March 2025

Glen Earrach Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 3: Evolution of Design and Alternatives

Glen Earrach Energy Ltd

Glen Earrach AECOM

Quality information

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Issue History

Issue	Issue date	Details	Authorized	Name	Position
1	March 2025	Submission	DL	DL	Technical Director – Renewable Energy

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3. Evolution of Design and Alternatives

3.1 Introduction

3.1.1 This chapter sets out the alternatives considered by the Applicant and the evolution of the design that has led to the Proposed Development as it is described in **Chapter 2: Project and Site Description (Volume 2: Main Report).**

3.1.2 Under Schedule 4, Paragraph 2 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the "**EIA Regulations**"), developers are required to provide *"a description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."*

3.2 Alternative Location

3.2.1 The site characteristics for the development of viable Pumped Storage Hydro (PSH) schemes are quite rare, requiring a combination of factors, notably topography (large height change over a short distance with proximity to at least one existing water body), geology (reasonable consistency of rock type), reasonable proximity to the national electricity grid and a reasonable minimum of evident environmental impacts.

3.2.2 The potential of the Proposed Development Site for PSH was originally identified in 2009 during feasibility work by SSE, which concluded that Balmacaan Estate had exceptional potential for a large-scale PSH development. Subsequent independent assessments commissioned by Glen Earrach Energy have confirmed that the Proposed Development Site not only meets but exceeds the criteria required for a viable, efficient, and environmentally deliverable PSH project, by having the following characteristics:

- **Significant topographical variation**: A substantial height difference over a relatively short horizontal distance is needed to allow for effective energy storage and release. The Glen Earrach site benefits from a height differential of approximately 480 m between the proposed upper and lower reservoirs, which enables efficient generation using less water. This makes it one of the most water-efficient PSH opportunities in the UK.
- **Proximity to a large water body**: At least one suitable existing water body is typically required to minimise construction complexity and environmental impact. Glen Earrach utilises Loch Ness as its Tailpond, which provides a naturally suitable lower reservoir without requiring the creation of an entirely new loch or reservoir.
- **Favourable geology**: The Proposed Development Site exhibits strong, consistent rock conditions suitable for large-scale tunnelling and underground caverns. Initial geological investigations and specialist studies have confirmed the presence of rock types appropriate for constructing the extensive underground infrastructure associated with PSH, such as the Power Cavern Complex and Headrace tunnels.
- **Grid connection potential**: The Proposed Development Site lies close to existing grid infrastructure.
- **Existing access infrastructure**: The Proposed Development Site can be accessed via existing forestry roads, reducing the need for major new road infrastructure to be constructed.

3.2.3 There are limited suitable sites for the viable deployment of PSH technology. The feasibility studies determined that the Proposed Development Site was particularly suited to accommodate a PSH scheme by exceeding the criteria required for a successful scheme which avoids sensitive environmental features and, as such, no alternative site locations were considered.

3.2.4 **Section 3.4 Design Evolution** provides further details on the on-site location alternatives of the Proposed Development components and how the spatial orientation of these have progressed through design evolution.

3.3 Alternative Technology

3.3.1 There are few, if any, energy storage technologies which can provide the grid scale services of Pumped Storage Hydro. Alternative storage technologies are either too small (batteries) to provide the necessary long durations required, or largely unproven (compressed air) and in the case of ancillary grid services such as fast response, more carbon intense (open cycle gas).

3.3.2 PSH schemes provide benefits by balancing the electricity supply and demand. Recharge occurs at periods of low demand and stores excess energy generated by baseload and intermittent power stations so that this energy can be re-released at peak times. This is especially beneficial in Scotland where an increasing percentage of electricity is coming from wind power, the delivery of which is intermittent and therefore PSH schemes support renewable energy generators by providing greater stability to the grid, reducing constraints on wind and solar generation in particular. PSH can also provide ancillary services to the grid.

3.3.3 The Proposed Development will have a storage capacity of approximately 34,000 megawatt hours subject to final configuration of the Headpond, with approximately 2,000 megawatts of installed electrical pumping capacity and 1,800 MW of installed electrical generating capacity (both subject to final pump-turbine selection), with an average gross head (vertical distance between Headpond and Tailpond) of approximately 480 m.

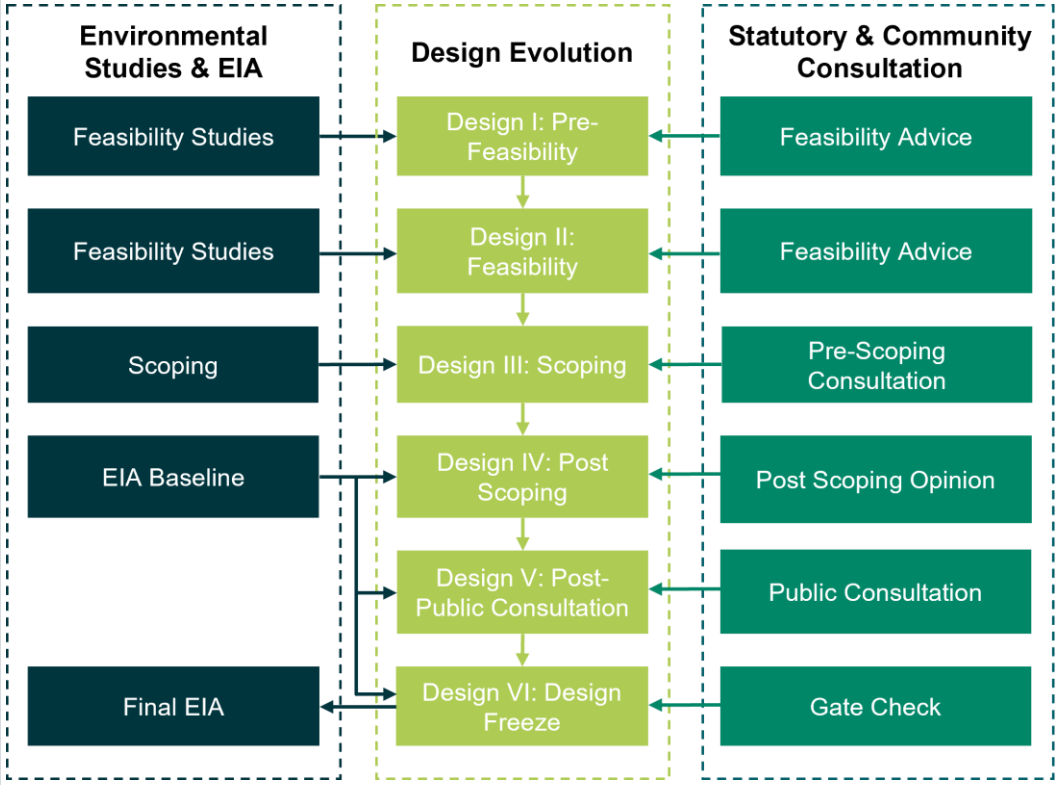
3.4 Design Evolution

3.4.1 The Proposed Development has evolved through an iterative design process where the design has been progressed in parallel with the EIA process through consideration of engineering feasibility, environmental constraints and consultation responses. This has resulted in the submitted design, as presented in **Chapter 2: Project and Site Description (Volume 2: Main Report).** Where possible, mitigation has been integrated into the design to reduce any potential significant effects from the Proposed Development on identified receptors. The embedded mitigation is set out in **Section 3.6: Embedded Mitigation** of this chapter.

3.4.2 The Headpond design has evolved through consideration of engineering feasibility, environmental constraints and overall operational output. Where possible, mitigation has been embedded into the design to reduce any potential significant effects from the Proposed Development on identified sensitive receptors. Consultation responses, stakeholder feedback, public consultation and collation of baseline survey results influenced the final submitted design for the Proposed Development.

3.4.3 The area has previously been subject to feasibility studies when Scottish and Southern Energy (SSE) investigated Balmacaan as a site for a PSH scheme in 2009/2010. SSE's concept was for a 900 MW, 30,000 MWh PSH project using Loch nam Breac Dearga as the Headpond on the north shore of Loch Ness. The Applicant subsequently chose to develop this existing concept as the topography and geology of the area provides a highly suitable location for a PSH development which delivers a substantial height difference (approximately 480m) over a relatively short horizontal distance which will support efficient generation using less water.

3.4.4 The evolution of the design of the Proposed Development is set out in the following sections and the process is shown in **Insert 3.1: Design Evolution Process for the Proposed Development**.



Insert 3.1: Design Evolution Process for the Proposed Development

Design I: Pre-Feasibility (April 2022)

3.4.5 The initial pre-feasibility phase reviewed the potential for PSH development across the Balmacaan Estate, utilising Loch Ness as the Tailpond. An indicative arrangement of the Proposed Development was designed which included a Headpond centred around Loch nam Breac Dearga. Two options were developed for the Headpond, a single Embankment layout and a two-Embankment layout. During the pre-feasibility stage, the overall buildability, landscape and visual impact of the Proposed Development and the overall operational capacity were considered for both options. This design can be viewed on **Figure 3.1 Design Evolution: Design I Pre-Feasibility (Volume 3: Figures).**

Design II: Feasibility (February 2023)

3.4.6 At the second feasibility phase, the work done in April 2022 was refined based on an economic analysis of the UK Grid's instability during 2022. This target capacity was achievable through the addition of a third Embankment for the Headpond, which increased the volume of water it could store. This design can be viewed on **Figure 3.2 Design Evolution: Design II Feasibility (Volume 3: Figures).**

Design III: Scoping (April 2024)

3.4.7 The design prepared for the February 2023 Feasibility study was confirmed as the scoping design in March 2024, upon further engineering and initial landscape and visual impact reviews. This design can be viewed on **Figure 3.3 Design Evolution: Design III Scoping (Volume 3: Figures).**

3.4.8 Following Headpond re-sizing, the access requirements were reviewed with three potential access routes identified for the Proposed Development these included: (1) the A82 leaving the adopted road network at Grotaig, (2) the A82 and leaving the adopted road network at Alltsigh, and (3) the A831 leaving the adopted road network at Balnain.

Design IV: Post-Scoping (September 2024)

3.4.9 The design was updated to take into account the feedback received at early public engagement events (prior to the statutory public consultation events) which were held between May and September 2024 and changes are detailed below:

- The major temporary and permanent works were consolidated and relocated to the north, near the River Coiltie. This change was made following concerns raised about the impact of construction traffic on the Grotaig local community and to consolidate above ground infrastructure in a single location.
- The boundary of the Proposed Development Site was altered to the north to allow for flexibility regarding the location of the above ground GIS switchyard.
- Construction access to the site was confirmed from the north via the existing FLS forestry road which will be upgraded to suit the needs of the project. The alternatives identified in Design III were deemed to be unsuitable for heavy construction traffic both due to grade and current condition of the roads and a desire to remove unnecessary traffic load on the A82.
- Two options were developed for the below ground infrastructure due to perceived geological risk. The main differences between the two options were the location of the power cavern, associated tunnels and the upper control works in the Headpond. The above ground infrastructure was consistent for both options.
- The design of the Lower Control Works (LCW) was refined with the intention to limit disruption on the A82 along Loch Ness. The smolt screen was separated from the main LCW structure to allow for a smaller structural footprint of the LCW.

3.4.10 The updated scheme was presented for feedback at public consultation events with two options for the location of the Power Cavern and Waterways. This design can be viewed on **Figures 3.4 Design Evolution: Design IV Post Scoping (Sheets 1 & 2) (Volume 3: Figures)**.

3.4.11 Details of the early engagement sessions and feedback can be viewed in the stand-alone **Pre-Application Consultation (PAC) Report**.

Design V: Post-Public Consultation (November 2024)

3.4.12 The design was reviewed following public consultation according to the feedback that was received as follows below and on **Figure 3.5: Design Evolution Design V Post-Public Consultation (Volume 3: Figures)**:

- Temporary diversion of the Affric Kintail Way adjacent to the existing FLS access track to provide ongoing safe recreational use during the Construction Phase.
- The Temporary Workers Accommodation compound was relocated and resized following a review of the requirements in amenities, and to avoid areas of existing woodland.

3.4.13 Details of pre-application consultation events and feedback can be viewed in the stand-alone PAC report.

Design VI: Design Freeze (January 2025)

3.4.14 The key changes post design freeze is listed below and shown on **Figure 3.6: Design Evolution: Design VI Design Freeze (Sheets 1 & 2) (Volume 3: Figures)**.

3.4.15 The two options presented in Design IV: Post Scoping were refined and presented as part of the Design Freeze. The main differences between Option A and Option B are in the location of the below ground works, to reflect the perceived geological risk. Largely, the above ground infrastructure is identical for both options, however, the location of the Upper Control Works within the Headpond footprint varies between the two options. Unless stated otherwise, the details below apply for both options and where the Waterways are considered, the description is consistent for both Waterway systems.

3.4.16 The key differences between the two options are as follows:

- Below Ground
  - Power Cavern Complex
    - Option A: East of Loch nam Breac Dearga and underneath of Meall Fuar-mhonaidh.
    - Option B: At the northern end of Loch nam Breac Dearga.

  - Upper Control Works
    - Option A: North of Loch nam Breac Dearga.
    - Option B: East of Loch nam Breac Dearga.
- Above Ground
  - Temporary Compounds
    - Option A: Does not have PC14 and TC17.
    - Option B: Has PC14 and TC17.
- Inclusion of the Valve Cavern (below ground) for control and isolation of the Headrace Tunnel and Pressure Shaft. An underground solution was preferred to minimise visual impact on the landscape.
- To access the Valve Cavern, an additional dry tunnel and tunnel portal has been included.
- Each Headrace tunnel is split into 2No. smaller tunnels to align with the Valve Cavern (due to physical constraints on the size of the Valves). This is relevant for both Waterway systems.
- Inclusion of a Ventilation Shaft going from the Power Cavern Complex to the surface to allow for the expulsion of operational warm air to the atmosphere.
- Inclusion of 3No. new compounds:
  - TC17 – Pressure Shaft Construction Compound – To allow for the construction of the pressure shaft from surface level.
  - PC14 – Ventilation Shaft Compound – Location where the Ventilation shaft comes to ground level.
  - TC16 – LCW Construction Compound – Temporary compound to support the construction of the LCW. TC16 is considered to be a marine structure for the most part and heavy operations are expected to be undertaken from jack-up barges or moored barges.
- Inclusion of a secondary bund downstream of Main Dam 1 to attenuate the flow from the scour valve.
- The main access track alignment was confirmed following some rearranging of compounds.

3.5 Detailed Design and Optimisation

3.5.1 The engineering design process resulting in the Section 36 Application design has been undertaken in accordance with set design principles and engineering standards, therefore safety is inherent within the design of the Proposed Development. For instance, the design, construction and operation of the dams will be in accordance with the requirements of the Reservoirs (Scotland) Act 2011.

3.5.2 The design process has also been refined where possible, drawing on environmental information gathered to date. An overview of how environmental information is incorporated into the design is available in **Section 4.5: Approach to Environmental Impact Assessment** of **Chapter 4: Approach to EIA (Volume 2: Main Report).**

3.5.3 There will be elements of the Proposed Development that will be subject to detailed design informed by further site investigation works, confirmed operational requirements and the working practices and methodology of the Construction Contractor. At this stage the construction materials and methods will be finalised.

3.5.4 During detailed design there is also the potential for engineering improvements and optimisation, such as a smaller, split or relocated Power Cavern Complex.

3.5.5 The Proposed Development has the potential to generate both more or less unsuitable / excess material than is anticipated. Post consent, once further site investigation works have been undertaken, the detailed design will be undertaken which will look to balance the materials in the same way the preliminary design has done. There may be potential to develop the design of the Headpond as required as a result of insufficient or excess material and this would be the primary method of maintaining a materials balance.

3.6 Embedded Mitigation

3.6.1 Mitigation which is included in the design of the Proposed Development, such as the measures described in **Section 3.4: Design Evolution** of this chapter (design measures), and mitigation implemented through standard

control measures routinely used, such as working within good practice guidance during construction (management measures), are known as embedded mitigation.

3.6.2 This embedded mitigation has been assumed for the purposes of this EIAR to be in place once the Proposed Development becomes operational, as it is mitigation which the Proposed Development would employ in any event and without which the Proposed Development would be unlikely to be granted consent or allowed to commence. This EIAR has therefore assessed the likely significant effects of the Proposed Development including embedded mitigation.

3.6.3 A comprehensive list of the embedded mitigation assumed within the assessments reported in Chapters 6-18 of this EIAR is set out the Mitigation Register contained in **Appendix 19.1: Mitigation Register (Volume 5: Appendices)** but is summarised below in **Table 3-1: Embedded Mitigation by Environmental Topic**.

Construction Environmental Management Plan

3.6.4 An Outline Construction Environmental Management Plan (oCEMP) has been prepared as part of the Section 36 Application and is available in **Appendix 3.1: Outline Construction Environmental Management Plan (Volume 5: Appendices).**

3.6.5 The oCEMP sets out the environmental management framework to be adopted during the Pre-Construction and Enabling and Construction phases, and measures to be implemented to minimise construction environmental impacts. The oCEMP covers:

- Pollution prevention;
- Construction noise;
- Emergency response and flood risk management plan;
- Waste management plan;
- Ecological management plan;
- Biosecurity measures;
- Dust management; and
- Tree protection during construction.

3.6.6 The standard good practice measures for the above topics, set out within the oCEMP, are considered to be embedded mitigation and assumed to be in place within the construction effects assessments contained within Chapters 6-18 of this EIAR. Where applicable, specific measures may also have been identified within the EIAR topic chapters and included in the oCEMP as additional mitigation.

3.6.7 The oCEMP will be updated post-consent on the appointment of the Construction Contractor and in consultation with The Highland Council (THC), NatureScot, Scottish Environment Protection Agency (SEPA) and other relevant consultees, where appropriate. Throughout the Pre-Construction and Enabling and Construction Phase of the Proposed Development, the CEMP will remain a live document which is updated as circumstances, policies and best working practices change.

Construction Traffic Management Plan

3.6.8 In addition to the oCEMP, a Framework Construction Traffic Management Plan (CTMP) has also been prepared as part of the Section 36 Application and is available in **Appendix 13.2: Framework Construction Traffic Management Plan (Volume 5: Appendices**). Following the grant of Section 36 Consent, the Framework CTMP will be further developed in consultation with THC, Transport Scotland (as necessary), Police Scotland and other stakeholders.

3.6.9 The Framework CTMP sets out measures to be implemented to minimise adverse effects from construction traffic. Details to be provided in the Framework CTMP include as a minimum:

- The agreed route for construction traffic including any abnormal loads;
- The necessary agreements and timing restrictions for construction traffic. For example, during works between Monday - Friday there may be timing restriction around school drop-off and pick-up times, and prohibition during loading times at commercial premises;

- Details of a proposed condition survey on access routes;
- Proposals for maintenance of the agreed routes for the duration of the Construction Phase;
- Proposals for monitoring and agreeing maintenance costs;
- Escort arrangements for abnormal indivisible loads (AIL);
- Route signing;
- Details of the advanced notification to the general public warning of any construction transport movements, specifically abnormal loads;
- Details of information road signage warning road users of forthcoming AIL transport and construction traffic movements;
- Arrangements for regular road maintenance and cleaning, e.g. road sweeping in the vicinity of the Proposed Development Site access point as necessary, wheel cleaning/ dirt control arrangements;
- Details of actions that must be taken by contractors to mitigate the traffic impact of site workers travelling to the Proposed Development Site;
- Contractor speed limits; and
- Community and emergency services liaison details.

3.6.10 Measures set out in the Framework CTMP are considered embedded and assumed to be in place within the Pre-Construction and Enabling and Construction Phase effects assessments contained within Chapters 6-18 of this EIAR. Where applicable, specific measures may also have been identified within the EIAR topic chapters as proposals for inclusion within the Framework CTMP post-consent.

Topic Specific Management Plans

3.6.11 As set out in **Section 1.4: The Environmental Impact Assessment Report** of **Chapter 1: Introduction (Volume 2: Main Report)**, the Section 36 Application will be accompanied by a number of other plans, contained within **Volume 5: Appendices**. These include;

- **Appendix 6.4: Outline Landscape and Ecology Management Plan (oLEMP)** which outlines the holistic landscape and ecological reinstatement measures;
- **Appendix 7.6: Outline Peat Restoration Plan**, which provides an outline of proposed peat resource, and peatland restoration and management measures related to the Proposed Development;
- **Appendix 10.2: Private Water Supplies Assessment**, which includes a summary supply response plan for application in the event of a contamination or supply incident to a private water supply;
- **Appendix 10.4: Outline Water Management Plan** which outlines how water quality will be maintained, watercourse protection and the protection of private water supplies;
- **Appendix 15.1: Materials Management Appraisal** which sets out the management of materials that would be excavated to create the infrastructure associated with the Proposed Development;
- **Appendix 15.2: Outline Peat Management Plan (oPMP)** which details the management of peat; and
- **Appendix 16.1: Outline Access Management Plan** which outlines how safe and appropriate access will be maintained for recreational users and that new recreational opportunities.

3.6.12 As these are topic specific management plans, the embedded mitigation contained within them is summarised within **Table 3-1: Embedded Mitigation by Environmental Topic** and set out in full within each technical **Chapters 6-18 (Volume 2: Main Report).**

Table 3-1 Embedded Mitigation by Environmental Topic

Environmental Topic	Pre-Construction & Enabling Phase and Construction Phase	Operational Phase
Landscape and Visual	• Landscape and visual mitigation measures during the Construction Phase will be set out within the oCEMP in **Appendix 3.1: Outline Construction Environmental Management Plan (Volume 5: Appendices).** • Embedded landscape mitigation, such as planting to provide screening, and the design of the above ground infrastructure, has also been developed to reduce impacts on setting. Further details are available in **Chapter 6: Landscape and Visual (Volume 2: Main Report)**	Planting and habitat creation measures to integrate the Proposed Development into the landscape and its wider setting are set out within the oLEMP, **Appendix 6.4: Outline Landscape and Ecology Management Plan (Volume 5: Appendices).** Further details are available in **Chapter 6: Landscape and Visual (Volume 2: Main Report)**
Terrestrial Ecology	• The Proposed Development Components have been sited to minimise the loss of habitats, woodland, peat and minimise the disturbance to protected and notable flora and fauna species. Further embedded mitigation measures include compensation flow discharges to maintain a natural hydrological regime, water intake and discharge cut off points, the fitting of smolt screens, and measures on deer density to prevent deer pressure. Full details are provided in **Section 7.7 Embedded Mitigation** of **Chapter 7: Terrestrial Ecology (Volume 2: Main Report)**. • A range of measures that are standard good practice for development of this type, and which are required to comply with environmental protection legislation, will also be implemented. The full details of these measures can be found in **Chapter 7: Terrestrial Ecology (Volume 2: Main Report)** and **Appendix 3.1 Outline Construction Environmental Management Plan (Volume 5: Appendices).** • Standard best practice measures to protect wildlife will be implemented, including providing overnight means of escape from excavations and capping pipes that animals might enter.	The implementation of ecological reinstatement and enhancement will be secured through the adoption of the LEMP, which will contain species-specific measures for the optional reinstatement of the Proposed Development Site post-construction. Proposed measures are set out in **Appendix 6.4: Outline Landscape and Ecology Management Plan (Volume 5: Appendices).**
Ornithology	• The Proposed Development Components have been sited to minimise the loss of habitat and minimise the disturbance to protected species. Further details are provided in **Section 8.7** of **Chapter 8: Ornithology (Volume 2: Main Report).** • An Ecological / Environmental Clerk of Works (ECoW) will be employed for the duration of the construction of the Proposed Development. • All personnel involved in the Construction Phase of the Proposed Development will be made aware of the ornithological features and the mitigation measures and working procedures that must be adopted. All measures will be set out within a CEMP, including good practice measures for avoidance of pollution and works near trees. The oCEMP is available in **Appendix 3.1 Outline Construction Environmental Management Plan (Volume 5: Appendices)**. • Sightings of protected and/or important bird species within the Proposed Development Site during the Construction Phase will be recorded. If any evidence or sightings of specially protected bird species listed on Schedule 1 of the Wildlife and Countryside Act 1981 suggest that a nest site may be present within 1 km of active or planned near term works, then works in that area will stop immediately and the ECoW will be contacted for further advice.	• The implementation of habitat replacement and enhancement for ornithology will be secured through the LEMP (**Appendix 6.4: Outline Landscape and Ecology Management Plan Volume 5: Appendices**). The LEMP will describe in detail the mitigation measures which are required to minimise the effects of the Proposed Development on important ornithological features. • During all phases of the Proposed Development, pollution prevention measures will be adopted, following SEPA Guidance on Pollution Prevention (GPP).

Environmental Topic	Pre-Construction & Enabling Phase and Construction Phase	Operational Phase
	• As far as possible, works that will directly impact upon areas of vegetation that could be used by nesting birds will be undertaken outside of the breeding season, this being taken to be between March and September, inclusive. Should vegetation clearance works be required during the breeding season, a pre-works check for active nests will be carried out by the ECoW or another suitably experienced ornithologist. Such checks will be completed no more than 48 hours in advance of clearance works taking place as nests can be quickly established. Where any active nests are identified or suspected, suitable species-specific exclusion zones will be implemented and maintained until the breeding attempt has concluded; • Breeding bird surveys will be carried out in the breeding season prior to commencement of construction and throughout the Construction Phase to be carried out by a suitably experienced ornithologist. The detailed programme of breeding bird surveys will be set out in a Bird Protection Plan (BPP) which will be approved by THC and The Scottish Government Energy Consents Unit prior to the commencement of construction works. • Any artificial lighting required for construction works will be directional to avoid or minimise light spill beyond immediate works areas.	
Aquatic & Marine Ecology	• The Biosecurity Management Plan will set out the methods and procedures that will be implemented by the Construction Contractor to minimise potential effects on aquatic habitats and species due to Invasive Non-Native Species (INNS). • Works in Loch Ness (and other watercourses) will require a Controlled Activities Regulations (CAR) licence application to SEPA before the works can proceed. The CAR licence will specify restrictions on the timing of works that will minimise effects on aquatic ecology. • Features to control run- off into watercourses and lochs and avoid contamination of these waterbodies have been incorporated into the design of the Proposed Development. The full details can be found within **Section 9.7 Embedded Mitigation** of **Chapter 9: Aquatic & Marine Ecology (Volume 2: Main Report)**. • Good practice drainage and water management measures are contained within **Appendix 10.4: Outline Water Management Plan (oWMP) (Volume 5: Appendices)**. • Prior to commencement of construction surveys will be undertaken to inform the requirements for fish rescue and translocation of brown trout from Loch Nam Breac Dearga. The full details can be found within **Section 9.7 Embedded Mitigation** of **Chapter 9: Aquatic & Marine Ecology (Volume 2: Main Report)**.	• There will be a smolt screen with suitable aperture size (maximum 12.5 mm) at the LCW to protect against fish entrainment into the Proposed Development Waterways. Water velocities at the intake screen during pumping will be ≤0.3 m/sec to prevent fish impingement on the screen. Velocities during energy generation will be approximately 0.3 metres per second (m/s) to mitigate fish attraction. • Project operating parameters will be adopted which will ensure that water levels in Loch Ness remain within the historic range. • A smolt study to identify migratory movements within Loch Ness is underway and will confirm the range of additional mitigation that will be required.
Water Environment	• Wherever possible, all water features will have a 50 m buffer applied to them to ensure new permanent infrastructure or temporary compounds are set back to mitigate the risk from construction runoff as well as physical impacts. For Proposed Development components where this is not practically possible, as they are located by or in water features, they will require a dynamic temporary 50 m buffer zone approach until it is necessary to undertake works that physically impact the water features. The application of buffer zones in combination with other measures is outlined in the oCEMP **Appendix 3.1: Outline Construction Environmental Management Plan** and **Appendix 10.4:**	• During Operation, surface water runoff from permanent above ground facilities will be treated using sustainable drainage systems (e.g. ditches, swales, ponds etc.) where possible or otherwise proprietary treatment measures will be considered (e.g. filter drains, vortex flow separators). The Access Tracks will have adjacent swales or other suitable SuDS to capture and treat any runoff, although these will only be relatively lightly trafficked. • To avoid fish and debris entailment at the LCW where the waterways terminate into Loch Ness, it will incorporate a suitably sized screen mesh designed

Environmental Topic	Pre-Construction & Enabling Phase and Construction Phase	Operational Phase
	oWMP (Volume 5: Appendices). Further details can also be found within **Chapter 10: Water Environment (Volume 2: Main Report).** • Good practice measures with regards to preventing chemical pollution will be set out within the oCEMP. Suitable compensation flow will be maintained at all times in association with the Upper Control Works's operation. • Construction of the LCW is expected to be using a cofferdam and bespoke silt curtain to contain sediment transfer and mitigate associated impacts on water quality. Further details are provided within **Chapter 10: Water Environment (Volume 2: Main Report)**	according to SEPA best practice guidance. The screen also acts as an energy dissipation measure to reduce the velocity of the water discharging from the Proposed Development Site. • A Detailed Drainage Strategy will be prepared post consent considering foul drainage, surface water drainage etc.
Flood Risk & Water Resources	• Implementation of the CEMP. The CEMP includes the contents of an Environmental Response and Flood Risk Management Plan **(Appendix 3.1: Outline Construction Environmental Management Plan (Volume 5: Appendices))**. • An Outline Surface Water Drainage Strategy has been included within **Appendix 11.2: Flood Risk Assessment (Volume 5: Appendices))** building on the requirements set out in the Flood Risk Assessment	• Operational Controlled Activities Regulations (CAR) Licence and operational arrangements around flood and drought conditions. • Compliance with the Reservoirs (Scotland) Act 2011.
Cultural Heritage	• No embedded mitigation proposed during Construction.	• Embedded landscape mitigation, such as planting to provide screening, as well as the design of the above ground infrastructure, has been developed to reduce impacts on setting. Landscape Mitigation is detailed in **Appendix 6.4 Outline Landscape and Ecology Management Plan (Volume 5: Appendices)**.
Access, Traffic & Transport	• Borrow pits will provide aggregate for track building and concrete production on-site. • Batching (producing) concrete on site will greatly reduce any requirement for ready-mixed concrete to be delivered to site in 8 m^3 concrete mixer lorries. Batching concrete on-site also allows diversification of transport routes to site for different constituent parts of the concrete production process, reducing traffic demands on potentially sensitive locations by not focussing traffic on single routes to site. • The LCW will be a marine construction project and will generate a minimal amount of road going construction traffic. • A CTMP will strictly control road-going construction traffic travelling to and from the Proposed Development Site. The Framework CTMP is in **Appendix 13.1 Transport Assessment (Volume 5: Appendices)**. • The provision of a Temporary Workers Accommodation within the Proposed Development Site will greatly reduce car and LGV traffic using study area roads. • A Workers Traffic Management Plan will control the travel patterns of construction personnel, and they will be bused to and from the Temporary Workers Accommodation. • The Affric Kintail Way in the environs of the Proposed Development Site will be segregated from any access track that will be used by construction traffic. At Balnain this will see the walking path offset by some 20 m from the vehicle track	No embedded mitigation is required during Operation.
Noise & Vibration	• The best available construction methods shall be employed at all times, having regards to the principles of Best Practicable Means (BPMs) to minimise noise and vibration impacts during the construction of the Proposed Development. These measures are	No embedded mitigation is required during Operation.

Environmental Topic	Pre-Construction & Enabling Phase and Construction Phase	Operational Phase
	particularly important during any construction activity on the northern access track connecting the Temporary Workers Accommodation. Further details can be found within **Chapter 14: Noise and Vibration (Volume 2: Main Report)**. • Best practice measures during Construction include but are not limited to: – Establishing good community relations – Compliance with construction working hours set by the EHO, – Location of equipment and employing construction methods to eliminate unnecessary noise – Planning noisier activities during certain times of day • Employing best practice measures to mitigate airborne noise from vessel movements and to mitigate blasting air overpressure and vibration. • The Outline CEMP and Framework CTMP have been prepared in accordance with good practice and relevant British Standards to help to minimise noise and vibration effects from construction works. • Agreement on methods of blasting will be sought with THC to minimise air overpressure and vibration effects as well as adherence to guidance in the relevant British Standards. • Appropriate noise and vibration mitigation measures will be incorporated into the outline CEMP **(Appendix 3.1: outline Construction Environment Management Plan, Volume 5: Appendices)** which will form the basis of the Contractor CEMP. The Contractor CEMP will be implemented by the Construction Contractor, who is yet to be appointed.	
Geology & Ground Conditions	• Access tracks and Permanent / Temporary Compounds have been located to avoid areas of peat > 1.0 m in depth. • Where this was not possible, alternative construction methodologies have been specified such as floating access tracks. • In agreement with SEPA, peatland within the Headpond basin that is not excavated for the Proposed Development will be left in situ and not excavated. • **Appendix 15.2: Outline Peat Management Plan (Volume 5: Appendices)** demonstrates the approximate volumes of peat expected to be disturbed / excavated, the potential re-use options and handling and storage methods to be used.	No embedded mitigation is required during Operation.
Socioeconomics, Tourism and Recreation	• Path diversions will be implemented to retain access and connectivity across the Proposed Development Site while also maintaining amenity for path users. Realignment will be conducted as part of the Proposed Development's Pre-Construction and Enabling works and rerouted core paths will be open for use ahead of full construction starting on the Proposed Development. Further details are available in **Appendix 16.1: Outline Access Management Plan (Volume 5: Appendices).** • The implementation of a Construction Environmental Management Plan (CEMP) is considered to be embedded mitigation. The Outline CEMP is in Appendix 3.1 Outline Construction Environmental Management Plan (Volume 5: Appendices). The CEMP will:	No embedded mitigation is required during Operation.

Environmental Topic	Pre-Construction & Enabling Phase and Construction Phase	Operational Phase
	– Outline the complaint procedure and the clear channels for the community to provide feedback and make complaints regarding construction activities. – Provide details of the communication channels for information on the construction activities to be shared with the community. • The provision of on-site Temporary Workers Accommodation with recreational and health facilities and dedicated staff transport are embedded features of the Proposed Development.	
Climate	**Greenhouse Gas (GHG) impacts** • An Outline CEMP is included within the S36 Application (**Appendix 3.1 Outline Construction Environmental Management Plan (Volume 5: Appendices)**). This identifies various mitigation measures to be embedded within the Proposed Development to reduce the GHG impact. Further details can be found in **Chapter 17: Climate (Volume 2: Main Report)**. **Climate change risk assessment:** • Storing topsoil, construction plant and construction materials outside of high-risk flood risk areas; • Named person(s) – likely the Safety, Health and Environment Manager/ Ecological Clerk of Works (ECoW) – to monitor weather forecasts and receive SEPA flood alerts to allow works to be planned and carried out accordingly to manage extreme weather conditions, such as storms and flooding; and • Health and safety plans developed for construction activities will be required to account for potential climate change impacts on workers, such as flooding and heatwaves. Measures such as regular Toolbox Talks to educate workers on the dangers of extreme weather conditions should be included. • Climate change: embedded mitigation is considered in the relevant technical chapters.	No embedded mitigation is required during Operation.
Forestry	• Permanent and temporary infrastructure which was originally located to east of the Proposed Development Site was moved north to near the River Coiltie to avoid areas of forestry as described in **Chapter 18: Forestry (Volume 2: Main Report).** • Good practice measures in respect to felling requirements will be incorporated into environmental management controls prepared for the oCEMP **(Appendix 3.1 Outline Construction Environmental Management Plan (Volume 5: Appendices)** including: – adherence to Forestry Commission (Scottish Forestry) Forest and Water Guidelines e.g. to ensure protection and enhancement of the water environment; – management of forestry waste (SEPA) to ensure all excess waste resulting from forestry operations is correctly disposed of; and – implementation of tree harvesting and extraction methods to ensure minimisation of soil disturbance and compaction.	Given that the Proposed Development would result in the permanent loss of woodland, the Applicant is committed to making arrangements to plant on-site the equivalent area of woodland as Compensatory Planting, meeting the Scottish Government's CoWRP (Control of Woodland Removal Policy) objective of no net loss of woodland. A Compensatory Planting Management Plan has been created to ensure forest and woodland lost through felling is replaced. In addition to this, the Applicant is committed to planting an additional 674 hectares of woodland as part of the overall Compensatory Planting strategy, which will not only compensate for the woodland loss but also contribute to the enhancement of biodiversity, carbon sequestration, and overall environmental value. This planting area will exceed the area of woodland removed to ensure a net environmental gain. The planting proposed is presented in the **oLEMP (Appendix 6.4 Outline Landscape and Ecology Management Plan (Volume 5: Appendices)**.

Environmental Topic	Pre-Construction & Enabling Phase and Construction Phase	Operational Phase
		Woodland Reports in **Appendix 18.1** and **Appendix 18.2 (Volume 5: Appendices)** have identified a range of mitigation to: • to address the likely significant effect predicted for forest land-use management during construction and operation; • reduce the risk of future windthrow by identifying felling to stable forest edges outside the Proposed Development.

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