

Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment
Report

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

ILI (Borders PSH) Ltd

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Quality information

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3. Evolution of Design and Alternatives

3.1 Introduction

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

Under Schedule 4, paragraphs 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

The Development was identified as part of a Scotland wide review of potential pumped storage hydro (PSH) locations conducted by the Applicant. There is a precedent for renewable energy generation in the Argyll and Bute region and specifically for PSH. The topography and geology of Loch Awe provide suitable conditions for PSH in this location.

Consideration was given to the option to increase capacity of existing schemes as part of a review of alternatives, however, the Applicant is not the owner of any existing assets that could be expanded upon. The nearby Cruachan scheme was already being investigated, and no other suitable PSH sites were identified that would fit with both the project and Applicant’s needs or ability to develop due to ownership. *Section 3.4: Design Evolution (Chapter 3 Evolution of Design and Alternatives (Volume 2 Main Report))* provides further detail about the spatial evolution of the Development, and its final orientation with respect to Loch Awe.

3.3 Alternative Technology

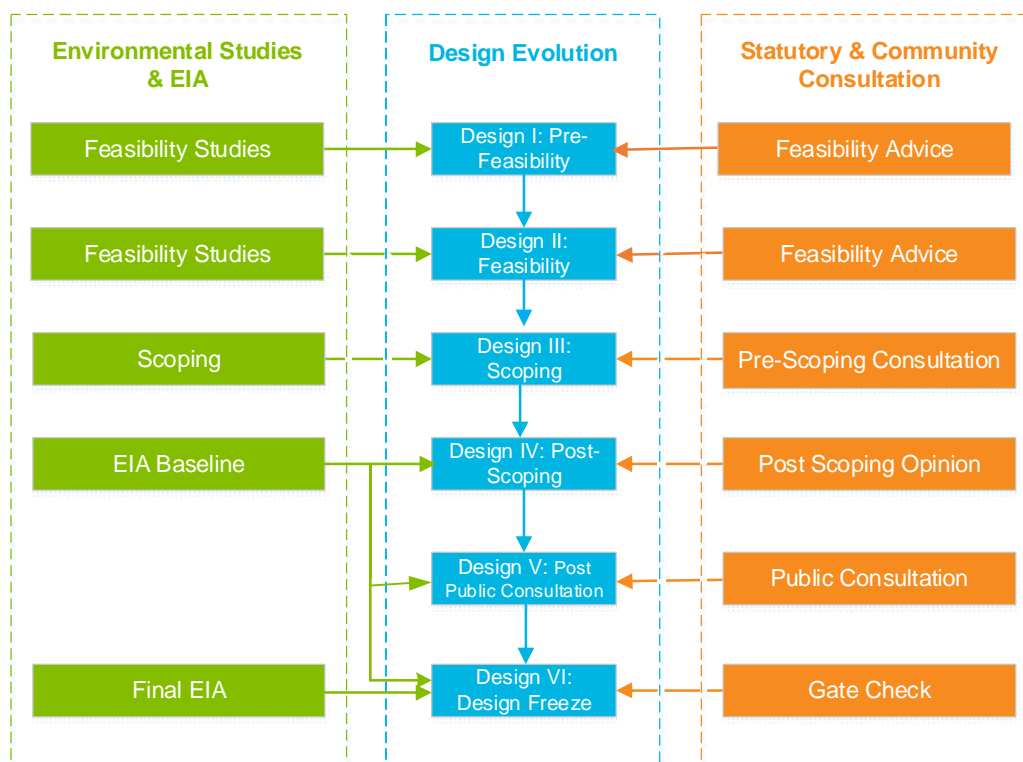
There are few, if any, energy storage technologies which can provide the grid scale services of pumped storage hydro. Alternative storage technologies are either too small (batteries) to provide the necessary long durations required, or largely unproven (compressed air) and, in the case of ancillary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

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. PSH can also provide ancillary services to the grid.

3.4 Design Evolution

The 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 Development on identified receptors. The embedded mitigation is set out in *Section 3.6: Embedded Mitigation of this Chapter (Chapter 3 Evolution of Design and Alternatives)*.

The evolution of the design of the Development is set out in the following sections and is shown in *Insert 3.1: Design Evolution Process for the Development*, below. Embedded figures have been included for the ease of reference for the reader, but larger sized A3 figures (using the same corresponding figure number) are available separately in *Volume 3 Figures*.



Insert 3.1 : Design Evolution Process for the Development

3.4.1 Design I: Feasibility

The Applicant reviewed potential PSH scheme locations throughout Scotland and the Development Site location was identified as having the potential to develop a PSH scheme utilising Loch Awe as a natural Tailpond with the creation of a Headpond utilising the natural landform.

An initial schematic was produced as shown in *Figure 3.1: Design Evolution: Design I: Feasibility (Volume 3 Figures)*.

Key features of this design iteration included:

- Headpond comprised one Embankment - Embankment 1 to the west, maximum height above existing ground 110 m.
- Tailpond inlet / outlet within Loch Awe.
- Access to the site off the A819 following existing forestry tracks southwards to the Headpond location.
- Secondary access from the south off the A819 following Blarghour Wind Farm access. Noting that this access would only be utilised should the wind farm be constructed and the necessary land rights agreed.
- A traffic study was undertaken to review the route to the site which indicated the following would be required within the design to ease pressures on the local road network:
 - Requirement for a Marine Facility to deliver large components such as a tunnel boring machine, if required;
 - Access off the A83 to the A819 through Inveraray Castle grounds access to avoid Inveraray town centre; and
 - Access from the Marine Facility along proposed upgraded Upper Avenue, Inveraray, for deliveries from the Marine Facility.

3.4.2 Design II: Scoping

The design evolved to incorporate two new Embankments to increase the capacity of the scheme:

- Embankment 2 to the north-east, maximum height above existing ground 13 m; and

- Embankment 3 to the south-east, maximum height above existing ground 10 m.

As part of the design iteration, a high-level environmental assessment was undertaken which included a desk-based review of environmental constraints and a Phase 1 habitat survey of the proposed headpond in Design 1: Feasibility.

The results of the desktop analysis identified the importance of the following key receptors, which influenced the evolution of the design to reduce impacts:

- Embankment 1 was reduced from 110 m to 92 m to reduce visual effects.
- Two possible Switching Station locations: one at the north-western edge of the Headpond, the second to the north-east of the Headpond off the internal Access Track south of Keppochan and Upper Sonachan Forest.
- Eight Construction Compound locations were identified avoiding key sensitive receptors.
- Identification of location for the intake tower within the Headpond.

An initial indicative design of the Marine Facility was drafted to accommodate the size of vessels that may be necessary to deliver a tunnel boring machine (if required) and other abnormal indivisible loads (AILs).

The Scoping Design can be viewed on *Figure 3.2: Design Evolution: Design II Scoping (Volume 3 Figures)*.

3.4.3 Design III: Post Scoping

On receipt of the Scoping Opinion a number of changes were made to the design to reflect feedback from consultees and discipline specialists following from site surveys. In addition, a bathymetric and topographic survey of the two lochs were undertaken. Key changes to the design included:

- Further design optimisations including:
 - Siting of the Construction Compounds to minimise habitat loss and visual prominence using existing landform and tree cover.
 - Consideration of wider landscape and habitat restoration opportunities.
 - Alignment of the Marine Facility to minimise visual effects from local residents and from recreational paths.
- Removal of the south-eastern Embankment (Embankment 3) which slightly increased the size of the Headpond. However, the removal of the Embankment reduced landscape and visual effects. Removing an Embankment also reduced vehicle movements of materials.
- Temporarily diverting B840 to accommodate Tailpond inlet / outlet.
- Moving tunnel portal 1 due to B840 road diversion.
- Removal of the intake tower to reduce landscape and visual effects from elevated views within landscape designations and WLAs to the north. The intake evolved to be embedded into the Headpond and therefore not visible above top water level.
- Addition of an Access Track running on top of Embankment 1 to access new compounds.
- Removal of the Access Track to the north of the Headpond shown as submitted within Design II: Scoping and addition of Access Track around the eastern extents of the Headpond.

The updated scheme was presented for feedback at the public consultation events. This design can be viewed on *Figure 3.3: Design Evolution: Design III Post Scoping (Volume 3 Figures)*.

3.4.4 Design IV: Post Public Consultation

Following public consultation, Design IV was prepared based on the comments and feedback received from the local community and the landowner.

The post public consultation design can be viewed on *Figure 3.4: Design Evolution: Design IV Post Public Consultation (Volume 3 Figures)*, which contains the following updates from Design IV:

- Jetty within the Marine Facility to be temporary, in order to reduce long-term effects on nearby residential properties. Once the jetty has been demobilised, only the piles would remain partially visible above lower water levels.

- Design and layout of jetty to reduce potential visual effects on nearby residential properties, whilst balancing the geo-technical constraints and lighting requirements.
- Change in location, layout and use purpose of Construction Compound near the Marine Facility to reduce effects on nearby residential properties and take account of existing vegetation and landform to partially screen the appearance and operation of the temporary compounds.
- Showing within the design how the proposed new and upgraded Access Tracks could be utilised by recreational users through inclusion of benches, information signage (on the PSH and walking/cycling routes available through the site), warning signage (at the Headpond and inlet / outlet) and directional signage.

3.4.5 Design V: Design Refinement

Design V: Design Refinement is the iteration of the Development design brought together following on from the changes post public consultation feedback. Two design workshops were held with the landscape and visual and ecology specialists for a holistic review of the Development components. The following sets out the updates to the Post Scoping Design IV as a result of refined engineering feasibility requirements and environmental constraints. This design was submitted with the Gate Check Report, as shown on *Figure 3.5: Design Evolution: Design IV Design Refinement (Volume 3 Figures)*.

- Access Tracks realigned to reduce landscape and visual effects, in particular the tracks leading to PC16-18 to route around the eastern side of the hill as opposed to the west.
- Refinement of Marine Facility jetty positioning and layout due to landscape and visual effects in terms of alignment within the loch and to ensure that the extent of hardstanding at the loch shore is minimised.
- Tunnel portal 3 introduced as Switching Station. The tunnel will be used for delivery of AILs and repurposed as the power tunnel post construction. The orientation of tunnel portals to minimise visual prominence, such that there would be no visibility from more sensitive views to the north of the site.
- Landscape restoration proposals have been developed to aid visual integration of the Tailpond inlet / outlet structure. These are comprised of native woodland mixes to assimilate the Tailpond inlet / outlet structure, gate house buildings, and tunnel portals 1, 2, and 3. Some areas of planting could be undertaken at early stages of construction to enable the screening effect of operational infrastructure in a shorter duration.
- Wider landscape and habitat restoration proposals have been developed to aid landscape integration. The scale of broadleaf woodland within the site seeks to maximise native woodland planting extending east from the loch shore towards the Headpond, maximising tree cover within the glens and lower slopes and strengthening the overall landscape fabric within the site whilst also reducing the scale of proposed constructed infrastructure.
- Building and structure heights at PC17 - upper gate house and PC18 - surge shaft compound have been limited to integrate with the existing landform to avoid visual prominence, whilst also avoiding deeper peat and more susceptible areas of bog. The location of these structures is set against the backdrop of plantation forestry to avoid sky-lining effects.
- TC22 has been relocated to an existing borrow pit within plantation forestry to avoid visual prominence from nearby visual receptors and views across Loch Fyne.
- Tracks realigned to avoid deeper areas of peat as identified during peat probing, in addition to floating tracks included in the design to reduce impacts on peat.
- Change in compound number and layout taking into account topography, avoidance of heritage assets, ecological receptors, watercourses, deep peat and improved gradient.
- Introduce a borrow pit in the Headpond due to reduce the requirement to import material.
- A number of changes to reduce impacts on ecological receptors including:
 - Switching Station relocated and resized to accommodate 400kV – 275kV switching gear and to avoid ecological wetter bog habitat.
 - PC13 relocated to avoid wetter bog habitat.
 - At the Tailpond the extent of woodland loss beside Loch Awe has been reduced below that originally proposed.

- TC02 has been reduced to be confined only to the agricultural field, with no further impact on woodland beside Loch Awe.
- TC04 has been relocated to avoid impact on wet rushy habitat that constitutes a potential Groundwater Dependent Terrestrial Ecosystem (GWDTE) and supports greater floristic diversity than the heavily-grazed grassland that TC04 now occupies.
- TC07 has been re-shaped so that it no longer impacts on an existing grazing exclusion area, mainly affecting low quality wet heath and acid grassland degraded by overgrazing.
- PC20 and associated Access Track have been moved to avoid deeper peat area.
- The permanent track / bridge near PC09 has been moved to avoid a species-rich rocky riparian area.
- TC11 and associated Access Track were initially moved to avoid significant deep peat that also supports the only known location in the area with *Sphagnum austinii*; subsequently, these elements were further adjusted to avoid a bog area with two substantial bog pools and a steep slope with species-rich vegetation.
- The temporary Access Track just north of the small northern Headpond Embankment has been altered to avoid a base-rich flush containing bog orchid.

3.4.6 Design VI: Section 36 Submission Design

Design VI: Section 36 Submission Design is the iteration of the Development design for which consent under Section 36 of the Electricity Act 1989 (“Section 36 Consent”) is being sought and upon which the assessments contained in Chapters 5-20 of this EIA Report (*Volume 2 Main Report*) have been based. Design VI can be viewed on *Figure 2.3 Above Ground Infrastructure* and *Figure 2.4 Below Ground Infrastructure (Volume 3 Figures)*, which show the layout for the Development and the above ground and below ground components respectively.

Amendments from Design V included minor adjustment to the red line boundary to sit directly aligned with landownership boundaries and minor design changes to the above ground Access Tracks connecting to the proposed Blarghour Wind Farm access track and the B840 temporary diversion.

3.5 Detailed Design and Optimisation

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

The design process has also been undertaken and refined where possible based on the environmental information gained to date. An overview of how environmental information is incorporated into the design is available in *Section 4.5 of Chapter 4: Approach to the EIA (Volume 2 Main Report)*.

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

During detailed design there is also the potential for engineering improvements and optimisation, such as a smaller or relocated Power Cavern Complex or reducing the capacity of the Headpond itself.

The 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. The design of the Headpond can be optimised and manipulated as required as a result of insufficient or excess material potentially being generated, and this would be the primary method of managing the potential for excess material.

3.6 Embedded Mitigation

Mitigation which is implicit in the design of the 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.

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

A comprehensive list of the embedded mitigation assumed within the assessments reported in Chapters 5-16 of this EIAR is set out the Mitigation Register contained in *Appendix 21.1: Mitigation Register (Volume 5 Appendices)* but is summarised below in *Table 3.1: Embedded Mitigation by Environmental Topic*.

3.6.1 Construction Environment Management Plan

An Outline Construction Environment Management Plan (CEMP) 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)*.

The outline CEMP sets out the environmental management framework to be adopted during construction and measures to be implemented to minimise construction environmental impacts. The outline CEMP 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.

The standard good practice measures for the above topics, set out within the Outline CEMP, are considered to be embedded mitigation and assumed to be in place within the construction effects assessments contained within Chapters 5-16 of this EIA Report. Where applicable, specific measures may also have been identified within the EIAR topic chapters and included in the Outline CEMP as additional mitigation.

The Outline CEMP will be updated post-consent on the appointment of the Construction Contractor and in consultation with ABC and other relevant consultees. Throughout the construction of the Development, the CEMP will remain a live document which is updated as circumstances, policies and best working practices change.

3.6.2 Construction Traffic Management Plan

In addition to the Outline CEMP, a Framework Construction Traffic Management Plan (CTMP) has also been prepared as part of the Section 36 Application and is available in *Appendix 14.1: 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 ABC, Transport Scotland (as necessary), Police Scotland and other stakeholders.

The Outline 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 loads;
- 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 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 site;
- Contractor speed limits; and
- Community and emergency services liaison details.

Measures set out in the Framework CTMP are considered embedded and assumed to be in place within the construction effects assessments contained within Chapters 5-16 of this EIA. Where applicable, specific measures may also have been identified within the EIA Report topic chapters as proposals for inclusion within the Framework CTMP post-consent.

3.6.3 Workers Housing Strategy

A draft Workers' Housing Strategy has been prepared as part of the Section 36 Application and is available in *Appendix 16.2: Draft Workers Housing Strategy (Volume 5 Appendices)*.

The draft Workers' Housing Strategy demonstrates a range of possible options for accommodating construction workers employed by the scheme during the seven year (approx.) construction period of the project. It is anticipated that a requirement for a detailed Workers Housing Strategy will be a condition of any direction deeming planning permission to be granted under Section 57(2) of the Town and Country Planning (Scotland) Act 1997 issued in relation to the project.

3.6.4 Topic Specific Management Plans

As set out in *Section 1.4 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 of the EIA Report. These include;

- *Appendix 5.4: Outline Landscape and Ecology Management Plan (LEMP) (Volume 5 Appendices)* – which outlines the holistic landscape and ecological reinstatement measures;
- *Appendix 10.2: Outline Peat Management Plan (PMP) (Volume 5 Appendices)* – which details the management of peat;
- *Appendix 11.5: Outline Water Management Plan (oWMP) (Volume 5 Appendices)* – which outlines how water quality will be maintained, watercourse protection and the protection of private water supplies; and
- *Appendix 14.1: Outline Access Management Plan (Volume 5 Appendices)* – which outlines the diversions, closures and management of recreational and formal access routes and paths within the Development Site and connections to them outside the redline boundary.

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 *chapter 5-20 (Volume 2 Main Report)*.

Table 3.1: Embedded Mitigation by Environmental Topic

Environmental Topic	Enabling Works and Construction	Operation
Landscape and Visual	<ul style="list-style-type: none"> The temporary Access Tracks has been designed to minimise landscape and visual impacts, further details are available in <i>Chapter 5: Landscape and Visual (Volume 2 Main Report)</i>. Advanced planting of native woodland near Loch Awe and a few other locations, where existing habitats are of lower ecological value and it is appropriate to plant native woodland, which would assist in the screening and softening of construction works as well as reduce the scale of the Tailpond part of the Development. Landscape and visual mitigation measures during the construction phase will be set out within the Outline CEMP, an Outline CEMP is in <i>Appendix 3.1: Outline Construction Environmental Management Plan (Volume 5 Appendices)</i>. 	<ul style="list-style-type: none"> Planting and habitat creation measures to integrate the Development into the landscape and its wider setting are set out within the Outline LEMP, <i>Appendix 5.4: Outline Landscape and Ecology Management Plan (Volume 5 Appendices)</i>. Temporary Access Track will be removed, and the ground reinstated to minimise the operational visual impacts of the Development. Reinstatement of temporarily lost habitats, including grassland sowing and heathland sowing. Restoration and rehabilitation measures including peat bog / upland rehabilitation, natural regeneration and steep mountainside enhancement. Replacement of felled forestry plantation, where lost to widen existing tracks for access, with productive woodland, heathland and grassland planting to enhance the structure and diversity of species. The design of the Development has minimised the requirement for additional structures, which has kept the Headpond and the Tailpond shoreline as uncluttered as possible. The architectural design of the buildings and structures within the Development Site will seek to assimilate them into the surrounding landscape as much as possible by using simple, clean forms and a palette of materials and colour which lessens the contrast with the surrounding landscape.
Terrestrial Ecology	<ul style="list-style-type: none"> The Development Components have been sited to minimise the loss of habitats, peat and minimise the disturbance to protected and notable floral and faunal species. Full details are provided in <i>Section 6.7.1 of Chapter 6: Terrestrial Ecology</i>. Ecological good practice will be secured during construction through the implementation of the CEMP, which will contain standard measures for the protection of habitat and species during works. A CEMP will be prepared and will set out all environmental management measures and the roles and responsibilities of construction personnel. 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 INNS. 	<ul style="list-style-type: none"> The implementation of ecological reinstatement and enhancement will be secured through the adoption of the LEMP, which will contain species specific measures for the optimal reinstatement of the Development Site post-construction. Proposed measures are set out in the Outline LEMP.
Aquatic Ecology	<ul style="list-style-type: none"> 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 INNS. Works in Loch Awe (and other watercourses) will require a Controlled Activities Regulations (CAR) licence application to SEPA before the works can proceed. The CAR licence will likely specify restrictions on the timing of works that will minimise effects on aquatic ecology. Features to control run-off into watercourse and lochs and avoid contamination of these waterbodies have been incorporated into the design of the Development. Full details can be found within <i>Section 7.11.1 Embedded Mitigation (Chapter 7 Aquatic Ecology)</i>. 	<ul style="list-style-type: none"> There will be a screen with suitable aperture at the Tailpond inlet / outlet structure to protect against fish egress into the Development Waterways. Water velocity at the intake screen will also be lower than fish escape velocities to prevent fish being trapped against the screen. Additional mitigation is proposed whereby operational conditions will ensure that water levels in Loch Awe remain within the historic range.

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	<ul style="list-style-type: none"> • Good practice drainage and water management measures are contained within the <i>Appendix 11.5: Outline Water Management Plan (oWMP) (Volume 5 Appendices)</i>. • A CEMP will be developed alongside the Construction Methodology report and will set out the methods and procedures that will be implemented by the Construction Contractor to minimise the environmental impact, including potential effects on aquatic habitats due to water quality, pollution, and runoff (refer also to <i>Chapter 11: Water Environment (Volume 2 Main Report)</i>) • Pre-commencement surveys will be undertaken to inform the requirement for fish rescue and translocation and avoidance of INNS within Loch Awe. Full details can be found within <i>Section 7.11.2 (Chapter 7 Aquatic Ecology)</i>.
Marine Ecology	<ul style="list-style-type: none"> • The Development Components have been sited to minimise the loss of habitat and minimise the disturbance to protected species. Further details are provided in <i>Section 8.9 of Chapter 8: Marine Ecology</i>. • Construction works will follow current good practice guidance to minimise risk of injury to marine mammals, risk of collisions at sea and risk of pollution from ships. Measures will be included within the project CEMP. • The installation of the piles during the construction of the jetty will be undertaken using vibratory piling wherever possible and impact piling only used where necessary to drive the pile toe into bedrock. • 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 INNS. <ul style="list-style-type: none"> • No operation mitigation required.
Ornithology	<ul style="list-style-type: none"> • The Development Components have been sited to minimise the loss of habitat and minimise the disturbance to protected species. Further details are provided in <i>Section 9.7 of Chapter 9: Ornithology (Volume 2 Main Report)</i>. • An Ecological / Environmental Clerk of Works (ECoW) will be employed for the duration of the construction of the Development. • All personnel involved in the construction and operation of the 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. • 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 72 hours in advance of clearance works taking place as nests can be quickly established. Where any active nests are identified, suitable species-specific exclusion zones will be implemented and maintained until the breeding attempt has concluded. <ul style="list-style-type: none"> • The implementation of habitat replacement and enhancement for ornithology will be secured through the LEMP. The LEMP will describe in detail the mitigation measures which are required to minimise the effects of the Development on important ornithological features. • During all phases of the Development, pollution prevention measures will be adopted, following SEPA Pollution Prevention Guidelines (PPG) and Guidance on Pollution Prevention (GPP).
Geology and Soils	<ul style="list-style-type: none"> • Post-consent site investigation works to confirm both geo-environmental and geotechnical properties to confirm detailed design. • The production of a Materials Management Appraisal (<i>Appendix 10.1: Materials Management Appraisal (Volume 5 Appendices)</i>) to aid materials balance and reuse. <ul style="list-style-type: none"> • Design of the tunnels and below ground infrastructure. • Compliance with the Reservoirs (Scotland) Act 2011.

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	<ul style="list-style-type: none"> The Outline PMP (<i>Appendix 10.2: Outline Peatland Management Plan (Volume 5 Appendices)</i>) contains potential re-use options and handling and storage methods to be used to minimise effects on peat and from peat disturbance. Deep peat avoided in the design where possible. Floating access tracks detailed where avoidance is not possible. 	
Water Environment	<ul style="list-style-type: none"> The oWMP (<i>Appendix 11.5: Outline Water Management Plan (Volume 5 Appendices)</i>) describes all measures required to avoid, reduce and minimise adverse impacts on the water environment during construction, including setting out the scope in detail of any water quality or other relevant monitoring. Wherever possible, water features have had a 50 m buffer applied to them to ensure that wherever possible new permanent infrastructure or temporary compounds are set back Good practice measures with regards to preventing chemical pollution will be set out within the CEMP. A silt curtain or similar will be installed around the Tailpond works prior to the construction of the cofferdam commencing. The silt curtain will minimise sediment transfer into Loch Awe during the construction works and mitigate the associated impacts on water quality. In order to protect the water environment and minimise the risk of water pollution, a temporary drainage system will be implemented on-site. The drainage system will comprise appropriate treatment measures, potentially in a train to prevent run-off contaminated with particulates directly or indirectly entering watercourses. Good practice measures for the protection of water quality from run-off containing particulate will be secured through the implementation of the Surface Water Management Plan an outline of which is available in <i>Appendix 11.5: Outline Water Management Plan (Volume 5 Appendices)</i>. Monitoring requirements will also be set out within the Water Management Plan. 	<ul style="list-style-type: none"> During operation, surface water runoff from permanent above ground facilities will be treated using sustainable drainage systems that may include SuDS ponds/settlement lagoons, temporary ditches, silt fences, silt busters, dewatering/sediment bags, silt curtains and designated bunded fuelling areas. The Access Tracks will have swales to capture any runoff. To avoid fish and debris entrainment, the Tailpond inlet / outlet structure where the Waterways terminate into Loch Awe, will incorporate a suitably sized screen mesh designed 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 Development. This ensures that the 0.3 m/s maximum discharge velocity is not exceeded.
Water Resources	<ul style="list-style-type: none"> Implementation of the CEMP. The CEMP includes the contents of an Environmental Response and Flood Risk Management Plan. A Surface Water Management Strategy Plan (SWMP) will be prepared building on the requirements set out in the Flood Risk Assessment (<i>Appendix 12.2: Flood Risk Assessment (Volume 5 Appendices)</i>). 	<ul style="list-style-type: none"> Operational Controlled Activities Regulations (CAR) Licence and operational arrangements around flood and drought conditions. Compliance with the Reservoirs (Scotland) Act 2011.
Cultural Heritage	<ul style="list-style-type: none"> Micro-siting of access tracks, or reducing the working width of access tracks within the Limits of Deviation, to avoid heritage assets, as well as the protection of assets near work areas through fencing. All mitigation will be agreed and approved by the planning archaeologists for the area (i.e. WoSAS), with no works commencing on site until a Written Scheme of Investigation (WSI) has been agreed and approved. 	<ul style="list-style-type: none"> Embedded landscape mitigation, such as planting to provide screening, as well as the design of the above ground infrastructure, has also been developed to reduce impacts on setting. Outline LEMP, <i>Appendix 5.4: Outline Landscape and Ecology Management Plan (Volume 5 Appendices)</i>.
Access, Traffic and Transport	<ul style="list-style-type: none"> Effects from construction traffic will be minimised through the adoption of a CTMP. Further details are provided in <i>Chapter 14: Access, Traffic and Transport (Volume 2 Main Report) and Appendix 14.1: Framework CTMP (Volume 5 Appendices)</i>. 	<ul style="list-style-type: none"> No operation mitigation required.
Noise and Vibration	<ul style="list-style-type: none"> The best available construction methods shall be employed at all times, having regards to the principles of Best Practicable Means (BPM) to minimise noise and vibration impacts 	<ul style="list-style-type: none"> Employment of the principles of best practice to minimise noise and vibration from the Development.

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	<p>during the construction of the Development. Further details can be found within <i>Chapter 15 Noise and Vibration</i>. Measures to achieve BPM will be adopted through the CEMP; proposed measures are set out in the Outline CEMP.</p> <ul style="list-style-type: none"> • 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. • Diesel impact piling will cease on MoD trial days for up to 12 days per year. • Consultation and communication with the local community will be covered in the CEMP and undertaken throughout the construction period. The proposed process is set out within the Outline CEMP. • With regard to construction activities, agreement on working hours and working methods will be sought from ABC to minimise noise effects at Noise Sensitive Receptors (NSRs). Working hours will be subject to agreement between the Construction Contractor and ABC. In addition, adherence to working hours will be contractually implemented within any subsequent enforcement to be regulated by ABC via planning conditions and also via the CEMP. 	<ul style="list-style-type: none"> • Confirmation of control measures to prevent underground plant noise from exceeding appropriate operational sound limits during detailed design. These control techniques may include measures such as orientation away from NSRs, vent attenuators, acoustic lining within the vent shaft, and acoustic louvres at intake and extract terminals. • Designing of external surface plant and buildings at the Upper Reservoir to limit sound emissions to 70dBA at 5 m as previously discussed in the operational assessment. • Designing out of audible low frequency noise from the Development at NSRs, by design. If required, mitigation for tonal noise and groundborne noise and vibration could include vibration isolation, mufflers, attenuators, etc. and will be considered during the detailed design stage.
Socioeconomics and Tourism	<ul style="list-style-type: none"> • A Community Liaison Group, established during the pre-construction phase, will remain throughout construction facilitating direct, two-way discussion between the Applicant and the local community including businesses, tourist / recreational operators • Path diversions will be implemented to retain access and connectivity across the Development Site while also maintaining amenity for path users. Realignment will be conducted as part of Development enabling works and rerouted core paths will be open for use ahead of full construction starting on the Development. Further details are available in <i>Appendix 16.1: Outline Access Management Plan (Volume 5 Appendices)</i>. • An outline Housing Strategy has been drafted <i>Appendix 16.2 Workers Housing Strategy – Preliminary Draft Report (Volume 5 Appendices)</i> which sets out options to accommodate the majority of construction workers throughout the construction period. This will allow for local hotels / holiday lodges and other accommodation to be readily available for tourists with use of some low season hotel capacity a potential option for some workers without impacting upon tourism. No impact upon the availability of tourist accommodation is therefore expected as a result of the Development's construction and further mitigation is therefore not required. • <i>Chapter 5: Landscape and Visual Assessment</i>, and <i>Chapter 13 Cultural Heritage (Volume 2 Main Report)</i> sets out mitigation measures which will be implemented to reduce and avoid any significant impacts upon the local area's setting and character, where possible. 	<ul style="list-style-type: none"> • Post-construction local paths affected by the Development will be realigned and made good using appropriate materials for path use. Longer diversions on the core paths will be left in-situ. • Certain forestry paths falling within the Development Site may be impacted during operation, however through the upgrade and addition of new walking paths through the Development Site area, overall access in the local area is expected to be maintained. Details of the proposed upgrades will be provided when a construction contractor has been appointed.
Climate	<ul style="list-style-type: none"> • An Outline CEMP is included within the Section 36 submission. This identifies various mitigation measures to be embedded within the Development to reduce the greenhouse gases (GHG) impact. Further details are provided in <i>Chapter 17: Climate (Volume 2 Main Report)</i>. • Further climate change resilience measures embedded within the Development, particularly in relation to flood risk are included in the Outline CEMP. The specific flood risk impacts and associated adaption measures are discussed in more detail in <i>Chapter</i> 	<ul style="list-style-type: none"> • No operation mitigation required.

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11: Water Environment and Chapter 12: Water Resource and Flood Risk (Volume 2 Main Report).

Marine Physical Environment and Coastal Processes

- Piled foundations will be used to support the deck of the Marine Facility jetty. This provides minimal blockage to tidal currents and wave propagation relative to alternative construction options. This will minimise the impact from the Marine Facility on the local flows during the operational phase.
- The avoidance of dredging means there will be minimal disturbance to sediments on the seabed during the construction phase. The potential requirement for maintenance dredging and spoil disposal is also avoided.

- A limited scope of post-construction monitoring is recommended as a precautionary measure for the life of the development:
 - Visual inspection of outfalls to check for accretion of sediment (monthly).
 - Visual inspection of coastline 500 m either side of the marine facility to check for any localised erosion or accretion (monthly).

Shipping and Navigation

- As part of the design process for the Development, a number of embedded mitigation measures have been considered to minimise the adverse impacts of the Development. Further details are provided in *Chapter 19: Shipping and Navigation*.

- No operation mitigation required.

Commercial Fisheries

- No commercial fisheries mitigation is considered necessary because the likely effects of the Marine Facility on identified receptors is not significant in EIA terms. Further details are provided in *Chapter 20: Commercial Fisheries*.

- No operation mitigation required.

