	0	10	20	60	0	10	0	0	0	0	Sub-Optimal
	C8.3	NH 45720 16951	1.9	0	10	10	10	0	70	0	0	0	0	Unsuitable
	C8.4	NH 45718 16951	2.6	0	10	10	10	0	70	0	0	0	0	Unsuitable
	C8.5	NH 45714 16952	5	0	10	10	10	0	70	0	0	0	0	Unsuitable
	C8.6	NH 45716 16954	8	0	0	0	0	0	100	0	0	0	0	Unsuitable
	C8.7	NH 45705 16957	9.9	0	0	5	0	0	95	0	0	0	0	Unsuitable
LNBC9	C9.1	NH 45811 17053	3.1	0	0	30	20	0	50	0	0	0	0	Unsuitable
	C9.2	NH 45812 17051	5	0	20	20	0	0	60	0	0	0	0	Unsuitable
	C9.3	NH 45807 17052	8.5	0	0	15	15	0	70	0	0	0	0	Unsuitable
	C9.4	NH 45802 17053	10	0	0	15	15	0	70	0	0	0	0	Unsuitable
LNBC10	C10.1	NH 45926 17196	1.7	0	0	0	60	20	20	0	0	0	0	Sub-Optimal
	C10.2	NH 45924 17196	5.6	0	0	0	60	20	20	0	0	0	0	Sub-Optimal
	C10.3	NH 45922 17195	6.5	0	0	0	60	20	20	0	0	0	0	Sub-Optimal
	C10.4	NH 45906 17190	7	0	0	40	40	20	0	0	0	0	0	Sub-Optimal

Table 10. Lochan a' Choin Uire Shoreline Transects Fish Habitat Survey

Transect	Grid Reference	Substrate Type %										Spawning Habitat Potential	
		BE	BO	CO	PE	GR	SA	SI	CL	HO	MU		
LCS1	NH 46134 16461 – NH 46144 16402	0	5	35	45	15	0	0	0	0	0	0	Sub-Optimal
LCS2	NH 46144 16402 – NH 46106 16335	0	5	40	0	0	0	10	0	0	45	0	Unsuitable
LCS3	NH 46106 16335 – NH 45979 16402	0	0	0	0	0	0	0	0	0	100	0	Unsuitable
LCS4	NH 45979 16402 – NH 46134 16461	0	5	5	5	5	0	0	0	0	0	0	Unsuitable
LCS5	NH 46134 16461 – NH 46020 16422	0	5	70	10	5	0	0	0	0	10	0	Unsuitable
LCS6	NH 46020 16422 – NH 46054 16426	80	10	10	0	0	0	0	0	0	0	0	Unsuitable
LCS7	NH 46054 16426 –	0	20	60	5	5	10	0	0	0	0	0	Unsuitable

Transect	Grid Reference	Substrate Type %										Spawning Habitat Potential	
		BE	BO	CO	PE	GR	SA	SI	CL	HO	MU		
	NH 46096 16443												
LCS8	NH 46096 16443 – NH 46134 16463	0	5	5	20	30	40	0	0	0	0	0	Sub-Optimal

Table 11. Lochan a' Choin Urie Shoreline Transects Fish Habitat Survey

Transect	Transect Point	Grid Reference	Depth	Substrate Type %										Spawning Habitat Potential
				BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
LCB1	1.1	NH 46071 16369	7.2	0	0	0	0	5	5	0	0	0	90	Unsuitable
	1.2	NH 46083 16380	8.1	0	0	0	0	5	10	0	0	0	85	Unsuitable
	1.3	NH 46088 16397	5.9	0	0	0	0	5	10	0	0	0	85	Unsuitable
	1.4	NH 46102 16408	4.6	0	0	0	0	10	10	0	0	0	80	Unsuitable
	1.5	NH 46108 16410	3.3	0	0	0	0	5	10	0	0	0	85	Unsuitable
	1.6	NH 46109 16409	2	0	0	0	0	5	5	0	0	0	90	Unsuitable
	1.7	NH 46119 16418	1.2	0	0	0	0	5	5	0	0	0	90	Unsuitable
	1.8	NH 46126 16432	1.3	0	0	0	5	5	5	0	0	0	85	Unsuitable
	1.9	NH 46133 16435	0.7	0	20	10	30	20	0	0	0	0	20	Sub-Optimal
	1.10	NH 46131 16440	0.6	0	0	10	25	65	0	0	0	0	0	Optimal
	1.11	NH 46132 16446	0.3	0	0	10	40	50	0	0	0	0	0	Optimal
	1.12	NH 46137 16451	0.1	0	0	10	85	5	0	0	0	0	0	Sub-Optimal
LCB2	2.1	NH 46137 16409	0.9	0	0	5	5	5	5	0	0	0	80	Unsuitable
	2.2	NH 46134 16411	0.5	0	0	0	5	5	5	0	0	0	85	Unsuitable

Transect	Transect Point	Grid Reference	Depth	Substrate Type %										Spawning Habitat Potential
				BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
	2.3	NH 46104 16430	0.8	0	0	10	25	20	5	0	0	0	40	Unsuitable
	2.4	NH 46105 16432	0.5	0	5	20	5	35	20	0	0	0	15	Sub-Optimal
LCB3	3.1	NH 46044 16408	0.6	0	0	0	0	0	0	0	0	0	100	Unsuitable
	3.2	NH 46042 16396	4.8	0	0	0	0	5	10	0	0	0	85	Unsuitable
	3.3	NH 46046 16387	6.9	0	0	0	0	5	10	0	0	0	85	Unsuitable
	3.4	NH 46062 16377	7	0	0	0	0	0	20	0	0	0	80	Unsuitable
	3.5	NH 46092 16351	4.8	0	0	0	0	0	0	20	0	0	80	Unsuitable

Table 12. Loch Pàiteag Shoreline Transects Fish Habitat Survey

Transect	Grid Reference	Substrate Type %										Spawning Habitat Potential	
		BE	BO	CO	PE	GR	SA	SI	CL	HO	MU		
LPS1	NH 47449 15636 – NH 47394 15591	85	5	5	0	0	0	0	0	0	0	5	Unsuitable
LPS2	NH 47394 15591 – NH 47355 15582	40	0	40	20	0	0	0	0	0	0	0	Unsuitable
LPS3	NH 47355 15582 – NH 47318 1556	0	80	20	0	0	0	0	0	0	0	0	Unsuitable
LPS4	NH 47318 1556 – NH 47290 15560	50	10	30	5	0	0	0	0	0	0	5	Unsuitable
LPS5	NH 47290 15560 – NH 47263 15547	10	20	40	0	0	0	0	0	0	0	30	Unsuitable
LPS6	NH 47263 15547 – NH 47420 15447	5	5	10	0	0	0	0	0	0	0	80	Unsuitable
LPS7	NH 47420 15447 – NH 47446 15541	0	5	45	25	0	0	0	0	0	0	25	Sub-Optimal
LPS8	NH 47446 15541 – NH 47467 15570	5	60	30	0	0	0	0	0	0	0	5	Unsuitable

Transect	Grid Reference	Substrate Type %										Spawning Habitat Potential	
		BE	BO	CO	PE	GR	SA	SI	CL	HO	MU		
LPS9	NH 47467 15570 – NH 47484 15598	5	10	0	0	0	0	0	0	0	45	0	Unsuitable
LPS10	NH 47484 15598 – NH 47449 15636	0	5	70	25	0	0	0	0	0	0	0	Sub-Optimal

Table 13. Loch Pàiteag Boat Transects Fish Habitat Survey

Transect	Transect Point	Grid Reference	Depth	Substrate Type %										Spawning Habitat Potential
				BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
LPB1	1.1	NH 47428 15577	2.3	0	0	0	5	5	60	0	0	0	30	Unsuitable
	1.2	NH 47440 15590	1.6	0	0	0	0	0	50	0	0	0	50	Unsuitable
	1.3	NH 47451 15597	1.2	0	0	0	0	0	50	0	0	0	50	Unsuitable
	1.4	NH 47468 15613	0.9	0	10	0	0	0	50	0	0	0	40	Unsuitable
	1.5	NH 47492 15631	0.3	0	0	0	0	0	50	0	0	0	50	Unsuitable
LPB2	2.1	NH 47490 15603	0.5	0	0	30	30	0	20	0	0	0	20	Unsuitable
	2.2	NH 47488 15601	0.9	0	0	0	0	0	50	0	0	0	50	Unsuitable
	2.3	NH 47470 15070	0.9	0	0	0	0	0	50	0	0	0	50	Unsuitable
	2.4	NH 47456 15612	0.4	0	25	30	10	0	20	0	0	0	15	Unsuitable
LPB3	3.1	NH 47428 15605	1.1	0	0	0	0	0	50	0	0	0	50	Unsuitable
	3.2	NH 47430 15598	1.4	0	0	0	0	0	50	0	0	0	50	Unsuitable
	3.3	NH 47462 15572	1.1	0	50	0	0	0	30	0	0	0	20	Unsuitable
	3.4	NH 47462 15571	0.3	0	40	40	10	0	10	0	0	0	0	Unsuitable

Transect	Transect Point	Grid Reference	Depth	Substrate Type %										Spawning Habitat Potential
				BE	BO	CO	PE	GR	SA	SI	CL	HO	MU	
LPB4	4.1	NH 47449 15530	0.5	0	0	30	40	10	20	0	0	0	0	Sub-Optimal
	4.2	NH 47432 15525	1.4	0	0	0	0	0	50	0	0	0	50	Unsuitable
	4.3	NH 47421 15532	5.6	0	0	0	0	0	50	0	0	0	50	Unsuitable
	4.4	NH 47406 15556	5.7	0	0	0	0	0	50	0	0	0	50	Unsuitable
	4.5	NH 47392 15575	4.7	0	0	0	0	0	50	0	0	0	50	Unsuitable
	4.6	NH 47380 15597	0.5	0	50	10	0	0	20	0	0	0	20	Unsuitable

### 4.3 Fish Population Assessment

Survey locations rated as *Moderate* or above for Fish Habitat Quality were considered for further fish population assessment (KP1, LCM4, LG3). At the time of the fish population assessment, very few areas across the site had sufficient water levels for carrying out effective electrofishing. Only areas of river with sufficient flow could be considered for effective sampling. Therefore, all other survey locations deemed moderate or above for fish habitat quality could not be sampled.

**Table 14** presents the species composition and abundance data recorded within the survey locations for fish fauna (September 2022), and identifies the population estimates for each survey location using fully-quantitative and single-run methodologies. Some fully quantitative population estimates are unavailable as the densities of fish recorded during electrofishing runs were too low to be applicable to the removal sampling methodology calculation. Results and survey locations are also displayed in **Appendix A – Figures 4.1 and 4.2**.

Table 14. Fish Population Assessment (September 2022)

Survey Location	Survey Technique and Sample Area	Length Range (mm)	Species Recorded and Abundance	Fully-Quantitative Population Estimate	Single-Run Density Estimate	SFCC Classification Scheme Rating
K_EF1 NH 45096 16197	Fully Quantitative (~100m <sup>2</sup> )	42 - 123	Trout 0+: 41 Trout 1++: 10 European Eel: 3	Trout 0+: 54.03 Trout 1++: 13.31	Trout 0+: 34.45	<b>Good</b>
					Trout 1++: 8.93	<b>Low</b>
K_EF2 NH 47244 16411	Fully Quantitative (~100m <sup>2</sup> )	45 - 114	Trout 0+: 6 Trout 1++: 3	Trout 0+: N/A Trout 1++: N/A	Trout 0+: 5.64	<b>Very Low</b>
					Trout 1++: 2.82	<b>Very Low</b>



Survey Location	Survey Technique and Sample Area	Length Range (mm)	Species Recorded and Abundance	Fully-Quantitative Population Estimate	Single-Run Density Estimate	SFCC Classification Scheme Rating
K_EF3 NH 46733 15559	Fully Quantitative (~100m <sup>2</sup> )	47 - 87	Trout 0+: 7 Trout 1++: 4	Trout 0+: N/A Trout 1++: N/A	Trout 0+: 5.89	Very Low
					Trout 1++: 3.37	Very Low

#### 4.4 Macroinvertebrate Kick Sampling

In total, 15 loch survey locations and 13 riverine survey locations were investigated for the suitability of performing kick samples to collect aquatic invertebrates. Marginal areas on Loch Kemp, Lochan a’ Choin Uire, Loch Cluanie, Loch Pàiteag and Loch Ness were examined for their suitability for performing sweep samples. Kick sampling was carried out at survey locations on the Allt a’ Chinn Mhonaich, Allt an t-Sluichd, Allt Leachd Gowerie and Allt Paiteag.

Loch kick samples undertaken in July and September 2022 on all Lochs within the Site boundary, along the shoreline margins. Samples were sent off for professional analysis and identified to species level where practical to do so. Invertebrate samples were collected at locations likely to be affected by the Proposed Development and at ‘control’ locations either upstream of likely affected areas or outwith the development boundary. All samples were collected in areas which were suitable for safe access and had the ability to support aquatic invertebrates.

Results from Loch Aquatic Macroinvertebrate Samples are displayed in **Table 15** below. Results from Riverine Aquatic Macroinvertebrate Samples are displayed in **Table 16** below. Results and Survey Locations are also displayed in **Appendix A - Figure 5.0**.

*Table 15. Loch Aquatic Macroinvertebrate Samples*

Survey Location	Summary	Invertebrate Families
K_L1 Loch Kemp NH 46775 16856	Invertebrate Families	<i>Lymnaeidae, Oligochaeta, Glossiphoniidae, Caenidae, Leuctridae, Chloroperlidae, Sialidae, Coenagrionidae, Corixidae, Limnephilidae, Sericostomatidae, Chironomidae</i>
	Total No. of Taxa	12
	ASPT Score	6
	Total BMWP Score	72
	Number of Odonata & Megaloptera taxa	2
	Number of Coleoptera Taxa	4
K_L2 Loch Kemp	Invertebrate Families	<i>Lymnaeidae, Oligochaeta, Nemouridae, Leuctridae, Coenagrionidae, Gyridae, Elmidae, Hydroptilidae, Lepidostomatidae,</i>

Survey Location	Summary	Invertebrate Families
NH 47239 16272		<i>Limnephilidae, Sericostomatidae, Pychodidae, Chironomidae</i>
	Total No. of Taxa	12
	ASPT Score	6
	Total BMWP Score	72
	Number of Odonata & Megaloptera taxa	1
	Number of Coleoptera Taxa	1
K_L3 Loch Kemp NH 47232 16435	Invertebrate Families	<i>Lymnaeidae, Oligochaeta, Caenidae, Heptageniidae, Leuctridae, Elmidae, Haliplidae, Polycentropodidae, Hydroptilidae, Limnephilidae, Sericostomatidae, Tipulidae, Pychodidae, Chironomidae</i>
	Total No. of Taxa	13
	ASPT Score	6
	Total BMWP Score	78
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	2
K_L4 Loch Kemp NH 46589 16342	Invertebrate Families	<i>Oligochaeta, Nemouridae, Coenagriidae, Elmidae, Polycentropodidae, Hydropsychidae, Phryganeidae, Lepidostomatidae, Limnephilidae (incl. Apataniidae), Sericostomatidae, Tipulidae, Ceratopogonidae, Chironomidae</i>
	Total No. of Taxa	12
	ASPT Score	6.25
	Total BMWP Score	75
	Number of Odonata & Megaloptera taxa	1
	Number of Coleoptera Taxa	1
K_L5	Invertebrate Families	<i>Asellidae, Gammaridae, Coenagrionidae,</i>

Survey Location	Summary	Invertebrate Families
Loch Pàiteag NH 47494 15664		<i>Corixidae, Veliidae, Dytiscidae, Limnephilidae, Leptoceridae, Phryganeidae, Chironomidae</i>
	Total No. of Taxa	10
	ASPT Score	6.4
	Total BMWP Score	64
	Number of Odonata & Megaloptera taxa	1
	Number of Coleoptera Taxa	1
K_L6 Loch Pàiteag NH 47323 15582	Invertebrate Families	<i>Oligochaeta, Caenidae, Siphonuridae, Nemouridae, Leuctridae, Coenagrionidae, Corixidae, Dytiscidae, Haliplidae, Lepidostomatidae, Limnephilidae, Sericostomatidae, Ceratopogonidae, Chironomidae</i>
	Total No. of Taxa	13
	ASPT Score	6.5
	Total BMWP Score	85
	Number of Odonata & Megaloptera taxa	1
	Number of Coleoptera Taxa	2
K_L7 Loch Pàiteag NH 47428 15456	Invertebrate Families	<i>Lymnaeidae, Glossiphoniidae, Asellidae, Caenidae, Leuctridae, Sialidae, Libellulidae, Coenagrionidae, Corixidae, Gerridae, Veliidae, Elmidae, Limnephilidae, Leptoceridae, Phryganeidae, Chironomidae</i>
	Total No. of Taxa	14
	ASPT Score	5.6
	Total BMWP Score	78
	Number of Odonata & Megaloptera taxa	3
	Number of Coleoptera Taxa	1

Survey Location	Summary	Invertebrate Families
K_L8 Lochan a' Choin Urie NH 46137 16459	Invertebrate Families	<i>Lymnaeidae, Sphaeriidae, Oligochaeta, Siphonuridae, Leuctridae, Aeshnidae, Coenagrionidae, Corixidae, Dryopidae, Limnephilidae, Leptoceridae, Chironomidae</i>
	Total No. of Taxa	12
	ASPT Score	6
	Total BMWP Score	72
	Number of Odonata & Megaloptera taxa	2
	Number of Coleoptera Taxa	0
K_L9 Lochan a' Choin Urie NH 46048 16424	Invertebrate Families	<i>Lymnaeidae, Oligochaeta, Libellulidae, Corixidae, Gerridae, Veliidae, Gyrinidae, Limnephilidae, Phryganeidae, Chironomidae</i>
	Total No. of Taxa	9
	ASPT Score	5.1
	Total BMWP Score	46
	Number of Odonata & Megaloptera taxa	1
	Number of Coleoptera Taxa	1
K_L10 Lochan a' Choin Urie NH 45988 16415	Invertebrate Families	<i>Lymnaeidae, Sphaeriidae, Oligochaeta, Glossiphoniidae, Gammaridae, Caenidae, Leuctridae, Coenagrionidae, Corixidae, Elmidae, Polycentropodidae, Lepidostomatidae, Limnephilidae, Sericostomatidae, Leptoceridae, Chironomidae, Muscidae</i>
	Total No. of Taxa	15
	ASPT Score	5.9
	Total BMWP Score	89
	Number of Odonata & Megaloptera taxa	1
	Number of Coleoptera Taxa	1
K_L11	Invertebrate Families	<i>Aeshnidae, Libellulidae, Coenagrionidae,</i>

Survey Location	Summary	Invertebrate Families
Lochan a' Choin Urie NH 46142 16408		<i>Corixidae, Gerridae, Notonectidae, Dytiscidae, Lepidostomatidae, Limnephilidae, Chironomidae</i>
	Total No. of Taxa	9
	ASPT Score	6.2
	Total BMWP Score	56
	Number of Odonata & Megaloptera taxa	3
	Number of Coleoptera Taxa	1
K_L12 Loch Ness NH 45665 16909	Invertebrate Families	<i>Oligochaeta, Asellidae, Gammaridae, Nematode, Leuctridae, Elmidae, Hydroptilidae, Sericostomatidae, Chironomidae, Muscidae</i>
	Total No. of Taxa	9
	ASPT Score	5.6
	Total BMWP Score	50
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	1
K_L13 Loch Ness NH 45333 16555	Invertebrate Families	<i>Oligochaeta, Heptageniidae, Leuctridae, Hydrophilidae, Elmidae, Hydroptilidae, Lepidostomatidae, Limnephilidae, Chironomidae</i>
	Total No. of Taxa	8
	ASPT Score	6.4
	Total BMWP Score	51
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	1
K_L14 Loch Ness NH 45200 16406	Invertebrate Families	<i>Lymnaeidae, Oligochaeta, Heptageniidae, Ephemerellidae, Nematode, Leuctridae, Chloroperlidae, Elmidae, Polycentropodidae, Hydroptilidae, Sericostomatidae,</i>

Survey Location	Summary	Invertebrate Families
		<i>Leptoceridae, Ceratopogonidae, Chironomidae</i>
	Total No. of Taxa	13
	ASPT Score	7
	Total BMWP Score	91
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	1
K_L15 Loch Cluanie NH 47505 16392	Invertebrate Families	<i>Aeshnidae, Libellulidae, Coenagrionidae, Corixidae, Gerridae, Notonectidae, Dytiscidae, Lepidostomatidae, Limnephilidae, Chironomidae</i>
	Total No. of Taxa	10
	ASPT Score	6.1
	Total BMWP Score	61
	Number of Odonata & Megaloptera taxa	3
	Number of Coleoptera Taxa	1

Light Green block for ASPT/BMWP Scores which deem water quality to be "very good biological quality"

Dark Green block for ASPT/BMWP Scores which deem water quality to be "good biological quality"

Yellow block for ASPT/BMWP Scores which deem water quality to be "fair biological quality"

Orange block for ASPT/BMWP Scores which deem water quality to be "poor biological quality"

Red block for ASPT/BMWP Scores which deem water quality to be "very poor biological quality"

Table 16. Riverine Aquatic Macroinvertebrate Samples

Survey Location	Summary	Invertebrate Families
K_R1 Allt a' Chinn Mhonaich NH 45096 16197	Invertebrate Families	<i>Oligochaeta, Gammaridae, Leuctridae, Perlidae, Sialidae, Limnephilidae (incl. Apataniidae), Odontoceridae, Chironomidae</i>
	Total No. of Taxa	8

Survey Location	Summary	Invertebrate Families
	ASPT Score	6.25
	Total BMWP Score	50
	Number of Odonata & Megaloptera taxa	1
	Number of Coleoptera Taxa	0
K_R2 Allt Paiteag NH 47244 16411	Invertebrate Families	<i>Oligochaeta, Leuctridae, Dryopidae, Polycentropodidae, Chironomidae</i>
	Total No. of Taxa	5
	ASPT Score	5
	Total BMWP Score	25
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	1
K_R3 Allt Paiteag NH 47303 16408	Invertebrate Families	<i>Oligochaeta, Heptageniidae, Nemouridae, Hydraenidae, Limnephilidae (incl. Apataniidae), Odontoceridae, Tipulidae, Simuliidae, Chironomidae</i>
	Total No. of Taxa	9
	ASPT Score	5.77
	Total BMWP Score	52
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	1
K_R4 Allt Paiteag NH 47413 16420	Invertebrate Families	<i>Oligochaeta, Heptageniidae, Leuctridae, Elmidae, Sericostomatidae, Chironomidae</i>
	Total No. of Taxa	6
	ASPT Score	6.3
	Total BMWP Score	38
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	1
K_R5	Invertebrate Families	<i>Oligochaeta, Baetidae, Leptophlebiidae,</i>

Survey Location	Summary	Invertebrate Families
Allt Leachd Gowerie NH 46745 15710		<i>Nemouridae, Leuctridae, Perlodidae, Dytiscidae, Hydraenidae, Elmidae, Lepidostomatidae, Limnephilidae (incl. Apataniidae), Simuliidae, Chironomidae</i>
	Total No. of Taxa	13
	ASPT Score	6.2
	Total BMWP Score	81
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	3
K_R6 Allt Leachd Gowerie NH 46774 15484	Invertebrate Families	<i>Lymnaeidae, Oligochaeta, Nemouridae, Leuctridae, Hydrophilidae, Hydroptilidae, Hydropsychidae, Chironomidae</i>
	Total No. of Taxa	8
	ASPT Score	4.9
	Total BMWP Score	39
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	1
K_R7 Allt a Leachd Gowerie NH 46950 15046	Invertebrate Families	<i>Oligochaeta, Heptageniidae, Perlidae, Hydropsychidae, Limnephilidae (incl. Apataniidae), Sericostomatidae, Odontoceridae, Chironomidae</i>
	Total No. of Taxa	8
	ASPT Score	6.9
	Total BMWP Score	55
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	0
K_R8 Allt a' Chinn Mhonaich NH 45929 15702	Invertebrate Families	<i>Oligochaeta, Leuctridae, Sialidae, Hydropsychidae, Chironomidae</i>
	Total No. of Taxa	5
	ASPT Score	4.4



Survey Location	Summary	Invertebrate Families
	Total BMWP Score	22
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	1
K_R9 Allt a' Chinn Mhonaich NH 45556 16050	Invertebrate Families	<i>Oligochaeta, Baetidae, Heptageniidae, Ephemerellidae, Leuctridae, Perlodidae, Cordulegasteridae, Elmidae, Sialidae, Polycentropodidae, Hydropsychidae, Limnephilidae (incl. Apataniidae), Sericostomatidae, Tipulidae, Chironomidae</i>
	Total No. of Taxa	15
	ASPT Score	6.5
	Total BMWP Score	98
	Number of Odonata & Megaloptera taxa	2
	Number of Coleoptera Taxa	1
K_R10 Allt an t-Sluichd NH 46779 16878	Invertebrate Families	<i>Oligochaeta, Baetidae, Leptophlebiidae, Nemouridae, Leuctridae, Veliidae, Scirtidae, Elmidae, Sialidae, Polycentropodidae, Hydropsychidae, Lepidostomatidae, Limnephilidae (incl. Apataniidae), Odontoceridae, Simuliidae, Chironomidae</i>
	Total No. of Taxa	16
	ASPT Score	5.2
	Total BMWP Score	83
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	1
K_R11 Allt an t-Sluichd NH 46798 16923	Invertebrate Families	<i>Oligochaeta, Siphonuridae (incl. Ameletidae), Baetidae, Nemouridae, Leuctridae, Dytiscidae, Hydrophilidae, Elmidae, Limnephilidae (incl. Apataniidae), Sericostomatidae, Simuliidae, Chironomidae</i>
	Total No. of Taxa	12

Survey Location	Summary	Invertebrate Families
	ASPT Score	5.9
	Total BMWP Score	71
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	3
K_R12 Allt Paiteag NH 47848 16140	Invertebrate Families	<i>Oligochaeta, Nemouridae, Leuctridae, Dytiscidae, Elmidae, Hydropsychidae, Limnephilidae (incl. Apataniidae), Tipulidae, Simuliidae, Chironomidae</i>
	Total No. of Taxa	10
	ASPT Score	5.2
	Total BMWP Score	52
	Number of Odonata & Megaloptera taxa	0
	Number of Coleoptera Taxa	2
K_R13 Allt Paiteag NH 47817 15696	Invertebrate Families	<i>Oligochaeta, Gammaridae, Baetidae, Leptophlebiidae, Leuctridae, Perlodidae, Hydrophilidae, Sialidae, Hydroptilidae, Polycentropodidae, Hydropsychidae, Sericostomatidae, Simuliidae, Chironomidae</i>
	Total No. of Taxa	14
	ASPT Score	6.1
	Total BMWP Score	85
	Number of Odonata & Megaloptera taxa	1
	Number of Coleoptera Taxa	1

Light Green block for ASPT/BMWP Scores which deem water quality to be "very good biological quality"

Dark Green block for ASPT/BMWP Scores which deem water quality to be "good biological quality"

Yellow block for ASPT/BMWP Scores which deem water quality to be "fair biological quality"

Orange block for ASPT/BMWP Scores which deem water quality to be "poor biological quality"

Red block for ASPT/BMWP Scores which deem water quality to be "very poor biological quality"

## 5 Discussion

### 5.1 Fish Habitat Assessment

#### 5.1.1 Riverine Fish Habitat Assessment

The habitat quality across the survey locations was variable in supporting salmonid populations. All of the watercourses with the exception of the outflow from Lochan a' Choin Urie had the potential to support salmonid populations however the survey locations within these watercourses had varying habitat quality, some of which was limiting for fish. The main limiting factors encountered across the site were lack of flow, lack of bankside and instream cover, impacts from adjacent forestry land use, steep gradients and impassable barriers further down the catchment. All survey locations, except LMC4 are likely to be inaccessible to migratory fish due to the topography of the land and impassable natural barriers identified on Allt a Chinn Mhonaich, Allt an t-Sluichd, and the outflow of Lochan a' Choin Uire.

Riverine fish habitat quality ranged from *Poor* (KP2, KP3, KP4, KP5, LCU1 and LCU2) to *Low* (KP8, LG6, LG7 and LG8) to *Moderate* (TS1, KP1, KP6, KP7, KP9, KP10, LG1, LG3, LG4, LG5, LCM1, LCM2 and LCM3) to *Good* (TS2, LG2 and LCM4). None of the survey locations were classified as *High* for fish habitat quality. Of the total riverine fish habitat quality surveyed (5.2km), *Poor* made up 18.2%, *Low* made up 18.9%, *Moderate* made up 50.1% and *Good* made up 12.8%.

Suitable salmonid spawning habitat was generally limited across the site, with availability of suitable substrates and lack of oxygenated flow the main limiting factors. Most of the survey locations featured the input of high organic substrates likely as a result of historic run of from forestry plantations and leaf litter decomposition. This caused compaction of suitable spawning gravels and pebbles and in some areas was the dominant substrate type along with peat formations. Lack of oxygenated flow was a common limiting factor across the site, particularly with the drought spells experienced during the 2022 survey season.

Riverine salmonid spawning potential ranged from *Unsuitable* (KP2, KP3, KP4, KP6, KP7, KP8, KP10, LG1, LG4, LG6, LG7, LG8, LCU1, LCU2, LCM1, LCM2, LCM3) to *Sub-Optimal* (TS1, TS2, KP1, KP9, LG2, LG3, LG5 and LCM4) within the instream sections. None of the survey locations were rated as having *Optimal* salmonid spawning potential. Of the total riverine spawning habitat potential surveyed (5.2km), *Unsuitable* made up 70.8% and *Sub-Optimal* made up 29.2%.

Within the survey locations, there were areas that were deemed suitable habitat for juvenile lamprey i.e. fine, soft substrate in well oxygenated, slow flowing water, however most survey locations featured coarse substrates, predominately pebbles, cobbles, boulders or lacked suitable oxygen input. There were few areas of habitat where European eel may generally be found, in particular large instream / bankside boulders or bankside crevices to utilise as cover.

For European eel and migratory lamprey species *Petromyzon marinus* and *Lampetra fluviatilis* it is unlikely that they are able to freely access the survey locations, other than LCM4 which has migratory access from Loch Ness. European eel was captured during the fish population assessments at K\_EF3 (LCM4) and an ammocoete (juvenile lamprey) was recorded incidentally during invertebrate kick sampling at LCM4. Habitat present across the site was suitable for supporting other species including three-spined stickleback *Gasterosteus aculeatus*, European minnow *Phoxinus phoxinus* and stone loach *Barbatula barbatula* which are now commonly found in Scottish rivers.

#### 5.1.2 Loch Fish Habitat Spawning Assessment

Loch salmonid spawning habitat suitability across Loch Kemp, Loch Cluanie, Lochan a' Choin Urie and Loch Paiteag was generally limited with mud, sand or high organic substrates dominant, especially out with the littoral zones. Within the littoral zones large coarser substrates such as boulder and cobble tended to dominate rather than optimal wave washed gravels and pebbles. Gravels and pebbles also tended to be partly-compacted by sand or mud

and lacked wave washing other than a select few areas (LKS26). Loch Ness was slightly different with more availability of wave washed gravel and pebbles, especially within the littoral zone, in what was a far more mobile environment than the aforementioned inland lochs on the site. The substrate composition in Loch Ness tended to quickly change between the littoral zone to the limnetic zone (open water) where there was typically a rapid change in depth and a sand dominated substrate.

Loch Kemp shoreline transects ranged from *Unsuitable* (LKS2, LKS6, LKS9, LKS10, LKS11, LKS14, LKS17, LKS18, LKS19, LKS20, LKS21, LKS22, LKS23, LKS25, LKS27, LKS28, LKS31, LKS32, and LKS33) to *Sub-Optimal* (LKS1, LKS3, LKS4, LKS5, LKS7, LKS8, LKS, LKS12, LKS13, LKS16, LKS24, LKS29 and LKS30) to *Optimal* (LKS26). *Unsuitable* spawning habitat made up 64.6% of the shoreline, *Sub-Optimal* spawning habitat made up 32.1% of the shoreline and *Optimal* spawning habitat made up 3.3% of the shoreline.

Loch Kemp boat transects ranged from *Unsuitable* (LKB1.1-1.5, LKB2.1-2.4, LKB3.1-3.5, LKB4.1-4.4, LKB5.1-5.5, LKB6.1-6.3, LKB7.3-7.6, LKB8.1-8.4, LKB9.1-9.6, LKB10.1-10.5 and LKB11.1-11.4) to *Sub-Optimal* (LKB1.6, LKB2.5) to *Optimal* (LKB7.1 - LKB7.2).

The Loch Cluanie shoreline transect was recorded as 100% *Unsuitable* (LCLS1).

Loch Ness shoreline transects ranged from *Unsuitable* (LNS1, LNS2, LNS3, LNS4, LNS7, LNS10 and LNS14) to *Sub-Optimal* (LNS5, LNS6, LNS11 and LNS15) to *Optimal* (LNS8, LNS9, LNS12, LNS13, LNS16, LNS17, LNS18 and LNS19). *Unsuitable* spawning habitat made up 40.5% of the shoreline, *Sub-Optimal* spawning habitat made up 16.4% of the shoreline and *Optimal* spawning habitat made up 43.1% of the shoreline. For context, of the *Optimal* spawning habitat recorded at Loch Ness, 73.9% was out with the red line development boundary, with the remaining 27.1% inside the red line development boundary.

Loch Ness Boat transects ranged from *Unsuitable* (LNB1.1-1.5, LNB2.3-2.5, LNB3.5-3.6, LNB4.1-4.10, LNB5.4-5.7, LNB6.2-6.6, LNB7.1-7.7, LNB8.2-8.6, LNBC1.1-1.3, LNBC6.3-6.5, LNB7.1, LNBC7.4-7.7, LNBC8.1, LNBC8.3-8.7, LNBC9.1-9.4) to *Sub-Optimal* (LNB2.2, LNB3.1-3.4, LNB5.2-5.3, LNB6.1, LNB8.1, LNBC6.1-6.2, LNBC7.3, LNBC8.2, LNBC10.1-10.4) and *Optimal* (LNB2, LNB5 and LNBC7.2).

Lochan a' Choin Urie shoreline transects ranged from *Unsuitable* (LCS2, LCS3, LCS4, LCS, LCS6, LCS7) to *Sub-Optimal* (LCS1 and LCS8). None of the shoreline transects were recorded as *Optimal*. *Unsuitable* spawning habitat made up 82.1% of the shoreline and *Sub-Optimal* spawning habitat made up 17.9% of the shoreline.

Lochan a' Choin Urie boat transects ranged from *Unsuitable* (LCB1.1-1.8, LCB2.1-2.3, LCB3.1-3.5), *Sub-Optimal* (LCB1.9, LCB1.12 and LCB2.4) *Optimal* (LCB1.10-1.11)

Loch Paiteag shoreline transects ranged from *Unsuitable* (LPS1, LPS2, LPS3, LPS4, LPS5, LPS6, LPS8 and LPS9) to *Sub-Optimal* (LPS7 and LPS10). None of the shoreline transects were recorded as *Optimal*. *Unsuitable* spawning habitat made up 77.1% of the shoreline and *Sub-Optimal* spawning habitat made up 22.9% of the shoreline.

Loch Paiteag boat transects ranged from *Unsuitable* (LPB1.1-1.5, LPB2.1-2.4, LPB3.1-3.4 and LPB4.2-4.6) to *Sub-Optimal* (LPB4.1). None of the boat transects were recorded as *Optimal*.

## 5.2 Fish Population Assessment

The fish fauna surveys were dominated by brown trout which were present at all of the survey locations. It is unlikely that migratory sea trout and salmon are able to access survey locations K\_EF2 and K\_EF3 as there are barriers to migration such as impassable waterfalls downstream. K\_EF1 has the potential for migratory fish to be present as this location is downstream of any barriers, and this location has direct connectivity to Loch Ness.

In the presence of barriers to upstream migration, the fish captured will be from self-sustaining resident brown trout populations. Brown trout fry (0+) and parr (1++) were present at all survey locations. European eel was captured at survey location K\_EF1. No other fish species were captured.

Fully quantitative population estimates for survey location K\_EF1 were 54.03 for trout fry (0+) and 13.31 for trout parr (1++) respectively. Fully quantitative population estimates for survey locations K\_EF2 and K\_EF3 were unavailable as fish densities recorded were too low for application to the removal sampling methodology calculation. Only minimum density estimates were available for these locations as described below.

Analysing the fish population assessment results against the SFCC Regional Classification Scheme for the Moray Firth, trout fry densities ranged from *Very Low* (K\_EF2 and K\_EF3) to *Good* (K\_EF1) and trout parr densities ranged from *Very Low* (K\_EF2 and K\_EF3) to *Low* (K\_EF1).

## 5.3 Macroinvertebrate Sampling

### 5.3.1 Loch Sampling

In total, fifteen locations were surveyed which were undertaken in Loch Kemp (n=4), Loch Pàiteag (n=3), Lochan a' Choin Uire (n=4), Loch Cluanie (n=1) and the Loch Ness shoreline (n=3) during July 2022. Invertebrate samples collected from Loch Kemp across four survey locations produced thirteen family groups. BMWP scoring was reflective of this deeming Loch Kemp "Fair Biological Quality" across the four survey locations, although ASPT scoring deemed Loch Kemp to be of "Very Good Biological Quality" at each of the four sites. The taxa collected were mainly generalists with the most abundant family group being that of *Oligochaeta* (aquatic and terrestrial worms) (n=41) and *Corixidae* (Water boatman- nymph indet) (n=41). In addition, the sample also contained a large number of the family group *Chironomidae* (non-biting midge) (n=24) and the common wandering snail, *Radix balthica* (n=23).

Aquatic oligochaetes are benthic dwellers, occupying the sediments and decaying organic matter of most river and lake habitats, where they play a substantial eukaryotic role in decomposition. Most of these worms are adapted to live in sediments ranging from sand to mud. They can be found in pockets of such sediments in stony habitats as well as in lowland rivers, lakes, and ponds where soft substrates are the norm. In biotic indices, this family scores relatively low when looking at weighted abundance and can produce negative scores if high abundances are contained within a sample. This indicates that the family are tolerant of pollution.

Loch Pàiteag was moderate to good regarding family groups present at the time of sampling (n=14). Both BMWP and ASPT scoring were reflective of this, deeming the loch of both "Fair" for BMWP and "Very Good" for ASPT across all survey locations. The taxa collected were mainly generalists with the most abundant family group being that of *Chironomidae* (non-biting midge) (n=71). In addition, the sample also contained a large number of *Corixidae* (Water boatman- nymph indet) (n=34), common wandering snail, *Radix balthica* (n=34) and the family group *Daphniidae* (planktonic crustacean) (n=31).

The Loch Ness shoreline samples collected across three sites contain a moderate species family abundance with thirteen groups present at the time of sampling. Survey locations K\_L13 and K\_L14 were deemed "Fair Biological Quality" and K\_L12 was deemed "Poor Biological Quality" for BMWP. All ASPT scores were however rated as "Very Good". The largest family group present being that of *Chironomidae* (non-biting midge) (n=59). The second largest group to be collected was of the species *Leuctra hippopus* (Stonefly) (n=43). Throughout, the Loch Ness shoreline samples species and families collected were uniform throughout containing mainly stoneflies, beetles, caddisflies, and mayflies. *Chironomidae* are responsible for most of the richness and abundance of aquatic communities, especially in naturally poor environments and are generally considered a pollution resistant group (Molineri *et al.*, 2020). In biomonitoring, a rather impoverished benthic community, dominated by this family, is generally attributed to bad water quality (Raunio *et al.*, 2007). This is reflected in biotic indices such as the WHPT (Walley Hawkes Paisley Trigg) biotic index which produces low scores and even negative scores based on their weighted abundance within a sample. They inhabit all types of permanent and temporary aquatic habitats, and a few species inhabit semiaquatic or terrestrial habitats. Larvae are often the dominant insects in the profundal and sublittoral zones of lakes. Larvae of most species of *Chironomidae* are quite tolerant of

lowered levels of dissolved oxygen; some can survive in areas where oxygen levels are so low that oxygen cannot be detected. Such species are usually red in colour and contain a haemoglobin like pigment that retains oxygen. These species may become abundant in organically polluted areas of lakes or streams (Pinder, 1986).

Both family groups (*Oligochaeta* and *Chironomidae*) are likely to be the most prolific within the site based on where the samples were taken. The areas were marginal and are likely to experience periodic episodes of dewatering. Sampling occurred during the hot summer months (July) therefore, drought is a likely impact of low water levels at the time of the survey. Furthermore, as the areas on Loch Ness were conducted on the shoreline, they contained an abundance of organic debris which would provide suitable habitat for both family groups.

The samples collected from Lochan a' Choin Uire revealed fifteen family groups. BMWP scores ranged from "Poor Biological Quality" (K\_L9) and "Fair Biological Quality" (K\_L8, K\_L10 and K\_L11). ASPT scores ranged from "Good Quality Biological Quality" (K\_L9) and "Very Good Biological Quality" (K\_L8, K\_L10 and K\_L11). As with the results from Loch Kemp, Loch Pàiteag and Loch Ness Shoreline, the family of *Oligochaeta* were present in large numbers (n=28). However, the most abundant family group was found to be *Gammaridae* (amphipod crustacean) (n=39). Additionally, *Daphniidae* (planktonic crustacean) (n=34), common wandering snail, *Radix balthica* (n=29) were also found in large abundances. This large abundance of *Oligochaeta* is likely due to the high amount of organic silt present with Lochan a'Choin Uire.

Loch Cluanie showed there being a low species abundance present during the time of the survey with only ten family groups present. The largest group collected were from the family *Gerridae* (Pond Skaters) (n=4) where all collected were Nymph instars. Additionally, Azure damselfly, *Coenagrion puella* (n=3) were the second largest group collected. In total only 5 groups were identified down to species level. Both BMWP and ASPT scoring was consistent with both Loch Kemp and Loch Pàiteag.

No species of nature conservation interest were noted from the sampling conducted. Of the species recorded, they were 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. Species such as *Sericostoma personatum* are widespread throughout the UK and lake shores exposed to wave action with stony substrate (Elliot, 1969). Beetles were also recorded including the *Neibroporus elegans* which is commonly noted in a range of habitats. The Small Silver Sedge (*Lepidostoma hirtum*) a species of caddisfly was recorded and is widespread in the north of the UK within habitats such as lakes with stony substrate. *Caenis luctuosa* is a species of small squaregilled mayfly which frequents margins of rivers and lake shores in the UK. Furthermore, samples collected were indicative of the species composition, which is typical of upland burns, with predatory caseless caddisfly species such as *Lepidostoma hirtum* noted along with stonefly family *Leuctridae*. being common in small flowing and oxygen rich upland streams. The beetle *Neibroporus elegans*, found across majority of samples is commonly noted in a range of habitats in Southern Scotland but is slightly rarer in habitats noted in Argyll and Bute, but this species has been recorded as far north as Orkney. This species is eurytopic occurring in both still and running water in a wide range of habitats from running water to ponds and lakes. *Elmis aenea* another beetle species noted, is also typical of riffle habitats within small burns.

### 5.3.2 Riverine Sampling

In total 13 riverine survey locations were sampled which were undertaken in surrounding tributaries both in and outflowing to Loch Kemp and adjacent tributaries of Loch Ness which could be impacted by the Development. All riverine sample were rated as "Poor or Fair Biological Quality" BMWP scores, ASPT scoring was predominately of "Very Good Biological Quality" or "Good Biological Quality" though K\_R8 on the Allt a' Chinn Mhonaich was deemed "Fair Biological Quality". The most common and abundant family group present were *Oligochaeta* and *Chironomidae*. Both species are found in areas of increase alkaline waters, high silt concentrations and tolerate to low dissolved oxygen levels which is a characteristic

of deep silted environments. *Leuctridae* (stonefly) family group was common across all riverine sample locations and was comparable with the Loch samples. *Leuctridae* provide a dietary source for salmonid fish such as brown trout (*Salmo trutta*) which are present within watercourses across the Site.

No species of nature conservation interest were noted from the sampling conducted. Of the species recorded, they were common and widespread taxa, typical of a range of habitat types.

## 6 Conclusion

- Riverine Fish habitat varied in quality across the Site. Habitat rated as *Good* was limited, mainly by lack of flow, gradient and substrate types but some sections of river suitable for supporting populations of brown trout were present across the Site.
- Riverine salmonid spawning suitability was limited with none of the survey locations given an overall rating of *Optimal*.
- Loch Salmonid Spawning suitability was predominantly *Unsuitable* and *Sub-optimal* across the locations surveyed however *Optimal* shoreline habitats were found at Loch Ness, although predominantly out with the development boundary.
- Brown trout were present on all of the tributaries surveyed. Analysing the fish population assessment results against the SFCC Regional Classification Scheme for the Moray Firth, trout fry densities ranged from *Very Low* (K\_EF2 and K\_EF3) to *Good* (K\_EF1) and trout parr densities ranged from *Very Low* (K\_EF2 and K\_EF3) to *Low* (K\_EF1). Survey location K\_EF1 lies out with the area of maximum inundation.
- Macroinvertebrate results from surveys conducted were fairly uniform throughout all survey locations. No species of nature conservation interest were noted from the sampling conducted. Both family groups *Oligochaeta* and *Chironomidae* were found in high abundance across the majority of sites. This large abundance of *Oligochaeta* is likely due to the high amount of organic silt present across the survey locations. Of the species recorded, they were common and widespread taxa, typical of a range of habitat types.

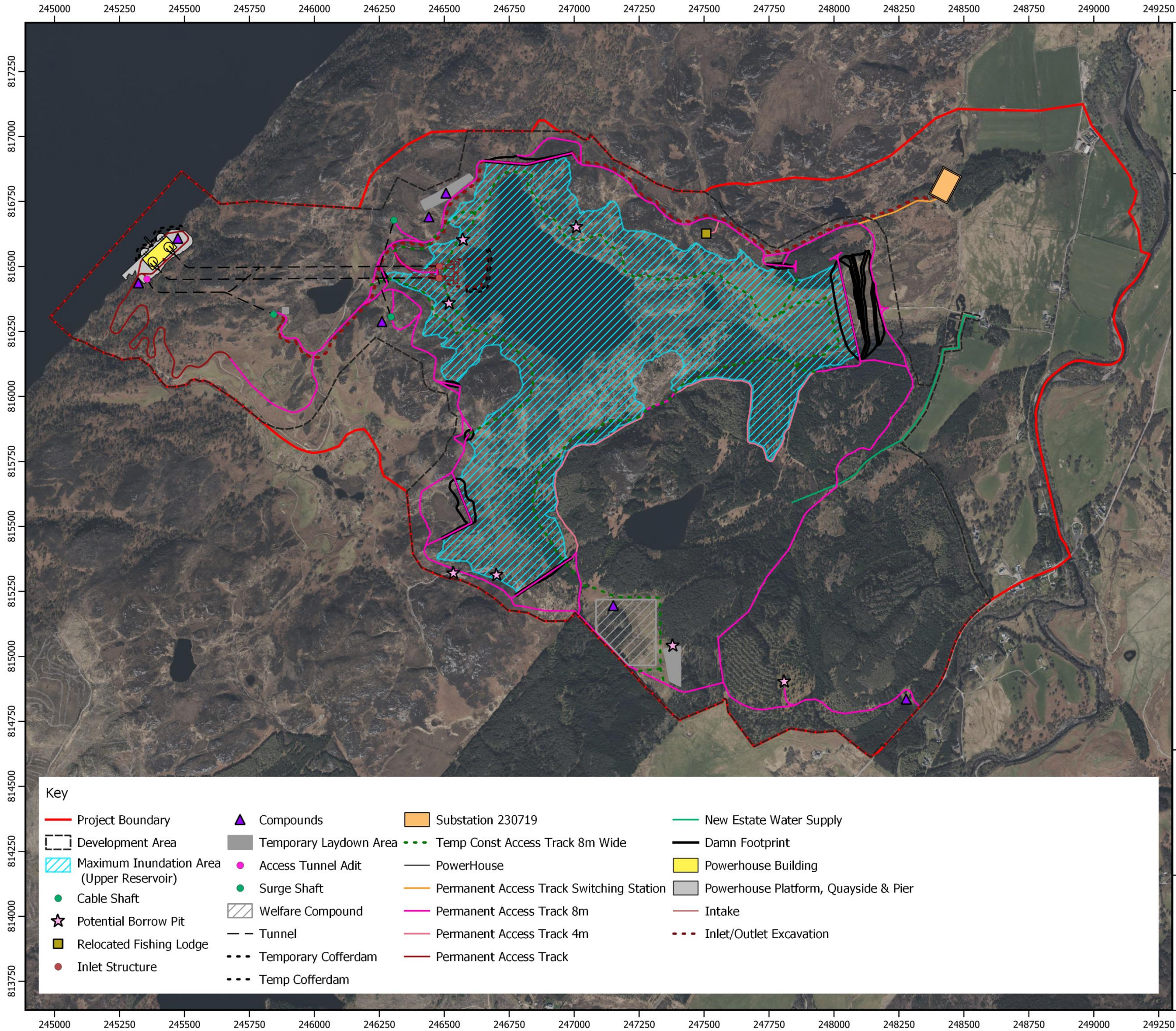
## 7 References

- Hendry, K. & Cragg-Hine, D. (1997) A Guidance Manual. APEM Ltd, Fisheries Technical Manual 4, R & D Technical Report W44, Version 1.0/07-97. R & D Project 603.
- Barker N., 2017. Electro-fishing Results 2017: River Beaulieu Catchment. NBFT internal report.
- Elliot, J. M. (1969) Life History and Biology of *Sericostoma personatum* Spence (Trichoptera). *Oikos*, 20, p.110-118
- Molineri, C., Tejerina, E. G., Torrejón, S. E., Edgardo, J.I. P. & Hankel, Guillermo. (2020) *Indicative value of different taxonomic levels of Chironomidae for assessing the water quality*. Ecological Indicators. Volume 108
- Raunio, J., Paavola, R., & Muotka, T. (2007) Effects of emergence phenology, taxa tolerances and taxonomic resolution on the use of the Chironomid Pupal Exuvial Technique in river biomonitoring. *Freshwater Biology*, 52, p.165-176
- Pinder, L. C. V. (1986) Biology of freshwater Chironomidae. *Annual Review of Entomology* 31:1 – 23
- Environment Agency, (2003) River Habitat Survey in Britain and Ireland. Field Survey Guidance Manual: 2003 Version. Environment Agency, Bristol.
- Scottish Government. (2022) Salmon and Sea Trout Fishery Statistics updated for the 2021 Season. Available Online At: <https://www.gov.scot/news/salmon-and-sea-trout-fishery-statistics-updated-for-the-2021-season/> Last accessed 04<sup>th</sup> October 2022.
- Coyle, S., and Adams, C.E. (2011) Development of a methodology for the assessment of the quality of vendace spawning substrate and its application to sites in Scotland and northern England. Scottish Natural Heritage Commissioned Report No. 308
- Maitland, P.S. (2003) Ecology of the River, Brook and Sea Lamprey. *Conserving Natura 2000 Rivers Ecology Series No. 5*.



## **8 Appendices**

### Appendix A – Figures



Loch Kemp Storage

Figure 1.0  
Proposed Development Overview

Key			
	Project Boundary		Compounds
	Substation 230719		New Estate Water Supply
	Development Area		Temporary Laydown Area
	Maximum Inundation Area (Upper Reservoir)		Temp Const Access Track 8m Wide
	Dam Footprint		PowerHouse
	Powerhouse Building		Permanent Access Track Switching Station
	Cable Shaft		Permanent Access Track 8m
	Potential Borrow Pit		Permanent Access Track 4m
	Relocated Fishing Lodge		Permanent Access Track
	Inlet Structure		Powerhouse Platform, Quayside & Pier
	Compounds		Intake
	Temporary Laydown Area		Inlet/Outlet Excavation
	Access Tunnel Adit		Tunnel
	Surge Shaft		Temporary Cofferdam
	Potential Borrow Pit		Temp Cofferdam
	Relocated Fishing Lodge		Welfare Compound

N

Scale @ A3: 1:13,500

0 250 500 m

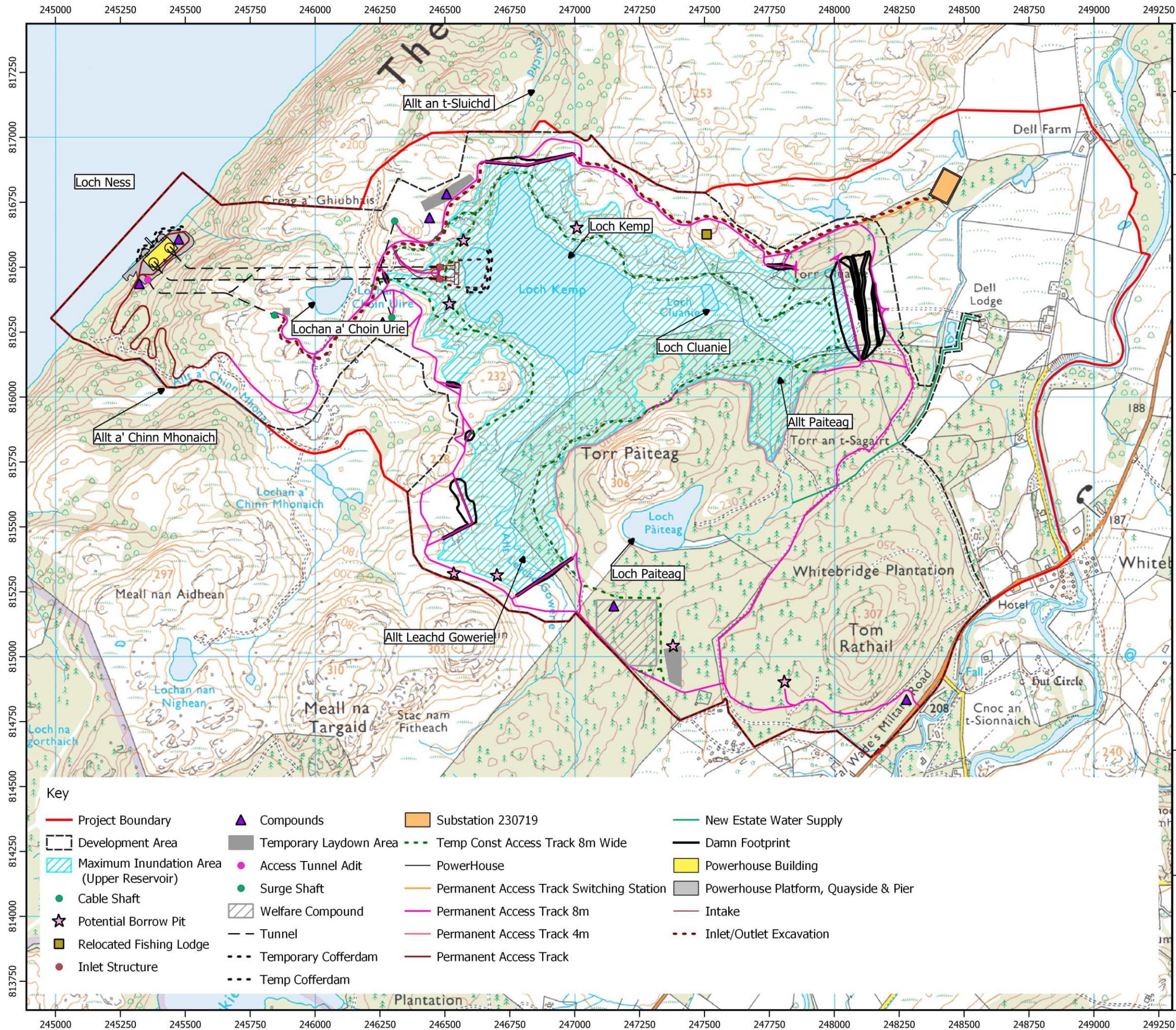
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Prepared By: DM

Reviewed By: MH

Approved By: MH



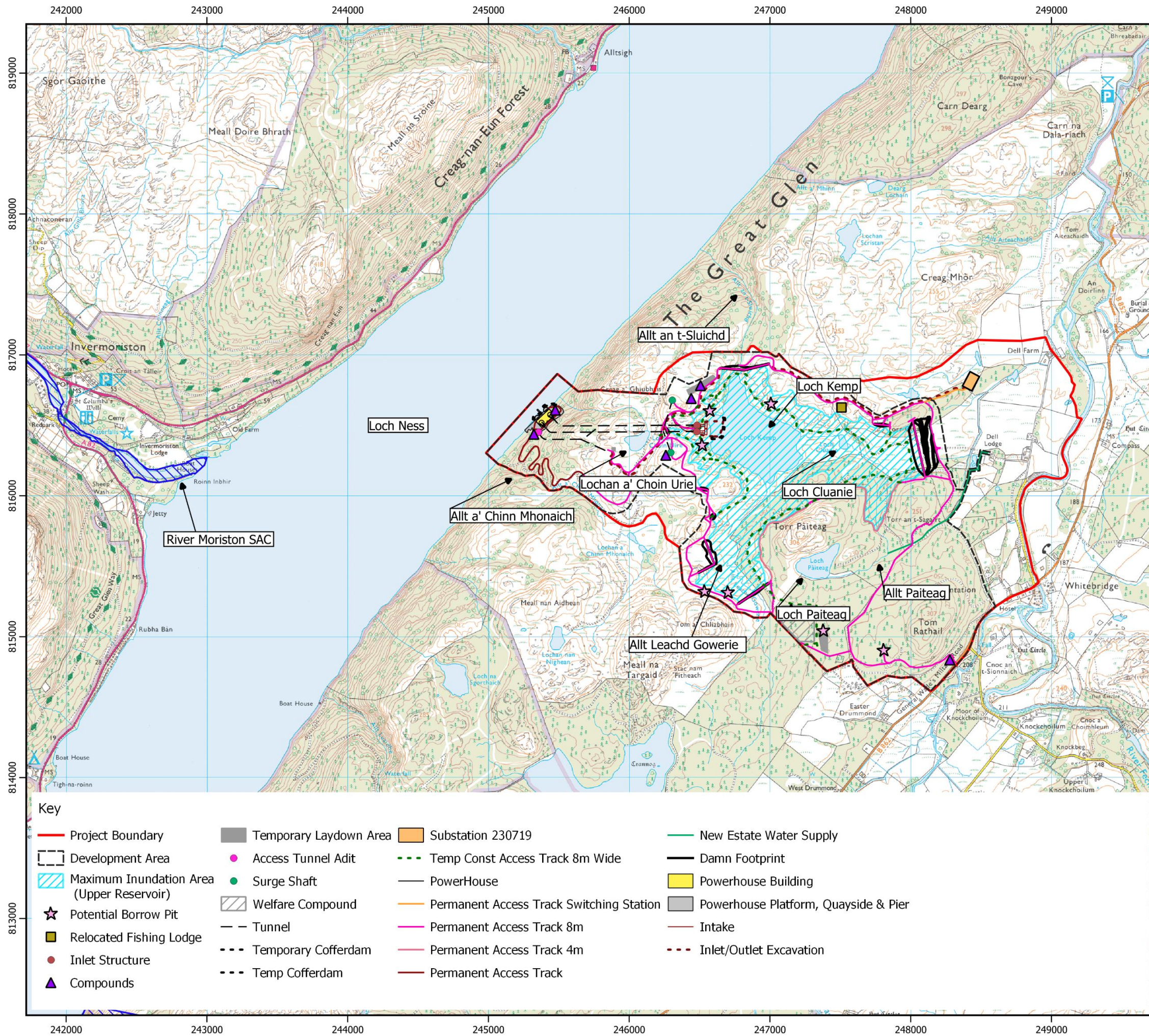
Loch Kemp Storage

Figure 1.1  
Field Study Areas

Scale @ A3: 1:13,500

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Loch Kemp Storage




























Figure 1.2  
Field Study Areas and Designated Sites

 River Moriston  
Special Area of Conservation (SAC)

 Scale @ A3: 1:25,000

0 250 500 m

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- Key**
- |   |  |  |  |
|---|--|--|--|
|  Project Boundary                          |  Temporary Laydown Area |  Substation 230719                        |  New Estate Water Supply              |
|  Development Area                          |  Access Tunnel Adit     |  Temp Const Access Track 8m Wide          |  Dam Footprint                        |
|  Maximum Inundation Area (Upper Reservoir) |  Surge Shaft            |  PowerHouse                               |  Powerhouse Building                  |
|  Potential Borrow Pit                      |  Welfare Compound       |  Permanent Access Track Switching Station |  Powerhouse Platform, Quayside & Pier |
|  Relocated Fishing Lodge                   |  Tunnel                 |  Permanent Access Track 8m                |  Intake                               |
|  Inlet Structure                           |  Temporary Cofferdam    |  Permanent Access Track 4m                |  Inlet/Outlet Excavation              |
|  Compounds                                 |  Temp Cofferdam         |  Permanent Access Track                   |  |

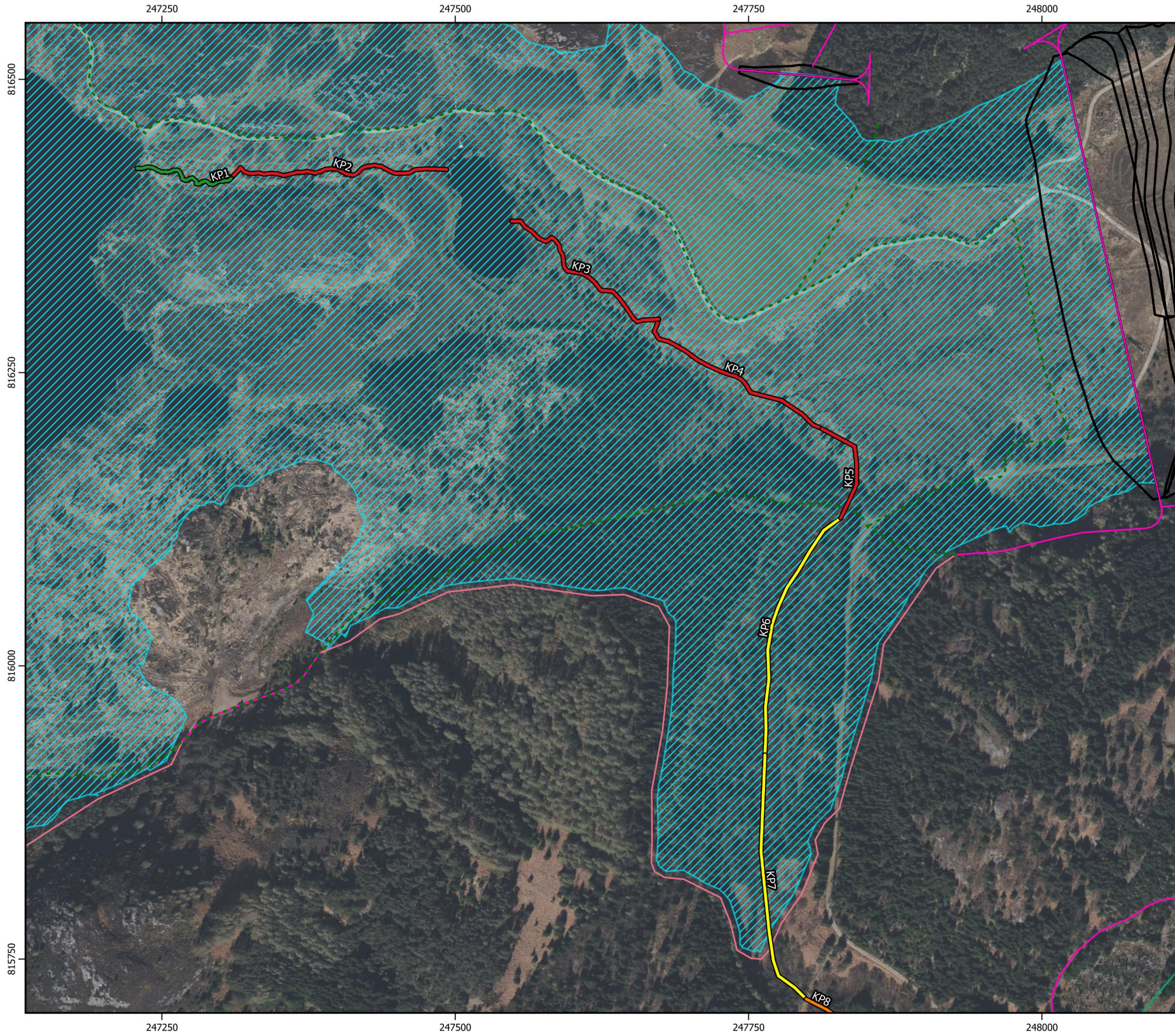


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Prepared By: DM

Reviewed By: MH

Approved By: MH



Loch Kemp Storage

Figure 2.1  
Riverine Fish Habitat Quality

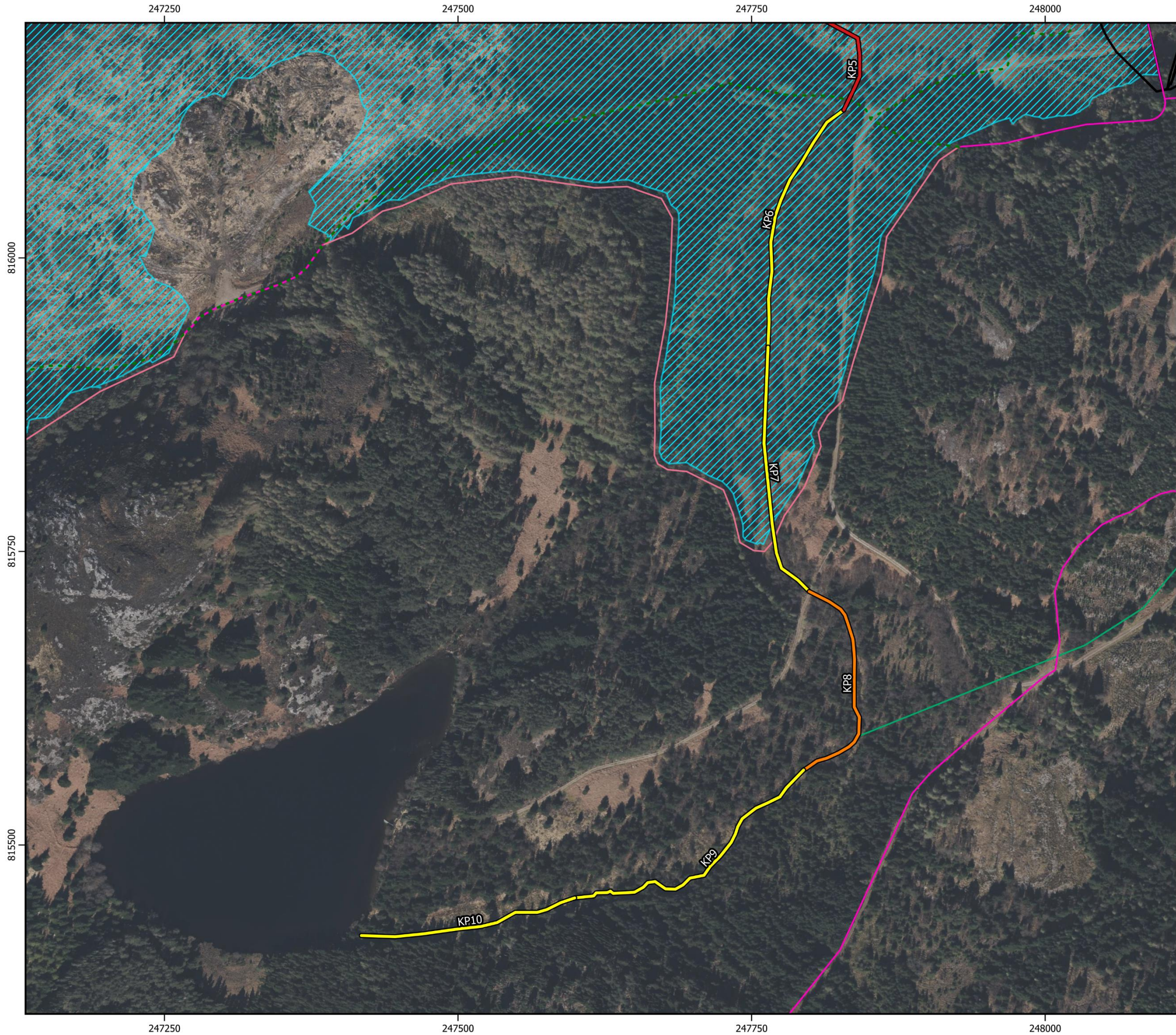
- Key
- Development Area
  - Maximum Inundation Area (Upper Reservoir)
  - Temp Const Access Track 8m Wide
  - Permanent Access Track 8m
  - Permanent Access Track 4m
  - New Estate Water Supply
  - Dam Footprint
- Riverine Fish Habitat Quality
- Poor
  - Low
  - Moderate
  - Good

N  
  
 Scale @ A3: 1:3,000

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 Approved By: MH



Loch Kemp Storage

Figure 2.2  
Riverine Fish Habitat Quality

**Key**

- Development Area
- Maximum Inundation Area (Upper Reservoir)
- Temp Const Access Track 8m Wide
- Permanent Access Track 8m
- Permanent Access Track 4m
- New Estate Water Supply
- Dam Footprint

**Riverine Fish Habitat Quality**

- Poor
- Low
- Moderate

N

Scale @ A3: 1:3,000

0 25 50 75 100 m

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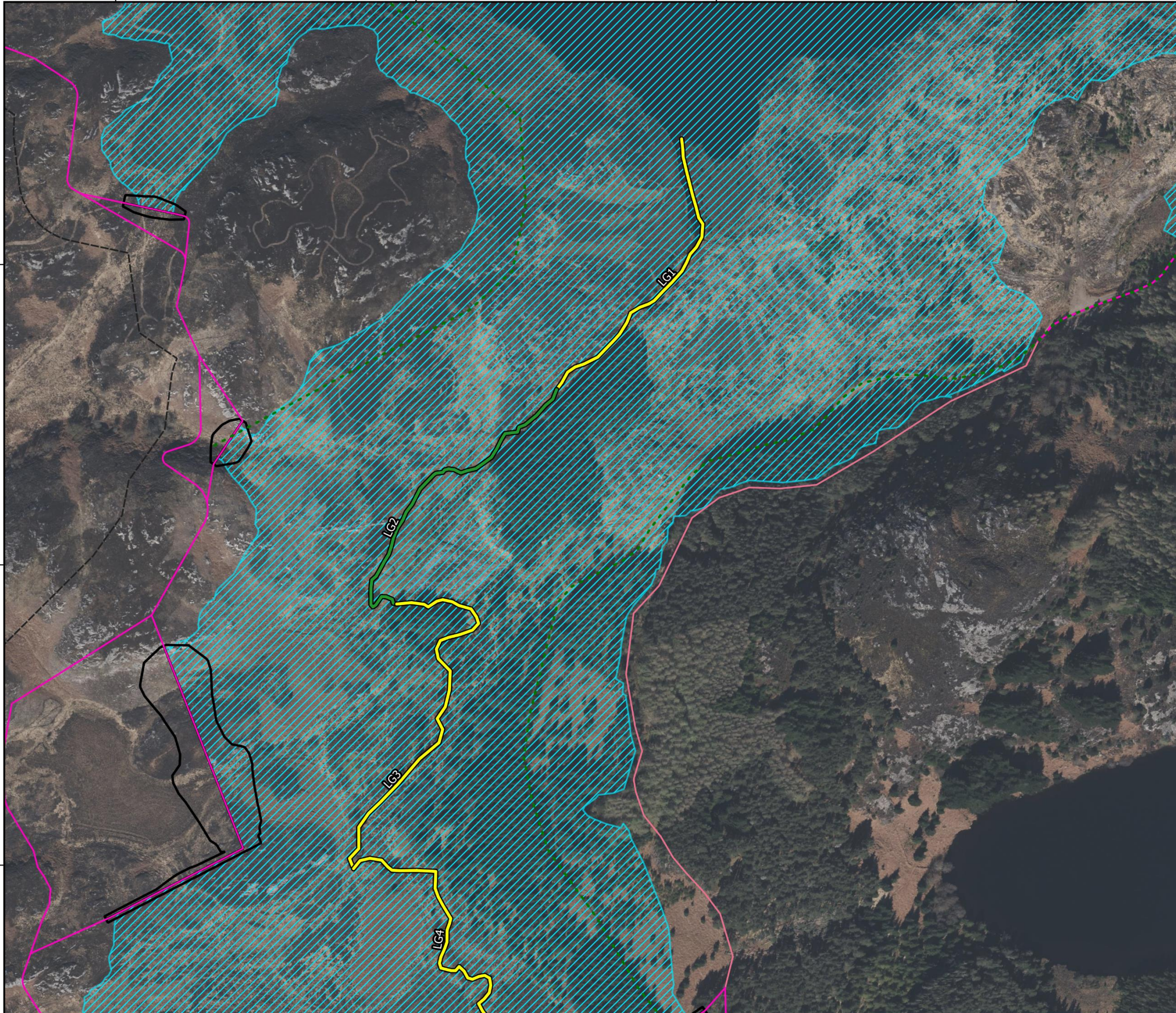
Prepared By: DM

Reviewed By: MH

Approved By: MH

246500 246750 247000 247250

816000  
815750  
815500



Loch Kemp Storage

Figure 2.3  
Riverine Fish Habitat Quality

- Key
- Development Area
  - Maximum Inundation Area (Upper Reservoir)
  - Temp Const Access Track 8m Wide
  - Permanent Access Track 8m
  - Permanent Access Track 4m
  - Damn Footprint
- Riverine Fish Habitat Quality
- Moderate
  - Good

N

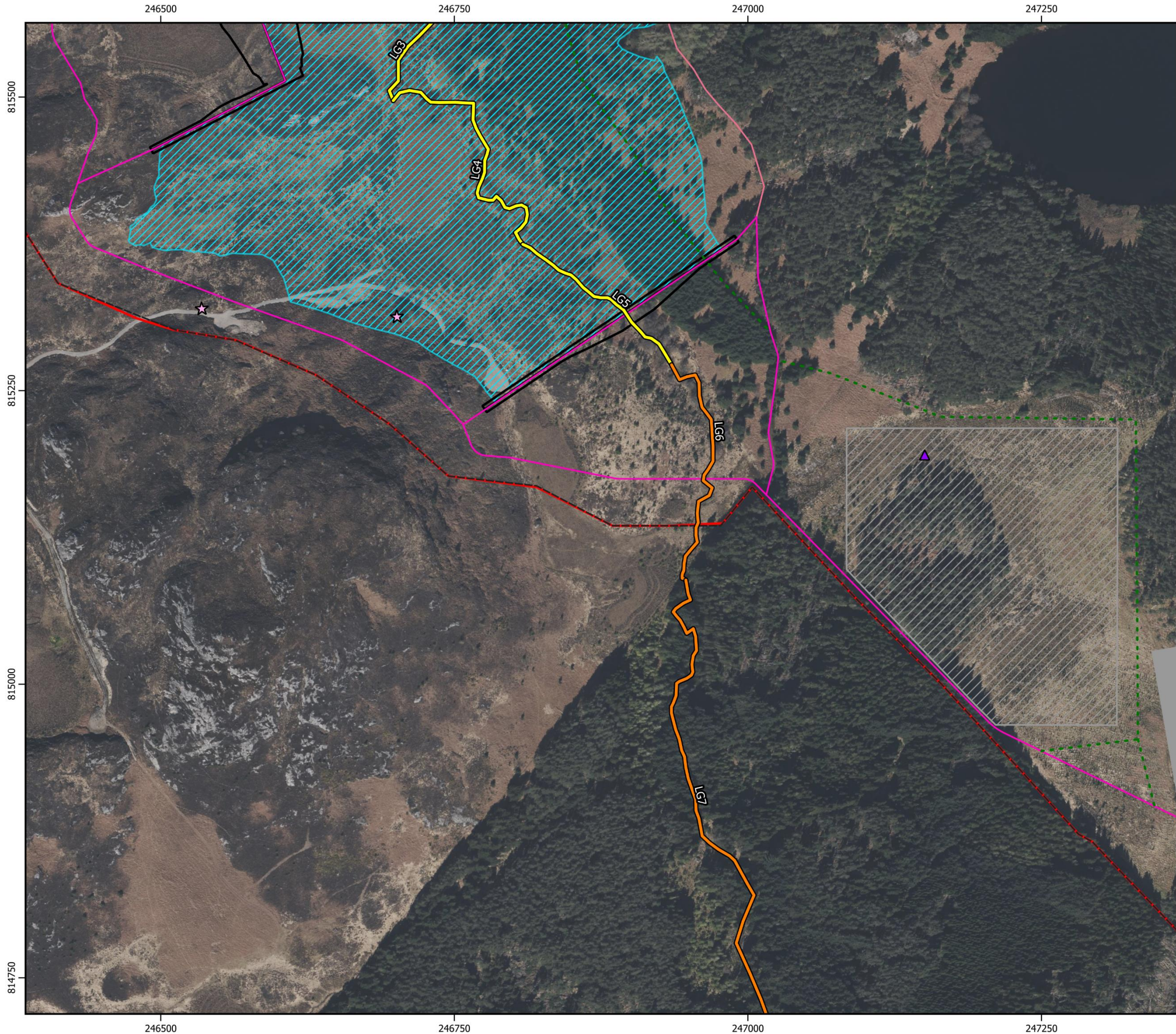
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 Approved By: MH

246500 246750 247000 247250



Loch Kemp Storage

Figure 2.4  
Riverine Fish Habitat Quality

- Key**
- Project Boundary
  - Development Area
  - Maximum Inundation Area (Upper Reservoir)
  - ★ Potential Borrow Pit
  - ▲ Compounds
  - Temporary Laydown Area
  - Welfare Compound
  - - - Temp Const Access Track 8m Wide
  - Permanent Access Track 8m
  - Permanent Access Track 4m
  - Dam Footprint
- Riverine Fish Habitat Quality**
- Low
  - Moderate

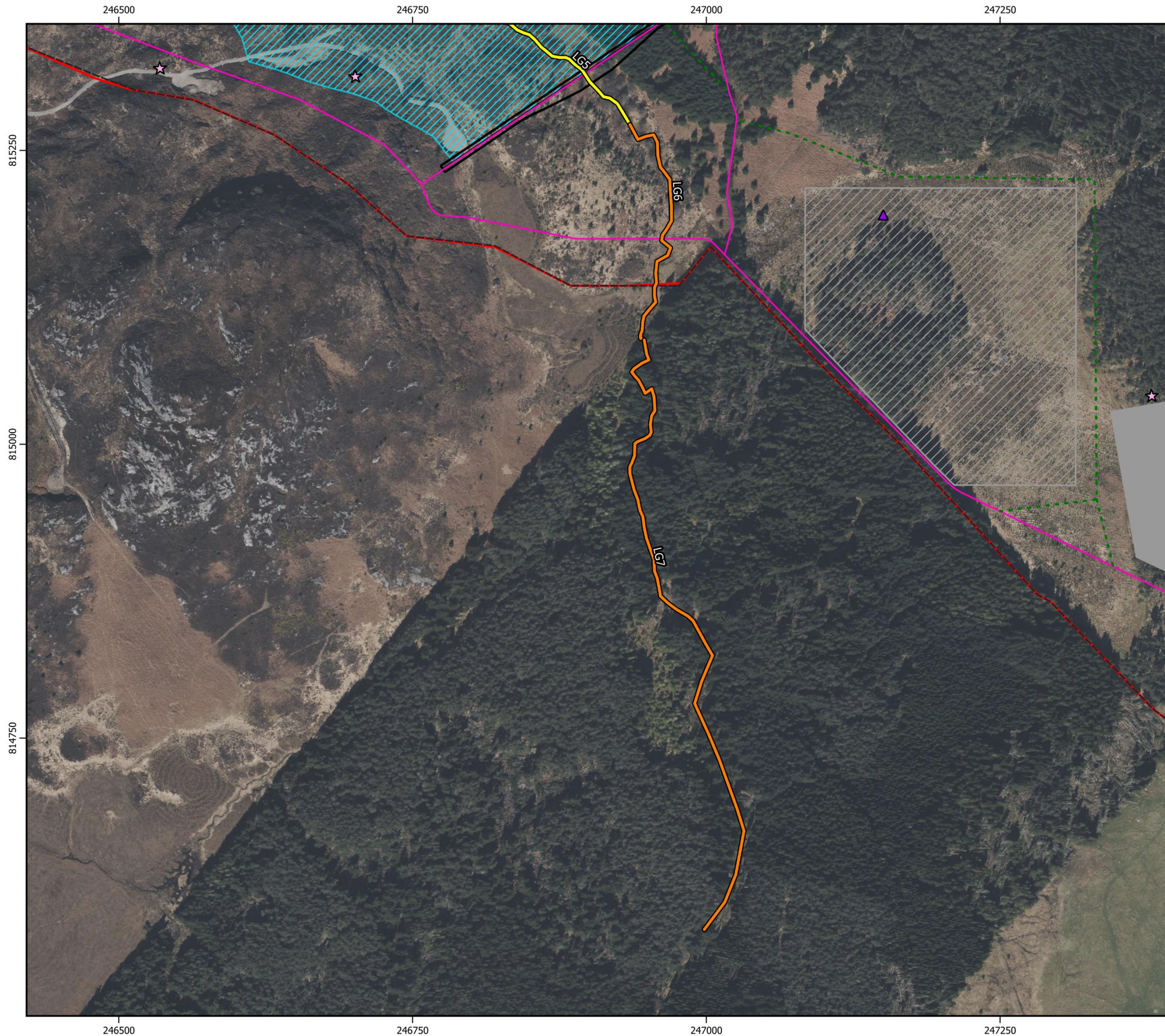
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Loch Kemp Storage

Figure 2.5  
Riverine Fish Habitat Quality

- Key
- Project Boundary
  - Development Area
  - Maximum Inundation Area (Upper Reservoir)
  - Potential Borrow Pit
  - Compounds
  - Temporary Laydown Area
  - Welfare Compound
  - Temp Const Access Track 8m Wide
  - Permanent Access Track 8m
  - Dam Footprint
- Riverine Fish Habitat Quality
- Low
  - Moderate

N  
Scale @ A3: 1:3,000  
0 25 50 75 100 m

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Approved By: MH



Loch Kemp Storage

Figure 2.6  
Riverine Fish Habitat Quality

- Key**
- Project Boundary
  - Development Area
  - Maximum Inundation Area (Upper Reservoir)
  - Cable Shaft
  - ▲ Compounds
  - Temporary Laydown Area
  - Surge Shaft
  - Tunnel
  - Temp Const Access Track 8m Wide
  - Permanent Access Track 8m
  - Dam Footprint
  - Intake
- Riverine Fish Habitat Quality**
- Poor

N

Scale @ A3: 1:2,000

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Date: 30-10-2023

Prepared By: DM

Reviewed By: MH

Approved By: MH

245750

246000

246250

816750

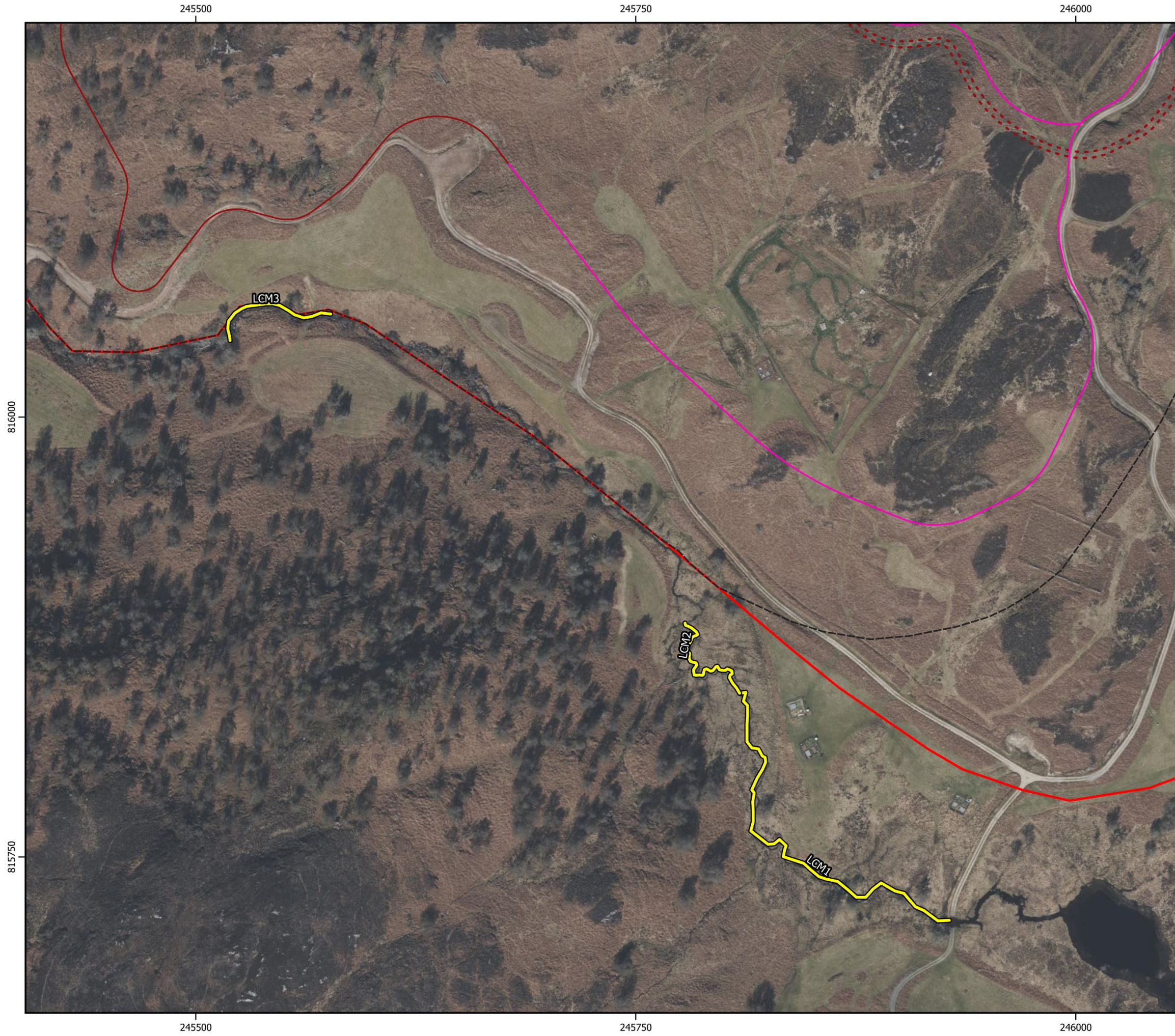
816500

816250

245750

246000

246250



Loch Kemp Storage

Figure 2.7  
Riverine Fish Habitat Quality

Key

- Project Boundary
- Development Area
- Permanent Access Track 8m
- Permanent Access Track
- Riverine Fish Habitat Quality
- Moderate

N Scale @ A3: 1:2,000

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Date: 30-10-2023  
Prepared By: DM  
Reviewed By: MH  
Approved By: MH

245000










245250

245500

Loch Kemp Storage

Figure 2.8  
Riverine Fish Habitat Quality

Key

-  Project Boundary
  -  Development Area
  -  Compounds
  -  Access Tunnel Adit
  -  Tunnel
  -  Permanent Access Track
  -  Powerhouse Platform, Quayside & Pier
- Riverine Fish Habitat Quality
-  Moderate
  -  Good

816250

LCM4

LCM3



Scale @ A3: 1:2,000

0 25 50 75 100 m

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Date: 30-10-2023

Prepared By: DM

Reviewed By: MH

Approved By: MH

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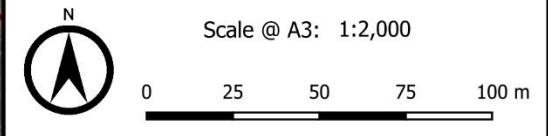
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Loch Kemp Storage

Figure 2.9  
Riverine Fish Habitat Quality

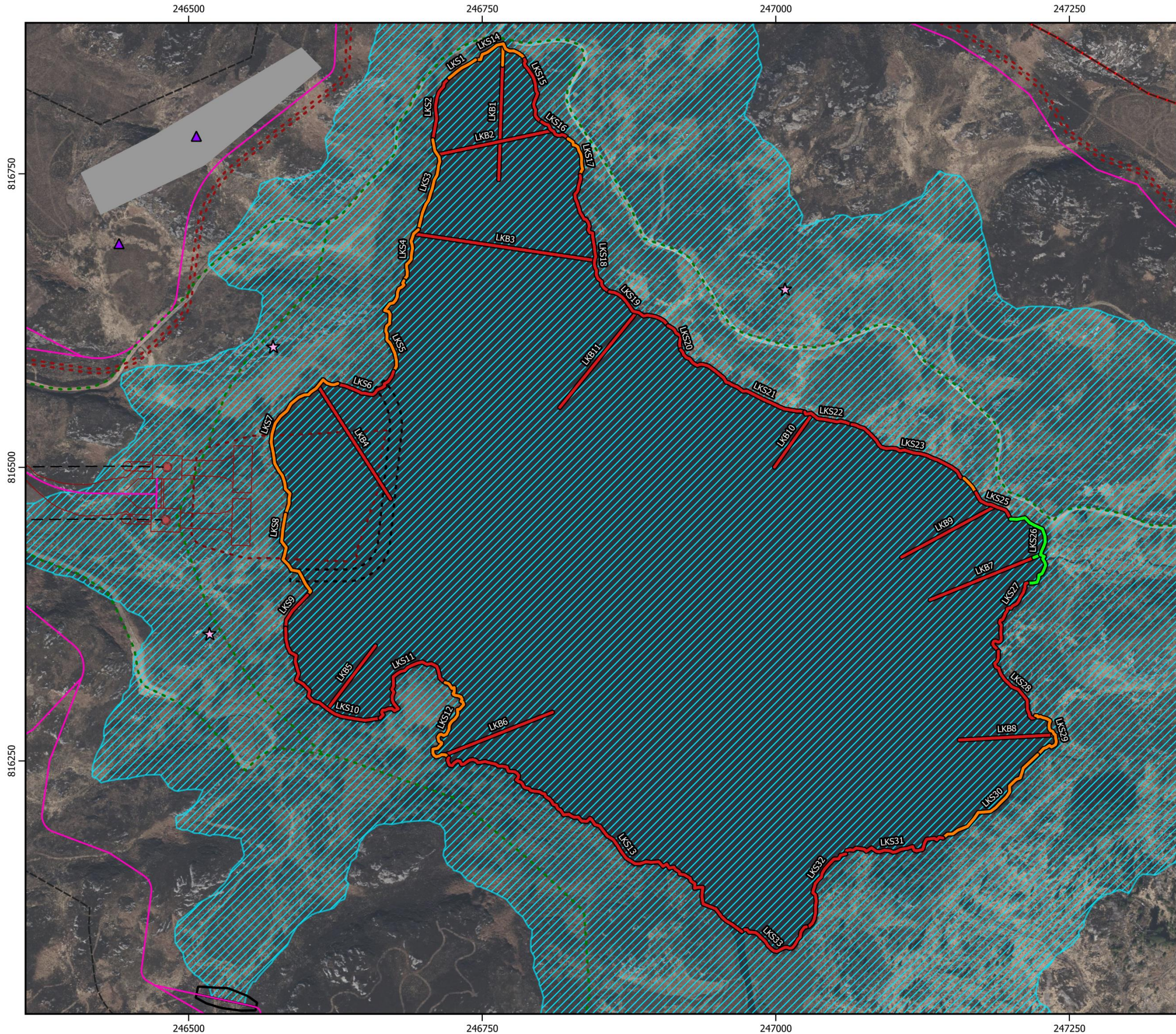
- Key
- Project Boundary
  - Development Area
  - Maximum Inundation Area (Upper Reservoir)
  - Temporary Laydown Area
  - Temp Const Access Track 8m Wide
  - Permanent Access Track 8m
  - Damn Footprint
- Riverine Fish Habitat Quality
- Moderate
  - Good



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Approved By: MH



Loch Kemp Storage

Figure 3.1  
Loch Kemp  
Salmonid Spawning Habitat Assessment  
Shoreline and Boat Transects

- Key**
- Project Boundary
  - Development Area
  - Maximum Inundation Area (Upper Reservoir)
  - ★ Potential Borrow Pit
  - Inlet Structure
  - ▲ Compounds
  - Temporary Laydown Area
  - Tunnel
  - Temp Cofferdam
  - Temp Const Access Track 8m Wide
  - Permanent Access Track 8m
  - Dam Footprint
  - Intake
  - Inlet/Outlet Excavation
- Salmonid Spawning Habitat Rating**
- Not Suitable
  - Sub-Optimal
  - Optimal

N Scale @ A3: 1:3,000

0 25 50 75 100 m

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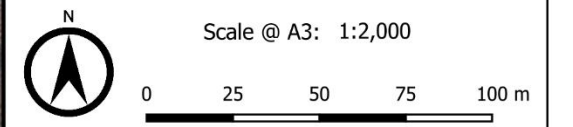


Loch Kemp Storage

Figure 3.2.1  
Loch Ness  
Salmonid Spawning Habitat Assessment  
Shoreline and Boat Transects

Key

- Project Boundary
- Development Area
- Permanent Access Track
- Salmonid Spawning Habitat Rating**
- Not Suitable
- Sub-Optimal
- Optimal



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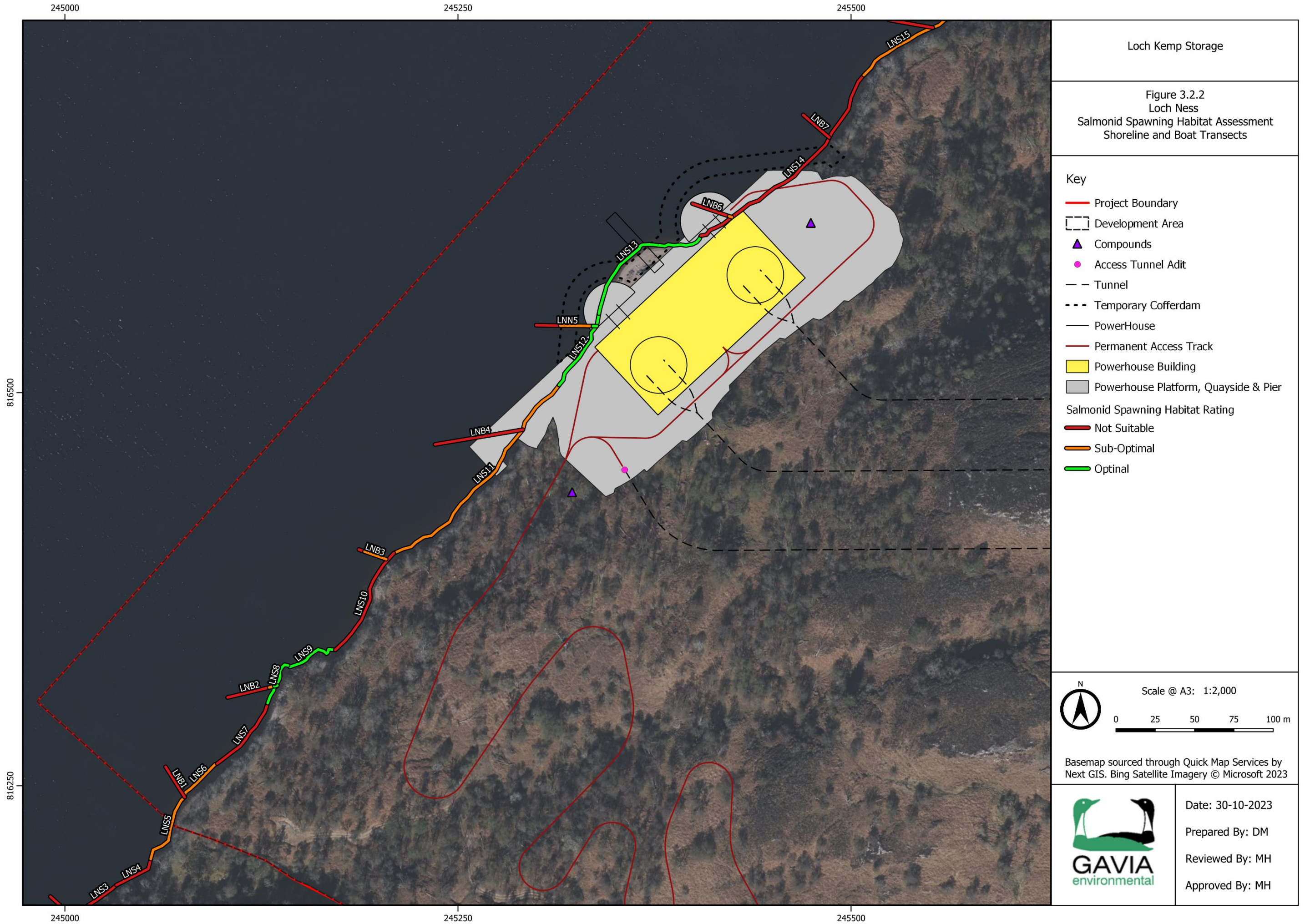
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Loch Kemp Storage

Figure 3.2.3  
Loch Ness  
Salmonid Spawning Habitat Assessment  
Shoreline and Boat Transects

Key

- Project Boundary
- Development Area
- Temporary Cofferdam
- Salmonid Spawning Habitat Rating**
- Not Suitable
- Sub-Optimal
- Optimal



Scale @ A3: 1:2,000

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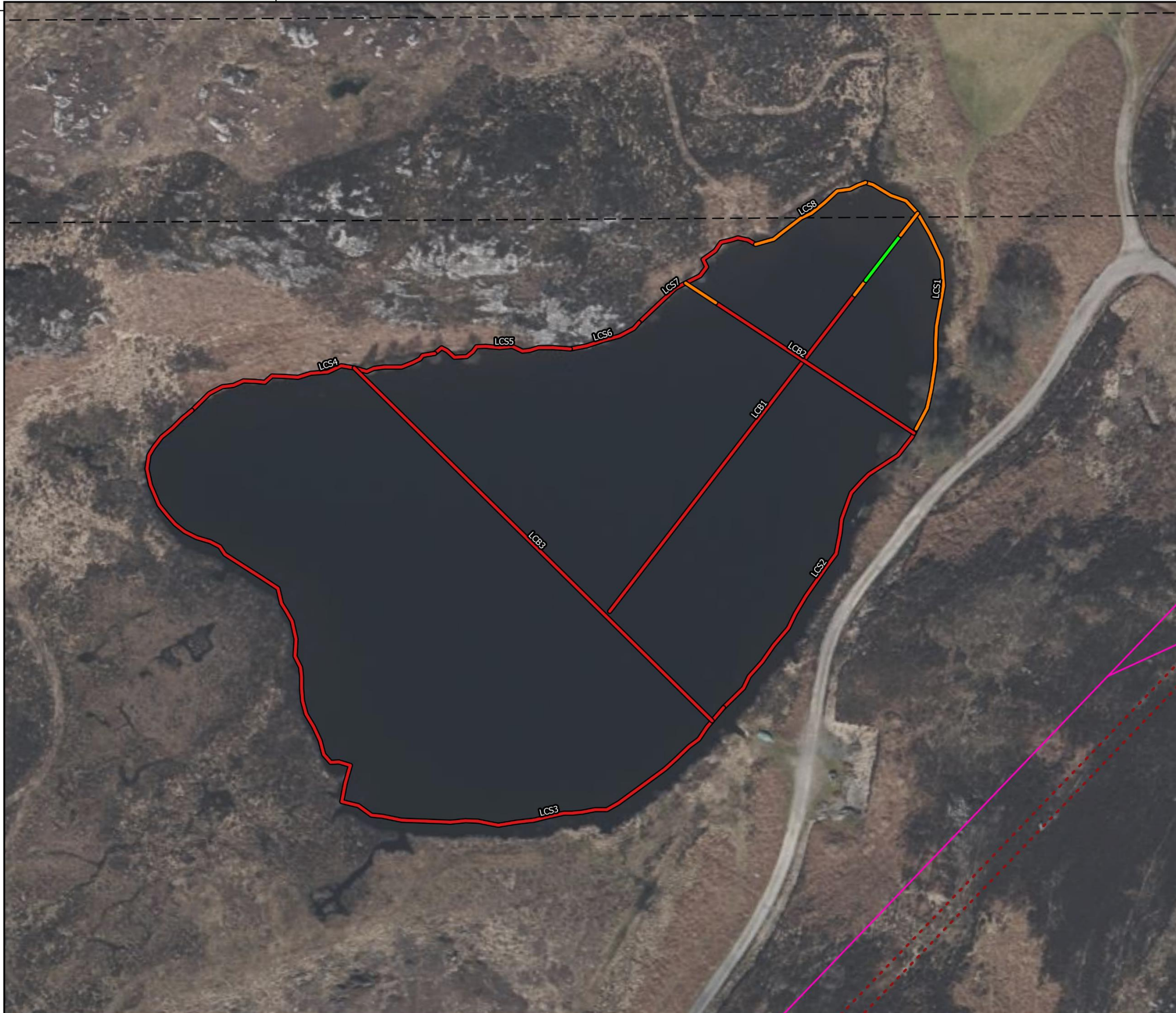
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Loch Kemp Storage

Figure 3.3  
 Lochan a' Choin Urie  
 Salmonid Spawning Habitat Assessment  
 Shoreline and Boat Transects

Key

Development Area

Tunnel

Permanent Access Track 8m

Salmonid Spawning Habitat Rating

Not Suitable

Sub-Optimal

Optimal



Scale @ A3: 1:800

0 10 20 30 40 m

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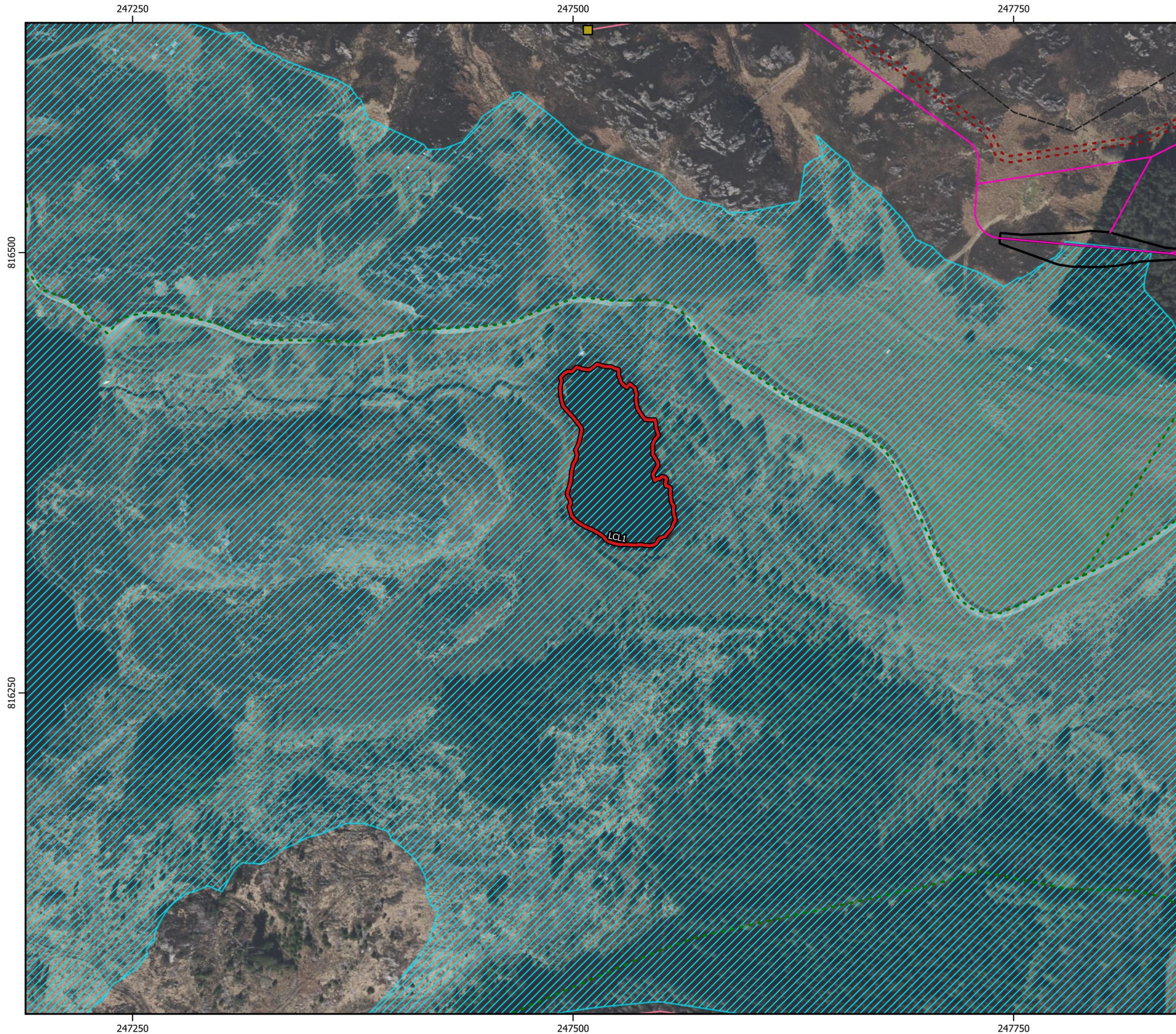


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Reviewed By: MH




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Loch Kemp Storage

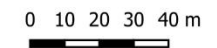
Figure 3.4  
Loch Cluanie  
Salmonid Spawning Habitat Assessment  
Shoreline

Key

-  Development Area
-  Maximum Inundation Area (Upper Reservoir)
-  Relocated Fishing Lodge
-  Temp Const Access Track 8m Wide
-  Permanent Access Track 8m
-  Permanent Access Track 4m
-  Damn Footprint
- Loch Cluanie Shoreline Habitat
-  Not Suitable



Scale @ A3: 1:2,000



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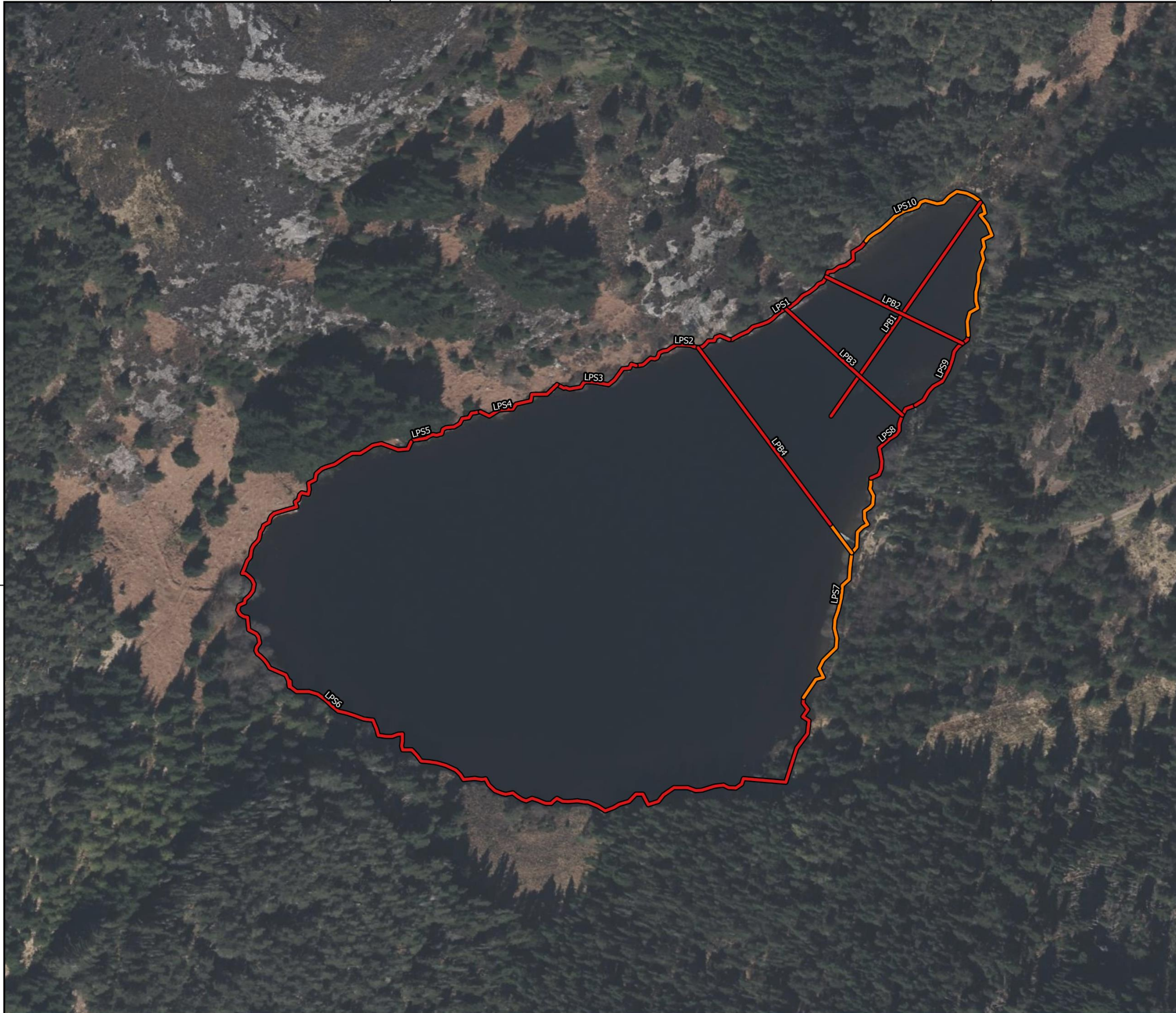
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Loch Kemp Storage

Figure 3.5  
Loch Paiteag  
Salmonid Spawning Habitat Assessment  
Shoreline and Boat Transects

Key

Development Area

Loch Paiteag Shoreline and Boat Transects

Not Suitable

Sub-Optimal



Scale @ A3: 1:1,500

0 10 20 30 40 m

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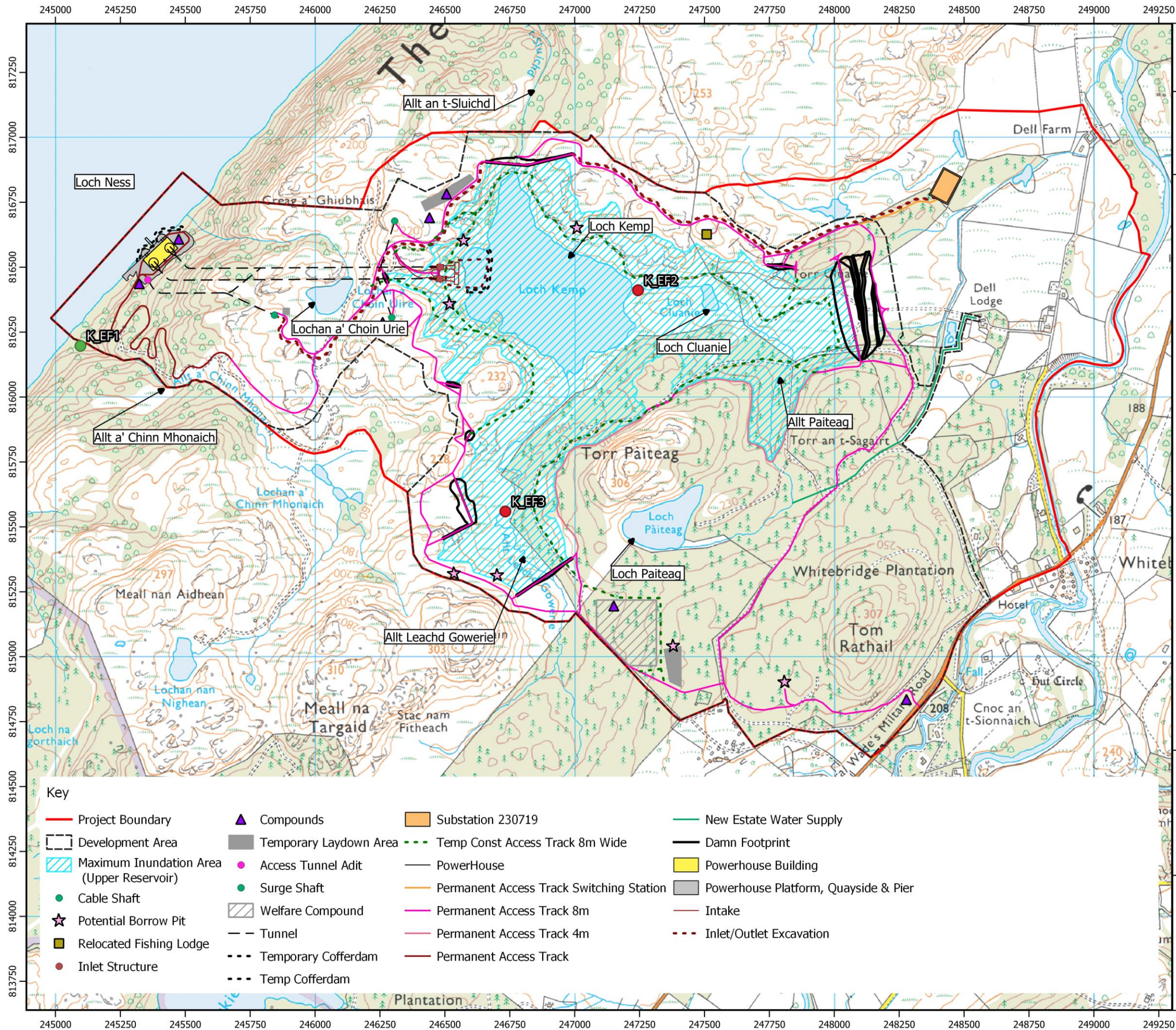


Date: 17-11-2023

Prepared By: DM

Reviewed By: MH

Approved By: MH



Loch Kemp Storage  
 Figure 4.1  
 Fish Population Survey Results

- SFCC Classification  
 Brown Trout Fry (0+)
- Excellent
  - Good
  - Moderate
  - Low
  - Very Low
  - Absent

Key

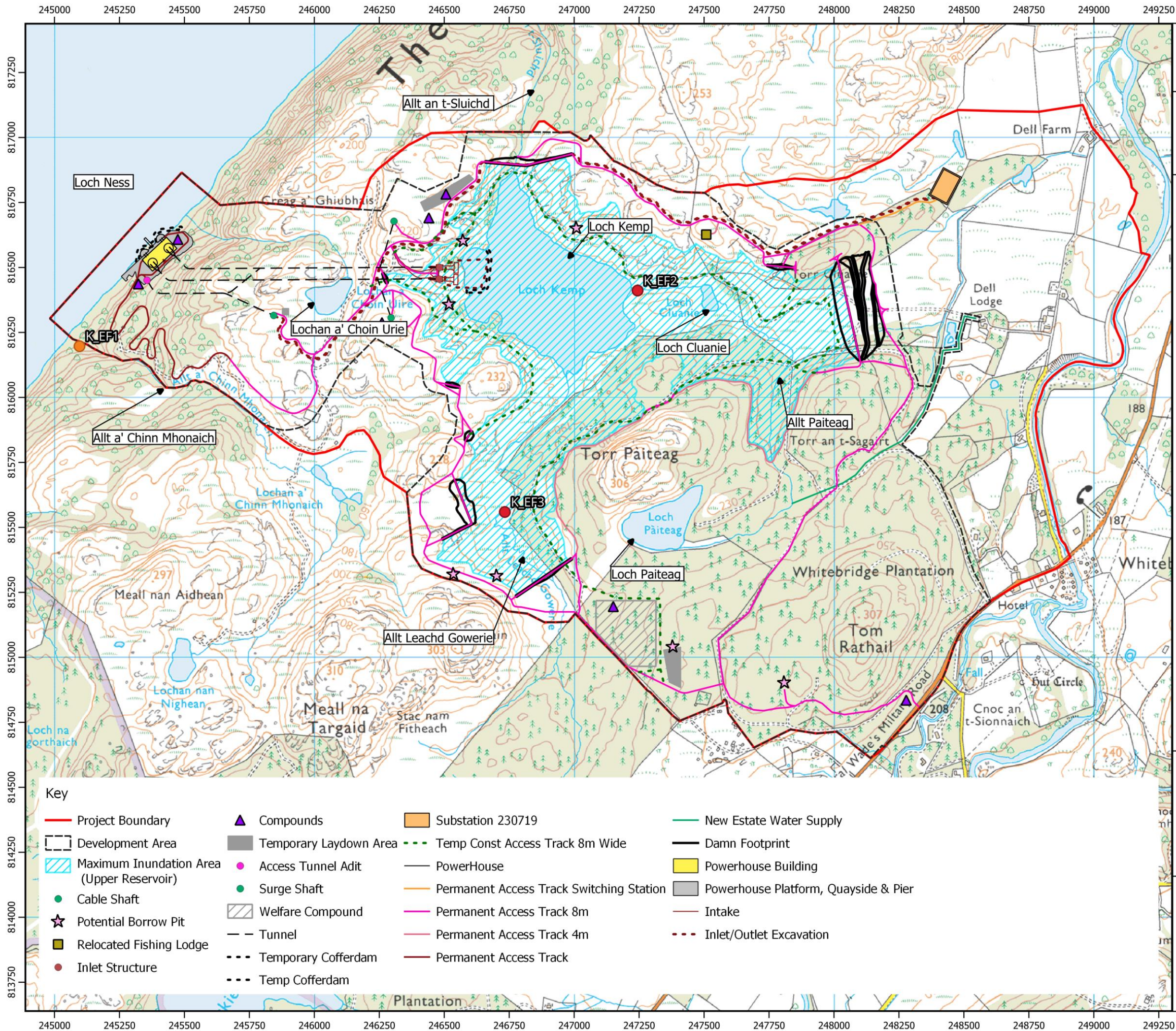
- |   |                          |  |  |
|---|--------------------------|--|--|
| — Project Boundary                          | ▲ Compounds              | ■ Substation 230719                        | — New Estate Water Supply              |
| □ Development Area                          | ■ Temporary Laydown Area | --- Temp Const Access Track 8m Wide        | — Dam Footprint                        |
| ▨ Maximum Inundation Area (Upper Reservoir) | ● Access Tunnel Adit     | — PowerHouse                               | ■ Powerhouse Building                  |
| ● Cable Shaft                               | ● Surge Shaft            | — Permanent Access Track Switching Station | ■ Powerhouse Platform, Quayside & Pier |
| ★ Potential Borrow Pit                      | ▨ Welfare Compound       | — Permanent Access Track 8m                | — Intake                               |
| ■ Relocated Fishing Lodge                   | --- Tunnel               | — Permanent Access Track 4m                | --- Inlet/Outlet Excavation            |
| ● Inlet Structure                           | --- Temporary Cofferdam  | — Permanent Access Track                   |  |
|   | --- Temp Cofferdam       |  |  |

Scale @ A3: 1:13,500  
 0 250 500 m

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 Reviewed By: MH  
 Approved By: MH



Loch Kemp Storage

Figure 4.2  
Fish Population Survey Results

- SFCC Classification  
Brown Trout Parr (1+)
- Excellent
  - Good
  - Moderate
  - Low
  - Very Low
  - Absent

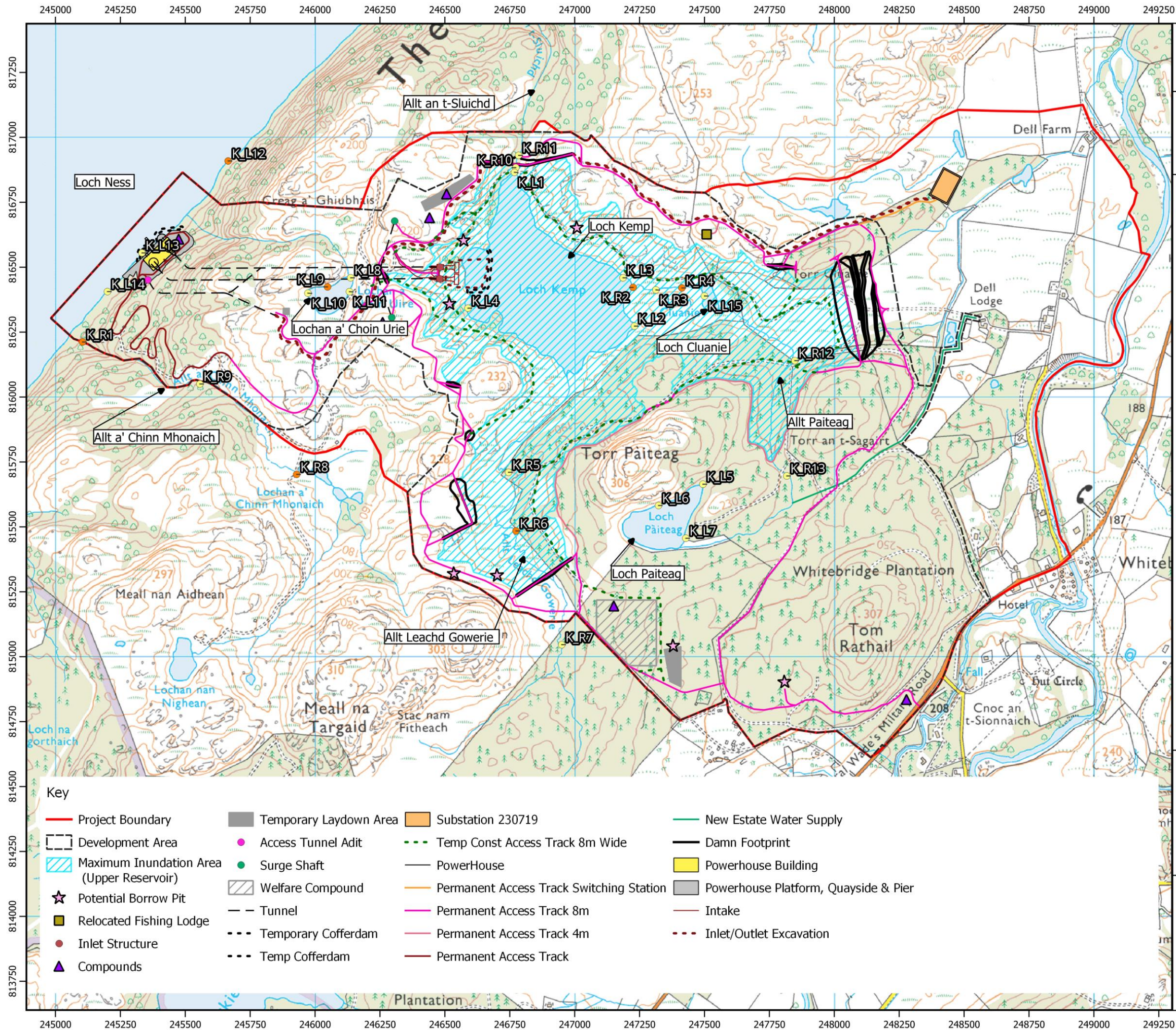
Key

- |   |                          |  |  |
|---|--------------------------|--|--|
| — Project Boundary                          | ▲ Compounds              | ■ Substation 230719                        | — New Estate Water Supply              |
| □ Development Area                          | ■ Temporary Laydown Area | --- Temp Const Access Track 8m Wide        | — Dam Footprint                        |
| ▨ Maximum Inundation Area (Upper Reservoir) | ● Access Tunnel Adit     | — PowerHouse                               | ■ Powerhouse Building                  |
| ● Cable Shaft                               | ● Surge Shaft            | — Permanent Access Track Switching Station | ■ Powerhouse Platform, Quayside & Pier |
| ★ Potential Borrow Pit                      | ▨ Welfare Compound       | — Permanent Access Track 8m                | — Intake                               |
| ■ Relocated Fishing Lodge                   | --- Tunnel               | — Permanent Access Track 4m                | --- Inlet/Outlet Excavation            |
| ● Inlet Structure                           | --- Temporary Cofferdam  | — Permanent Access Track                   |  |
|   | --- Temp Cofferdam       |  |  |

Scale @ A3: 1:13,500

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Approved By: MH



Loch Kemp Storage

Figure 5.0  
Riverine and Loch Macroinvertebrates  
Biological Monitoring Working Party (BMWP)  
Scores

- Macroinvertebrate BMWP Score
- Very good biological quality
  - Good biological quality
  - Fair biological quality
  - Poor biological quality
  - Very poor biological quality
- L = Loch  
R = Riverine

Key

- |   |                          |  |  |
|---|--------------------------|--|--|
| — Project Boundary                          | ■ Temporary Laydown Area | ■ Substation 230719                        | — New Estate Water Supply              |
| □ Development Area                          | ● Access Tunnel Adit     | --- Temp Const Access Track 8m Wide        | — Damn Footprint                       |
| ▨ Maximum Inundation Area (Upper Reservoir) | ● Surge Shaft            | — PowerHouse                               | ■ Powerhouse Building                  |
| ★ Potential Borrow Pit                      | ▨ Welfare Compound       | — Permanent Access Track Switching Station | ■ Powerhouse Platform, Quayside & Pier |
| ■ Relocated Fishing Lodge                   | --- Tunnel               | — Permanent Access Track 8m                | — Intake                               |
| ● Inlet Structure                           | --- Temporary Cofferdam  | — Permanent Access Track 4m                | --- Inlet/Outlet Excavation            |
| ▲ Compounds                                 | --- Temp Cofferdam       | — Permanent Access Track                   |  |

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