Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Volume 2: Main Report

Table of Contents

Glossary

Acronym	Definition	Acronym	Definition
ABC	Argyll and Bute Council	GWDTE	Groundwater Dependent Terrestrial Ecosystem
AIL	Abnormal Indivisible Loads	HAT	Highest Astronomical Tide
AIS	Automatic Identification System	HBRG	Highland Biological Recording Group
ALARP	As Low As Reasonably Practicable	HD	Hydro-Dynamic
AOD	Above Ordnance Datum	HES	Historic Environment Scotland
ASPT	Average Score Per Taxon (ref WHPT metric)	HFC	Hydrofluorocarbons
AWT	Average Weekday Traffic	HGV	Heavy Goods Vehicle
bgl	Below ground level	IIP	Infrastructure Investment Plan
BGS	British Geological Survey	IUCN	International Union for Conservation of Nature
BOD	Biochemical Oxygen Demand	JNCC	Joint Nature Conservation Committee
BODC	British Oceanographic Data Centre	JRCC	Joint Rescue Coordination Centre
BSS	Bed Shear Stress	kg CO2e/kWh	Kilograms of carbon dioxide equivalent per kilowatt hour
BTO	British Trust for Ornithology	kWh	Kilowatt hour
CAR	Controlled Activities Regulations	LB	Listed Building
CBC	Common Birds Census	LBAP	Local Biodiversity Action Plan
CCC	Climate Change Committee	LCT	Landscape Character Type
CCI	Community Conservation Index	LDP	Local Development Plan
CCP	Climate Change Plan	LEAFPACS2	The aquatic macrophyte Prediction and Classification System (V2)
CCR	Climate Change Resilience	LGV	Light Goods Vehicle
CEMP	Construction Environmental Management Plan	LIFE	Lotic-invertebrate Index for Flow Evaluation
DfT	Department for Transport	LNCS	Local Nature Conservation Site
DMRB	Design Manual for Roads and Bridges	LVIA	Landscape and Visual Impact Assessment
DOC	Dissolved Organic Carbon	Ma	Million Years
DTM	Digital Terrain Model	MAIB	Marine Accident Investigation Branch
EA	Environment Agency	mAOD	Meter Above Ordnance Datum
EcIA	Ecological Impact Assessment	MBES	Multi-Beam Echo-Sounder
ECoW	Ecological / Environmental Clerk of Works	MCA	Maritime & Coastguard Agency
eDNA	Environmental DNA (survey method)	NAC	Noise Advisory Council
EIA	Environmental Impact Assessment	NAVTEX	Navigational Telex
EIAR	Environmental Impact Assessment Report	NBN	National Biodiversity Gateway
EQR	Ecological Quality Ratio	NCMPA	Nature Conservation Marine Protected Area
EQS	Environmental Quality Standard	NF_3	Nitrogen trifluoride
ES	Environmental Statement	NGR	National Grid Reference
EU	European Union	NHZ	Natural Heritage Zone
FSA	Formal Safety Assessment	nm	Nautical Mile(s)
FWPM	Freshwater Pearl Mussel	NOAA	National Oceanic and Atmospheric Administration
GDL	Garden and Designed Landscape	N_2O	Nitrous oxide
GHG	Greenhouse Gas	NPF	National Planning Framework
GPP	Guidance on Pollution Prevention		
GPS	Global Positioning System		

Acronym	Definition
NPF4	National Planning Framework 4
NPS	National Planning Statement
NSR	Noise Sensitive Receptor
NTAXA	Number of scoring Taxa
NTS2	National Transport Strategy 2
NTU	Nephelometric Turbidity Unit
NVC	National Vegetation Classification
OCCT	Open Cycle Gas Turbine
ODN	Ordnance Datum Newlyn
OS	Ordnance Survey
oWMP	Outline Water Management Plan
PAN	Planning Advice Note
PC	Permanent Compound
PFCs	Perfluorocarbons
PLL	Potential Loss of Life
PMF	Priority Marine Feature
PPC	Pollution Prevention and Control (Scotland) Regulations 2012
PPG	Pollution Prevention Guidelines
PPV	Peak Particle Velocity (mm/s)
PSH	Pumped Storage Hydro
PSI	Proportion of Sediment-sensitive Invertebrates index
PSYM	Predictive System of Multimetrics (pond survey method)
PWS	Private Water Supply
RAM	Restricted in Ability to Manoeuvre
RBMP	River Basin Management Plan
RCP	Representative Concentration Pathways
RICT	River Invertebrate Classification Tool
RLB	Red Line Boundary
RNLI	Royal National Lifeboat Institution
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SAR	Search and Rescue
SCOS	Special Committee on Seals
SEPA	Scottish Environment Protection Agency
SF_6	Sulphur dioxide
SFF	Scottish Fishermen's Federation
SLR	Sea Level Rise
SM	Scheduled Monument
SMU	Seal Management Units
SNH	Scottish Natural Heritage (now NatureScot)
SNMP	Scottish National Marine Plan
SOLAS	Safety of Life at Sea
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
SVOCs	Semi-Volatile Organic Compounds
SWCRIFG	South West Coast Regional Inshore Fisheries Group
TAG	Transport Assessment Guidance
TBM	Tunnel Boring Machine
TC	Temporary Compound
tCO_2e	Tonnes CO2 equivalent
TCV	Taxon Cover Values (aquatic macrophytes)
TSS	Total Suspended Solids
UKCP18	UK Climate Projections 2018
UKHO	UK Hydrographic Office
UKSIA	United Kingdom Single Issuing Authority
UNCLOS	United Nations Convention on the Law of the Sea
UNFCCC	United Nations Framework Convention on Climate Change
VDV	Vibration Dose Value (m.s-1.75)
VMS	Vessel Monitoring System
VOCS	volatile organic compounds
VP	Vantage point
WANE	Wildlife and Natural Environment (Scotland) Act 2011
WBCSD	World Business Council for Sustainable Development
WCA	Wildlife and Countryside Act
WeBS	Wetland Bird Survey
WEWS [Act]	Water Environment Water Services ('the WEWS Act') (Scotland) Act 2003
WFD	Water Framework Directive
WHPT	Whalley, Hawkes, Paisley & Trigg (WHPT) Metric
WL	Water Level
WLA	Wild Land Area
WoSAS	West of Scotland Archaeology Service
WPZ	Water Protection Zones
WRI	World Resources Institute
ZoI	Zone of Influence

Definitions

Term	Description
As the crow flies	In a straight line
The Applicant	ILI (Borders PSH) Ltd, the company responsible for the application for consent of the Development.
Amenity	The preferable features of a location which contribute to its overall character and the enjoyment of residents or visitors.
Baseline	Environmental conditions at specific periods of time, present on, or near a site, against which future changes may be measured or predicted.
Bat Logger	Aids in the detection and identification of bats
British Standard	A standard is a published document that contains a technical specification, or other precise criteria designed to be used consistently as a rule or definition. Standards are designed for voluntary use and do not impose any regulations. However, laws and regulations may refer to certain standards and make compliance with them compulsory. Sometimes British Standards (BS) will be accompanied by the letters EN and/or ISO. These mean that the standard was developed as an European (EN) or International (ISO) standard and then adopted by the UK as a British Standard.
Conservation Areas	Conservation Areas are described by the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 as "*areas of special architectural or historic interest, the character of which it is desirable to preserve or enhance*". Local planning authorities are required to determine which parts of their area should be safeguarded due to their architectural or historic interest, to ensure that any new development pays respects to or enhances their character.
Construction Contractor	The individual or organisation who will be contracted to provide and manage the construction of the Development
Construction Environmental Management Plan	Strategic document setting out best practice methods to minimise environmental impacts during construction. An outline CEMP has been produced for the Development *(Appendix 3.1 (Volume 5: Appendices)*.
Construction Traffic Management Plan	Strategic document that outlines the management of vehicle movements and interactions with the surrounding road network during the various stages of the construction process. A framework CTMP has been produced for the Development *(Appendix 14.1 (Volume 5: Appendices)*.
Cumulative Effects	The summation of effects caused by both intra-project (where a single receptor is affected by multiple aspects of a project, worsening the effect) and inter-project effects (where effects are exacerbated due to other reasonably foreseeable projects either in construction, consented or yet to be built).
Dawn	During the period before sunrise
Desk Based Assessment	Research based primarily on database and internet data gathering methods, and other third party data.
the Development	Balliemeanoch Pumped Storage Hydro
Development Site	Land within the red line boundary encompassing the Development
District Network Operator	The operator of a electricity distribution network
Dusk	During the period shortly after sunset
Effect	The consequence of an impact on the environment, multiplied by the sensitivity of the receptor.
Section 36 of the Electricity Act 1989	The application to construct, operate and decommission the Development will be made in accordance with the requirements of Section 36 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, and will be submitted to the Energy Consents Unit (ECU) of the Scottish Government.
EIA Development	A development requiring EIA by virtue of its size, nature or location under schedule 2 of the EIA Regulations.
EIA Regulations	For the Development the relevant EIA Regulations are the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. By virtue of its size, nature and location, the Development constitutes an 'EIA development' under regulation 6 and Schedule 2 of the EIA regulations.
Embankment	Earth and rockfill structures which contain the water within the Headpond.
Environmental Impact Assessment	The assessment of the likely significant environmental effects of the Development. Undertaken in accordance with the EIA Regulations.

Term	Description
Environmental Impact Assessment Non-Technical Summary	A report presenting a non-technical summary of the information provided in the EIA Report.
Environmental Impact Assessment Report	A report that includes such of the information referred to in Schedule 4 of the EIA Regulations as is reasonably required to assess the environmental effects of the Development.
Gardens and Designed Landscapes	The Historic Environment (Amendment) Scotland Act (2011) made it a statutory duty for HES to compile and maintain an Inventory of Gardens and Designed Landscapes in Scotland.
Groundwater	Water occurring in the ground which can be reasonably attributed to relatively geologically recent recharge and which can be reasonably considered to be wholesome (potable) unless it has been contaminated (altered) by anthropogenic activity.
Headpond	The headpond is the upper reservoir with associated embankments.
Habitat	The environment in which populations or individual species live or grow.
Habitats Regulations	The Conservation of Habitats and Species Regulations 2017
Habitats Directive	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
Heavy Goods Vehicle	A commercial road vehicle that is of a construction primarily suited for the carriage of goods or burden of any kind and designed or adapted to have a maximum weight exceeding 3,500 kilograms when in normal use and travelling on a road laden.
Hectare	A unit of area (10,000 m² / 2.471 acres).
Historic Environment	All aspects of the environment resulting from the interaction between people and places through time including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped, planted or managed flora. Those elements of the historic environment that hold significance are called heritage assets.
IEMA Guidelines	Institute of Environmental Management and Assessment (IEMA) Guidelines, 2023
Impact	A physical or measurable change to the environment.
Inlet / Outlet structure	The Headpond Inlet / Outlet structure is where the waterways exit the Headpond through the headrace. The waterways will terminate at the Tailpond Inlet / Outlet structure situated on the eastern bank of Loch Awe.
Inter-Project Effects	Combined effects from other projects on a shared receptor.
Intra-Project Effects	Combined effects on a single receptor from other sources of effect arising from different aspects of the Development. Also known as “in-combination effects”.
Kilometre	Measurement of distance (1,000 metres).
Landscape and Visual Impact Assessment	A tool used to identify and assess the likely significant effects of change resulting from development both on the landscape as an environmental resource in its own right and on people’s views and visual amenity.
Landscape Character	The distinct and recognisable pattern of elements that occur consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement.
Laydown Area	A temporary construction compound area for the storage of materials, plant and equipment as well as containing site accommodation and welfare facilities, temporary car parking and temporary fencing.
Limits of Deviation	The maximum extent within which a development can be carried out as shown on any work plans. Allows for refinement of the preliminary design during detailed design.
Listed Building	A list of buildings of special architectural or historic interest compiled by HES for the guidance of local planning authorities in the exercise of their planning functions under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. Buildings are graded as follows: Category A – Buildings of special architectural or historical interest which are outstanding examples of a particular period, style or building type.; Category B - Buildings of special architectural or historic interest which are major examples of a particular period, style or building type.; and Category C – Buildings of special architectural or historic interest which are representative examples of a period, style or building type.
Magnitude	A combination of the scale, extent and duration of an impact.
Mitigation	Action proposed to avoid, prevent, reduce and where possible offset adverse effects arising from the whole or specific elements of a development.
Not Significant	Effects predicted to be minor and manageable.

Term	Description
Outline Surface Water Management Plan	A document outlining the approach to onsite surface water and foul water drainage. An Outline Surface Water Management Plan for the Development is included as *Appendix 11.5 (Volume 5: Appendices)*
Ramsar Convention	Convention on Wetlands of International Importance
Realistic Worst Case	Selection of the most environmentally detrimental parameter for assessment within the EIA.
Receptor	A component of the natural, created, or built environment such as a human being, water, air, a building, or a plant that has the potential to be affected by the Development.
Red line boundary	The area of land over which consent for the Development will be sought and within which the Development will be constructed
The Reservoirs Act	The Reservoirs Act provides a legal framework with regards to responsibilities and requirements for inspection and maintenance of reservoirs, in order to ensure the risk presented by such structures is acceptable.
Residual Effect	Those effects of a development that remain following the implementation of mitigation measures.
Rochdale Envelope	The establishment of a series of maximum development extents.
Scheduled Monument	Scheduled monuments are of national or international importance and are protected under the Ancient Monuments and Archaeological Areas Act 1979.
Section 36 Application	Planning application for consent under Section 36 of the Electricity Act 1989
Section 36 Consent	Consent under Section 36 of the Electricity Act 1989 to construct, operate and decommission the Development.
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor.
Site of Special Scientific Interest	A site statutorily notified under the Wildlife and Countryside Act 1981 (as amended) as being of special nature conservation or geological interest. SSSIs include wildlife habitats, geological features and landforms.
Special Area of Conservation	Areas of protected habitats and species as defined in the Habitats Directive, also known as an European site as defined in the Habitats Regulations.
Special Protection Area	Classified for rare and vulnerable birds, and for regularly occurring migratory species, as defined in the EC Birds Directive (2009/147/EC), also known as an European site as defined in the Habitats Regulation.
Species	A group of organisms that seldom or never interbreed with individuals in other such groups, under natural conditions; most species are made up of subspecies or populations.
Tailpond	The Tailpond is the lower reservoir, and in the case of this Development, will be the existing body of Loch Awe.
The Act	The Electricity Act 1989.
The Baseline	Existing environmental conditions.
The CAR Regulations or CAR	Water Environment (Controlled Activities) (Scotland) Regulations 2011
Topography	The natural or artificial features, level and surface form of the ground surface.
Visual amenity	The value of a particular area or view in terms of what is seen.
Visual effect	Change in the appearance of the landscape from available viewpoints as a result of development.
Visual receptors	Individuals and/or defined groups of people who have the potential to be affected by the visual appearance of a development.
Water Framework Directive'	Council Directive 2000/60/EC establishing a framework for Community action in the field of water policy as implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003 and related regulations.
Wild Land Area	Wild land areas are defined by NatureScot as the most extensive areas of high wildness. They are identified as nationally important in Scottish Planning Policy but are not a statutory designation.
Zone of Theoretical Visibility	Areas from which a specified element of a development may be visible. Hence, the development would not be visible beyond the ZTV.

AECOM

Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 1: Introduction

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

# Hard Copies	PDF Required	Association / Company Name

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Inserts

Tables

1. Introduction

1.1 Introduction

This Environmental Impact Assessment (EIA) Report has been prepared by AECOM on behalf of ILI (Borders PSH) Limited (hereafter referred to as the 'Applicant'). This EIA Report (EIAR) has been prepared to accompany an application for consent to construct, operate and decommission a pumped storage hydro (PSH) scheme to be known as the Balliemeanoch Pumped Storage Hydro (referred to throughout as the 'Development') under Section 36 of the Electricity Act 1989 (the 'Act') (the "Section 36 Application").

This EIAR describes the results of the EIA for the Development. This chapter introduces the Development and sets out the context and structure of the EIAR.

1.2 About the Development

1.2.1 Background

Hydropower is an established electricity generation technology in Scotland. The first public hydro scheme was built by the Benedictine monks at Fort Augustus Abbey in 1891 to power the abbey and village at the southern end of Loch Ness. However, it was not until after World War II that the adoption of hydropower became widespread across Scotland.

The Hydro Electric Development (Scotland) Act 1943 drove the creation of the North of Scotland Hydro Electric Board. The efforts of the Board, combined with growing energy demands, in particular from the aluminium industry, resulted in significant developments in hydropower technology. By 1965, 54 main hydropower stations had been constructed with a total generating capacity of more than 1,000 megawatts (MW)[1].

The first Scottish PSH scheme, Cruachan Power Station (440 MW), opened in 1965. At the time it was the first PSH of its scale in the world[2] and is still the largest operational hydropower scheme in Scotland.

Today, hydropower is a commercial technology that accounts for around 19% of Scotland's total energy generation[3]. As set out within the Energy Strategy: The Future of Energy[4], and Draft Energy Strategy and Just Transition Plan[5], further development of hydropower in Scotland, and PSH in particular, is supported by the Scottish Government in the pursuit of a flexible and resilient future energy network and power supply.

A Scotland-wide review of the untapped hydropower potential to identify locations suitable for PSH development was conducted by the Applicant. Through this review the potential for a PSH scheme utilising Loch Awe was identified.

The Development will discharge water from its Headpond back into Loch Awe, which is also utilised by the existing Cruachan scheme. Cruachan is a 440 MW pumped storage hydro-electric scheme which has been operating since 1965. An application to expand the scheme was recently given consent by the Scottish Government with the proposed expansion proposed to provide up to 600 MW of new generating capacity, resulting in a total generating capacity of up to 1,040 MW.

The Development is predominantly located within the catchment of the Allt Beochlich watercourse. The catchment consists of a number of small streams which ultimately flow into Loch Awe, these originate from smaller lochs (Airigh, Dubh and Romach).

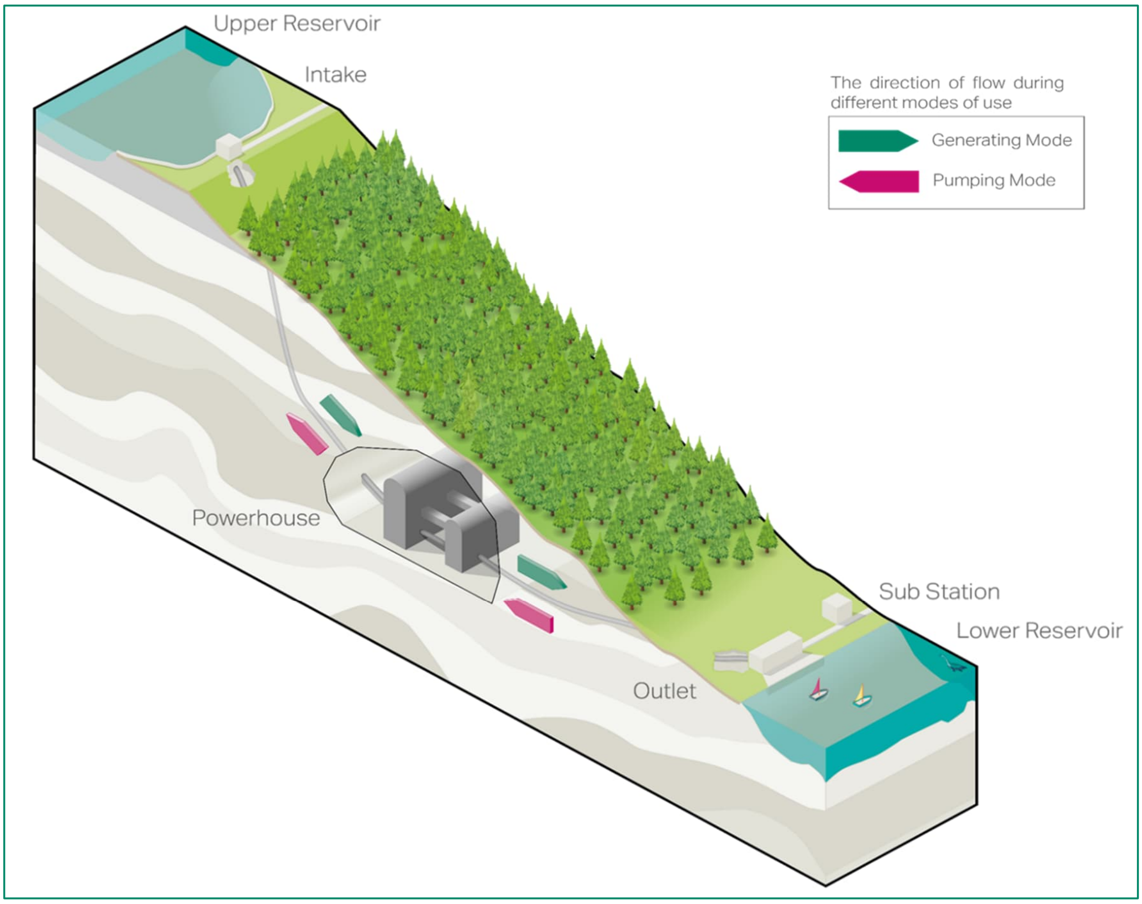
[1] Scottish and Southern Energy plc. Power from the Glens. https://studylib.net/doc/7919719/power-from-the-glens. [Accessed 13/02/2024].
[2] Scottish Power. (2018). Cruachan. https://www.visitcruachan.co.uk/pages/history.aspx. [Accessed 13/02/2024].
[3] Scottish Government. (2021) Annual Energy Statement & Quarterly Statistics Bulletin, as reported within: Energy Statistics for Scotland - Q3 2023 Part 2. https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2018/10/quarterly-energy-statistics-bulletins/documents/energy-statistics-summary---december-2021/energy-statistics-summary---december-2021/govscot%3Adocument/Scotland%2BEnergy%2BStats%2BQ3%2B2021.pdf [Accessed 13/02/2024].
[4] Scottish Government. (2017, Errata published 2018). Scottish Energy Strategy: The Future of Energy. [Online]. Available: https://www.gov.scot/Resource/0052/00529523.pdf. [Accessed 13/02/2024].
[5] Scottish Government (2023) Draft Energy Strategy and Just Transition Plan https://www.gov.scot/publications/draft-energy-strategy-transition-plan/

1.2.2 Concept of Pumped Storage

The main principle of pumped storage is to release water from an upper reservoir (the Headpond) to a lower reservoir (the Tailpond) when there is a demand to generate electricity and to pump water from a lower reservoir to an upper reservoir when there is either a low demand or excess supply of electricity. As the water transfers between the upper and lower reservoirs, the water passes through a pumped turbine either generating electricity or storing the water (as potential energy) at a higher elevation to be used later for electricity generation.

Pumped storage is currently the most efficient technology for storing large amounts of energy and is capable of generating and pumping in a relatively short period of time, when there is either a demand for, or a surplus of, electricity. Pumped storage is complementary to variable intermittent energy sources such as wind and solar and is able to reduce the curtailment of excess generation by providing load and energy storage for the grid. Therefore, this Development can enable greater deployment of renewable energy into the grid and at the same time provide flexibility to generation plants to meet the demands from the grid.

The schematic below provides an indicative view of how a pumped storage system works. **Note that this is a diagrammatic illustration, and it therefore does not accurately represent the proposed scheme for the Development.**



Insert 1.1 Schematic of a Typical Pumped Storage Hydro Scheme

1.2.3 Balliemeanoch Pumped Storage Hydro

The Development is located at central national grid reference NN 03615 17578 approximately 4.4 km to the south of the village of Portsonachan and 9 km northwest of Inveraray in Argyll and Bute, as shown on *Figure 1.1 Location Plan* (*Volume 3 Figures*) The Development Site is generally characterised by upland moorland plateau grazing land. The Headpond (upper reservoir) location at Lochan Airigh sits at approximately 360 m above ordnance datum (AOD) and 3 km to the east of the Balliemeanoch farm steading. A new temporary Marine Facility, comprising a temporary jetty to aid construction of the Development, is to be located south of Inveraray off the A83.

The Development Site boundary is shown by the red outline on *Figure 1.1 Location Plan* (*Volume 3 Figures*) and includes all the land that is required during construction, operation and decommissioning including the Headpond and Embankments, Tailpond inlet / outlet structure, temporary Marine Facility with jetty, waterways, Power Cavern

Complex, Access Tunnels, Access Tracks and other associated permanent and temporary infrastructure. The total area within the red line boundary is approximately 3,115 hectares (ha). Not all of the area within the red line boundary will be developed.

The Development will have a storage capacity of approximately 45,000 gigawatt hours (GWh) with approximately 1,500 MW installed electrical generation capacity.

1.2.4 The Applicant

The Applicant is a clean energy developer who has been developing renewable energy projects for over 15 years. This has included onshore wind, solar and run river hydro schemes, with their focus now on energy storage.

The Applicant seeks to play its part in meeting Scotland's future energy needs and contribute to world leading climate change and net zero targets. It has developed a portfolio of battery and pumped storage hydro projects.

Energy storage projects will be of critical importance as we move towards 100% renewable energy generation, as they provide the balancing and back-up services a secure and efficient energy system requires.

The Applicant's lead pumped storage hydro project, Red John, received Section 36 consent and deemed planning permission from the Scottish Government in June 2021. In recognition of this success, the Applicant was a finalist in the 2021 Scottish Green Energy Awards and in the Regen Green Energy Awards 2023.

1.3 Consenting Requirements

As the Development will comprise an electricity generating plant with a gross electrical output in excess of 50 MW, consent to construct and operate will be required from the Scottish Ministers under Section 36 of the Act. The Section 36 Application will be prepared in accordance with the requirements of the Act and submitted to the Energy Consents Unit (ECU) of the Scottish Government. As part of that consent, the Scottish Ministers will also be requested to give a direction for deemed planning permission to be granted under Section 57(2) of the Town and Country Planning (Scotland) Act 1997.

1.4 The Environmental Impact Assessment Report

1.4.1 Requirement for Environmental Impact Assessment

As consent is sought under Section 36 of the Act, the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (hereafter referred to as the 'EIA Regulations') also apply to the Development. By virtue of its size, nature and location, the Development constitutes an 'EIA development' under Schedule 2 of the EIA Regulations.

An EIA has therefore been undertaken. More details on the EIA process and the approach to EIA for the Development are set out in *Chapter 4: Approach to Environmental Impact Assessment*.

In compliance with Regulation 5(1) of the EIA Regulations, this EIAR has been prepared to accompany the Section 36 Application.

1.4.2 Content and Structure of the EIA Report

This EIAR describes the results of the EIA for the Development. This includes a detailed description of the Development and its surroundings, an overview of the design process, and technical assessments with associated reports by individual environmental topic.

The EIAR has been published in six volumes:

- Volume 1: Non-Technical Summary (NTS) - concise and written in non-technical language, providing a description of the Development, a summary of its residual environmental effects, and proposed mitigation measures;
- Volume 2: EIAR Main Text - contains the introductory and topic specific environmental assessment chapters, which is structured around the chapter headings as set out in *Table 1.1 Volume 2: EIAR Main Text Chapter Structure;*
- Volume 3: Figures - contains the figures relating to the EIAR chapters;

- Volume 4: Visualisations - contains photomontages to NatureScot standards, projecting how the Development will sit within the surrounding landscape;
- Volume 5: Appendices - contains supporting Appendices to the EIAR. The Appendices include detailed technical information such as raw data, survey reports and plans that are cross referenced where relevant within Volume 2 of the EIAR; and,
- Volume 6: Confidential Appendices - contains supporting Appendices which are only provided to certain competent bodies due to the nature of the information which is contained within them.

Table 1.1 Volume 2: EIAR Main Text Chapter Structure

Chapter No	Title	Author
1	Introduction	AECOM
2	Project and Site Description	AECOM
3	Evolution of Design and Alternatives	AECOM
4	Approach to EIA	AECOM
5	Landscape and Visual Amenity	AECOM with DGA Forestry providing Appendix 5.5
6	Terrestrial Ecology	AECOM
7	Aquatic Ecology	AECOM
8	Marine Ecology	AECOM
9	Ornithology	AECOM
10	Geology and Soils	AECOM
11	Water Environment	AECOM
12	Flood Risk and Water Resources	AECOM
13	Cultural Heritage	AECOM
14	Access, Traffic and Transport	AECOM
15	Noise and Vibration	AECOM
16	Socio-Economics and Tourism	AECOM
17	Climate	AECOM
18	Marine Physical Environment and Coastal Processes	AECOM
19	Shipping and Navigation	Anatec
20	Commercial Fisheries	Brown and May Marine
21	Summary of Effects and Conclusions	AECOM

1.4.3 Availability of the Environmental Impact Assessment Report

This EIAR and other documentation prepared to support the Section 36 Application are available for download from the Argyll and Bute Planning Portal website: https://www.argyll-bute.gov.uk/planning-and-environment/find-and-comment-planning-applications and the ECU website: http://www.energyconsents.scot/.

The EIA Report will be available for viewing at the following locations:

- Oban, Lorn and the Isles Argyll & Bute Council office at Municipal Buildings, Albany Street, Oban PA34 4AW
- Dalmally Village Hall
- Portsonachan Village Hall
- West Lochfyneside Parish Church, Inveraray

Digital USB pen copies of the EIAR will also be offered to the following community councils (CC):

- Inveraray CC
- Glenorchy & Innishail CC
- Avich & Kilchrenan CC
- Furnace CC
- Dunadd CC
- West Lochfyne CC
- Taynuilt CC

Digital USB pen copies of the EIAR will also be offered to the following councillors from Oban North and Lorn:

- Independent (Kieron Green)
- Scottish Greens (Luna Martin)
- Scottish National Party (Julie McKenzie)
- Scottish Conservative and Unionist Party (Andrew Vennard)

1.4.3.1 Representations

Any representations regarding the application should be made as per guidance on Scottish Government, Energy Consents website at:

https://www.gov.scot/publications/energy-consents-how-to-support-or-object-to-an-application/

Which advises that representations can be made by email to The Scottish Government, Energy Consents Unit mailbox at: representations@gov.scot

Or by post to:

Energy Consents Unit, Energy Division, Scottish Government, 4th Floor, 5 Atlantic Quay, 150 Broomielaw, Glasgow, G2 8LU.

Representations should be dated and should clearly state the name (in block capitals) and full return email or postal address of those making representation. All representations to the Scottish Government will be copied in full to the planning authority, and made available to the public on request, unless individuals request otherwise.

1.4.3.2 Copies of the Application Documents

Electronic copies of the application documents (with the exception of Volume 6: Confidential Appendices) can be made available at a fee of £10 per USB pen drive. A paper copy of the Non-Technical Summary can be made available free of charge. Cheques should be made payable to AECOM Ltd, with your name and address on the back.

To request copies of the EIAR documents please contact the Balliemeanoch PSH Project Team at the following address:

Balliemeanoch PSH Project Team, AECOM, 1 Tanfield, Edinburgh, EH3 5DA

E-mail: pumpedstorage@aecom.com

Information on the Development will also be available on the Development website: https://www.balliemeanochpsh.co.uk/ and requests for copies of the EIAR may be submitted through the queries form.

1.5 Other Supporting Information

Other documents that will be submitted along with the EIAR as part of the Section 36 Application, include:

- Planning Statement;

- Pre-Application Consultation Report;
- Marine Licence; and
- Planning Drawings.

1.5.1 Secondary Consents

It is recognised that other consents and licenses are required for the construction and operation phase of the Development. At present it has been identified that the following may be required:

- Acquisition of Water Rights application;
- Controlled Activities Regulation (CAR) Licence;
- European Protected Species licences;
- Felling Licence (if required);
- Reservoir registration under the Reservoir (Scotland) Act 2011;
- Construction Site License; and
- Generation Licence.

This list is not exhaustive and will be updated as required. Information on when and who will gain the relevant consents and licenses has been included within the Mitigation Register in *Chapter 21: Summary of Effects and Conclusions* of this EIAR (Volume 2). As much information as possible is provided within the EIAR to support the application for these secondary consents.

Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 2: Project and Site Description

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

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Table of Contents

2. Project and Site Description

2.1 Introduction

This chapter provides a description of the Development (submitted design) and its surrounding environment. It also provides an overview of the likely construction methods, an indicative construction programme, including enabling pre-construction works, and an overview of the operational and decommissioning phases of the Development. A description of the generation and reuse of excavated material is also included.

This chapter is organised as follows:

- Site description (*Section 2.2: Site Description*);
- Development description (*Section 2.3: Development Description*) and summary of key development characteristics (*Sections 2.4: Description of Headpond – 2.14: Grid Connection*) - these sections provide a description of the submitted design for which consent under Section 36 of the Electricity Act 1989 ("Section 36 Consent") is sought;
- The construction programme (*Section 2.15: Construction Programme*); and
- Development phases (*Sections 2.16: Pre-Construction – 2.20: Decommissioning*) - these sections provide a description of each phase of the development: pre-construction, construction, operation and decommissioning.

2.2 Site Description

The Development Site is located in the Argyll and Bute region, centred on national grid reference NN 03615 17578, approximately 4.4 km to the south of the village of Portsonachan and 9 km northwest of Inveraray, with the red line boundary shown on *Figure 1.1: Location Plan (Volume 3 Figures).* The Development Site is generally characterised by upland moorland plateau grazing land. The Headpond location at Lochan Airigh sits at approximately 360 m above ordnance datum (AOD) and 3 km to the east of Balliemeanoch Farm Steading. The proposed Marine Facility is located south of Inveraray off the A83.

There is no woodland within the main area of the Development Site, with woodland pockets restricted to those located along proposed Access Tracks. These woodlands include plantation woodland along the existing, to be upgraded, Access Track from the A819 at the north; along the proposed new and upgraded existing tracks proposed to the west of Inveraray; and along the upgraded access to the north of Inveraray Castle. Degraded woodland is present in the vicinity of the Tailpond inlet / outlet.

The Development is predominantly located within the catchment of the Allt Beochlich watercourse. The catchment consists of a number of small streams, which ultimately flow into Loch Awe, these originate from smaller lochs (Airigh, Dubh and Romach).

Figure 2.1: Constraints (Volume 3 Figures) shows environmental and recreational constraints within the site and surrounding area. *Figure 2.2: Utilities (Volume 3 Figures)* shows utilities within the red line boundary.

2.2.1 Water Features

The Development Site is consisted of two main catchment areas: the Loch Awe catchment and the Loch Fyne catchment. The Loch Awe catchment covers the Headpond area and the inlet / outlet structure. While the Loch Fyne catchment includes the Inveraray bypass route and the Loch Fyne Marine Facility. The majority of watercourses within the Loch Awe catchment flow directly into Loch Awe. However, there are three sub-catchments, including Allt Beochlich, that has a number of tributaries and lochans within its catchment, and Allt Mor which has some unnamed lochans and Claddich River catchment.

Table 2.1: Water Features, below lists each of the water features within each catchment and sub catchment, these features are also identified in *Figure 11.1: Surface Water and Groundwater Receptors and Attributes – Wider Context (Volume 3 Figures).*

Table 2.1: Water Features

Sub Catchment	Water Features
Loch Awe	
Loch Awe	Allt na Cuile Riabhaiche and tributaries
	Allt a Chrosaid and small (unnamed) lochan
	Allt na Dail Ferna
	Allt na Fainge
	Allt a' Ghreataidh
	Allt Blarghour and tributaries
Allt Beochlich and tributaries	Loch Breac-liath
	Lochan Airigh
	Beochlich Lochan
	Lochan Dubh
	Lochan Romach
Alt Mor and tributaries	Unnamed Lochs
Claddich River	Keppochan River and tributaries
	Archan River and tributaries
Loch Fyne	
Loch Fyne	Crom Allt and tributaries
River Aray and tributaries	Allt Riabhachan
	Allt Bail' a' Ghobhainn
	Erallich Water
	Allt Phàruig

Refer to *Chapter 11: Water Environment* for further details.

2.2.2 Topography

The main Development Site slopes from the summit of Cruach na Gearr-choise (571 m AOD), along the eastern boundary of the Development Site, towards Loch Awe in the west.

The proposed Headpond is located at Lochan Airigh (360 m AOD), which sits in the valley between Cruach na Gearr-Choise (571 m AOD) to the east and an unnamed summit (470 m AOD) to the west. The topography around the Headpond area is generally flat around Lochan Airigh (centre of the basin) and slopes up at approximately 12 % and 9 % from the centre of the basin to the northwest and the southeast, respectively.

The Tailpond inlet / outlet is located on Loch Awe, south of Balliemeanoch Farm. The top level of the structure is at an elevation of 38.6 m AOD and extends approximately 50 m into Loch Awe. The existing ground slopes steeply to the southeast at a gradient of approximately 14 % to the existing track, where it levels out and slopes steadily upwards to the proposed Headpond location in the east. The Balliemeanoch farmhouse is located approximately 400 m away from the proposed Tailpond inlet / outlet location*. Figure 10.1: Topography (Volume 3 Figures)* shows the topography of the Development Site based upon a 5 m digital terrain model (DTM).

2.2.3 Geology

The bedrock geology at the main Development Site is dominated by Metabasaltic rock of the Tayvallich Volcanic formation. The Tayvallich Volcanic formation is of the Tayvallich Subgroup, which is defined onby the British Geological Survey (BGS) as: "*Dominated by calcitic limestone, in part slumped, resedimented; however, east of mid-Deeside the limestone is replaced by psammite and quartzite with thin beds of calcsilicate rock; lavas, hyaloclastites and graphitic pelites present in Tayvallich area; Banffshire Coast – thick semipelite and calc sequence in upper part*."

This formation covers the majority of the proposed Headpond and the sloping ground to the west, towards Loch Awe.

At the tail pond inlet / outlet structure (on Loch Awe), the bedrock geology is shown to be psammitic in nature, of the Loch Avich Grit Formation. The Loch Avich Grit Formation is of the Southern Highland Group, which is defined by the BGS as: " *A thick pile of psammitic and pelitic greywackes and associated rocks, some volcanic*."

The bedrock geology is made up of Tayvallich Volcanic Formation – Metalava and Metatuff and the Tayvallich Slate and Limestone Formation – Pelite, Graphitic to the north and south of the Headpond, respectively. Both of these formations are of the Tayvallich Subgroup, described above.

As shown on *Figure 10.3: Superficial Geology (Volume 3 Figures),* no superficial deposits are identified across the majority of the main Development Site. This is an indication that bedrock is at, or near, the surface. Where superficial deposits are identified, they are generally till deposits, alluvium and peat.

A review of the BGS Faults layer (1:625,000 scale) on the BGS Onshore GeoIndex (citation) indicated the presence of a fault trending southwest – northeast through the proposed Embankment 1, terminating to the east of the Headpond..

2.2.4 Peat

A review of the Carbon and Peatland 2016 map on Scotland's Soils online map viewer (Scottish Government, 2016) shows the area surrounding the Headpond is a mixture of peat soils, mostly peaty gleys with semi-confined peat, peaty gleyed pozdols with peaty gleys with distrophic semi-confined peat and peaty gleys with peaty rankers.

The areas along the banks of Loch Awe and to the east towards the Headpond is described as brown earths with humic gleys.

An onsite peat depth survey was undertaken using peat probes, the results from the surveys are listed below:

- 38 % of the area surveyed recorded a depth of peat below 0.5 m
- 24 % of the area surveyed recorded a depth of peat between 0.5 m and 1.0 m
- 12 % of the area surveyed recorded a depth of peat between 1.0 m and 1.5 m
- 10 % of the area surveyed recorded a depth of peat between 1.5 m and 2.0 m
- 9 % of the area surveyed recorded a depth of peat between 2.0 m and 3.0 m
- 7 % of the area surveyed has depths of peat ranging between over 3.0 m and up to 7.30 m,, however, it is mostly located on the outer eastern edges of the survey extents.

The results of the peat probing surveys undertaken at the site were used to create a map of the varying depths of the peat surface across the Development – shown on *Figure 10.5: Peat Depth Interpolation (Volume 3 Figures).*

2.2.5 Land Use

The Development Site is generally characterised by upland moorland plateau grazing land. The wider landscape includes a rocky coastland, upland glens and steep ridges and mountains. The Headpond location at Lochan Airigh sits at approximately 360 m AOD and 3 km to the east of the village of Balliemeanoch. Loch Awe lies immediately to the northwest of the Development Site and Loch Fyne lies immediately to the south, where the proposed Marine Facility is located south of Inveraray, off the A83. Beyond these lochs there are areas of higher ground, which are characterised by mountains and Wild Land Areas.

The land around the area of the proposed Headpond within the Development Site comprises an upland plateau moorland with craggy outcrops, used mainly for sheep grazing. The land capability for agriculture is class 6.3, "*capable of only rough grazing due to intractable physical limitations; semi-natural vegetation provides grazing of low value*" (Hutton Institute).

There is no woodland within the main area of the Development Site, with woodland pockets restricted to those located along proposed Access Tracks and a small area near the Tailpond inlet / outlet. These woodlands include plantation woodland along the existing, to be upgraded, Access Track from the A819 at the north; along the proposed new and upgraded existing tracks proposed to the west of Inveraray; and along the upgraded access to the north of Inveraray Castle, and as noted near the Tailpond inlet / outlet on Loch Awe.

2.2.6 Designations

There are no statutory environmental designations within the main area of the Development Site. Inveraray Castle Garden and Designed Landscape is located within the red line boundary, along the existing Access Track north of Inveraray Castle (*Figure 2.1 Constraints (Volume 3 Figures*)). However, the proposed Marine Facility would be situated within the Upper Loch Fyne and Loch Goil Marine Protected Area (MPA), which is located to the west of Inveraray.

Within the wider area, Glen Etive and Glen Fyne Special Protected Area (SPA) is located approximately 5 km to the east of the proposed Headpond and is designated for breeding golden eagle (*Aquila chrysaetos*).

Non-statutory long established (of plantation origin) woodland is located to the north and south of stretches of the proposed access route to the north of Inveraray Castle, in addition to a number of scattered category A and B Listed Buildings. There is one Scheduled Monument within the main Development Site – Balliemeanoch chapel and burial ground, which is located approximately 500 m north of the proposed tailrace tunnel.

2.2.7 Access

There are no classified roads or tracks within the Development Site at the Headpond or Tailpond location. However, at Inveraray there is a <1 km section of classified road (A83) at the proposed Marine Facility location.

Site access is proposed from the A819, which links the strategic trunk roads: A85 to the north at Dalmally and A83 to the south at Inveraray. It is anticipated the general construction access will come from the north and south along the A819. Construction access from the south will bypass Inveraray, via a section of unclassified existing track (to be upgraded) north of Inveraray Castle, which will connect the A83 to the A819.

Larger construction traffic, such as abnormal loads, will be delivered by boat to the proposed Marine Facility jetty, where they will be then transported to site via the A819. Access to the A819 will be via an upgraded existing Access Track that runs to the north and then east, from the A83, around the north of Inveraray. There are proposed upgrades to the existing unclassified road “Upper Avenue” at Inveraray and a new track linking this to the A83 at the proposed Marine Facility jetty location.

These upgrades are proposed to ease traffic and to avoid sensitive bridges within the area of Inveraray.

In summary:

- There is a proposed heavy goods vehicle (HGV) construction traffic bypass route between the A83 east of Inveraray and the A819 to the north of Inveraray. This utilises a combination of existing construction Access Track and new Access Tracks to the north of Inveraray Castle.
- A proposed abnormal indivisible load (AIL) route, utilising Upper Avenue, between the A83 south of Inveraray and the A819 north of Inveraray would facilitate the movement of AIL deliveries from the proposed Marine Facility jetty facility.
- HGV construction traffic will avoid the B840. It is unlikely that this route would be required for construction traffic, as a route will be available directly from Access Tracks from the A819 at Craig nan Sassanach to the Development site.
- The proposed HGV construction traffic routes would avoid Inveraray Town Centre, as well as the historic Aray Bridge on the A83.

2.2.8 Utilities

Utility searches were commissioned for three key areas of the Development. The three search areas were selected given the size of the Development and the aim to limit the search areas to those receptors within proximity to residential areas where such services are most likely to be affected. These can be seen on *Figure 2.2: Utilities (Volume 3 Figures).*

The report identified the following receptors potentially affected by the Development:

- Water & Sewerage – Scottish Water (SW).
- Electricity Distribution – Scottish and Southern Energy Networks (SSEN).
- Telecoms & Cables – BT Openreach.

2.2.8.1 Water and Sewerage

SW plans only show the public mains in the area. Any connections / supply pipes are classed as private and are usually not recorded by SW.

Water utilities are present within the area of the proposed Marine Facility. Raw water supply is present along the southern corner section of Upper Avenue, at the residential dwelling and water treatment works.

Adopted public water mains are present at temporary compound 23 as shown on *Figure 2.3 Above Ground Infrastructure Sheet 2 of 2 (Volume 3 Figures*) at South Cromalt, within the area of the proposed temporary Access Track to connect the proposed Marine Facility to Upper Avenue, and along the southern corner section of Upper Avenue.

Given the temporary nature of the proposed access routes at these locations, it is considered that, at the detailed design stage, measures will be put in place to effectively mitigate against disturbance. Consultation with SW at Gate Check was undertaken. Refer to *Chapter 3 Evolution of Design and Alternatives* for further information on Gate Check and the design process. SW advised that they must be consulted during the detailed design stage and provided with timescales for construction start dates, in order to discuss the possibility to avoid or mitigate coinciding with SSEN pylon works scheduled in this area.

In addition, 3 months in advance of any works commencing on site, SW should be notified at protectdwsources@scottishwater.co.uk. to ensure SW are aware of activities in the catchment. If it is required, a site meeting with the relevant member of SW Sustainable Land Management team can take place to discuss the construction programme.

During the detailed design, arrangements will be required for surface water, for reasons of sustainability and to protect SW customers from potential future sewer flooding. SW will not accept any surface water connections into their combined sewer system.

2.2.8.2 Electricity Distribution

There is an existing run-of-river hydro scheme on Allt Beochlich, with an associated private generator and low voltage (LV) cable routes. These have been taken into consideration throughout the Development design process.

Where the proposed Temporary B840 Realignment begins at Barr Beithe, there is an LV mains and 16 kVA cable. LV cables are typically dug at a maximum of 1 m underground for agricultural land, 0.6 m at road crossings, and 0.45 m at footpaths / unmade land. It is considered that these cables will be avoidable within the detailed design.

A 33 kV overhead line (OHL) runs from north to south over the west of the Development Site, to the east of the proposed Temporary B840 Realignment from the northeast of Balliemeanoch Farm southwest to Cruach Bheac, and crosses the proposed temporary road diversion. At the northern section of the proposed Temporary B840 Realignment there is a 22 kV OHL between Oaklea and Balliemeanoch Farm. This OHL crosses the existing farm access that is proposed to be upgraded for the Temporary B840 Realignment. The detailed design stage will take into consideration the OHLs and any interactions from the Development during construction.

South of Inveraray near the proposed Marine Facility, LV mains cross Upper Avenue at the water treatment facility, with the 11kV and 33kV OHLs crossing the alignment of the proposed temporary access from the Marine Facility to Upper Avenue. It is likely that these will require realignment to enable the Development to proceed. This will be determined at the detailed design stage.

2.2.8.3 Telecoms and Cables

BT Openreach telecommunications are present along the existing B840, via overhead cables on poles. Underground cables are also present north of Barr Beiche to the north of Allt Beochlich, connecting to the existing run of river hydro scheme.

There are underground cables that follow the A819 and, at Inveraray, there are overhead cables on poles that follow Upper Avenue from the A83.

Consultation with BT Openreach was undertaken at Gate Check and BT Openreach advised that the project should not cause interference to BT Openreach's current and presently planned radio network.

The Emapsite Report also identified that gas distribution network (Scotia Gas Network (SGN)) is not considered to be affected by the Development.

2.2.9 Local Community and Economy

The main Development Site is located in a rural area. Isolated static caravans are situated at the west of the site on the banks of Loch Awe in proximity to the proposed Tailpond inlet / outlet. There are two houses in the area close to the proposed western Access Track, linking the Headpond and Tailpond; these are identified as a detached bungalow and Balliemeanoch farm.

The Development Site lies within the Argyll and Bute Council area, where it is noted that 47.2 % of the area's population live in areas classified by the Scottish Government as 'rural' (Argyll and Bute Council (2020[1])). Surrounding the Development Site lie the settlements of Ardchonnell, Ballimeanoch, Drimfern, Ladyfield, Portsonachan and Taynafead. Inveraray is the largest nearby settlement to the Development Site with an estimated population of 560 (Argyll and Bute Council (2020)).

2.2.10 Future Baseline

If the Development were not to be built, the characteristics and land use within the Development Site boundary would remain as currently existing. Therefore, the future baseline is not anticipated to differ significantly from the Site Description provided in *Section 2.2: Site Description*, above.

2.3 Development Description

Table 2.2: Description of Development Component Parts introduces the terminology and component parts of a typical pumped storage hydro (PSH) scheme and describes these components for the Development.

The above and below ground infrastructure can be seen separately on *Figures 2.3: Above Ground Infrastructure and Figure 2.4: Below Ground Infrastructure (Volume 3 Figures)* respectively. This project description is summarised below.

[1] Argyll and Bute Council (2020). Population: Where we live [Online]. Available at: https://www.argyll-bute.gov.uk/my-community/population-where-we-live

Table 2.2: Description of Development Component Parts

Arrangement	Component	Description
	Headpond	The Headpond is the upper reservoir with associated Embankments. The Headpond will be constructed through a combination of excavation and creation of two new Embankments. The existing topography is utilised in the design to reduce the number of Embankments, Embankment size and length as far as practically possible. Component parts of the Headpond include: • Headpond reservoir – referring to the waterbody containing approximately 59,580,500 m³ of water, with a working volume of 53,397,000 m³ located at NN 04594 16411; • Embankment 1 – the largest of the two Embankment structures retaining the waterbody approximately 1,635 m long, approximately 485 m wide and approximately 95m high • Embankment 2 – the smaller of the two Embankment structures retaining the waterbody approximately 279 m long, approximately 85 m wide and approximately 13 m high. • Headpond inlet / outlet structure – where the Waterways exit the Headpond, the structure will predominantly sit within Embankment 1. • Upper Gate House (permanent) – The upper gate house location east of the Headpond and accessed via the Embankment 1 and will be 35 m x 25 m x 10 m [L x B x H]. • The Headpond will include one borrow pit within its interior. This borrow pit (BP01) is required to excavate the required material for the construction of the Embankments and reduce the reliance on delivery of additional material to site via public roads. BP01 could yield up to approximately 9,600,000 m³ of stone. The borrow pit floor measures approximately 825 m x 445 m and is around 37 m in depth.
Above Ground (as shown on **Figure 2.3 (Volume 3)**)	Tailpond	The Tailpond is the lower reservoir, and in the case of this Development, will be the existing body of Loch Awe. The permanent and temporary components of the Development located within the Tailpond include: • Lower Gate House (permanent) – the lower gate house location approximately 90 m south east of the Tailpond inlet / outlet structure and will be 8 m x 7 m x 5 m [L x B x H]. • Cofferdam (temporary) – a water-tight, temporary structure that will encircle the area required for Tailpond works. The area within the cofferdam will be pumped dry to facilitate the construction of the Tailpond inlet / outlet structure.
	Construction Compounds	Temporary compounds (TC) and permanent compounds (PC) will be required across the Development. Some will be used for construction related activities such as laydown areas, work yards and for general site activities. Others will be used for office space, parking areas, welfare areas, and accommodation. These may include electric charging points for electric shuttle cars / buses. • There will be 11 temporary compounds and 11 permanent compounds at various locations across the Development Site to facilitate different construction works.
	Development Site Access	• The Development Site access via the public road network is from the A819 near Craig nan Sassanach. The A819 runs to the east of the Development Site from north to south. • There is potential to access the Development Site further south down the A819 at Three Bridges utilising the proposed access for the Blarghour Wind Farm should this be constructed, and the necessary land rights secured. • The Marine Facility located on the coast south of Inveraray will act as Development Site access for certain deliveries via water from Loch Fyne. The marine structure will be a jetty structure that will extend into Loch Fyne. The jetty will extend south-east from the shore perpendicular to the A83 and will be approximately 180 m from the shoreline and 10 m in width.

Arrangement	Component	Description
	Access Tracks	There will be both temporary and permanent internal Access Tracks required to be constructed. The alignment of existing Access Tracks has been utilised as far as possible. Any existing Access Track will be upgraded to accommodate the size and number of vehicles required to travel to, from and around the Development. • Existing tracks to be upgraded - 12.8 km length and up to 10 m wide, which will be restored to 5 m wide post-construction with the exception of Upper Avenue and the Inveraray Castle Garden access route. Upper Avenue will be maintained at approximately 3 m wide, with local temporary widening where necessary, avoiding tree felling along the route. Inveraray Castle Gardens access will have limited widening and will be no more than 3 m wide, with local passing places installed where necessary. Post construction the road will be restored to pre-construction state. • New Access Tracks - 10.3 km (5.3 km excavated and 5.0 km floated) and up to10 m wide. • Temporary construction tracks - 5.8 km and up to 10 m wide. • Blarghour Wind Farm access - 8.6 km which would not be built as part of the Development and only utilised should the wind farm be constructed and in operation, and the necessary land rights secured.
	Temporary B840 Realignment	Temporary realignment of a section of the public road network. • To allow for construction of the Tailpond inlet / outlet structure a 1.5 km section of the B840 requires to be diverted. This will be temporary, with the B840 reinstated post construction. The newly built sections of the temporary diversion will be returned to its original condition, with the upgraded sections of the existing farm access retained.
	Walking Routes	Sections of existing informal Walking Routes within the site boundary will be temporarily diverted during construction. These routes will be fully reinstated on completion of construction. In addition, sections of the Access Tracks required to be constructed for the Development will be signposted and included as new Walking Routes for use by the public post construction. A public right of way (PRoW) crosses the internal Access Track into the site at the north. This PRoW is listed as a Heritage Path, it is not listed on HER, or CANMORE, or visible on aerial imagery; however, access will be maintained at all times with additional signage provided to warn any walkers of construction traffic that may be present on the intersecting road. An Outline Access Management Plan is located within *Appendix 16.1: Outline Access Management Plan (Volume 5 Appendices).*
	Switching Station	The Switching Station (NN 05087 17754) will consist of two secure electrical compounds (one controlled by the project and one controlled by the Distribution Network Operator (DNO)), in which electrical equipment will be housed. In addition to the external switchgear, a number of parking spaces and permanent welfare facilities will be present.
	Marine Facility	A temporary jetty will be constructed within Loch Fyne (NN 08500 07100). The jetty will be used for delivery of AILs of materials and equipment during construction, removed post construction and reassembled during operation for maintenance when required. The jetty will be used for delivery of a maximum of 10 shipments, estimated based on a combination of the number of AILs and units that can be carried on a barge appropriate for the size of the Marine Facility), and only at high tide due to the tidal nature of the loch and the design of the jetty. Key jetty parameters are: • Approximately 180 m in length from the shoreline. • 10 m wide. • Deck top level: 3.3 m AOD (1.6 m above Mean High Tide Level (MHTL)) and approximately 600 mm deep. • Supported by vibro-driven piles into the seabed. • The jetty will be temporary and will be in place for the duration of construction with the jetty platform being removed during demobilisation. The piles will remain in-situ.
	Temporary Workers' Accommodation	Temporary Workers' Accommodation will be required to house construction workers during the development phase. A housing strategy is located within *Appendix 16.2 Outline Housing Strategy (Volume 5 Appendices),* which will set out options including onsite accommodation, offsite accommodation, and park and ride options. The aim will be to have a mix of accommodation / travel options to ensure no significant adverse impacts on local accommodation for tourists and / or residents. The final locations have yet to be identified with the relevant studies currently being undertaken with discussions ongoing with Argyll and Bute Council. Any workers accommodation requiring planning consent will be subject to its own studies and assessments as part of separate planning application(s) under the Town and Country Planning (Scotland) Act 1997, as required.
Below Ground (as	Waterways	Waterway tunnels will transfer water between the Headpond and Tailpond and consist of: Headrace - High pressure tunnel connecting the Headpond to the pump turbines within the Power Cavern Complex, approximately 670 m in length.

Arrangement	Component	Description
shown on **Figure 2.4 (Volume 3)**)		Tailrace - Low pressure tunnel connecting the pump turbines to the Tailpond inlet / outlet, approximately 2.3 km in length. The spillway - an open cut trench from the top of Embankment 1 used to drain any excess water from the Headpond. The spillway is approximately 580m and drains into an unnamed river that drains into Allt Beochlich. The scour pipe - a pipe within the trench at the bottom of the Headpond that joins the spillway pipe within a chamber below the Headpond. Along with the spillway, the scour is used for the scouring and draining down of the Headpond. Surge shafts associated with the high and low pressure tunnels. Located along the Waterways to contain pressure fluctuations within the hydraulic system. The low-pressure tunnel surge shaft will be underground. The high-pressure tunnel surge shaft will be underground and will extend to ground level (top of surge shaft to be covered by steel grate and contained within a permanent compound) but may have section cut / filled into the hillside and fenced which will be determined at the detailed design stage.
	Power Cavern Complex	Split into three sections: 1. Powerhouse cavern (contains the combined pump turbines), 2. Transformer cavern (contains the transformers) and, 3. Main inlet valve (MIV) cavern (contains the MIV), all three connected by galleries. The powerhouse cavern will be the largest section, measuring approximately 200 m long, 25 m wide and 50 m high. The Power Cavern Complex is located approximately 460 m below ground level. There is a ventilation tunnel from the Power Cavern Complex, the ventilation shaft does not have a tunnel portal but does comes to ground level. At ground level the shafts will be housed in a permanent compound and cordoned off by adequate safety measures.
	Access Tunnels	Tunnels for access, construction and power which will also be used in operation. • Construction and emergency egress tunnel, approximately 2.2 km in length. Also used in operation to provide access to the Power Cavern Complex (NN 01222 15828). • Access tunnel, approximately 2.4 km in length (NN 01528 15624). • Power cable tunnel, approximately 3.2 km in length (NN 050931 8511). • Ventilation tunnel, approximately 240 m in length (NN 03526 16819).
Grid Connection		The grid connection will not form part of the Section 36 Application and will be subject to its own separate consents. The Development will connect into the grid at Creag Dhubh substation via the Switching Station within the Development.

A detailed description of each component part of the Development is provided in the following sections. There is some information that is unconfirmed at present and will only be determined at a later design stage or and / or post detailed site investigation (SI) works, which will occur once Section 36 Consent is granted.

However, a 'Rochdale Envelope' has been applied to all built features, including those that are temporary, and establishes the maximum (or worst case) dimensions of that component part of the Development (such as the maximum height of a building or maximum noise limit of a construction vehicle) or the Limits of Deviation (LoD). LoD allow for geographical flexibility during the construction phase, such as the maximum buffer strip within which construction access will be located to allow for any unexpected ground conditions. The LoD are outlined in **Chapter 4: Approach to EIA** in further detail.

2.4 Description of the Headpond

The Headpond is located within the south of the main Development Site at Lochan Airigh centred on NN 04594 16411. The Headpond consists of a body of water, two Embankments, a Headpond inlet / outlet structure, which will be embedded into the hillside, a spillway, Access Tracks for construction, operation and maintenance and a temporary Construction Compound. A Switching Station is proposed to the north east of the Headpond, in addition to a tunnel portal and PC15. Three additional small permanent Compounds are proposed to the north west of the Headpond (PC17, PC18 and PC19). There is no fencing proposed around the Headpond.

2.4.1 Headpond Waterbody

The Headpond is designed to hold approximately 59.6 million meters cubed (Mm^3) of water with approximately 53.4 Mm^3 of it being used as the working volume during operation. *Figure 2.5 Headpond – Indicative Arrangement (Volume 3 Figures)* provides a general arrangement of the Headpond.

The working bottom water level (BWL) will be 374 m AOD, and the working top water level (TWL) will be 420 m AOD. The water levels can be viewed on *Figure 2.6 Headpond Cross Sections (Volume 3 Figures).*

2.4.2 Embankments

Two Embankments will retain the Headpond waterbody: Embankment 1, which is the largest of the two Embankment structures and will be located to the western side of the waterbody, and Embankment 2, which is the smaller of the two Embankment structures and will be located to the north-eastern side of the waterbody.

The Embankments can be viewed on *Figure 2.6: Headpond Cross-Sections and Figure 2.7: Headpond Embankments (Volume 3 Figures).*

The Embankments will be a built-up earth and / or rockfill structure.

2.4.2.1 Embankment 1

Embankment 1 will be up to 1,635 m long, approximately 482 m wide and approximately 95 m high. It will have a maximum top bank level of 425 m AOD, providing a minimum 5 m freeboard from the TWL of 420 m AOD.

The crest of the Embankment will typically be a maximum of 10 m wide and will include a 5 m wide Access Track with low kerb on the external side. Details of the Embankment can be viewed on *Figure 2.6 Headpond Cross Section (Volume 3 Figures*), *Figure 2.7: Headpond Embankments and Figure 2.8: Headpond Borrow Pit (Volume 3 Figures.*

The inner slope of the Embankment will be approximately 1 in 2.5 (V:H) and the external slope will be 1 in 2.5 (V:H) with 5 m horizontal benches at 10 m vertical increments. The external slope will be finished with soil and turf.

The inner slopes of the Embankment will be lined, however, the rest of the Headpond will not be lined. The lining will be a waterproof system that would be either an asphalt or concrete lining (or equivalent).

2.4.2.2 Embankment 2

Embankment 2 will be up to 279m long, approximately 85 m wide and approximately 13 m high. It will have a maximum top bank level of 425 m AOD providing a minimum 5 m freeboard from the TWL of 420 m AOD.

The crest of the Embankment will typically be a maximum of 10 m wide. There will be no Access Track along the top of Embankment 2. Details of the Embankment can be viewed on *Figure 2.6 Headpond Cross Section (Volume 3 Figures*), *Figure 2.7: Headpond Embankments and Figure 2.8: Headpond Borrow Pit (Volume 3 Figures).*

The inner slope of the Embankment will be approximately 1 in 2.5 (V:H) and the external slope will be 1 in 2.5 (V:H). The external slope will be finished with soil and turf.

The inner slopes of the Embankment will be lined. However, as stated in paragraph 2.4.2.1, the rest of the Headpond will not be lined. The lining will be a waterproof system that would be either an asphalt or concrete lining (or equivalent).

2.4.3 Headpond Inlet / Outlet Structure

The Headpond inlet / outlet structure is where the Waterways exit the Headpond through the headrace. The structure will predominantly sit within the base of the Headpond at existing ground level directly behind the main Embankment as shown on *Figure 2.9: Indicative Headpond Inlet / Outlet Structure (Volume 3 Figures).*

This structure will incorporate the inlet / outlet for the high-pressure headrace tunnel and will predominately site below the bottom water level of the Headpond. The structure will comprise a trashrack (debris screen), stoplog (to control water level / discharge), deck area with parapet wall around the deck with a manhole for maintenance. The structure will be approximately 90 m in length, 20 m in height and 30 m wide, at its widest point. Rock armour will be located either side of the trashrack behind the deck.

The related mechanical equipment for operating the scour valve along with the gates will be housed within a timber clad frame on top of the Embankment, which will be a maximum of 10 m tall, 25 m wide and 35 m long. This building will also denote the subsurface location of the Headpond inlet / outlet structure as shown on *Figure 2.9: Indicative Headpond Inlet / Outlet Structure (Volume 3 Figures).*

2.4.4 Borrow Pit

The Headpond will include one borrow pit (BP01) within its footprint. This borrow pit is required to excavate the required material for the construction of the Headpond Embankments and compounds and reduce the reliance on delivery of additional material to site. BP01 could yield approximately 9,600,000 m³ of stone. The borrow pit floor measures approximately 825 m x 445 m and has a maximum cut height of 37 m.

2.5 Description of the Waterways

The Waterways create a connection between the Tailpond and the Headpond. The Waterways comprise of the high-pressure tunnel, low-pressure tunnel, the spillway, the scour pipe and the surge shafts. This is shown on *Figure 2.10: Waterways and Tunnels Section (Volume 3 Figures).*

2.5.1 High and Low Pressure Tunnels

The high-pressure tunnel, also known as the headrace, connects the Headpond inlet / outlet to the pump turbines within the Power Cavern Complex, and is controlled via the main inlet valve (MIV) located within the Power Cavern Complex. This tunnel will be approximately 670 m in length.

The high-pressure tunnel will have a maximum internal diameter of up to 13 m and will be lined with reinforced shotcrete. The specification of lining and stabilisation will depend on the underlying geology. This will be confirmed during further site investigation to be undertaken post-consent.

The low-pressure tunnel, also known as the tailrace, connects the pump turbines within the Power Cavern Complex to the outlet / inlet in the Tailpond. This tunnel will be approximately 2.3 km in length. The low-pressure tunnel will have a maximum internal diameter of up to 13 m. The low-pressure tunnel may also be lined in a similar manner to the high-pressure tunnel and is subject to further site investigation.

2.5.2 Spillway and Scour Pipes

Adjacent to the Headpond inlet / outlet are the spillway and scour pipes. At the top of Embankment 1, the spillway is used to drain any excess water from the Headpond. The spillway is approximately 580 m long and drains into an unnamed river that drains into Allt Beochlich.

Within the trench at the bottom of the Headpond will be the scour pipe. This pipe joins the spillway within a chamber below the Headpond. Along with the spillway, the scour is used for the scouring and draining down of the Headpond.

The spillway inlet will be situated above the top water level of the Headpond with a 0.5 m freeboard.

2.5.3 Surge Shafts

Surge shafts are associated with the high-pressure and low-pressure tunnels and will be located along the Waterways to contain pressure fluctuations within the hydraulic system. The low-pressure tunnel surge shaft will be underground. The high-pressure tunnel surge shaft will be underground and will extend to ground level.t The top of the surge shaft will be covered by a steel grate and contained within a permanent compound (PC18) cut into the hillside and fenced.

2.6 Fencing

Fencing will be required across the Development. It will be restricted to all permanent compounds and is assumed to be palisade fencing up to 2.4 m in height.

2.7 Switching Station

There will be high voltage Switching Station within the Development located within the footprint of PC15 at central NN 05087 17754. This will be approximately 225 m in length and 100 m in width and may have equipment up to 14 m in height. The Switching Station is a switchyard that is partly the responsibility of the grid operator (SSEN Transmission) and partly the responsibility of the scheme developer and so the switchyard is divided into two sections of roughly equal area separated by a common boundary. The two parties own and operate their sections of the switchyard (with associated equipment), separately from the other party. The two areas will be fenced off from one another and have separate and private accesses.

In addition to the switchgear, there will be parking, welfare and offices located within both sides of the Switching Station.

2.8 Description of the Power Cavern

The Power Cavern Complex is the main underground component of the Development, split into three sections:

1. Powerhouse (contains the combined pump / turbines),
2. Transformer cavern (contains the transformers), and
3. MIV cavern (contains the MIV), connected by galleries.

Refer to *Figure 2.11: Cross-section of the Development,* with and indicative arrangement shown on *Figure 2.12: Indicative Power Cavern Section (Volume 3 Figures).*

The Power Cavern Complex is located approximately 460 m below ground level. There is a ventilation tunnel from the cavern, the ventilation shaft does not have a tunnel portal but does comes to ground level. At ground level the shafts will be housed in a permanent compound (PC 19) and cordoned off by adequate safety measures.

The precise arrangement of the Power Cavern Complex will be subject to detailed design.

2.8.1 Powerhouse

The powerhouse will be the largest section of the Power Cavern Complex, measuring approximately 200 m long, 25 m wide and 50 m high, and will contain the pumphouse, generator, switchgear, compressors, gantry crane, cable gallery, offices, and the control room. The powerhouse can be accessed via the Access Tunnel portal (tunnel portal 2).

2.8.2 Transformer Cavern

The transformer cavern will be approximately 70 m from the powerhouse and will be approximately 200 m long, 20 m wide and 35 m tall. The transformers will be housed within the transformer cavern, along with a gantry crane and the draft tube gate. The transformer cavern can be accessed via the power tunnel portal (tunnel portal 3).

2.8.3 Main Inlet Valve Cavern

The main inlet valve cavern is the smallest section of the Power Cavern Complex, measuring approximately 200 m long, 15 m wide and 15 m high and will contain the gantry crane, sump and main inlet valve with counterweight.

2.9 Description of the Access Tunnels

The Access Tunnels comprise of the construction and emergency egress tunnel, Access Tunnel, power cable tunnel and vent tunnel. The indicative routes and sections of the construction and emergency egress tunnel and Access Tunnel can be viewed on *Figure 2.13: Access and Construction Tunnel Section (Volume 3 Figures).*

2.9.1 Construction and Emergency Egress Tunnel

The construction and emergency egress tunnel will be approximately 2.2 km long, 5 m wide and 5 m high as shown on *Figure 2.13: Access and Construction Tunnel Section (Volume 3 Figures*). It is accessed via tunnel portal 1 within PC05 and provides access to / from the Power Cavern Complex.

Post-construction, the construction and emergency egress tunnel will also be utilised for the operational phase for maintenance, plant/equipment movements and an emergency exit.

2.9.2 Access Tunnel

The Access Tunnel will be approximately 2.4 km long, 9 m wide and 10.5 m high as shown on *Figure 2.13: Access and Construction Tunnel Section (Volume 3 Figures).* It provides access to the Power Cavern Complex via tunnel portal 2 within PC06.

It will be used for both the construction and operation phases and therefore is a permanent feature of the Development. During operation, the Access Tunnel will be utilised for operational workers travelling to the Power Cavern Complex.

2.9.3 Power Cable Tunnel

The power cable tunnel will be approximately 3.2 km in length, 10 m wide and 13 m high as shown on *Figure 2.14: Power Tunnel Section (Volume 3 Figures).* The power cable tunnel provides access to the transformer cavern via tunnel portal 3 within PC14.

2.9.4 Vent Tunnel

The heat and moisture environment can directly affect the operation safety of electrical equipment and the health of workers, as such a vent tunnel is required. The ventilation tunnel is approximately 240 m in length and 5 m in diameter, as shown on *Figure 2.13: Access and Construction Tunnel Section (Volume 3 Figures).* The tunnel provides ventilation into the Power Cavern Complex, via tunnel portal 2 within PC14.

2.10 Description of Tailpond Structures

2.10.1 Tailpond Inlet / Outlet Structure

The Waterways will terminate at the Tailpond inlet / outlet structure situated on the eastern bank of Loch Awe at approximately NN 00900 16200 and can be viewed on *Figure 2.15: Indicative Tailpond Inlet / Outlet Structure (Operational) (Volume 3 Figures).*

The bed of Loch Awe will be reprofiled to a new level of 18.2 m AOD. The inlet / outlet structure will be a maximum of 20 m deep (within the bank of Loch Awe) and extend approximately 80 m into Loch Awe from the lower gatehouse. The majority of the structure is either sub-surface within the bank of Loch Awe or beneath the water level of the loch as shown on *Figure 2.16: Indicative Tailpond Inlet / Outlet Cross Section (Volume 3 Figures).* The inlet / outlet structure consists of an inclined screen, stoplog and rock armour.

The inclined screen extends into Loch Awe and will be up to 150 m in width. To avoid fish and debris entrainment, the screens will be designed according to SEPA best practice guidance. The screen also acts and an energy dissipation measure to reduce the velocity of the water discharging from the Development. The screen is protected on each side by rock armour and is covered over its entire width by the roof of the Tailpond inlet / outlet structure. There will be a removable safety handrail on the edge of the inlet / outlet structure at Loch Awe's water's edge.

During operation, when the Development is pumping water up to the Headpond, water passes through the screen into the low-pressure tailrace tunnel, which connects to the lower gate shaft below the lower gatehouse.

The water levels within Loch Awe are variable, but on average there is approximately 1 m of freeboard between the removable roof of the Tailpond inlet / outlet structure and the top water level of Loch Awe. Due to design / position of the roof and the inclined slope of the screen, the screen will not be visible.

There are two gatehouses along with a permanent plant and equipment storage area, car parking and permanent office and welfare facilities, which will be surrounded by security fencing to the east of the Tailpond inlet / outlet structure. The gatehouses will contain the mechanical equipment for operating the gate within the low-pressure tailrace tunnel. The gatehouse will be 5 m in height (above ground level), 8 m wide and 8 m long and will be clad in natural wood or a suitable finish to be agreed with Argyle and Bute Council.

The B840 existing road will be temporarily diverted during construction to allow for the construction of the Tailpond inlet / outlet structure which will sit below the road once reinstated. More information on the Temporary B840 Realignment can be found in *Section 2.13.2: Temporary B840 Realignment*.

Areas of permanent landscaped hardstanding and planting are incorporated into the design within the area of the Tailpond inlet / outlet structure.

2.10.2 Temporary Cofferdam in Loch Awe

A temporary cofferdam will be built out into Loch Awe up to 170 m from the shoreline and 270 m in width around the location of the Tailpond inlet / outlet structure. The exact type of cofferdam will be determined at a later design stage. A temporary silt curtain will be installed around the cofferdam for the duration of any works in the Loch Awe.

The cofferdam is a temporary structure that will be removed at the end of the construction phase of the Development, as will the silt curtain. This can be viewed on *Figure 2.17: Indicative Tailpond Inlet / Outlet Structure (Construction) (Volume 3 Figures).*

2.11 Description of Inveraray Temporary Marine Facility

A temporary Marine Facility will be required within Loch Fyne to allow for the delivery of large AILs. The Marine Facility will be located at NN 08510 07158 with the start of a jetty will adjacent to the A83, with the middle of the jetty at NN 08581 07089. The Marine Facility will take circa 12 months to construct, with the vibro-driven piles (or hammer where vibro-piles not feasible) installed from a jack-up barge. No dredging will be required for construction of the Marine Facility .

The Marine Facility will comprise 600 mm (D) piles in a 5 m x 5 m arrangement on a 600 mm deep pre-fabricated steel bridge deck, which will be 180 m long and 10 m wide.

The Marine Facility has been designed to accommodate the following vessel types:

- Deck Cargo Barge - 50 m x 14 m with a 2 m draft - deck load 6 t/m^2, deadweight tonnage 1,300 tonnes. Only for use during mean tide and above.
- Vessel - based crane - floating sheerleg. 45.1 m x 20.1 m with a 1.6 m draft, 400 tonne lift capacity.

The jetty is proposed to be accessed from a deep water load out quay, such as King George V Dock in Glasgow.

The Marine Facility is designed to be temporary for delivery of AILs and will be removed after delivery of the last AIL. For the purposes of the assessment, we assume the worst-case time-period is the entire construction period.

At the end of construction, the Marine Facility will be removed, however the piles will remain in-situ. The piles will remain in place should the pier be required for replacement components during the PSH's lifetime. *Figure 2.18: Indicative Temporary Marine Facility (Volume 3 Figures)* shows the indicative layout and composition of the proposed Marine Facility .

2.12 Description of the Compounds

There will be both temporary and permanent Compounds required for the Development. Temporary Compounds will be required to facilitate the construction of the Development, as shown on *Figure 2.3: Above Ground Infrastructure (Volume 3 Figures).*

The compounds are anticipated to be unsealed (stone, aggregate or gravel surface) in nature and will be either floated (over peat) or built into the hillside depending on the site conditions and anticipated loads.

2.12.1 Temporary Compounds During Construction Phase

Eleven temporary Compounds are anticipated to be required for the construction period. The proposed location, use and approximated size of each of the compounds are detailed in *Table 2.3: Proposed Construction Compound Location and Size*, below. TC08 is representative of compounds that will be used during construction and the outline design follows design guidance. Its indicative arrangement is shown on *Figure 2.19: Compound TC08 Indicative Layout Construction Phase (Volume 3 Figures).*

Table 2.3: Proposed Construction Compound Location and Size

Compound No.	Use	Approximate Location	Approximate Max Size of Working Area (m^2)
TC01	Temp. Construction Compound Material storage, plant and equipment	NN 01083 16691	5,460
TC02	Temp. Construction Compound Material storage, plant and equipment	NN 01006 16188	50,460
TC04	Temp. Construction Compound Material storage, plant and equipment	NN 01142 15953	10,940
TC07	Temp. Construction Compound Material storage, plant and equipment	NN 02877 15461	4,000
TC08	Temp. Construction Compound Material storage, plant and equipment, site offices and welfare, car parking and SuDS	NN 03314 15882	7,500
TC10	Temp. Construction Compound Material storage, plant and equipment	NN 04156 15386	5,000
TC11	Temp. Construction Compound Material storage, plant and equipment	NN 05365 16728	5,400
TC12	Temp. laydown area for construction/upgrade of access	NN 06567 19357	9,800
TC16	Temp. Construction Compound Material storage, plant and equipment	NN 04020 16488	10,000
TC22	Temp. laydown area for construction/upgrade of access	NN 08801 08464	4,000
TC23	Temp. laydown area for vehicle turning and loading. Welfare Facilities.	NN 08452 07151	3,025

Note: The size is in relation to the boundary of each compound and not in relation to the size of any hardstanding areas.

2.12.2 Permanent Compounds

Following the completion of the construction period, all temporary Compounds will be removed and the ground fully reinstated.

Eleven permanent Compounds are required to remain for the lifespan of the Development. These are detailed in *Table 2.4: Proposed Permanent Compound Location and Size*, below. PC03 is representative of a permanent compound that will be used during operational phase of the Development. The outline design shows an indicative arrangement on *Figure 2.15: Indicative Tailpond Inlet / Outlet Structure (Operational) (Volume 3 Figures).*

Table 2.4: Proposed Permanent Compound Location and Size

Compound No.	Usage	Approximate Location	Approximate Max Size of Working Area (m^2)
PC03	Lower gate houses, permanent welfare, parking, stores, site office and landscaping.	NN 00982 16225	5,010
PC05	Tunnel portal 1 compound	NN 01191 15804	3,900
PC06	Tunnel portal 2 compound	NN 01476 15601	5,000

Compound No.	Usage	Approximate Location	Approximate Max Size of Working Area (m^2)
PC09	Permanent compound housing flow control building	NN 03816 15871	5,520
PC14	Tunnel portal 3 compound	NN 04904 17954	7,880
PC15	Switching Station	NN 05079 17758	22,500
PC17	Upper Gate House compound	NN 03809 16644	2,450
PC18	Surge shaft compound	NN 03678 16748	1,250
PC19	Ventilation shaft compound	NN 03646 16875	1,250
PC20	Ventilation shaft compound	NN 02855 15912	750
PC21	Ventilation shaft compound	NN 02503 16299	1,250

2.13 Description of the Permanent and Temporary Access

2.13.1 Development Site Access

Site access is proposed off the A819, which links the strategic trunk roads A85 to the north at Dalmally and A83 to the south at Inveraray. It is anticipated the general construction access will come from the north and south along the A819. Construction access from the south will bypass Inveraray via a section of unclassified existing track (to be upgraded) north of Inveraray Castle which will connect the A83 to the A819. This access uses the existing Maltlands bridge, however there may be a need for a temporary bridge constructed adjacent to this bridge should the existing bridge not be deemed suitable following detailed structural surveys. At this point, it has been assumed that the existing bridge will be suitable for construction traffic.

Larger construction traffic, such as AILs, will be delivered by boat to the proposed Marine Facility, where they would be transported to site via the A819. Access to the A819 will be via an upgraded existing Access Track that runs to the north, then east, from the A83, around the north of Inveraray. There are proposed upgrades to the existing unclassified road "Upper Avenue" at Inveraray and a new track linking this to the A83 at the proposed Marine Facility location.

These roads can be viewed on *Figure 1.1: Location Plan (Volume 3 Figures).* Local improvements may be required along these routes, such as local widening, and additional passing places, this is outlined in more detail in *Chapter 14: Access, Traffic and Transport.*

2.13.2 Temporary B840 Realignment

A section of the B840 is located at the Tailpond inlet / outlet structure at Loch Awe. A temporary realigned route for the B840 has been proposed and can be viewed on *Figure 2.20: B840 Temporary Realignment - Indicative Arrangement (Volume 3 Figures).*

The realigned section of the B840 will be located to the east of the existing alignment and will start from Balliemeanoch Farm at approximately NN 01131 16598 and route southwards before rejoining to the north of the bridge over Allt Boechlich at approximately NN 00581 15357. The temporary realigned portion of road will, for approximately half its length, utilise an existing farm track which will be upgraded, and will be approximately 1.45 km in length and 5 m wide.

Access along the B840 will be maintained at all times with the temporary section constructed prior to closure of the existing road section. Post-construction, the B840 will be reinstated to its former route and the new sections of the road, which are not currently part of the existing farm track, removed and the ground reinstated to its former use. The upgraded existing farm track section will remain permanently.

2.13.3 Permanent Access Tracks

Access into the site will be off the A819 at approximately NN 10060 19965 into Keppochan Forest to the proposed Switching Station as shown on *Figure 2.3: Above Ground Infrastructure (Volume 3 Figures).* The alignment will follow existing forestry access which will be upgraded to 10 m wide, plus 0.7 m for swales and 4 m peat / topsoil mounds requiring a total working width of approximately 15 m. Sections of new Access Track will be required to join the existing forestry tracks within the plantation. New sections will be either excavated or floating depending on ground conditions. These are shown on *Figure 2.21: Excavated Access Track Typical Detail and Figure 2.22: Floating & Widening Access Track Typical Details (Volume 3 Figures).*

From the Switching Station, the Access Track is routed south around the eastern side of the Headpond before routing west past Embankment 1 to the farmers track / Temporary B840 Realignment. There will also be a permanent Access Track along the top of the Headpond and connecting to three permanent Compounds (PC17, PC18, and PC19), in addition to another branch off to two permanent Compounds (PC 20 and PC21), west of the Headpond.

2.13.4 Temporary Access Tracks

Four sections of temporary Access Tracks will be required during construction as shown on *Figure 2.3 Above Ground Infrastructure (Volume 3 Figures).* The temporary Access Tracks are as follows:

- From the existing B840 to the Compound at tunnel portal 1 to allow for construction traffic to access the Tailpond inlet / outlet working area. The temporary Access rack is required to restrict impact on public traffic along the B840 diversion.
- From the proposed Switching Station into the Headpond to access the proposed temporary Compound within the Headpond (TC16). The Access Track within the Headpond will be left in-situ for access to the inlet / outlet structure.
- Branches off the section above and is routed around the northern side of the proposed Headpond to the proposed permanent access along the western Embankment and permanent Compounds.
- From the temporary Marine Facility to Upper Avenue to allow for movement of vehicles transporting AILs from the Marine Facility to the main site.

The construction corridor required for temporary Access Tracks will be a maximum of 30 m to allow for two-way vehicular traffic, drainage and peat mounds.

The temporary Access Tracks will typically be unsealed in nature and will be removed following the completion of the construction phase.

Tree protection measures, dust screens and fencing to separate working areas from trees will be implemented along the temporary Access Track within the Ancient Woodland Inventory (AWI) listed woodland area.

2.13.5 Public Road Crossing

During construction, the Temporary B840 Realignment will be crossed by a temporary Access Track at approximately NN 00948 15655 (the “Crossing”). During the construction phase, it is intended that the Crossing will consist of semi-permanent traffic two-way signalling system given the duration of construction. The Crossing will be a conventional crossroads that will cross the public road where grade and visibility is optimal to reduce the impact on the public roads as far as practicable. The crossroads will have temporary signage and line markings warning drivers of road layout ahead. Priority will be given to the public road users.

The Crossing will be removed following the end of the construction phase when the temporary Access Track and Temporary B840 Realignment are removed and B840 reinstated to its former alignment.

2.13.6 Public Paths

To maintain public safety during the construction phase, temporary safety signage will be required. Core paths and forestry paths will largely remain open and accessible to all users during construction. To maintain public health and safety, diversions to certain forestry paths, such as the SA128, may be necessary. It is not expected that diversions to recreation routes will be required during operation.

A full description of the local path network within the Development Site and the surrounding area is provided within *Chapter 16: Socio-Economics and Tourism* and can be viewed within the *Appendix 16.1: Outline Access Management Plan (Volume 5 Appendices).*

2.14 Grid Connection

The grid connection route is anticipated to be to Creag Dhubh substation, which is located to the north-east of the Development Site. Within the Development Site, the high voltage (HV) cable will be routed from the underground transformer gallery, through the power tunnel to PC15, from here the cable will be undergrounded to the Switching Station.

The exact route of the grid connection from the Development Site to Creag Dhubh is currently unconfirmed, the connection may be via an underground cable however for the purposes of the assessment it has been assessed on a “worst case” scenario that it will be via an overhead line. The grid connection location at Creag Dhubh is at NN08739 19509, approximately 4.0 km north-east of the Development Site.

A grid connection agreement has been accepted for Development between the Applicant and SSEN. The grid connection will be subject to its own separate consents under the Act and does not form part of this S36 Application.

2.15 Construction Programme

The lifespan of the Development has been broken into four distinct phases:

1. Pre-Construction – initial works that enable the construction of the Development;
2. Construction – the building and commissioning of the Development;
3. Operation – the period when the Development is active and has the potential to generate electricity; and
4. Decommissioning – the end of operational use and the removal and / or making safe of the Development.

Sections 2.16: Pre-Construction to 2.19: Decommissioning set out the different phases of the Development and the works required by each component part.

A more detailed construction methodology will be produced by the Construction Contractor for the Development post-consent.

2.15.1 Timescales

Construction is expected to last up to 7 years, including the pre-construction works. The construction work is anticipated to peak within years 2 and 3 as the tunnelling construction and the Headpond construction are the two largest operations, and they are likely to be sequenced in parallel. It is expected that the tunnelling work will be a 24-hour operation. *Table 2.5: Indicative Construction Programme* below shows an indicative programme of the construction phase.

Table 2.5: Indicative Construction Programme

			Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Y8	
Phase	**Activity**		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Enabling Works	Existing Access Improvements		■	■																												
Pre-Construction	Safety and Security Measures						■	■																								
	Construction Compound Set Up (Permanent and Temporary)				■	■																										
	Borrow Pit and Associated Access				■	■	■																									
	Marine Facility				■	■	■	■																								
Construction	Access Track Construction				■	■	■	■																								
	Headpond	Embankment Lining										■	■	■	■	■	■	■														
		Embankment 1 Construction										■	■	■	■	■	■	■														
		Embankment 2 Construction							■	■	■	■	■																			
		Spillway Construction							■	■	■	■																				
		Headpond Inlet / Outlet Works					■	■	■	■	■	■	■																			
	Tailpond	Temporary B840 Realignment			■	■	■	■																								
		Temporary Works (in Loch Awe)						■	■																							
		Inlet / Outlet Works and Gate House						■	■	■	■	■	■	■	■	■																
		Rock Excavation and Armouring															■															
		Removal of Temporary Works																■														
	Tunnels	Access to Tunnel Portals			■																											
		Construction of Tunnel Portals			■	■	■	■																								
		Construction Tunnel				■	■	■	■	■	■	■	■	■																		
		Emergency Egress & Access Tunnel				■	■	■	■	■	■	■	■	■																		
		Power Tunnel		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■													
		Ventilation Tunnel															■	■	■	■	■	■	■	■	■	■						
	Waterways	Headrace Tunnel (Low Pressure)											■	■																		
		Headrace Tunnel (High Pressure)															■	■														
		Surge Shaft												■	■	■																
	Switching Station				■	■	■	■	■	■	■	■	■	■	■	■	■	■														
	Power Cavern	Excavation, Lining and Support												■	■	■	■	■														
		Power House Buildings																■	■	■	■	■										
		Mechanical and Electrical																				■	■	■	■	■	■	■	■			
Commissioning																													■	■	■	■

2.16 Pre-Construction

The pre-construction phase incorporates:

- Site clearance;
- Borrow pits;
- Compound set up;
- Construction of the permanent Access Tracks;
- Construction of the temporary Access Tracks;
- Sustainable drainage systems;
- Public path diversions; and
- Construction of the Marine Facility.

2.16.1 Site Clearance

Prior to the commencement of works, vegetation will be cleared including tree felling where necessary. Trees will be retained wherever possible. To facilitate this, the Development Site will be surveyed to determine the extent of forestry removal.

Tree felling will be conducted in accordance with the measures outlined in *Appendix 5.5 Forestry (Volume 5 Appendices*) with the timber removed from the Development Site. Some temporary timber storage will be required, and this will be located within the Construction Compounds. The tree stumps will then be removed and shredded on-site along with any remaining brash wood. This processed material will also be removed from the Development Site.

Further details on felling and timber management are available within *Appendix 5.5 Forestry (Volume 5 Appendices*).

Once trees and other vegetation are removed, soil will be excavated in a sequential manner. Turves, topsoil and subsoil will be excavated as required and stored individually. Stockpiles of soil will be compacted and sealed as far as practicably possible.

2.16.2 Borrow Pit

One borrow pit will be created within the Headpond to win material and minimise the requirement to import material at the start of construction. Material from the borrow pit is anticipated to be used for the construction of the Headpond Embankments and Construction Compounds . Access to the borrow pit will be via the new Access Track from the A819. Refer to *Section 2.4.4: Borrow Pit* for further details on the borrow pit.

2.16.3 Compound Set Up

The vegetation and topsoil that has been excavated will be temporarily stored nearby so that it can be reused to dress off the Construction Compounds areas post-construction. The Construction Compounds will be constructed with material from the borrow pit, which is located within the Headpond.

2.16.4 Construction of Permanent and Temporary Access, including Temporary B840 Realignment

The construction method to be used for the permanent and temporary Access Tracks and the Temporary B840 Realignment will be similar. Once the required areas are cleared, the routes of the permanent and temporary Access Tracks, and the Temporary B840 Realignment, will be marked out and the ground prepared. Drainage will be installed along the full length of the Access Tracks before stone is placed and covered with a base and wearing course. The temporary and permanent Access Tracks will be left unsealed during construction while the B840 will be surfaced as per its current condition.

Temporary and permanent Access Tracks will require a construction corridor between 30 m and 50 m.

There is the potential for sections of the permanent Access Tracks to be floated over peaty hollows. *Figure 2.3: Above Ground Infrastructure (Volume 3 Figures*) indicates the extend of sections for floating tracks, however, the exact requirement for floated sections and their detailed extent will be determined during site investigations to be undertaken post-consent.

The majority of the material for the Access Tracks is anticipated to be generated within the Development Site. This will be from the borrow pit within the Headpond in the first instance. There may be a need for materials to be sourced or imported from a nearby quarry depending on the finalised construction programme determined by the Construction Contractor – this is considered unlikely but local quarries have been identified to aid the Construction in *Chapter 14: Access, Traffic & Transportation*.

Should ancillary temporary tracks be required, those not already established or those requiring upgrading will be made up of bog mats or trackway systems. These alternate road construction materials will be employed where the ground may be saturated.

2.16.5 Sustainable Drainage Systems (SuDS)

During the pre-construction phase, much of the on-site SuDS will be implemented. This is anticipated to include, but is not limited to:

- SuDS ponds/settlement lagoons;
- Temporary ditches;
- Silt fences;
- Silt busters;
- Dewatering / sediment bags;
- Silt curtains; and
- Designated bunded fuelling areas.

There will be SuDS along all of the Access Tracks including downslope silt fences and temporary ditches.

Further details on extent, positions, size and filtration methods that will be used are available within *Appendix 3.1: Outline CEMP (Volume 5 Appendices)*.

2.16.6 Public Path Diversions

During the pre-construction works, the temporary diversions for the following core paths will be implemented:

- C200(a) - Coille Bhraghad-Queens Drive-Inveraray (Upper Avenue, connects to C203(a)).
- C203(a) - Bealach an Fhuarain, Inveraray (circular).
- C201 - Dun Na Cuaiche, Inveraray (crosses access around castle).

The proposed diversion routes for these paths are available to view in *Appendix 16.1: Outline Access Management Plan (Volume 5 Appendices).*

The path diversions will be constructed using material sourced from the on-site borrow pit.

2.16.7 Construction of the Marine Facility

The Marine Facility will be a fixed structure comprising decks supported by steel piles into the seabed. The Marine Facility will of 600 mm (D) piles in a 5 m x 5 m arrangement on a 600 mm deep prefabricated steel bridge deck, which will be 180 m long and 10 m wide.

No geotechnical information is available at this stage. However, based on the bathymetry, it is anticipated that the seabed would comprise a thin layer of marine deposits over shallow bed rock. This would require the piles to be socketed into pre-augured holes in the rockhead. Piles are anticipated to remain post-construction to allow for the reinstatement of the temporary jetty during the operation of the Development for the delivery of AILs for replacement components during any periods of maintenance and repair. However, if the piles are required to be removed, the socketed piles would need to be cut off by divers just above seabed leaving the feet in place.

The deck structure would be a prefabricated steel deck structure, forming a temporary platform that could be both installed and removed in modular sections. Steel corrosion is normally a concern for marine structures but should not be a major issue for a temporary structure. Post-delivery of the AILs, the deck will be removed, and the steel piles will remain in situ.

It is envisaged that the jetty deck would be located at a height of 3.30 m AOD. However, a full hindcasting study is required to confirm that this is the required level.

The Marine Facility will take circa 12 months to construct with the vibro-driven piles installed from a jack-up barge. No dredging will be required for the construction of the Marine Facility.

The following equipment will be required during construction:

- Fendering - required at the vessel berthing location. As the proposed structure will be temporary, it is envisaged that pneumatic Yokohama fenders will be utilised.
- Lighting - lighting columns will be required for operating in low-light conditions. These should especially be considered if the lifting operations have tidal restrictions. Column height will be determined by the lighting design but can be up to 10m tall.
- Security - to prevent members of the public from accessing the jetty, gates and fencing will be required at the shore access point.
- Welfare - welfare facilities including sanitary and canteen provision may be required for the Marine Facility. This would be located within TC23.
- Services – provisions will be required for activities on the jetty, which will require switch boxes, water mains and service ducts.
- Barriers - traffic barriers would typically be required at exposed deck edges along the roadway. These have a standard height of 600 mm. Pedestrian barriers would typically be required at all exposed edges. These have a standard height of 1,100 mm with an additional mid-height rail.
- Life Preservation and Firefighting Equipment - life preservation systems will be required on the deck at regular spacing. Regulations[2] require ladders from the waterline to deck level at regular spacing. Firefighting provision will need to be considered, with hydrants and reels located on the jetty.
- Navigational Aids – markers and lights will be required on the structures to indicate the location and hazards around the jetty. These must be visible by vessels in all weather conditions. Additional marker buoys may be required in the loch to indicate navigation hazards.

2.17 Construction Phase

2.17.1 Construction Vehicles, Plant and Equipment

The construction of the Development will require task-specific vehicles, plant and equipment in addition to general construction equipment. Equipment potentially required on-site includes, but is not limited to:

- Concrete – on site batching plant, concrete mixers, concrete pavers, concrete pumps, concrete wagons, planers;
- Cable reels and cabling equipment;
- Cranes – crawler cranes, dock cranes, gantry cranes, large cranes and winches;
- Crushers and screeners;
- Dozers, grader, pavers, road brush, rollers and sheep foot rollers;
- Drill and blast equipment and hydraulic breakers;
- Excavators, long reach excavators and tracked excavators;
- Rigs – loading rig, piling rig, sequential / impact drill rig;
- Scaffolding, formwork and mobile elevated working platforms (MEWPs);

[2] International Convention on the Safety of Life at Sea, 1974 and The Merchant Shipping (Special Measures to Enhance Maritime Safety) Regulations 2024

- Shotcrete spraying machine and rock bolter;
- Silt fence, pumps, bog mats, low ground pressure (LGP) equipment, wheel wash and dust suppression;
- Site set up equipment such as traffic lights, portable buildings, generators, toilets and temporary utilities (lighting, ventilation, power);
- Transporting equipment – articulated dump trucks, flatbeds, HGVs, hiabs, load haul dumpers, tracked dump trucks, tractors, trailers, tipper wagons, unimogs and conveyors;
- Tree felling and site clearance equipment such as harvesters, mulchers and logging wagons; and
- Vessels for loch transport such as jack-up rig, barges and tugs.

Specialised types of the plant listed above may be required for the construction of specific components of the Development and the most suitable equipment for the task will be identified.

2.17.2 Materials Management

One of the key design principles for the Development has been to minimise any surplus material by balancing the material that is generated from the cutting, drilling and excavation activities with the Development.

It is anticipated that materials generated from drill and blast activities associated with the tunnelling works will be transported by dump trucks, stored in temporary compounds near the location of tunnelling and transported to the Headpond. The material will be processed and sorted for re-use within the Headpond for the Embankment construction. If material cannot be re-used within the Embankments, then other uses will be sought so that only residual material will remain for appropriate disposal, if any remains.

Underground excavation may occur on a 24-hour basis once the works are sufficiently underground.

A Materials Management Appraisal (MMA) has been undertaken and is available in *Appendix 10.1: Materials Management Appraisal (Volume 5 Appendices).* The MMA aims to demonstrate that the material that is generated from construction operations is reused, as far as practically possible, within the Development. The MMA results are used to ensure that the best practical option is secured by:

- Determining the final volumes and likely nature of the rock that will be excavated from the different excavation operations; and
- Classification of the excavated rock to determine the use in the Development.

Estimated volumes have been based on the Rochdale Envelope presented in *Chapter 4: Approach to EIA* and are derived using bulking factors and consideration of the source of generation (blasting, excavation or drilling) as detailed in the MMA. The MMA provides details on the likely volumes excavated and reused in the Development.

It is estimated that 20,010,000 m^3 of material will be excavated during construction. This material will primarily be used to construct the Headpond Embankments, with an excess excavated material of around 1,630,000 m^3.

Although the MMA appraisal shows an excess volume, it is anticipated that there will be a negligible excess volume of material during construction as the borrow pit will be excavated on a needs-must basis during construction. While on site, should there be excess material, this will be used across the site for:

- Construction Compounds – reinstatement, dressing and bunding.
- Access tracks – resurfacing of existing surfaces on-site.
- Switching Station – use for construction of hardstanding / internal tracks.

The post-consent site investigation will more accurately inform the volume and quality of material generated from the construction of each of the Development components.

2.17.3 Power

Electrical power will be required on the Development for various aspects of construction. It may be possible for a temporary connection to be made to the local distribution network. A grid connection would reduce fuel consumption on the Development Site and reduce noise from on-site generators. However, it is anticipated that this will not be available across the whole Development Site and for the full duration of the construction phase. Therefore, it has been assumed that construction power will also be supplied by portable generators fuelled by natural gas or diesel.

It is assumed that most of the smaller works, not requiring the use of construction plant or machines, will use handheld petrol generators and equipment.

Management measures for the use of generators on-site will be set out within the *Appendix 3.1: Outline CEMP (Volume 5 Appendices).*

2.17.4 Construction Workforce

The number of construction staff on the Development Site will vary according to the construction activities being undertaken and will be confirmed by the Construction Contractor upon appointment. These will range from admin and transportation of staff to construction and machine operators. It is expected that up to 1,000 personnel will be employed on site during the construction phase at its peak. The average number of personnel working on the Development Site over the construction period will be up to 500. As this will be subject to the requirements of the Construction Contractor this estimate could change.

The welfare and other facilities required for the personnel will be located within TC08. For some critical path activities, where 24-hour working is required, it is anticipated that on-site accommodation facilities will be required for a small proportion of the workforce.

Given the rural location of the site, there are a number of options that have been considered to accommodate workers on or near the site, including potential for park and ride. As a result, this has been considered within *Chapter 16: Socio-economics, Recreation and Tourism*, and an Outline Workers Housing Strategy has been produced in *Appendix 16.2: Outline Housing Strategy (Volume 5 Appendices)*. The Applicant is committed to identifying and developing a detailed Workers' Housing Strategy at the appropriate time that will support the project's delivery, provide quality accommodation for the non-home-based workforce and maximising the socio-economic benefits for communities within Argyll and Bute.

It is considered that a range of feasible options and locations exist for the provision of workers' housing. These include either a single site or an appropriate mix of housing options and location, examples include:

1. Hybrid solution 1: small scale development of new homes at Inveraray (plus potentially other sites), small scale permanent in-migration of workers to existing settlements (limited to avoid significant impacts on housing supply for residents), use of some low season hotel capacity plus the development of temporary accommodation in a satellite settlement with shuttle bus service.
2. Hybrid solution 2: small scale development of new homes at Inveraray, small scale permanent in-migration of workers to existing settlements, location of workers in 60-minute towns in existing housing/accommodation with transport provided from a park and ride in same town. Park and ride can be used by those living there as well as those travelling in from further afield e.g. Glasgow.
3. Temporary Workers' Compound: A self-contained compound would allow all accommodation to be located on a single site or split between a number of sites. This option would allow housing to be located in close proximity to the Development, but would require additional facilities and local transport links, particularly if remote from surrounding settlements.
4. Additional Options: The use of very low capacity or vacant hotels, such as the Dalmally Hotel, or other suitable commercial buildings may provide an option for adaption into workers' housing. Visitor accommodation has been identified as having some capacity throughout the year. Further engagement with the visitor accommodation sector is required.

Further work is required post-consent to identify which specific workers' housing option is to be implemented to facilitate the construction of the Development. This will require more detailed investigation of specific options and their ability to accommodate workers and engagement with receiving communities and stakeholders to avoid adverse impacts on the local community or key industries, such as tourism.

2.17.5 Headpond Construction

The design of the Headpond means that the excavation of the Headpond and the construction of the Embankment can be sequenced together. Where possible, material excavated from the Headpond will be used to construct the Embankment. The excavated material will be supplemented by the material generated from the tunnelling activities, which will be transported to the Headpond area via dump trucks. Due to the size of the excavation and the material anticipated to be handled, the Headpond works will be constructed under the Quarries Regulations 1999 and Explosives Regulations 2014 (as amended).

The following is an indicative methodology for the construction of the Headpond and Embankments. After the pre-construction works, the Headpond area will be split into sections. The southern end of the Headpond has some of the deepest areas of cut, and it is anticipated that this area could be excavated first to generate material for the start of the Embankments. Once the first section is complete, the next section will be started so that the construction sequence is rolling until the Embankments are completed.

Some areas of hard rock are anticipated to be encountered during the excavation of the Headpond. If conventional rippers and hydraulic breakers are not effective, blasting may be implemented. The amount and rate of blasting will be informed by detailed site investigation.

At the base of the Embankments, a drainage blanket of geosynthetic or geocomposite material will be laid. Embankment fill will be placed atop the drainage blanket and rolled in accordance with the Embankment design. The Embankment fill will be made up of compacted rock and soil generated through excavation and tunnelling activities. Temporary stockpiles of excavated and tunnelled material will be processed in order to separate the different types of material. Crushers and screens will be used to screen, sort / grade, and seal, if applicable, material ready to be used as Embankment fill.

As the construction of the Embankments progresses, the outside of the Embankments will be dressed off with topsoil that was generated during excavation. This material will have a higher organic content than the makeup of the Embankments so is anticipated to regenerate faster.

Material that is unable to be used in the Headpond Embankments construction will be transported compounds to be used for reinstatement, dressing and bunding of compounds, or for the Switching Station construction.

Should lining be required within the Headpond it will require grading and rolling / compacting of the selected waterproof lining system. During the lining works, any water collected from precipitation will need to be pumped out of the Headpond to appropriately sized settlement lagoons located nearby.

The crest of the main Headpond Embankment will consist of features such as Access Tracks, walls and drains as shown on *Figure 2.6 Headpond Cross Section (Volume 3 Figures*), *Figure 2.7: Headpond Embankments and Figure 2.8: Headpond Borrow Pit (Volume 3 Figures).* These will be constructed once the works inside the Headpond are complete.

2.17.6 Tailpond Construction

Whilst the Tailpond will be Loch Awe, works in and around the loch will be required as set out in the following sections.

2.17.6.1 Temporary Works

Works at the Tailpond will be initiated with the installation of the temporary infrastructure. This includes a temporary silt curtain and the temporary cofferdam. The silt curtain will be installed prior to works commencing on the cofferdam.

Irrespective of the type of cofferdam selected by the Construction Contractor, construction will require sheet piles and / or rock armour. A piling rig may be required for installing sheet piles which is likely to take the form of a jack-up barge, manoeuvred into place by a tugboat.

The method of supporting the cofferdam will be dependent on the type of cofferdam selected. However, it is considered likely that it will require bracing or infilling. These works will involve further activity of vessels, such as tugs and barges on the loch as well as activity on the shoreline to transfer materials from TC02 to the cofferdam.

The area within the completed cofferdam will be dewatered to facilitate drill and blast activities for the construction of the low-pressure tunnel. Any water collected from precipitation will be pumped out of the area while the cofferdam is in place.

2.17.6.2 Construction of the Tailpond Inlet / Outlet Structure

The Tailpond inlet / outlet structure will commence once tunnelling of the tailrace has reached the Headpond. This is to enable excavated material to continue to be delivered to the Tailpond inlet / outlet structure and transported to the Headpond via dump trucks. The inlet / outlet is likely to be a piled structure, supporting a structured steel frame, within which the screen is installed. Rock armour will be placed either side of the frame. The shoreline around the Tailpond inlet / outlet structure will be landscaped and the loch bed on the approach will be re-profiled. Once there is no access requirement for the tailrace tunnel portal, the roof of the Tailpond inlet / outlet structure will be installed.

2.17.6.3 Removal of the Temporary Works

Once the works at the Tailpond are complete, the cofferdam will be removed. The same plant and equipment that was used during the cofferdam installation will be used during the removal works. Some localised dredging and further demobilisation work may be required following removal of the cofferdam to remove any material that has built up around the piles.

2.17.7 Access Tunnel Construction

The Access Tunnel portals and Access Tunnels will be one of the first components to start being constructed. The starting point for the construction tunnel will be from PC05, with the Access Tunnel from PC06 and the power cable tunnel from PC14. The construction method for Access Tunnels is anticipated to be by a conventional drill and blast method.

Excavation using the drill and blast method is sequential in nature and a more flexible tunnelling method than that of a Tunnel Boring Machine (TBM). The geology along the route of the tunnels is currently unknown and would require further site investigation works to determine the rock types in more detail.

Prior to the tunnelling works, the tunnel portal areas will be excavated and prepared for the drilling equipment. This operation will involve localised breaking, excavating and rock stabilisation.

It is anticipated that the underground tunnelling could be a 24-hour operation. The anticipated blast cycle could be up to two blasts per 24 hours.

2.17.8 Waterways Construction

The Waterway is divided into two main parts, the high-pressure and the low-pressure sections. These sections are often the most complex to construct, due to restricted working space and restricted access. The entire Waterway will be lined with concrete with the higher-pressure section also likely lined with steel. The steel sections will consist of a steel collar that will be fabricated off site and then transported to site where it will be welded. A cross section of the subterranean features can be seen in *Figure 2.11: Cross-section of Development (Volume 3 Figures).*

All Waterway tunnels will be excavated using a drill and blast method. Prior to the commencement of tunnelling, the tunnel portal areas will be excavated and prepared to provide a suitable surface for drill and blast to take place.

2.17.8.1 High-Pressure Shaft

The high-pressure shaft is the vertical component of the scheme and connects the low-pressure and high-pressure sections of the headrace. It will be exposed to existing ground level at 451 m AOD and will act as the upper surge shaft. It is expected that the shaft will either be constructed by a raising bore drill (RBD) / shaft boring machine (SBM) or by drill and blast. This will be confirmed at a later design stage. The material that is generated from these operations will be transported to the Embankment site at the Headpond.

RBD involves setting up a drilling rig above the shaft (PC18). From here, a pilot hole will be drilled down the length of the shaft until it reaches the excavation made for the high-pressure tunnel. At this point the drill will change heads and utilise a reamer head. The reamer head will be rotated and pulled back up towards the drilling unit, generating the larger shaft. Fill generated from the drill will be deposited at the bottom of the pressure shaft. As the reamer head moves up, this fill will then be transported to the top of the Headpond to be used as fill for the Embankments. Following the completion of the drilling, the shaft will then be reinforced with shotcrete and concrete, with lower-pressure and higher-pressure sections of the shaft being reinforced with steel. Following construction, PC19 will secure the top of the surge shaft.

2.17.8.2 Lower Surge Shaft

Unlike the high-pressure shaft, the lower surge shaft does not extend to the surface, as such it will be excavated using a drill and blast method. It will be built adjacent to the Power Cavern Complex within the low-pressure section of the Waterway tunnel, as seen in *Figure 2.11: Cross-section of Development (Volume 3 Figures).*

2.18 Drill and Blast (Access Tunnels and Waterways)

Drill and blast is a method of rock excavation commonly used for the construction of tunnesl. It has been chosen as the method of construction for the Development, as opposed to the use of a TBM. This is due to limited access to the site and the proposed length of the tunnels, which would make the use of a TBM financially and logistically impractical.

Drill and blast involves drilling holes on the desired rock face before loading a series of explosives in the holes to break up the rock. Following the blasting of the rock the face is then ventilated and mucked out to remove loose material. This material will then be transported to the Headpond for use in the Embankments. The excavation will then be lined and secured as per the detailed design, possibly requiring shotcrete, and / or the use of rock bolts. Following the securing of the excavation, a new set of holes will be drilled and the cycle repeated until the desired length of tunnels is reached.

The use of drill and blast for tunnel excavation could be a 24-hour operation, and the anticipated blast cycle could be up to two blasts per 24 hours.

2.18.1 Switching Station Construction

The Switching Station will be constructed from PC15, which will also contain welfare facilities and offices. The location proposed for PC15 has a working area of approximately 22,500 m^2. The Switching Station will be approximately 225 m in length and 100 m in width and may have equipment up to 14 m height. The final equipment to be included in the Switching Station will be determined at detailed design stage, post-consent.

The construction of the Switching Station will take place in three main sections, these are: the ground works, the super structure, and the air-insulated switchgear (AIS) switchyard. The ground works will involve the preparation of the ground to be suitable for the required electrical equipment. The superstructure for the Switching Station will consist of the erection of the permanent welfare facilities, in addition to the switchyard control and metering room. The AIS switchyard section will be built following the completion of the superstructure, and the ground works, and will involve the installation of the require electrical equipment.

2.18.2 Power Cavern Complex Construction

The Power Cavern Complex will be accessed from PC05 via the construction tunnel, from PC06 via the Access Tunnel and from PC14 via the power tunnel. The Power Cavern Complex will be excavated using a conventional drill and blast methods.

The blasting will be carried out in a controlled sequence in accordance with a blast plan. The rate of blasting is dependent on the rock type, space, and orientation of excavation. However, it has been assumed that around four blasts could occur per day. If required, following blasting, there may be some localised scaling. This will be carried out by hydraulic breaking equipment and will ensure the size shape and position of the excavation is correct. Once it is safe to do so, the rubble that is produced from the blasting will be removed. Excavated material will be transported to the surface in dump truck via the Access Tunnels.

Exposed rock with the Power Cavern Complex will likely be lined, as a minimum, with reinforced shotcrete.

To fully form the Power Cavern Complex, horizontal galleries will be excavated, using conventional drill and blast methods, to connect the three sperate caverns.

Mechanical lifting (overhead cranes) and operating equipment will be installed in the Power Cavern Complex. These will be used for the installation of the turbines and associated mechanical equipment.

The turbines will be delivered through the construction tunnel to the powerhouse cavern where they will be lifted and installed in sections.

The generators will be fitted on top of the turbines and connected to the turbine shaft. The transformers and associated electrical wiring will be installed connecting to and in the transformer cavern. Following the wiring of the generators, the high voltage cable can then be installed out of the power tunnel at PC14.

2.18.3 Access Track Maintenance

During the construction phase, the temporary and permanent Access Tracks will require occasional maintenance. With the proposed construction traffic and the duration of usage, it is anticipated that local resurfacing and maintenance, such as the filling of potholes will be required. In the worst case, there may be section that will need to be re-constructed from the subgrade level.

The SuDS associated with the Access Tracks will be inspected and maintained on a regular basis and settlement ponds, silt fences and ditches will be monitored and cleaned when required.

2.18.4 Public Path Diversions - Construction

During the construction phase, the temporary diversions for the following core paths will be implemented:

- C200(a) - Coille Bhraghad-Queens Drive-Inveraray (Upper Avenue, connects to C203(a)).
- C203(a) - Bealach an Fhuarain, Inveraray (circular).
- C201 - Dun Na Cuaiche, Inveraray (crosses access around castle).

The proposed diversion routes for these paths are available to view in *Appendix 16.1: Outline Access Management Plan (Volume 5 Appendices)*.

Path closures will be advertised locally as well as being announced by signage at route ends. The temporary and permanent Access Tracks will be fenced along their lengths to promote safety. Crossings will be provided at designated points and will be managed to ensure public safety. Details of crossing locations and management are specified in *Appendix 16.1: Outline Access Management Plan (Volume 5 Appendices)*.

2.18.5 Commissioning

The Development will be commissioned in stages commencing with a period of "dry commissioning". During this period the Development components such as Embankment leakage control, valves, motors, pumps, screens, stop-logs, gates, and electrical control systems will be tested for functionality with no water in the Headpond.

During the testing, a small reservoir of water will be created at the Headpond using a small temporary cofferdam.

Once commissioning has been completed, the Headpond will be filled with water from the Tailpond by slowly opening the gates at the Tailpond inlet / outlet and letting the water flow into the low-pressure tunnel towards the turbines which will fill with water from the Tailpond. Once filled, one of the turbines that will have already been pre-commissioned will be used to slowly pump water into the high-pressure tunnel and then the Headpond. Once the high-pressure tunnel is filled, the other pumps will assist with the pumping.

Once the Headpond is full, the "wet commissioning" of the mechanical and electrical equipment can take place. This, together with the commissioning of the grid connection will allow the Development to operate, initially in a reduced capacity, if market conditions allow until full functionality testing can occur at full operating capacity for pumping and generating electricity.

2.19 Operational Phase

2.19.1 Operational Lifetime

The expected lifetime of a PSH scheme is reported in academic literature to be around 100 years. This is considered is to be a conservative estimation as Ffestiniog Power Station and Cruachan Power Stations were commissioned in 1963 and 1965 respectively and are still in good operational condition having had some relatively minor refurbishment works. It is expected that the civil works (Access Tunnels and Embankments) will have an operational life of up to 100 years. However, throughout this period it is expected that the electrical plant will require refurbishment or major overhaul every 25 years.

2.19.2 Maintenance Requirements

Once commissioned, PSH schemes typically require very little maintenance. However, there will be regular inspections to ensure the safety of the Headpond. Under the Reservoirs (Scotland) Act 2011, the operator of a reservoir must appoint a Supervising Engineer from a 'panel' of engineers pre-approved by the Scottish Government. The Supervising Engineer will monitor the Headpond, supervise operations and conduct visual inspections. Inspection must also be conducted with a minimum frequency of every two years by an Inspecting Engineer who is an independent, panel engineer. Further details on the expected maintenance requirements and inspections of the Development are set out in Table 2.7: Likely Maintenance Requirement, below.

Table 2.6 Likely Maintenance Requirements

Component	Objectives	Inspections Carried out by:	Frequency

Headpond (Embankment)	Examine the critical safety features including, Embankment structure, spillway, screens and scour arrangements, the condition of the major elements and the operating records.	A qualified third-party Panel Engineer, Supervising Engineer and / or the Operator	• Routine and Surveillance (Operator) – Minimum once or twice weekly. • Inspection (Supervising Engineer) – Annually. • Inspection (Inspecting Engineer) – at a minimum of every 2 years.
Access Tunnels	Tunnel inspection, maintenance, and performance	Operator	10 years
Pump / Turbines and Generators	Reliable operation of equipment in the service environment – achieved through planned, periodic inspection and checking of components and systems, together with replacement or rectification of parts wherever required. Maximum availability of equipment and a minimum of unplanned shut-downs by using planned / periodic shutdowns to inspect all equipment	Operator / turbine supplier	As recommended by the manufacturer, likely to be daily, weekly, monthly and quarterly checks as per the maintenance schedules, with major refurbishment works not expected more frequently than five year intervals.
Tailpond Inlet / Outlet Structure Screen	Maintain operation of inlet / outlet structure. Cleaning screen. Inspecting structure. Replacing screen.	Operator	• Routine cleaning of the screen – Maximum daily. • Inspection – 10 years. • Replacing Screen – 20 years.
Access Tracks	General maintenance, ensure fit for purpose and replacing	Operator	General Maintenance - Annually
Switching Station	General maintenance, servicing, replacing	Operator / DNO	• Routine and Surveillance (Operator) – Minimum once or twice weekly. • Inspection – Annually. • Major Service – 20 years.

2.19.3 Operational Workforce

After the initial construction of the Development, it is expected that there will be approximately 5 - 10 on-site jobs created as a result of the operation of the Development plus external contractors from time to time.

2.19.4 Operational Environmental Management

The Development will be subject to an Environmental Policy / Environmental Management System (EMS) that will require regular monitoring and auditing.

2.19.5 Operational Lighting Requirements

There will be internal lighting within the Access Tunnels and the Power Cavern Complex. Further to this, external lighting is expected to be required at the tunnel portals and at the Switching Station.

At the Headpond and Tailpond (Loch Awe), external lighting will be required for access. The lighting will only be used when needed rather than from dusk to dawn.

2.19.6 Operational Discharges and Abstractions

Once the Development is fully commissioned, the working water volume will pass between the Headpond and Loch Awe (Tailpond) in order to provide storage and generate electricity at peak times.

It is anticipated that the normal drawdown level of the Headpond will be between 420 and 374 m AOD.

The outflow during generation at the Tailpond inlet / outlet will be up to 520 meters cubed per second (m^3/s) with a velocity of approximately 0.38 metres per second (m/s). The inflow during pumping will be up to 407 m^3/s with a velocity of no more than 0.3 m/s, at the Tailpond inlet / outlet screens. It should be noted that a PSH scheme will tend to operate on cycles that are dictated by the energy markets.

An application for a Controlled Activities Regulation (CAR) license will be made shortly after the submission of the Section 36 Application. The Applicant has been in consultation with SEPA over the requirement and extent of the CAR license.

2.19.7 Access Tracks - Operation

The permanent Access Tracks will be sealed and maintained as an asphalt road after the completion of the construction phase. During the operational phase, the permanent Access Tracks will comprise maximum 5 m wide road, plus drainage ditches, as shown on *Figure 2.21 Excavated Access Track Typical Detail and Figure 2.22 Floating & Widening Access Track Typical Details (Volume 3 Figures).* The exception is to the existing access at Inveraray Castle Park and Gardens where the permanent access will be reinstated to the existing width with local widening in places.

The temporary Access Tracks will be reinstated after the completion of the construction phase.

2.19.8 Public Paths - Operation

During the operational Phase access to the temporarily diverted core paths will be reinstated.

The details of the on-site path network during the operational phase are set out within *Appendix 16.1: Outline Access Management Plan (Volume 5 Appendices).*

New paths and upgrades will utilise excavated material from the construction of the Development where appropriate. All access controls will be designed in accordance with British Standard 5709:2006 “Gaps, Gates and Stiles”.

2.20 Decommissioning

Hydropower assets are very durable and, consequently, it is very rare for large-scale hydro projects to be decommissioned. Rather, they may be refurbished or adapted. However, if decommissioning became necessary, then it is envisaged that at the end of its operational life, the Development can be decommissioned as follows:

- Water would be drained from the Headpond and released at an agreed rate and timescale through the appropriate licensing regime into Loch Awe;
- The pump turbines and associated mechanical and electrical plant will be removed;
- The Power Cavern Complex will be stripped of equipment and the entrances blocked off;
- The Waterways and tunnel portal entrances will be blocked off with local spoil;
- The Tailpond inlet / outlet structure will be removed;
- The Switching Station will be removed;
- To prevent any incident with the Headpond filling up, the scour valves will remain open, and the spillway pipe and the Headpond inlet / outlet structure will be left in place.

Under the Reservoirs (Scotland) Act 2011, the Headpond does not need to be drained, as long as ongoing maintenance is undertaken.

Decommissioning effects would be those which would occur as a result of the dismantling and draining of the Development at the end of its operational life (as outlined above) and would typically be similar to those assessed for construction. The Development has a design life of 100 years; however, it is anticipated that rather than be decommissioned, components of the Development would be replaced to extend the Development’s operational life. Given the lifespan of the development, with the effects of decommissioning being similar to that of construction, and the requirement for a decommissioning plan at the end of its lifespan, decommissioning effects have been scoped out of assessment. Notwithstanding, where information is deemed appropriate to be included this has been outlined within the relevant specialist assessment chapter.

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

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

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

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Table of Contents

Inserts

Tables

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

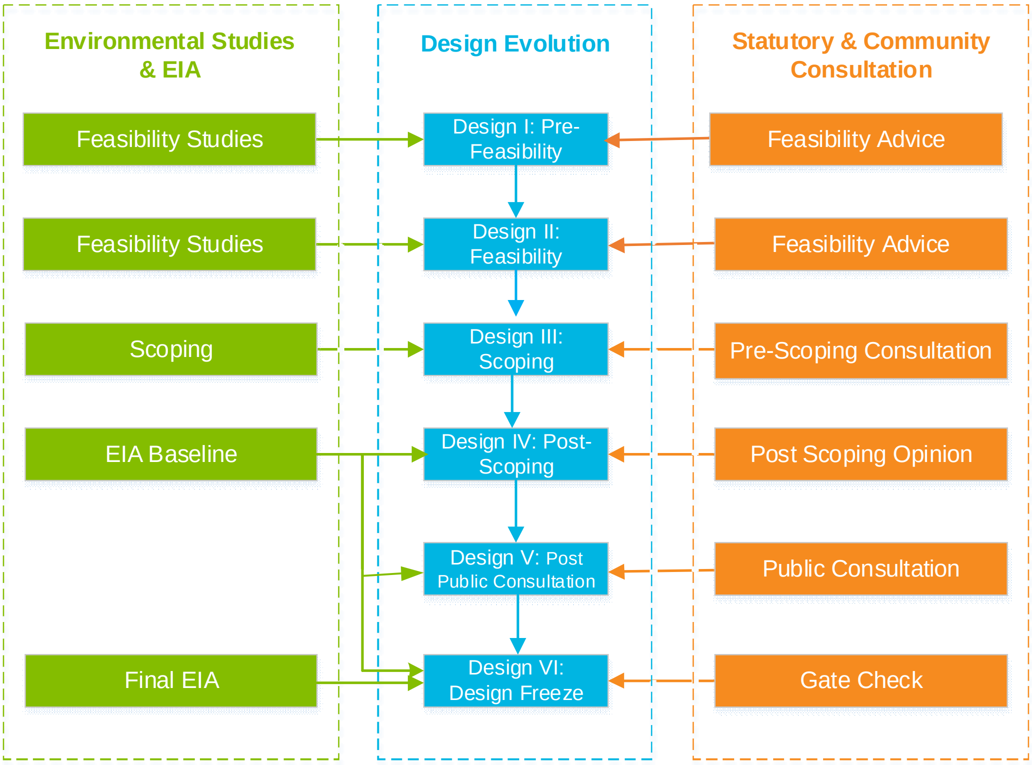
There are few, if any, energy storage technologies which can provide the grid scale services of pumped storage hydro. Alternative storage technologies are either too small (batteries) to provide the necessary long durations required, or largely unproven (compressed air) and, in the case of ancillary 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 EIAR. 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 1997issued 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	• The temporary Access Tracks has been designed to minimise landscape and visual impacts, further details are available in *Chapter 5: Landscape and Visual (Volume 2 Main Report).* • 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 *Appendix 3.1: Outline Construction Environmental Management Plan (Volume 5 Appendices).*	• Planting and habitat creation measures to integrate the Development into the landscape and its wider setting are set out within the Outline LEMP, *Appendix 5.4: Outline Landscape and Ecology Management Plan (Volume 5 Appendices).* • 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	• 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 *Section 6.7.1 of Chapter 6: Terrestrial Ecology.* • 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.	• 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	• 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 *Section 7.11.1 Embedded Mitigation (Chapter 7 Aquatic Ecology*).	• 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.

Environmental Topic	Enabling Works and Construction	Operation
	• Good practice drainage and water management measures are contained within the *Appendix 11.5: Outline Water Management Plan (oWMP) (Volume 5 Appendices).* • 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 *Chapter 11: Water Environment (Volume 2 Main Report))* • 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 *Section 7.11.2 (Chapter 7 Aquatic Ecology*).	
Marine Ecology	• The Development Components have been sited to minimise the loss of habitat and minimise the disturbance to protected species. Further details are provided in *Section 8.9* of *Chapter 8: Marine Ecology.* • 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.	• No operation mitigation required.
Ornithology	• The Development Components have been sited to minimise the loss of habitat and minimise the disturbance to protected species. Further details are provided in *Section 9.7 of Chapter 9: Ornithology (Volume 2 Main Report).* • 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.	• 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	• Post-consent site investigation works to confirm both geo-environmental and geotechnical properties to confirm detailed design. • The production of a Materials Management Appraisal (*Appendix 10.1: Materials Management Appraisal (Volume 5 Appendices))* to aid materials balance and reuse.	• Design of the tunnels and below ground infrastructure. • Compliance with the Reservoirs (Scotland) Act 2011.

Environmental Topic	Enabling Works and Construction	Operation
	• The Outline PMP *(Appendix 10.2: Outline Peatland Management Plan (Volume 5 Appendices))* 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	• The oWMP (*Appendix 11.5: Outline Water Management Plan (Volume 5 Appendices))* 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 *Appendix 11.5: Outline Water Management Plan (Volume 5 Appendices).* Monitoring requirements will also be set out within the Water Management Plan.	• 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	• 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 (*Appendix 12.2: Flood Risk Assessment (Volume 5 Appendices)).*	• Operational Controlled Activities Regulations (CAR) Licence and operational arrangements around flood and drought conditions. • Compliance with the Reservoirs (Scotland) Act 2011.
Cultural Heritage	• 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.	• 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, *Appendix 5.4: Outline Landscape and Ecology Management Plan (Volume 5 Appendices).*
Access, Traffic and Transport	• Effects from construction traffic will be minimised through the adoption of a CTMP. Further details are provided in *Chapter 14: Access, Traffic and Transport (Volume 2 Main Report) and Appendix 14.1: Framework CTMP (Volume 5 Appendices).*	• No operation mitigation required.
Noise and Vibration	• 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	• Employment of the principles of best practice to minimise noise and vibration from the Development.

Environmental Topic	Enabling Works and Construction	Operation
	during the construction of the Development. Further details can be found within *Chapter 15 Noise and Vibration*. Measures to achieve BPM will be adopted through the CEMP; proposed measures are set out in the Outline CEMP. • 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.	• 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	• 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 *Appendix 16.1: Outline Access Management Plan (Volume 5 Appendices).* • An outline Housing Strategy has been drafted *Appendix 16.2 Workers Housing Strategy – Preliminary Draft Report (Volume 5 Appendices)* 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. • *Chapter 5: Landscape and Visual Assessment,* and *Chapter 13 Cultural Heritage (Volume 2 Main Report)* 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.	• 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	• 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 *Chapter 17: Climate (Volume 2 Main Report).* • 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 *Chapter*	• No operation mitigation required.

Environmental Topic	Enabling Works and Construction	Operation
	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.

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 4: Approach to EIA

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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Revision History

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1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

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4. Approach to EIA

4.1 Introduction

This chapter describes the approach to and outlines the scope of the Environmental Impact Assessment (EIA) of the Development. This section provides general information about the EIA process including the key steps taken in the approach to EIA and the terminology used. For a detailed description of topic specific assessment methods reference should be made to the relevant chapter e.g. for a description of the approach to landscape and visual assessment of the Development, see *Chapter 5: Landscape* and *Visual Amenity.*

4.2 About Environmental Impact Assessment

EIA is the process of identifying, evaluating and mitigating the likely significant environmental effects of a proposed development such as those potentially occurring as a result of the construction and operation of the Development. Through the early identification and evaluation of the likely significant environmental effects of a proposed development, EIA enables appropriate mitigation (that is measures to avoid, reduce or offset significant adverse effects) to be identified and incorporated into the proposed development's design, or commitments to be made to environmentally sensitive construction methods and practices.

The EIA of the Development has been undertaken in parallel with the design process thereby maximising opportunities to mitigate likely significant effects as they have been identified. This approach ensures mitigation is embedded in the Development design and forms an integral component of it.

The results of the EIA also ensure that decision makers, such as the Scottish Ministers, and statutory consultees, such as planning authorities, in this case Argyll and Bute Council (ABC), as well as other interested parties, including local communities, are aware of a proposed development's potential environmental effects. These are then taken into account by the decision-maker prior to determination of an application.

As described in *Chapter 1: Introduction*, in the case of the Development the results of the EIA have been described within this EIAR, which accompanies the application for consent under Section 36 of the Electricity Act 1989 (the "Section 36 Application") to the Energy Consents Unit (ECU).

4.3 Legislative Background

4.3.1 The Need for EIA of the Development

EIAs are required for certain major developments. In the case of Balliemeanoch PSH, the relevant EIA Regulations are The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017.

Schedule 1 of the EIA Regulations identifies development types and thresholds for which EIA must always be undertaken. Schedule 2 of the EIA Regulations identifies development which may require EIA to be undertaken, but only where the development is likely to have significant effects by virtue of factors such as its nature, size or location. Developments that require EIA are known as 'EIA development'.

As a generating station of greater than 50 megawatts (MW) and is deemed to have the potential for likely significant effects on the environment, the Development constitutes Schedule 2 development and is considered an EIA development under Regulation 2(1) of the EIA Regulations.

4.3.2 Content of the EIAR

Applications for developments considered to be EIA development must be accompanied by an EIA report (EIAR). In order to comply with Schedule 4 of the EIA Regulations, an EIAR must contain certain prescribed information. *Table 4.1 EIA Regulations: Schedule 4 Requirements*, summarises these requirements and identifies where the relevant information may be found within this EIAR.

Table 4.1 EIA Regulations: Schedule 4 Requirements

Legislative Requirement	Where this information is in the EIAR
1. A description of the development, including in particular: (a) a description of the location of the development; (b) a description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases; (c) a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; (d) an estimate, by type and quantity, of expected residues and emissions such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases.	The Development location is described in *Chapter 2: Project and Site Description* and can be viewed on *Figure 1.1: Location Plan (Volume 3 Figures).* Details pertaining to requirements b-c are described in *Chapter 2: Project and Site Description.* Details pertaining to requirement d are set out within Chapters 5-20.
2. A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	A discussion of reasonable alternatives and reasoning for the selection of the chosen option is presented in *Chapter 3: Evolution of Design and Alternatives*.
3. A description of the relevant aspects of the current state of the environment (the "baseline scenario") and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of relevant information and scientific knowledge	A description of the current state of the environment is provided in *Chapter 2: Project and Site Description* with more detailed description available in each topic chapter.
4. A description of the factors specified in regulation 4(3) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	The results of baseline studies and the environmental factors likely to be significantly affected by the Development (referred to as receptors) have been identified and are reported in chapters 5-20
5. A description of the likely significant effects of the development on the environment resulting from, inter alia: (a) the construction and existence of the development, including, where relevant, demolition works; (b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; (c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); (e) the cumulation of effects with other existing and / or approved development, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; (f) the impact of the development on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the development to climate change; (g) the technologies and the substances used. The description of the likely significant effects on the factors specified in regulation 4(3) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union level (as they had effect immediately before IP completion day [i.e., 31 December 2020]) or United Kingdom level which are relevant to the development including in particular those established under the law of the United Kingdom that implemented Council Directive 92/43/EEC3 and Directive 2009/147/EC.	The likely significant effects resulting from the Development as required by Schedule 4, paragraph 5 of the EIA Regulations are assessed and reported in Chapters 5 to 20.
6. A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Relevant methods and limitations are set out in each of the chapters 5-20.
7. A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.	Embedded mitigation measures are outlined in *Section 3.6* of *Chapter 3: Evolution of Design and Alternatives*. Additional mitigation measures are identified in chapters 5-20.

Legislative Requirement	Where this information is in the EIAR
8. A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and / or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to retained EU law such as any law that implemented Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments may be used for this purpose provided that the requirements of any law that implemented the Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	The major accidents and / or disasters associated with the Development have been identified and are discussed in Section 4.4 of this chapter.
9. A non-technical summary of the information provided under points 1 to 8.	A non-technical summary (NTS) that sets out the key findings of the EIA is available in *Volume 1 NTS* of this EIAR
10. A reference list detailing the sources used for the descriptions and assessments included in the EIA report.	Where relevant, reference lists are provided at the end of each EIAR chapter.

4.4 Scope of the EIA

Regulation 4(3) of the EIA Regulations sets out the factors that should be identified, described and assessed within an EIAR where there are likely significant effects on the factors listed and / or the interaction between those factors. These factors are:

- Population and human health;
- Biodiversity, and in particular species and habitats protected under any law that implemented Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (a) and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (b);
- Land, soil, water, air and climate; and
- Material assets, cultural heritage and the landscape.

In addition, EIARs are to include the expected effects deriving from the vulnerability of the development to major accidents and disasters.

The factors relevant to the Development and the scope of their assessment within this EIAR have been agreed through consultation with relevant statutory consultees. The statutory consultation discussions are listed in *Table 4.2 Meetings Undertaken*. Further detail on consultation can be found within a separate Pre-Application Consultation Report (PAC) report which accompanies the S36 application.

Table 4.2 Meetings Undertaken

Date	Consultee in Attendance	Discussion
27th October 2021	Argyll & Bute Council	Introductory meeting to the Applicant and Development
28th March 2022	Marine Scotland (now Marine Directorate)	Introductory meeting to the Applicant and Development and scope of the EIAR
28th March 2022	ECU	Introductory meeting to the Applicant and Development and scope of the EIAR
12th October 2023	Argyll & Bute Council	Meeting to discuss the proposed Temporary Workers Accommodation
16th March 2023	NatureScot	Meeting to discuss site access for their upcoming site visit and validity of our bird survey data
12th October 2023	Argyll & Bute Council	Meeting to discuss the proposed Temporary Workers Accommodation and the approach to the s36 application
19th March 2024	SEPA	Meeting to discuss the potential effects and mitigation required

As part of the consultation process, a pre-scoping meeting was held with ECU and Marine Directorate (formerly Marine Scotland) on 28th March 2022, following on from this meeting the finalised Scoping Report was updated and then submitted to the ECU on 12th July 2022.

The Scoping Report identified those environmental factors considered likely to be significantly affected by the Development and the proposed approach to the identification and assessment of those effects. It scoped out those environmental factors that were considered unlikely to be significantly affected. The Scoping Report was submitted as a request to the Scottish Ministers to provide their Scoping Opinion. The Scoping Opinion set out the information that the Scottish Ministers require to be provided within this EIAR and their comments on the identification of significantly affected environmental factors and scope of assessment. A copy of the Scoping Report is provided in *Appendix 4.1: Balliemeanoch Pumped Storage Hydro Scoping Report (Volume 5 Appendices*) and a copy of the Scoping Opinion received is contained in *Appendix 4.2: Scoping Opinion* (*Volume 5 Appendices*).

The Applicant has engaged with the local community and community councils from an early stage. An online community council meeting was held on 13th September 2021 when an introductory presentation was provided by the Applicant, introducing members of the Applicant team and the project team from AECOM.

Post-scoping, further consultation was then conducted including two public exhibitions on Wednesday 19th July at the Inveraray Inn and Monday 7th August 2023 in Dalmally Community Hall. In addition, the Applicant and AECOM were invited to the South Loch Awe-side Community Company (SLACC) Annual General Meeting (AGM) on 26th October 2023 in Portsonachan Village Hall and gave a presentation on the Development akin to that at the public exhibitions.

A full overview of the scoping and other consultation comments (including non-statutory and local community consultees) and where they are addressed within this EIAR is available in *Appendix 4.3: Consultation Tracker* (*Volume 5 Appendices*). Targeted consultation on specific matters is presented within the relevant chapter. Comments received through public consultation are included within the PAC Report and within individual chapters where relevant.

The factors identified through the consultation process as being relevant to the Development, and where they are addressed within the EIAR, is set out in *Table 4.3: Summary of Factors by Environmental Topic.*

Table 4.3 Summary of Factors by Environmental Topic

Chapter	Environmental Topic	Factors
5	Landscape and Visual Amenity	Landscape
6	Terrestrial Ecology	Biodiversity
7	Aquatic Ecology	Biodiversity
8	Marine Ecology	Biodiversity
9	Ornithology	Biodiversity
10	Geology and Soils	Land and Soils
11	Water Environment	Water and Human Health
12	Flood Risk and Water Resources	Water, Major Accidents and Disasters, and Human Health
13	Archaeology and Cultural Heritage	Cultural Heritage
14	Access, Traffic & Transport	Material Assets
15	Noise and Vibration	Human Health
16	Socioeconomics, Recreation and Tourism	Population and Material Assets
17	Climate	Climate
18	Marine Physical Environment and Coastal Processes	Biodiversity
19	Shipping and Navigation	Material Assets
20	Commercial Fisheries	Material Assets and Human Health

Given the low population density in and around the Development Site, the population and human health effects of the Development are considered to be adequately addressed within the water quality, flood risk, noise, and socio-economic assessments.

The major accidents and / or disasters associated with the Development have been identified as uncontrolled releases of water either through Embankment overtopping, Embankment breach or pipe breach. A breach is very unlikely due to the requirements of the Reservoirs (Scotland) Act 2011 with which the design, construction, operation and decommissioning of the Development must comply. This includes the appointment of a panel engineer to oversee and approve construction as well as independent inspections, regular safety checks and monitoring during the lifetime of the Development. Details of operational monitoring are provided in *Chapter 2: Project and Site Description.*

Air quality was not considered relevant to the Development as there was limited scope for likely significant effects . No significant air quality effects are anticipated as emissions to air are restricted to construction power and construction dust, which can both be mitigated through good practice measures (e.g. dust management plan). In addition, there is the possibility to connect to local mains electricity, which would minimise the need for on-site electrical generators during construction.

With regards to the technical assessments, a summary of the matters that have been scoped out of the EIA Report are listed in *Table 4.4 Matters scoped out of EIA*.

Table 4.4 Matters scoped out of EIA

Environmental Topic	Element Scoped Out	Reasoning
Cultural Heritage	Physical Cumulative Effects	None of the projects identified as part of the cumulative assessment would result in physical impacts on assets assessed as part of the current assessment, and as such the potential for physical cumulative effects was scoped out. The potential for cumulative effects on the setting of assets was considered as part of the assessment on the setting of heritage assets within 10 km of the Development and can be found within *Chapter 13 Cultural Heritage (Volume 2 Main Report)*
Geology and Soils	Seismic activity & Operational effects	Seismic activity in the area could have the potential to destabilise the Embankment, however, embedded within the design is the legal requirement that the Embankment will be designed constructed, operated and decommissioned in line with the Reservoirs (Scotland) Act 2011, therefore, this is scoped out. Operational effects are considered unlikely to be significant as any disturbance to or effects on geological or ground condition receptors will have occurred during the construction phase. Operation effects have therefore been scoped out of the Geology and Soils assessment reported in Chapter 10 of this EIAR (*Volume 2 Main Report*).
Traffic and Transport	Operational effects	Operational effects resulting from traffic and transport have been scoped out of the transport assessment. Under normal operation of the Development, vehicle movements will be limited during a typical working day and as such are considered unlikely to result in a significant effect on road users. During periods of maintenance there may be additional heavy goods vehicle (HGV) and abnormal indivisible loads (AIL) movements, but these are considered likely to be rare. Although operational effects resulting from traffic and transport are not assessed, details of the proposed route to site during operation and traffic management are provided in *Chapter 14: Access, Traffic and Transport (Volume 2 Main Report)*
Noise and Vibration	Baseline Vibration Survey, Low Frequency Noise and Public Roads.	There are currently no significant sources of vibration in the area. Consequently, ambient vibration monitoring has not been undertaken. It should be noted that annoyance due to vibration is not related to the comparison of pre and post-development vibration levels, and pre-development vibration levels are not usually necessary to assess the likelihood of vibration damage or annoyance from any new vibration sources likely to be introduced into the area. Therefore, consideration of existing vibration levels is excluded from the vibration assessment. In addition, low frequency noise and public roads during operation have been scoped out (see *Chapter 15: Noise and Vibration, Volume 2 Main Report).*
Terrestrial Ecology	European sites more than 10 km from the Development, National statutory designated sites, Local designated sites, Woodland	These ecological features have been excluded from further assessment because: a) available data indicates that they are likely absent from the zone of influence of the Development; b) it is clear that no impact from the Development is possible; and/or c) they are features that, although 'important' by the criteria given in this chapter, are sufficiently common

Environmental Topic	Element Scoped Out	Reasoning
	that is neither semi-natural nor long-established plantation, Common habitats that are neither SBL priorities nor Annex I habitats, Wildcat, Badger, Mountain hare and hedgehog, Wild deer, Great crested newt and common amphibians / reptiles & Terrestrial invertebrates	and widespread that their conservation status even locally is clearly not threatened by the Development. Full details can be found within *Table 6.5 Ecological Features Scoped out of Further Assessment* within *Chapter 6 Terrestrial Ecology.*
Socio-economics and Tourism	Tourist Accommodation, Businesses within the Development Site & population demographics.	The inclusion of impacts to housing supply and the supply of visitor accommodation in proximity to the Development Site have been scoped out of assessment as a Workers Housing Strategy sets out potential options for workers during construction (*Appendix 16.2 Housing Strategy* (*Volume 5 Appendices*)). The Development is therefore not expected to have an impact upon the availability of tourist accommodation for visitors to the region. As stated within the Scoping Report, effects on businesses in proximity of the Development Site and population demographics have also been scoped out. The Socio-economics and Tourism assessment is set out in *Chapter 16* of this EIAR.
Air Quality	Assessment of adverse effects on air quality	Section 3.3.1 of the Scoping Report outlined the factors to be scoped out, including air quality assessment as no significant air quality effects are anticipated due to emissions to air being restricted to construction power and construction dust, which can both be mitigated through good practice measures (e.g. dust management plan through a Construction Environmental Management Plan). In addition, there is the possibility to connect to local mains electricity, which would minimise the need for on-site electrical generators during construction. It has been identified that there is limited potential for direct significant effects from dust on human and ecological receptors with the implementation of embedded mitigation. Therefore, a formal assessment was not included within the EIA Report. A Dust Management Plan has been prepared and submitted in the Outline CEMP (*Appendix 3.1 Outline CEMP* (*Volume 5 Appendices*)). The CEMP provides the general good housekeeping requirements to mitigate diesel emissions and PM10 generation.
Water Resources and Flood Risk	Breach analysis	Due to the high standard of design, management and maintenance required under the Reservoirs (Scotland) Act 2011 and provided by any responsible operator, flooding associated with the Headpond is deemed as a very low risk.
Decommissioning	Decommissioning	As detailed within Section 3.3 Scope of the EIA within the Scoping Report, the decommissioning phase has been scoped out of the assessment. Any life extension, re-use or repowering will be subject to a detailed review of the Development infrastructure, namely the Headpond Embankments, underground powerhouse, tunnels and Waterways, at the time of decommissioning. Should life extension, re-use or repowering not be an option at decommissioning, the scheme will be decommissioned, and the permanent Construction Compounds and Access Tracks may be removed and reinstated to pre-construction condition, in accordance with best practice guidance. Decommissioning has therefore been scoped out of assessment as the decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of the facility (*circa* 100 years). Potential decommissioning effects are therefore considered to be similar to, and associated with, the components described in the operational project phase. However, a decommissioning survey and plan would be produced when required along with a separate planning application to decommission the Development. The exception to this is on peat which has been included within *Chapter 10: Geology and Soils and* flood risk within *Chapter 12: Water Resources and Flood Risk.*
Three Bridges Access Track / Blarghour wind farm Access Track	Assessment	The Development will not construct an Access Track from Three Bridges (such an Access Track will only be used if already consented and constructed by Blarghour Wind Farm and the necessary land rights secured). Therefore, the Three Bridges Access Track was excluded from assessment of construction effects.

4.5 Approach to Environmental Impact Assessment

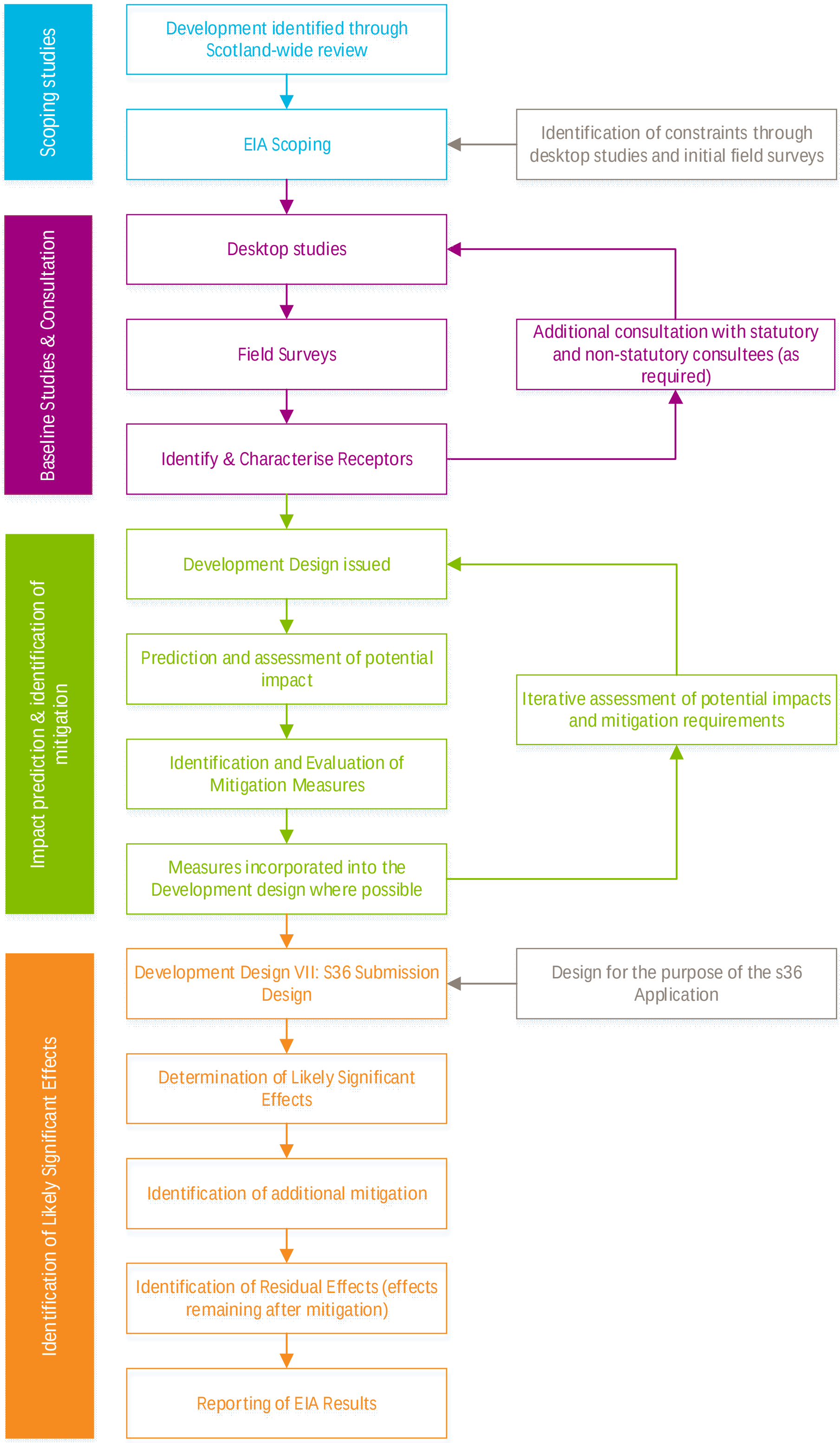
4.5.1 Overview

The primary objective of the EIA of the Development, consistent with the requirements of the EIA Regulations, is to identify, assess and report the Development's likely significant effects. This has been done by following a systematic process through the steps described below and illustrated in *Insert 4.1 EIA Process Schematic*, as shown below. The approach is iterative and has required a close working partnership between those designing the Development and those undertaking the EIA, to ensure that consideration of potential environmental impacts formed an integral part of developing the final design that is described in *Chapter 2: Project and Site Description*.

4.5.2 Key Stages in Environmental Impact Assessment

The key stages in the EIA are:

- **Scoping studies**: Scoping was the first step in the EIA process. Scoping provided an opportunity for the ECU and other consultees to comment on the proposed scope of, and approach to, the EIA of the Development. Subsequent chapters set out comments received in scoping and how they have been addressed in undertaking the EIA.
- **Baseline studies and consultation**: These have comprised a combination of desk-based studies and field surveys to establish an understanding of the existing environmental conditions ('the baseline') within the study area and therefore ensure an accurate assessment of the likely significant effects of the Development. Baseline studies have been ongoing since 2018 informing the design of the Development as well as forming the basis of the EIA. The scope of baseline studies has been agreed with relevant consultees as part of scoping and, where appropriate, additional consultation.
- **Impact prediction and identification of mitigation**: The potential environmental impacts of the Development (both beneficial and adverse) have been predicted and evaluated using a range of specialist methods which are described in subsequent chapters. Through iterative assessment, potential impacts have been predicted and opportunities to mitigate them identified, with the aim of preventing or reducing impacts as much as possible. Where possible mitigation measures have been incorporated into the Development design such that they inform its detailed design and / or how it shall be constructed. This approach provides the opportunity to prevent or reduce adverse effects from the outset. These embedded mitigation measures are set out in *Chapter 3: Evolution of Design and Alternatives.*
- **Identification of likely significant effects**: As stated above, the purpose of the EIA is to determine the likely significant effects of the Development. A detailed description of the general approach to assessing impacts is contained in this chapter, with detailed approaches tailored to individual technical assessments following environmental topic-specific guidance contained in subsequent sections. The EIAR identifies the significance of potential effects, identifies any additional mitigation and then the significance of the residual effect of the Development. Residual effects are those which remain, taking into account proposed additional mitigation. As described above, the approach to the design and EIA of the Development has resulted in much of the mitigation being embedded within the final design. Therefore, design and construction mitigation has been taken into account when evaluating the significance of the potential impacts, meaning that in some instances the significance of residual effects is the same as that reported for potential effects.



Insert 4. 1 EIA Process Schematic

4.5.3 Assessment of Impacts

The determination of the significance of the impacts arising from the Development is a key stage in the EIA process. In order to assess the overall significance of an impact, it is necessary to establish the magnitude of the effect occurring i.e. the change to the existing baseline conditions as a result of the development and the sensitivity or importance of the receiving environment or receptor. Assessment of significance for environmental topics combines professional judgement with consideration of a number of factors including:

- The type of effect, i.e. whether it is adverse, beneficial, neutral or uncertain;
- The probability of the effect occurring based on the scale of certain, likely or unlikely;
- The sensitivity of the resource or receptor under consideration;
- The magnitude of the potential effect in relation to the degree of change which occurs as result; and
- Whether the effect is temporary, permanent, and / or reversible.

4.5.4 Describing the Sensitivity Value or Importance of Receptors

The sensitivity of the baseline conditions is assessed according to the relative importance of existing environmental features on or near to the Development Site, or by the sensitivity of receptors which could potentially be affected by the Development. Criteria for the determination of sensitivity or importance or value of receptors are established based on approved guidance, legislation, statutory designation and / or professional judgement.

The criteria in *Table 4.5: Sensitivity or Value Criteria* provide a general definition for determining the sensitivity, value or importance of receptors.

Table 4. 5 Sensitivity or Value Criteria

Sensitivity or Value	Description
Very high	The receptor has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	The receptor has low capacity to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.
Negligible	The receptor is resistant to change and is of little environmental value.

4.5.5 Describing the Magnitude of Impacts

The magnitude of potential effects on environmental baseline conditions is identified through consideration of the Development, taking into account the scale or degree of change from the existing baseline as a result of the effect. Consideration is given to the duration and reversibility of the effect as well as consideration of relevant legislative or policy standards or guidelines.

General criteria for defining the magnitude of an impact are set out in *Table 4.6: Impact Magnitude Criteria*, below. Key factors influencing this include:

- The physical or geographical scale of the impact, (note that this is relative to the scale of the receptor or resource affected).
- The duration of the impact - will it be short term, lasting for a few days or weeks, or long term, lasting for a number of years.
- The frequency of the impact - will it occur hourly, daily, monthly or will it be permanent, lasting for the duration of the development.

- The reversibility of the impact - can it be reversed following completion of construction or decommissioning of the development.

Table 4.6 Impact Magnitude Criteria

Sensitivity or Value	Description
High	Total loss or major alteration to key elements/features of the baseline conditions such that post-development character/composition of baseline condition will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post-development character/composition of the baseline condition will be materially changed.
Low	Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/composition of the baseline condition will be similar to the pre-development situation.
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a "no change" situation.

4.5.6 Describing the Significance of Effects

The general approach adopted for evaluating the significance of effects is outlined in *Table 4.7 Approach to the Assessment of Significance*, below. A combination of the magnitude of the impact under consideration and the sensitivity of the receiving environment determines the significance of effect. For some specialist topics, additional categories have been added where a greater level of definition is required. It should be noted that this approach provides a general framework but should not be treated as a simple matrix; professional judgement should be applied in all cases.

Table 4.7 Approach to the Assessment of Significance

Magnitude	Sensitivity or Value of Receptors				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

The significance of the effects arising from the Development will be reported using a seven-point scale, as follows:

- Major Adverse, Moderate Adverse, Minor Adverse;
- Negligible; and
- Minor Beneficial, Moderate Beneficial, Major Beneficial.

This scale may differ between the specialist chapters but, where this occurs, the variation will be explained clearly and fully.

Effects predicted to be Minor are considered to be manageable and such effects are 'Not Significant'. Effects assessed as Moderate or Major are considered to be 'Significant'. When the significance of effects is assessed, this takes into account mitigation, i.e. the assessment applies to the residual effects of the Development, which can be defined as any effect that would remain following the implementation of proposed mitigation measures.

4.5.7 Approach to Mitigation

Some mitigation measures to avoid, reduce or offset the consequences of the Development are embedded within the Development design, whilst others may require adherence to particular constraints on construction methods or mode of operation. The final assessment of significance will take into account the mitigation measures and constraints that have been incorporated into the Development – this will be the assessment of residual likely significant environmental effects.

A standard hierarchal approach to the development of mitigation measures has been followed with the aim of ‘designing out’ adverse effects as much as possible (avoiding, preventing or reducing adverse effects) as well as seeking opportunities to maximise or enhance beneficial effects. The EIA has been undertaken in parallel with the design of the Development providing opportunities to incorporate mitigation measures into its design or how it will be constructed.

The following approach has been used for developing and categorising mitigation:

- **Design Measures**: These are measures embedded in the base design or that inform/constrain the detailed design. Examples could include measures such as the design of the Headpond, or the layout of the Tailpond infrastructure.
- **Construction Measures**: These are measures incorporated into how the Development will be constructed and could include measures in relation to the timing of certain activities or silt control or dust suppression.
- **Other Measures**: These are other measures which have been identified which are neither design nor construction mitigation.
- **Compensation Measures**: These are measures to be implemented in the event that an effect cannot be mitigated and could include measures to offset the loss of an important feature or resource.

The EIAR also identifies where it is considered appropriate to undertake monitoring as part of construction and/or operation of the Development. Monitoring provides a mechanism to take remedial action in the event that unforeseen significant effects occur. For example, this could include monitoring the water quality in discharges to ensure that no contaminated water is being released or monitoring noise emissions to ensure that they comply with agreed limits.

4.5.8 Types of Effects

4.5.8.1 Direct Effects and Indirect Effects

Direct effects are those where there is a physical connection between the Development and the receptor (for example, direct impacts on a sensitive ecological receptor), whereas indirect effects require some additional pathway for the effect to arise (for example, impacts on surface water quality on other watercourses within the catchment from spillage risk).

4.5.8.2 Temporary Effects

Temporary effects mainly occur during the construction phase only and are typically short term. This would include effects resulting from the construction of the Development such as construction traffic, noise and vibration from construction plant and machinery, dust generation and site runoff, as well as effects resulting from temporary loss of agricultural land or other temporary effects resulting from requirements for temporary Access Tracks or Construction Compounds.

4.5.8.3 Longer Term, Operational & Permanent Effects

Longer term, operational and permanent effects are those which would occur as a result of the Development, such as its land take or as a result of its operation. This would include effects which may begin during construction and endure for the lifetime of the Development (for example visual effects from the Headpond) or effects which occur for a period of time following completion of construction or during operation only (for example, changes in water levels within Loch Awe during operation of the Development).

4.5.8.4 Decommissioning Effects

Decommissioning effects would be those which would occur as a result of the dismantling and draining of the Development at the end of its operational life (as outlined in *Chapter 2: Project and Site Description*) and would typically be similar to those assessed for construction. The Development has a design life of 100 years, any life extension, re-use or repowering will be subject to a detailed review of the Development infrastructure, namely the Headpond Embankments, underground powerhouse, tunnels and Waterways, at the time of decommissioning. However, should life extension, re-use or repowering not be an option at decommissioning, the scheme will be decommissioned, the permanent Construction Compounds and Access Tracks may be removed and reinstated to pre-construction condition, in accordance with best practice guidance. Given the lifespan of the development, the effects associated with decommissioning being similar to those of construction and the requirement for a decommissioning plan at the end of its lifespan, decommissioning effects have been scoped out of assessment.

Notwithstanding, where information is deemed appropriate to be included this has been outlined within the relevant specialist assessment chapter as set out within *Table 4.4 Matters Scoped out of the EIA* within *Section 4 Scope of the EIA*, above.

4.5.8.5 Residual Effects

Residual effects are those effects that remain having taken account of mitigation measures. As noted above, the approach taken to the EIA of the Development means that much of the mitigation is an inherent part of the design (design measures) and how it will be constructed (management measures). As a result, the significance of some residual environmental effects may be the same as the significance of the potential environmental effects. It should be noted that this is not because they have not been mitigated, but rather that by incorporating mitigation into the design and construction of the Development from the outset, effects have been mitigated as far as possible. In subsequent chapters, this means that there may be more substantive reporting of the potential effects as opposed to the residual effects.

4.5.8.6 Cumulative Effects

The effects of the Development are assessed in combination with other projects that are either under construction or currently going through planning. Other projects have been identified through a search of ABC's Planning Portal and confirmed with ABC Planning Officers. The final planning portal check was conducted on 12th September 2023. Cumulative effects will be considered for each of the environmental topics, unless stated otherwise within *Chapters 5-20* (*Volume 2 Main Report*). The cumulative assessment will take into account any existing environmental issues and any areas of particular environmental importance such as designated sites and landscapes. The cumulative assessment will also consider effects between the different environmental topics (intra-project effects) for the Development as well as the effects from other projects (inter-project effects).

Cumulative effects will also consider the operational effects related to the water catchments related to other PSH schemes such as Cruachan Hydro Scheme, Cruachan Expansion, Nant Hydro Scheme, Inverawe hydropower station and Beochlich Hydro Scheme as listed within *Table 4.8 Cumulative Developments*, below. Whilst their operation is considered baseline, the cumulative operation in terms of drawdown and discharge on the hydrology and water balance of the receiving catchments will be considered although could be controlled through the conditions of the Controlled Activities Regulations[1] (CAR) and abstraction licence.

Table 4.8: Cumulative Developments, lists other developments that have been identified as either going through screening or scoping, or having been granted planning permission or section 36 consent, or under construction at present.

Table 4.8 Cumulative Developments

Development	Description	Approx. distance to Headpond (km)	Status	Likely Shared Receptors
Beochlich Hydro Scheme	Small-scale 1MW hydropower scheme. Operational since 1998.	0.3	Operational	Water environment and resources, roads and amenity
Cruachan Hydro Scheme	440 MW pumped storage hydro scheme that uses Loch Awe as a tailpond. Operational since 1965	11	Operational	Water
Cruachan Expansion	Increasing the capacity of the existing PSH scheme by up to 600 MW.	11	Consented	Water, noise
Inverawe Hydro Scheme	25 MW hydro scheme on Loch Awe. Operational since 1963	16	Operational	Water
Nant Hydro Scheme	15 MW hydropower scheme that uses Loch Nant as its Headpond. Operational since 1963	8.8	Operational	Landscape, water
Lochan Shira (Reservoir)	Reservoir of the Clachan hydro scheme. Operational since 1950's	12.5	Operational	Landscape, water
Blarghour Wind Farm	Wind farm development comprising 17 turbines with a total installed capacity of 57.8 MW.	0.17	Consented	Landscape, noise
Blarghour Wind Farm variation	S36C scoping for increase in turbine tip height from 136.5m to 180m. Proposed Development still contains	0.17	Scoping	Landscape, noise

[1] Water Environment (Controlled Activities) (Scotland) Regulations 2011

Development	Description	Approx. distance to Headpond (km)	Status	Likely Shared Receptors
	17 turbines as per previous consented Development and will generate 85MW of electricity.			
Blarghour Wind Farm 132kV OHL Connection	Variation will vary consented s36 from 17 x 136.5m to s36c 14 x 180m.	2.01	Screening	Landscape
Beinn Ghlas Wind Farm	Construct and operate a 132 kV overhead line and Underground Cable to connect the proposed Blarghour Wind Farm to the proposed Creag Dhubh Substation. The technology options considered include OHL comprised predominantly of trident H wood pole supports, switching to trident H steel poles or steel lattice towers at altitudes over c. 300 m AOD, and a 500m section of UGC on approach to Creag Dhubh Substation.	9.94	Operational	Landscape
Beinn Ghlas Wind Farm Repowering	Wind farm development comprising 14 turbines with a total installed capacity of 8.4 MW. Operational since 1999.	9.90	Scoping	Landscape
An Suidhe Wind Farm	Wind farm development of up to 18 turbines of up to 180 m to tip, replacing the existing 14 operational turbines of 54.1 m to tip	7.06	Operational	Landscape
Carraig Gheal Wind Farm	Wind farm development comprising 20 turbines with a total installed capacity of 46 MW.	6.22	Operational	Landscape
Ladyfield Wind Farm	Wind farm development comprising 22 turbines, with a total capacity of between 50 and 100 MW.	4.12	Scoping	Landscape, noise & roads
Inveraray to Taynuilt (ITE/ITW) Tie-In to Creag Dhubh Substation	Construction and operation of a Tie-In connection to the proposed Creag Dhubh Substation from the existing 132 kV Taynuilt to Inveraray Overhead Line (OHL), as well as the temporary diversion of the existing 132 kV Taynuilt to Inveraray OHL to facilitate its connection to the substation and associated ancillary works.	3.67	Consented	Landscape & roads
An Suidhe Substation Overhead Line Connection	Install and keep installed approximately 1.34km of realigned 275 kV overhead line supported on six new steel towers to connect the proposed An Suidhe substation (via downleads) to the existing 275 kV Inveraray to Crossaig overhead line	9.76	Consented	Landscape
Creag Dhubh to Dalmally OHL	275kv OHL.	4.20	Consented.	Landscape & roads
Creag Dhubh – Inveraray OHL	Upgrade from existing 132kv to 275kv. (LT194 ref on map)	2.47	Consented	Landscape & roads
An Carr Dubh Wind Farm	Wind Farm (Generating station of >100 <200 MW Capacity) 13 turbines max turbine height 180m.	2.70	Application submitted	Landscape & roads
33kv Overhead Line - ETU 166 - Dalmally	New overhead 33kv line consisting of 1150m of Overhead EHV Conductor in order to connect to a new mast site. The new 33kv line will consist of 15 new poles and two spans of single phase, which will house our plant equipment and transformer. The new overhead line will be installed using poles of a wooden variety and these will be approximately 9.5 metres in height. The total length of the 33kv overhead line will be 1150 metres.	1.92	Consented	Landscape & roads
Barachander Wind Farm	Proposed wind farm and associated Battery Energy Storage System (BESS) facility. 11 turbines each with capacity c.6MW with max tip 180 m and BESS with capacity of 10MW.	7.90	Scoping	Landscape
Creag Dhubh substation	Substation with construction likely to commence 2024	4.04	Consented	Landscape & roads
Eredine Wind Farm	22 turbine wind farm with up to 120 MW generating capacity	10.04	Scoping	Landscape
Inverary to Crossaig OHL	Construction of a new 275kV overhead line, initially operated at 132kV between Inveraray and Crossaig	5	Consented	Landscape & roads

Development	Description	Approx. distance to Headpond (km)	Status	Likely Shared Receptors
An Suidhe Substation	Construction of a new 275kV substation and overhead line, which will connect into the recently completed 275kV overhead line between Inveraray and Crossaig.	9.93	Consented	Landscape & roads

Sources: Argyll & Bute Planning Portal [Accessed: 12th September 2023*] ECU Portal [Accessed:* 12th September 2023*]*

It is also acknowledged that a grid connection will be required for the Development (as described in Section 2.14 of *Chapter 2: Project and Site Description*). This is not included as part of this application. The Balliemeanoch Grid Connection route is anticipated to be to Creag Dhubh substation, which is located north-east of the Development Site. The exact route of the Balliemeanoch Grid Connection from the Development Site to Creag Dhubh is currently unconfirmed, the connection may be via an underground cable however for the purposes of the assessment it has been assessed on a "worst case" scenario that it will be via an OHL. A grid connection agreement has been entered into for the Development between the Applicant and SSEN.

4.6 Limits of Deviation

The matter of design uncertainty has been addressed within this EIA by adopting a precautionary approach to identifying significant environmental effects, through the establishment of a series of maximum development extents known as a 'Rochdale Envelope'.

The Rochdale Envelope is named after a UK planning law case[2]. It is an established principle that allows a development to be described by broad or alternative parameters. Its adoption allows meaningful EIA to be undertaken by defining a 'realistic worst case' scenario that decision-makers can consider when determining the acceptability or otherwise of the environmental effects of a development.

The principle is based on the assumption that as long as the technical and engineering parameters of a development fall within the limits of the envelope, and the EIA has considered the likely significant effects of that envelope, then flexibility within those parameters is deemed to be permissible within the terms of any consent granted for the development.

The realistic worst-case scenario reflects the most environmentally detrimental parameter for assessment within the EIA. Where multiple options, or a range, are provided for a parameter it is assumed that one or other of the parameters will have a more significant adverse effect than the alternatives. The realistic worst case can differ depending on the environmental resource or receptor being assessed, and this has been highlighted where relevant.

In line with this approach, a series of parameters have been established across a number of aspects relating to the design and construction of the Development to manage design uncertainty and provide flexibility for deviation where needed, for example to enable minor design refinements to be made by the Applicant and / or their appointed Construction Contractor within the overall parameters of any consent granted.

These parameters are presented below and include matters such as defining the maximum extent of land required to mitigate environmental effects, and the identification of horizontal and vertical limits of deviation within which the design of the Development can be adjusted, if necessary, for example, in response to local ground conditions.

This approach to managing uncertainty within defined parameters and limits ensures that any design changes that may arise post submission of the Section 36 Application will not be of an order that renders the content of this EIAR inadequate or invalid.

4.6.1 Limits of Deviation – Permanent Access Track

The Permanent Access Tracks are shown on *Figure 2.21 Excavated Access Track Typical Detail* and *Figure 2.22 Floating & Widening Access Track Typical Details* (*Volume 3 Figures*). Upgraded forestry Access Tracks will be 10 m wide, plus 0.7 m for swales and 4 m peat / topsoil mounds requiring a total working width of approximately 15 m. Sections of new Access Track will be required to join the existing forestry tracks within the plantation. New sections will be either excavated or floating depending on ground conditions. The permanent Access Tracks will partially incorporate the existing forestry road and so it is proposed to apply a 50 m limit of deviation either side of

[2] *R v. Rochdale MBC ex parte Milne (No. 1)* [2000] Env. L.R. 1; *R. v. Rochdale MBC ex parte Tew* [1999] 3 PLR 74 and *R. v. Rochdale MBC ex parte Milne (No. 2)* [[2001] Env. L.R. 22.

the existing track. This would allow a 100 m buffer for the proposed 50 m Access Track, and allow for micro-siting for local ground conditions, topography, forestry, and watercourses.

4.6.2 Limits of Deviation – Temporary Access Track

Four sections of Temporary Access Tracks will be required during construction as shown on *Figure 2.3 Above Ground Infrastructure (Sheets 1 & 2)* (*Volume 3 Figures*). The construction corridor required for Temporary Access Tracks will be a maximum of 30 m to allow for two-way vehicular traffic, drainage and peat mounds.

The Temporary Access Tracks will typically be unsealed in nature and will be removed following the completion of the construction phase.

The temporary Access Tracks have been minimised as far as reasonably practical, and in places follows the routing of informal existing Access Tracks. However, to account for the topography, watercourses, and tree root protection within the ancient woodland inventory towards Loch Awe, it is proposed to have a 35 m buffer either side of the indicative route of the Temporary Access Track. This would allow for a 70 m buffer for the proposed 30 m Access Track.

4.6.3 Limits of Deviation – Generation and Reuse of Material

The Development will generate 20,010,000 m^3 of material that will be excavated during construction. This material will primarily be used to construct the Headpond Embankments, with an excess of excavated material of around 1,630,000 m^3. It has been recognised that the material generated from the Development will be excavated using different methods and be sourced from rock of varying quality. Therefore, to provide flexibility and allow for any optimisation during detailed design approximate volumes have been calculated using standard methods, on a reasonable assumption of the likely size required for the infrastructure and then rounded up to the next ten thousand to provide a likely worse case for the purposes of the assessment. This is explained in detail within the Materials Management Appraisal (*Appendix 10.1 Materials Management Appraisal*, *Volume 5 Appendices*).

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 5: Landscape and Visual Assessment

ILI (Borders PSH) Ltd

July 2024

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

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5 Landscape and Visual Assessment

5.1 Introduction

The Landscape and Visual Impact Assessment (LVIA) assesses the potential effects on landscape resources, Landscape Character Types (LCTs) and designated landscapes. It also assesses the nature and extent of effects on existing views and visual amenity. A full description of the Development is provided in *Volume 2 Main Report, Chapter 2: Project and Site Description* and should be read in conjunction with the LVIA. The main above ground components of the Development are shown on *Figure 2.3 Above Ground Infrastructure (Sheets 1 & 2*) and *Figure 2.4 Below Ground Infrastructure (Volume 3: Figures)* and listed below:

- **Headpond**: comprised of Headpond reservoir, Embankment 1 (1635 metres (m) long x 482 m wide x up to 95 m high), Embankment 2 – (279 m long x 85 m wide x up to 13 m high), Headpond inlet / outlet structure, upper gate house and one borrow pit within the Headpond interior during construction.
- **Tailpond**: including lower gate houses (permanent) - Two lower gate houses location approximately 90 m south east of the inlet / outlet structure screens and the temporary cofferdam that will encircle the area required for Tailpond works.
- **Compounds**: eleven temporary Construction Compounds and eleven permanent compounds at various locations across the Development Site, note that this includes the Switching Station as also noted below.
- **Development Site Access**: via the public road network is from the A819 near Craig nan Sassanach. The A819 runs to the east of the Development Site from north to south. There is also the potential to access the Development Site further south along the A819 at Three Bridges utilising the proposed access for the Blarghour Wind Farm should this be constructed, and the necessary land rights secured.
- **Access Tracks**: temporary and permanent internal Access Tracks required to be constructed. Existing tracks to be upgraded total 12.9 kilometre (km) total length, new Access Tracks total 13.75 km (of which 7.75 km excavated and 6 km floated) and 10 m wide (reducing to 5 m wide at operation). Temporary construction track 4.1 km length and use of the Blarghour Wind Farm access 8.6 km length (this would not be built as part of the Development and only utilised should the wind farm be constructed and in operation, and if the necessary land rights can be secured).
- **Temporary Public Road Diversion**: To allow for construction of the Tailpond inlet / outlet structure a 1.5 km section of the B840 requires to be temporarily diverted. This will include two new sections, returned to former use post construction, and an upgraded section of an existing farming track.
- **Walking Routes:** Sections of existing informal walking routes within the Development Site will be temporarily diverted during construction and fully reinstated on completion of construction. Sections of the Access Tracks required to be constructed for the Development will be maintained as new walking routes for use by the public post construction.
- **Switching Station**: consists of one permanent secure electrical compound and a number of parking spaces and permanent welfare facilities.
- **Marine Facility**: a temporary jetty will be constructed within Loch Fyne approximately 180 m in length from the shoreline, 10 m wide, deck top level: 3.3 m AOD (1.6 m above Mean High Tide Level (MHTL)) and approximately 600 millimetres (mm) deep. The jetty will be temporary and will be in place for the duration of construction with the jetty platform being removed during demobilisation. The piles will remain in-situ.

Below ground construction components are detailed in *Volume 2 Main Report, Chapter 2: Project and Site Description***.**

The Development will be assessed during the construction and operational phases of the Development. The LVIA also considers potential cumulative effects of the Development in combination with other developments.

The LVIA has been carried out by Chartered Landscape Architects, with extensive experience of the assessment of pumped storage hydro projects in Scotland, and in accordance with best practice guidance and consultation with statutory stakeholders. This LVIA is supported by the following figures, appendices, and volumes:

- Volume 3: Figures
  - Figure 5.1 Topography;
  - Figure 5.2A Zone of Theoretical Visibility – Headpond and Embankments;
  - Figure 5.2B Zone of Theoretical Visibility – Permanent Compounds and Inlet Outlet;
  - Figure 5.2C Zone of Theoretical Visibility – Permanent Tracks;
  - Figure 5.2D Zone of Theoretical Visibility – Operational Elements Combined; and
  - Figure 5.2E Zone of Theoretical Visibility – Operational Elements Combined and Permanent Tracks
  - Figure 5.3 Wild Land Areas and Operational Zone of Theoretical Visibility;
  - Figure 5.4 Landscape Designations and Operational Zone of Theoretical Visibility;
  - Figure 5.5 Landscape Character Types and Operational Zone of Theoretical Visibility;
  - Figure 5.6 Recreational Routes and Core Paths and Operational Zone of Theoretical Visibility;
  - Figure 5.7 Representative Viewpoints and Operational Zone of Theoretical Visibility;
  - Figure 5.8 Cumulative Schemes (Scenario 1) and Operational Zone of Theoretical Visibility;
  - Figure 5.9 Cumulative Schemes (Scenario 2) and Operational Zone of Theoretical Visibility;
- Volume 4: Visualisations
- Volume 5: Appendices
  - Appendix 5.1 Landscape and Visual Methodology;
  - Appendix 5.2 Landscape Assessment;
  - Appendix 5.3 Visual Assessment;
  - Appendix 5.4 Outline Landscape and Ecology Management Plan;
  - Appendix 5.5 Forestry

5.2 Legislation and Policy

This section identifies and describes legislation, policy and guidance of relevance to the assessment of the potential landscape and visual impacts associated with the Development. Legislation and policy have been considered on an international, national, regional and local level. The following is considered to be relevant to the landscape and visual assessment as it has influenced the sensitivity of receptors and requirements for mitigation or the scope and/or methodology of the EIA.

5.2.1 Legislation

European Landscape Convention

The European Landscape Convention (ELC) (Ref 1) was signed by the UK Government in 2006 and came into effect in March 2007. The ELC requires parties to recognise landscape in law. It focuses specifically on landscape issues and highlights the importance of integration of landscape into areas of policy, to promote protection, management and planning of all landscapes including the assessment of landscape and analysis of landscape change.

The ELC defines landscape as "*an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors*". The ELC considers landscape as a whole (land or marine), from urban to rural areas, and whether special or degraded.

5.2.2 National Planning Policy

National planning policy relevant to landscape and visual matters includes:

- National Planning Framework 4 (NPF4); and
- Planning Advice Note 60 – Planning for Natural Heritage (PAN 60) (2000).

National Planning Framework 4

The National Planning Framework (NPF4) (*Ref 1 Council of Europe (2000). Council of Europe Landscape Convention (ETS No. 176).*

Ref 2) is the national spatial strategy for Scotland. NPF4 highlights the importance and value of landscape to Scotland and notes the importance of landscape in place making and sustaining local distinctiveness.

Policy 11 of NPF4 sets out that development proposals for all forms of renewable, low-carbon and zero emissions technologies will be supported, including pumped storage hydro (which is recognised as a "national" development). It notes under criterion (e)(ii) that developments must demonstrate how project design and mitigation have addressed any significant landscape and visual impacts. It provides however, that it should be recognised that such impacts are to be expected for some forms of renewable energy and where impacts are localised and/or appropriate design mitigation has been applied, they will generally be considered acceptable.

NPF4 (page 04) sets out six overarching spatial principles as follows:

- "*Just transition: We will empower people to shape their places and ensure the transition to net zero is fair and inclusive;*
- *Conserving and recycling assets: We will make productive use of existing buildings, places, infrastructure, and services, locking in carbon, minimizing waste, and building a circular economy;*
- *Local living: We will support local liveability and improve community health and wellbeing by ensuring people can easily access services, greenspace, learning, work, and leisure locally;*
- *Compact urban growth: We will limit urban expansion so we can optimize the use of land to provide services and resources, including carbon storage, flood risk management, blue and green infrastructure, and biodiversity;*
- *Rebalanced development: We will target development to create opportunities for communities and investment in areas of past decline and manage development sustainably in areas of high demand; and*
- *Rural revitalisation: We will encourage sustainable development in rural areas, recognizing the need to grow and support urban and rural communities together*."

By applying these spatial principles, the national spatial strategy will support the delivery of:

- "*Sustainable Places where we reduce emissions, restore, and better connect biodiversity;*
- *Liveable Places where we can all live better, healthier lives; and*
- *Productive Places where we have a greener, fairer, and more inclusive wellbeing economy*."

Table 5.1 Relevant Policies in NPF4 to Landscape and Visual Matters below outlines the policies in the NPF4 most relevant for this Development in relation to landscape and visual matters.

Of note, Policy 4 (part d) refers to development proposal effects on local landscape designations. The policy sets out that "*Development proposals that affect a site designated as a local nature conservation site or landscape area in the LDP will only be supported where: i. Development will not have significant adverse effects on the integrity of the area or the qualities for which it has been identified; or ii. Any significant adverse effects on the integrity of the area are clearly outweighed by social, environmental or economic benefits of at least local importance*".

Table 5.1 Relevant Policies in NPF4 to Landscape and Visual Matters

Sustainable Places	Policy	Policy Principles
Tackling the Climate and nature crises	Policy 1	Policy Intent: To encourage, promote and facilitate development that addresses the global climate emergency and nature crisis. Policy Outcomes: • Zero carbon, nature positive places.
Climate mitigation and adaptation	Policy 2	Policy Intent: To encourage, promote and facilitate development that minimises emissions and adapts to the current and future impacts of climate change. Policy Outcomes: • Emissions from development are minimised; and

Sustainable Places	Policy	Policy Principles
		• Our places are more resilient to climate change impacts.
Biodiversity	Policy 3	Policy Intent: To protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks. Policy Outcomes: • Biodiversity is enhanced and better connected including through strengthened nature networks and nature-based solutions.
Natural Places	Policy 4	Policy Intent: To protect, restore and enhance natural assets making best use of nature-based solutions. Policy Outcomes: • Natural places are protected and restored. • Natural assets are managed in a sustainable way that maintains and grows their essential benefits and services.
Forestry, woodland, and trees	Policy 6	Policy Intent: To protect and expand forests, woodland, and trees. Policy Outcomes: • Existing woodlands and trees are protected, and cover is expanded. • Woodland and trees on development sites are sustainably managed.
Historic assets and places	Policy 7	Policy Intent: To protect and enhance historic environment assets and places, and to enable positive change as a catalyst for the regeneration of places. Policy Outcomes: • The historic environment is valued, protected, and enhanced, supporting the transition to net zero and ensuring assets are resilient to current and future impacts of climate change. • Redundant or neglected historic buildings are brought back into sustainable and productive uses. • Recognise the social, environmental, and economic value of the historic environment, to our economy and cultural identity.

<u>Planning Advice Note 60 – Planning for Natural Heritage (PAN 60) (2000)</u>

The Planning Advice Note 60 – Planning for Natural Heritage (PAN 60) (Ref 3) was published by the Scottish Government in 2000. This document refers to safeguarding and enhancing landscape character as well as the use of published Landscape Character Assessments.

5.2.3 Local Planning Policy

The Development is within the Argyll and Bute Local Authority Area. The implications of the statutory changes in relation to NPF4 means that if Local Development Plan (LDP) policies are not in accordance with the NPF4, then NPF4 will prevail until such time as all Local Planning Authorities update their LDPs. It is the more recently adopted policy that will prevail, where there is any incompatibility between NPF4 policies and LDP policies. Landscape character assessments will remain a relevant consideration where land is designated as a Local Landscape Area, Special Landscape or similar in the relevant LDP.

The Argyll and Bute LDP 2 (Ref 4) was adopted in February 2024. The Argyll and Bute LDP2 covers the entire Development Site and the majority of the Study Area, apart from the Loch Lomond and The Trossachs National Park Area (LLTNP), where a separate LDP is prepared by the National Park Authority. The Argyll and Bute LDP2 sets out the spatial strategy, general policies and local plan proposals relating to the Development.

For the purposes of the LVIA the policies contained in LDP2 have been considered. Differences between LDP 2015 and LDP2 relate to terminology in connection with local landscape designations. LDP2 redefines previously Areas of Panoramic Quality to Local Landscape Areas (LLAs). The LVIA refers to LLAs only. The policies which are relevant to landscape and visual matters and the Development are summarised below.

Policy 20 - Gardens and Designed Landscapes (GDLs)

This policy seeks to protect, preserve or enhance the cultural significance, character and integrity of nationally important GDLs. The policy notes that Developments should not significantly impact upon important views to, from and within the site, or its setting.

The policy sets out criteria for assessing potential impacts of proposed development in or adjacent to GDLs where particular attention shall be paid to: "*artistic, historical, horticultural, architectural, scenic, and nature conservation interest of the site; the site's original design concept, overall quality and setting; and trees and woodlands and the site's contribution to local landscape character within the site including the boundary walls, pathways, garden terraces or water features*".

Policy 71 – Development Impact on Local Landscape Area

This policy recognises the importance of LLAs. The policy states that "*Argyll and Bute Council will resist development in, or affecting, a Local Landscape Area where its scale, location or design will have a significant adverse impact on the character of the landscape. All development proposals in or affecting a Local Landscape Area must demonstrate that: a) Any significant adverse effects on the landscape quality for which the area has been designated are clearly outweighed by social, economic or environmental benefits of community wide importance; b) The proposal is supported by a landscape and visual impact assessment and has taken account of the content of any relevant Argyll and Bute Landscape Capacity Assessment; and c) The location, scale, design, materials and landscaping would be of a high standard and would safeguard or enhance the special qualities and character of the Local Landscape Area*".

Policy 72 – Development Impact on Areas of Wild Land

This policy outlines that Argyll and Bute Local Authority will resist proposed development within WLAs other than if the development meets renewable energy targets or is for small scale development directly linked to a rural business or croft or is required to support a fragile community in a rural area.

The policy sets out that if a development is located within an area of Wild Land, then a wild land impact assessment must accompany the application. This would include how "*design, siting, or other mitigation measures have been and will be used to minimise significant impacts on the qualities of the wild land, as well as any management and monitoring arrangements where appropriate*".

Policy 77 – Forestry, Woodland, and Trees

This policy sets out that: "*There is a strong presumption in favour of protecting our woodland resources. Particular care will be taken to ensure that ancient semi-natural woodland, native or long-established woods (including Atlantic Oakwoods), hedgerows and individual trees (including veteran trees) of high nature conservation value are safeguarded, conserved and, where possible, enhanced. Removal of woodland resources will only be permitted where it would achieve significant and clearly defined additional public benefits. These benefits will be secured by attaching a planning condition or by requiring a developer to enter into a planning obligation. Where woodland, hedgerows or individual trees are removed in association with development, adequate provision must be made for the planting of new woodland resources, including compensatory planting in accordance with the sequential approach set out in Policy 78 – Woodland Removal. Mitigation will be required where a development proposal would sever or impair connectivity between important woodland habitats*."

Policy 78 – Woodland Removal

This policy sets out that: "*Proposals that would involve the removal of woodland resources will be assessed against the criteria for determining the acceptability of woodland removal, as explained in Annex C of the Scottish Government's Control of Woodland Removal Policy. Where this assessment concludes that compensatory planting would be appropriate, developers will need to provide for this in accordance with the advice in Annex 5 of the Scottish Government's Control of Woodland Removal Policy: implementation guidance, published February 2019, and the Argyll and Bute Woodland and Forestry Strategy. All agreed compensatory planting will be located in accordance with the following sequential approach: i) On-site (most preferable); ii) Off-site within Argyll and Bute, or iii) Elsewhere within Scotland (least preferable*)."

5.3 Consultation

Consultation with stakeholders relating to the LVIA is summarised within *Table 5.2 Summary of Consultation* below. This includes reference to consultation with NatureScot and Argyll and Bute Council.

Table 5.2 Summary of Consultation

Consultee	Key Issue	Summary of Response	Action Taken
NatureScot	Wild Land Areas	Date: 17/07/2023 Agreement that Wild Land Area 06 Ben Lui is scoped out of the assessment. Agreement that an appreciation of any potential change to the relevant special qualities will be considered as part of the landscape assessment for Wild Land Area 09 Loch Etive Mountains.	Updated scope of assessment regarding the Wild Land Areas, refer to *Table 5.5 Landscape Assessment Scope.*
NatureScot	Representative viewpoints, Zone of Theoretical Visibility Figures and visualisations	Date: 17/07/2023 Content with representative viewpoints. Request for a Zone of Theoretical Visibility Plan for the Headpond Embankments and a Zone of Theoretical Visibility Plan for the Access Tracks. Request that the visualisations show the minimum and maximum water levels of the Headpond given that this will fluctuate and expose the drawdown area.	Additional Zone of Theoretical Visibility Plans for the Headpond Embankments and Access Tracks. Where relevant, visualisations will show the minimum and maximum water levels of the Headpond. As the design has developed, two additional viewpoints (18 and 19) were included to account for the potential visual effects during the construction of the Marine Facility during the Development construction phase assessment.
Argyll and Bute Council and NatureScot	Representative viewpoints	Date: 3/03/2023 In addition to the 11 viewpoints presented at the Scoping stage, six additional viewpoints have been suggested by Argyll and Bute Council and NatureScot. The additional viewpoints have been selected to represent views from Wild Land Areas and other places of interest within the landscape, including from open water on Loch Awe.	Six additional viewpoints added to representative viewpoints, refer to *Table 5.6 Representative Viewpoints.*

5.4 Study Area

A Study Area of 20 km from the Headpond part of the Development has been identified for the LVIA in order to establish the baseline and anticipated limit of significant landscape and visual effects. The Study Area shown on *Volume 3 Figures, Figure 5.1 Topography to Volume 3 Figures, Figure 5.8 Cumulative Schemes and Operational Zone of Theoretical Visibility* has been derived from a review of maps and aerial photographs as well as on-site appraisal and analysis. Occasional reference may be made to features beyond the defined Study Area where required. Landscape and visual effects beyond 20 km have been scoped out as they are unlikely to be significant.

5.5 Methods

The following section summarises the methodology for the LVIA which builds on the general assessment methodology presented in *Volume 2 Main Report, Chapter 4: Approach to EIA*. For clarity and in accordance with good practice, the assessment of potential effects on landscape character and visual amenity, although closely related, are undertaken separately.

5.5.1 Guidance and Standards

The LVIA has been undertaken using the following best practice guidance:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) (Ref 5);
- Assessing the cumulative landscape and visual impact of onshore wind energy developments (Ref 6);
- Guide to Hydro Construction Good Practice (Ref 7);
- Assessing Impacts on Wild Land Areas (Ref 8);
- Assessing landscape value outside national designations, Technical Guidance Note 02/21 (Ref 9);
- Hydroelectric Schemes and the Natural Heritage (Ref 10); and
- Visual representation of Development Proposals, Technical Guidance Note 06/19 (Ref 11).

GLVIA3 places a strong emphasis on the importance of professional judgement in identifying and defining the significance of landscape and visual effects. The LVIA has been undertaken by Chartered Landscape Architects who are experienced in undertaking and reporting assessments of similar types of projects. Professional judgement has been used in combination with structured methods and criteria to determine the sensitivity of landscape and visual receptors (informed by their value and susceptibility to change), the magnitude of effects on those receptors (i.e. the nature of the effect), and the significance of effects.

The method for the production of visualisations which support the completion of the assessment is set out in *Volume 5 Appendices, Appendix 5.1 Landscape and Visual Methodology.*

5.5.2 Assessment Scope

The assessment considers the effects during the three phases of the Development lifespan as identified in *Volume 2 Main Report, Chapter 2: Project and Site Description*. The phases include pre-construction, construction, and operation.

The construction phase of works falls into two phases, pre-construction and construction. For the purposes of the LVIA, impacts associated with the two phases are considered as a single construction phase of works with sequenced activities extending over the seven-year construction period.

For the different parts of the Development, there are times within the construction phase where the presence of plant, movement of material and construction works would be heightened, as summarised below. The detailed construction programme can be referred to within *Volume 2 Main Report, Chapter 2: Project and Site Description*. The overall construction period is expected to span up to seven years, however the more intensive periods are as follows:

- Headpond construction: short-term (four years);
- Northern Access Track to the Headpond construction and movement of material: short-term (four years);
- Southern Access Track to the Headpond and movement of material: short-term (four years) (noting that this would only include movement of material as the track would already be constructed if being used (constructed as part of the Blarghour Wind Farm project));
- Access Track construction and movement of plant between the Tailpond and Headpond: short-term (four years);
- Tailpond construction: short-term (four years);
- Marine Facility construction, operation and demobilising: medium-term, the Marine Facility would be demobilised at the end of the seven-year construction period however the most intensive period of use would be over the first four years;
- Inland Access Tracks near to Marine Facility construction and movement of material: short-term (four years as the most intensive period of use for the Marine Facility would be within the first four years); and
- Above ground tunnel portals construction – short-term (three years).

Landscape and visual effects can differ from one stage of the Development to the next and change over time as mitigation planting establishes and matures. The assessment therefore considers potential effects of the Development at each of the following stages:

- Construction: including consideration of all temporary structures and works areas relating to construction, such as temporary Construction Compounds, lay-down areas, cofferdam within Loch Awe and the movement of plant and machinery, construction, operation, and demobilisation of the Marine Facility on Loch Fyne.
- Operation Year 1: including consideration of potential effects associated with the Development following completion of the construction phase and associated reinstatement. This stage is intended to represent the potential worst-case operational effects prior to establishment of mitigation planting.
- Operation Year 15: including consideration of potential longer-term effects of the Development 15 years after becoming operational. This stage is intended to help demonstrate how proposed mitigation planting will influence effects once established.

Decommissioning of PSH schemes is extremely rare and in the unlikely event that the Development was to be decommissioned, the Headpond would remain in situ. As a result, potential effects on the landscape and visual resource during decommissioning would be no worse than those assessed during the construction and operational phases of works. Decommissioning effects are therefore not considered further in this chapter.

5.5.3 Baseline Data Collection

Field work was undertaken by Chartered Landscape Architects within summer and autumn 2023 to inform the iterative design process, assess the existing character of the landscape and visit representative viewpoints. This was carried out between 10th and 13th July 2023 and between 16th and 17th November 2023. Seasonal differences are taken into consideration within the LVIA, and the operational year 1 assessment on landscape character and visual amenity reports the worst-case scenario when broadleaf vegetation would not be in leaf.

Viewpoint photography was captured within April 2022, June 2023, September 2023 and November 2023.

Data sources that have been used to inform the baseline data gathering include but are not limited to the following:

- Planning policy and local plan evidence base documents;
- Published landscape character documents;
- Ordnance survey mapping;
- ZTV mapping;
- Aerial photography; and
- Fieldwork photography.

5.5.4 Assessment Methodology

A full explanation of the LVIA method and criteria used to assess sensitivity, magnitude of effect and classification of landscape and visual effects is included in *Volume 5 Appendices, Appendix 5.1 Landscape and Visual Methodology.*

5.5.4.1 Summary of Landscape Assessment Methodology

In assessing and classifying the predicted effects from any likely impacts to the landscape resulting from the Development, the following criteria are considered:

- Landscape character baseline characteristics;
- Landscape sensitivity;
- Magnitude of landscape effects; and
- Resulting significance of landscape effects.

Landscape receptors are described as components of the landscape that are likely to be affected by the Development. These can include overall character and key characteristics, individual elements or features and specific aesthetic or perceptual aspects.

The relationship between sensitivity and magnitude of effect allows an assessment of the relative significance of predicted landscape effects to be made. The sensitivity of the landscape to change is a combination of the value of the LCT combined with the degree to which a particular LCT or feature can accommodate changes or new features, without unacceptable detrimental effects to its key characteristics.

The magnitude of landscape effect relates to the size, extent or degree of change likely to be experienced as a result of the Development. The magnitude takes into account whether there is a physical change resulting in the loss of landscape components, or a change beyond the land-take of the Development that might have an effect on the character of the area, and whether the impact is permanent or temporary.

The combination of the sensitivity of the landscape receptor and the magnitude of landscape effect determines the significance of landscape effects. For the purposes of this assessment, moderate and major effects will be deemed 'significant'. Where significant environmental effects are identified, measures to mitigate these effects are proposed (where feasible) and remaining residual effects are identified.

5.5.4.2 Summary of Visual Assessment Methodology

The assessment of visual effects is structured by receptor groups (e.g. residential, recreational and road users). Individual receptors are identified through the analysis of the ZTV, within which views of the Development are likely to be possible, and field survey.

Individuals are subsequently categorised into receptor groups within different areas and representative viewpoints are selected. Views from each identified representative viewpoint are recorded, considering the receptor type, a baseline description of the existing views and the value of the view.

For the purposes of assessment, the sensitivity of a receptor and the magnitude of effect on that receptor are combined to determine the significance of effect that the Development is predicted to have on existing baseline visual conditions for that given receptor.

5.5.5 Limitations And Assumptions

Regarding limitations, no technical difficulties or practical problems were encountered in producing the landscape and visual assessment. Fieldwork to inform the design process and assessment of the Development was undertaken in variable weather with moderate visibility, however, photographs used to inform the assessment were taken with good visibility.

The assessment has been undertaken based on the worst-case scenario of the Development. This includes the maximum heights and footprints of the various component parts of the Development.

5.6 Baseline Environment

An overview of the current baseline conditions for landscape and visual amenity is outlined in this section. The baseline provides a description of the relevant aspects of the current state of the environment that may be affected. In line with GLVIA3, the visual baseline therefore establishes the *"area in which the development may be visible"* (page 32) in order to define the relevant aspects of the current landscape and visual environment of the Study Area.

5.6.1 Landscape Baseline

5.6.1.1 Location and Landform

The Development Site is located within the Argyll and Bute Council area and is split into three separate parts, two of which are located immediately adjacent to the town of Inveraray, as shown on *Volume 3 Figures, Figure 2.3, Above Ground Infrastructure.* The land within the application boundary is characterised predominantly by a craggy upland and plateau moor and forest landscape. The wider landscape setting includes a rocky coastland, upland glens and steep ridges and mountains.

Loch Awe forms the boundary of the central part of the Development Site and Loch Fyne lies immediately to the south, both with a very small section extending into the lochs. Beyond these lochs there are areas of higher ground to the north and north-east which are characterised by craggy uplands and remote rugged mountains. The proposed Headpond location at Lochan Airigh sits at approximately 360 m above ordnance datum (AOD) and lies approximately 3 km to the east of the village of Balliemeanoch. The proposed temporary Marine Facility is located south of Inveraray off the A83. The Development Site is predominantly located within the catchment of the Allt Beochlich watercourse. The catchment consists of several watercourses which ultimately flow into Loch Awe, these originate from smaller Lochs (including Airigh, Dubh and Romach). Topography is shown on *Volume 3 Figures, Figure 5.1, Topography.*

5.6.1.2 Movement and Connectivity

There are several A roads within the Study Area and near to the Development Site. This includes the A819, which runs northwards from Inveraray towards Dalmally and lies adjacent to the Development Site, as well as the A83, which lies adjacent to the shoreline of Loch Fyne and lies partially within the Development Site near to the site of the temporary Marine Facility. The B840 follows the loch shore of Loch Awe and lies within the Development Site, including near the site of the proposed Tailpond. The wider Study Area is served by various smaller B and C roads. The West Highland Line railway line also crosses the Study Area in two locations, in the northern and south-eastern parts.

Several core paths traverse the Study Area and are predominantly concentrated in the western part of the Study Area. Two core paths cross the Development Site, including one (C203 – Bealach an Fhuarain, Inveraray) to the north of the Tailpond, partially along Upper Avenue, and another one (C201 – Dun Na Cuaiche, Inveraray) crossing an Access Track upgrade between the A83 and A819 to the north of Inveraray. Two recreational routes pass across the Study Area, including the Loch Lomond and Cowal Way which lies within the eastern part of the Study Area on the opposite side of Loch Fyne to the Development Site and a small part of the Three Lochs Way in the south-eastern part of the Study Area.

There is a network of local paths across the Study Area and Development Site, including through plantation forest, along the loch shores and in and around Inveraray, as shown on the Scottish Record of Walking Routes, as well as heritage paths which are historic (yet still existing) public rights of way. The Caledonia Way, a promoted cycle route, also passes through the northern side of Loch Awe predominantly in forestry. Loch Fyne is regularly used for recreational purposes, including private boats, however, this is less common on Loch Awe. Visual receptors and the nature of views from them are covered in detail in the visual baseline.

5.6.1.3 Land Use, Built Form and Vegetation

The land use within the Development Site comprises a mixture of lowland grazing fields and commercial coniferous plantation. Forestry operations including felling are commonplace within the Study Area. Inveraray is the most notable settlement within the Study Area. Other relevant small settlements within the Study Area include Inverinan, Dalavich and Balliemeanoch. In addition, there are numerous farmsteads and standalone residential properties scattered throughout the landscape, which are accessed from a network of minor roads.

The Development Site is predominantly comprised of upland moorland where vegetation cover is dominated by bog. Occasional linear belts of broadleaf woodland and clusters of established trees are concentrated on the lower slopes of glens and watercourses. The Development Site includes more substantial linear belts of woodland glens which rise from the loch shore, the condition of which is established and includes ancient woodland. The Development Site also contains pockets of plantation forest. Plantation forest is at various stages of maturity and subject to woodland management plans. The following felling plans (*Volume 3 Figures, Figure 5.4.4, Felling Plan*) have been obtained:

- Three Bridges – which comprises the area of plantation forest where the southern Access Track to the Headpond passes through to the northwest of Inveraray and west of the A819.
- Upper Sonachan Keppochan E Claddich – which comprises several areas of plantation to the northeast of the Headpond, which the northern Access Track to the Headpond passes through, this includes Keppochan, Upper Sonachan and Keppochan East & Tullich.
- Argyll Estates – which comprises the area of forestry plantation surrounding Inveraray and where the two inland Access Tracks near to the Marine Facility.

Where plantation forest and its current condition varies, it has informed the description and value judgements for the Landscape Character Types.

5.6.2 Zone of Theoretical Visibility

The landscape and visual baseline is largely defined by the ZTVs. The ZTVs identify those areas that have the potential to experience views of the Development and are illustrated on the following figures:

- Volume 3, Figure 5.2A Zone of Theoretical Visibility – Headpond and Embankments;
- Volume 3, Figure 5.2B Zone of Theoretical Visibility – Permanent Compounds and Inlet Outlet;

- Volume 3, Figure 5.2C Zone of Theoretical Visibility – Permanent Tracks;
- Volume 3, Figure 5.2D Zone of Theoretical Visibility – Operational Elements Combined; and
- Volume 3, Figure 5.2E Zone of Theoretical Visibility – Operational Elements Combined and Permanent Tracks.

ZTVs show the area in which the Development would theoretically be visible, highlighting the locations where people may experience views of the Development and assisting in the identification of viewpoints in those locations that may be affected. The ZTV parameters and limitations are detailed below:

- The ZTV is based on a bare earth ground model, generated using Ordnance Survey (OS) Terrain 5, which is a 5 m grid resolution terrain model and does not take into account the screening effects of vegetation, buildings or other structures;
- Some areas of theoretical visibility may comprise woodland, moorland, or agricultural land, where there is effectively no public access and the likelihood of views being experienced is consequently low;
- The ZTV does not take account of the likely orientation of a viewer, such as the direction of travel and there is no allowance for reduction of visibility with distance, weather, or light;
- Headpond Embankments (Figure 5.2A): The ZTV is based upon a series of points along the Embankment spaced approximately 50 m apart with elevations with an observer eye height of 1.6 m; and
- Permanent Access Tracks (Figure 5.2D): The ZTV is based upon a series of points along the permanent Access Tracks with 2 m high vehicles at 50 m intervals.

The following table outlines the maximum height parameter assumptions used within the ZTV maps.

Table 5.3 ZTV maximum height assumptions

Feature	Height (m)	Location of Maximum Elevation on Feature
Inlet / Outlet Screen	5.84	4 m spacing on model
PC03 Gatehouses	4	Corners of structures
PC03 Site Office & Welfare Facilities	5	Corners of structures
PC09 Building	5	Corners of structure and mid between
PC05, PC06 & PC14 Tunnel Portals	0.1	2 m spacing edge of model
PC15 Switchgear	8 - 12	Highest points of each structure from model
PC15 Buildings	5	Corners of structure
PC17 Gatehouse	10	Corners of structure and mid between
PC18 Upper Surge Shaft Structure	10	Corners of structure
PC19 Upper Ventilation Structure	4	Corners of structure
Security Fences	2.4	20 m intervals
Plant & Equipment Sheds	4	Corners of structure(s)

These limitations mean that the ZTV maps tend to overestimate the extent of the visibility, both in terms of the area from which the Development is visible and the extent of the Development which is visible. It should be considered as a tool to assist in assessing the theoretical visibility of the Development and not a measure of the visual effect.

It should be noted that the southern Access Track leading to the Headpond across the craggy upland would be constructed as part of the Blarghour Wind Farm development and only utilised for the Development, without any further amendments, if the wind farm is built and the necessary land rights secured. The southern Access Track is therefore not included in the ZTVs.

Table 5.4 Zone of Theoretical Visibility Baseline below outlines the parts of the Development which ZTVs have been produced for as well as a brief description of the extent of theoretical visibility across the Study Area.

Table 5.4 Zone of Theoretical Visibility Baseline

Zone of Theoretical Visibility	Part of Development included	Brief description of the extent of theoretical visibility	Figure reference
Headpond and Embankments	All permanent aspects of the Headpond: Embankment 1, Embankment 2 and the Headpond waterbody	The extent of the theoretical visibility of the two Headpond Embankments and Waterbody is broadly limited to the northern, western and south-western parts of the Study Area. The majority of theoretical visibility lies within 10 km of the Development. Specifically relating to Headpond Embankment 1, theoretical visibility is predominantly located to the west and south-west of the Development and the higher parts of the rugged mountain landscape further north. Specifically relating to Headpond Embankment 2, theoretical visibility is predominantly located to the north of the Development. There are several very small pockets of theoretical visibility in which the Headpond waterbody is visible, but the Embankments are not. Specifically relating to where both Headpond Embankments and the waterbody are visible, this is generally limited to within 10 km of the Development. This is located in areas immediate landscape around the Headpond, within the craggy upland, the higher parts of the rugged mountain landscape further north, and pockets of higher land to the west and southwest of the Development including near to Durran and Bragleenmore. There is no theoretical visibility to the east of the Development beyond Cruach Mhor area as the land falls in this direction.	*Volume 3, Figure 5.2A Zone of Theoretical Visibility – Headpond and Embankments*
Tailpond and Permanent Compounds	All permanent aspects of the Tailpond infrastructure including the inlet / outlet structure and permanent compounds.	The extent of the theoretical visibility of the permanent Tailpond infrastructure and permanent compounds is broadly limited to the northern, western and south-western parts of the Study Area. This includes part of the rugged mountain landscape further north as well parts of the rocky coastland and craggy upland. The theoretical visibility is highly concentrated within the 10 km buffer of the Development, notably to the north, west and south.	*Volume 3, Figure 5.2B Zone of Theoretical Visibility – Permanent Compounds and Inlet Outlet*
Permanent Access Tracks	All permanent Access Tracks including new Access Tracks, construction tracks, existing tracks to be upgraded and Wind Farm Access Tracks.	The extent of the theoretical visibility of the permanent tracks is spread across the Study Area, however, is largely concentrated within 10 km of the Development. As well as this area, theoretical visibility extends into the rugged mountain landscape further north as well as the rocky coastland, craggy upland, plateau moor and forest and steep ridges and mountains. There are specific areas where only the Wind Farm Access Tracks are theoretically visible to the south and east of the higher point in the landform at Cruach Mhor. There is a small pocket of land where only the construction tracks are theoretically visible to the west and north-west of Balliemeanoch in close proximity to the Development. There are small pockets where only the existing tracks to be upgraded would be theoretically visible, predominantly to the east of the Development on either side of the A819, around	*Volume 3, Figure 5.2C Zone of Theoretical Visibility – Permanent Tracks*

Zone of Theoretical Visibility	Part of Development included	Brief description of the extent of theoretical visibility	Figure reference
		Inveraray and further south outside of the 10 km buffer. There are also small pockets where only the new Access Tracks would be theoretical, however these are very small and typically located outside of the 10 km buffer.	
Operational Elements Combined	All permanent operational aspects including the permanent compounds, Tailpond inlet / outlet structure, Headpond Embankments 1 and 2 and Headpond Waterbody. Excluding permanent Access Tracks.	The extent of theoretical visibility of the operational elements combined is broadly limited to the northern, western and south-western parts of the Study Area. This includes part of the rugged mountain landscape further north as well parts of the rocky coastland and craggy upland. The theoretical visibility is highly concentrated within the 10 km buffer of the Development, notably to the north, west and south.	*Volume 3, Figure 5.2D Zone of Theoretical Visibility – Operational Elements Combined*
Operational Elements Combined and Permanent Tracks	All permanent operational aspects including the permanent compounds, Tailpond inlet / outlet structure, Headpond Embankments 1 and 2, Headpond Waterbody and permanent Access Tracks.	The extent of theoretical visibility of the operational elements combined along with the permanent tracks is spread across the Study Area, however, is largely concentrated within 10 km of the Development. As well as this area, theoretical visibility extends into the rugged mountain landscape further north as well as the rocky coastland, craggy upland, plateau moor and forest and steep ridges and mountains. There are specific areas where only the existing tracks to be upgraded would be theoretically visible, including within the town of Inveraray and small pockets within predominantly the central, north-eastern and south-eastern parts of the Study Area including outside of the 10 km buffer.	*Volume 3, Figure 5.2E Zone of Theoretical Visibility – Operational Elements Combined and Permanent Tracks*

The theoretical visibility for the different elements of the scheme is shown on *Volume 3 Figures, Figures 5.2 A-E.* The theoretical visibility is varied dependent on the project elements but is generally concentrated within the 10 km buffer of the Development. The theoretical visibility is broadly limited to the northern, western and south-western parts of the Study Area for the Headpond and Tailpond permanent infrastructure, as well as the permanent compounds. The Headpond permanent infrastructure alone has less theoretical visibility than when combined with the Tailpond permanent infrastructure and the permanent compounds. This includes less theoretical visibility predominantly within the 10 km buffer, including to the east of the A819, within the Development Boundary and on the northern shore of Loch Awe.

There is comparatively more theoretical visibility when the new Access Tracks are included in the ZTVs and this is spread across the Study Area, however, is largely concentrated within 10 km of the Development. The theoretical visibility is similar in the northern, western and south-western parts of the Study Area to those ZTVs including the Headpond, Tailpond and permanent compounds. However, there is considerably more theoretical visibility in the central, eastern and south-eastern parts of the Study Area for the new Access Tracks. This includes to the east of the A819 and to the east of Inveraray and to the south of Loch Fyne.

5.6.3 Landscape Assessment Scope

The landscape receptors included within the Study Area are outlined in *Table 5.5 Landscape Assessment Scope* below with further information on inclusion and exclusion within the Landscape Assessment (refer to *Volume 5 Appendices, Appendix 5.2 Landscape Assessment*). A rationale is also included for explanation.

An appraisal of potential changes to the relevant key attributes and special qualities of WLA 09 Loch Etive Mountains is also included within *Volume 5 Appendices, Appendix 5.2 Landscape Assessment.*

Table 5.5 Landscape Assessment Scope

Receptor	Within Loch Lomond and The Trossachs National Park (in Study Area)	Within Wild Land Area (in Study Area)	Inclusion or exclusion of landscape assessment	Rationale for inclusion or exclusion
Loch Lomond and The Trossachs National Park	Yes	Yes – Ben Lui	Excluded	Unlikely for significant effects on the special landscape qualities of the National Park or its setting due to a lack of intervisibility.
Inveraray Castle GDL	No	No	Included	Potential for significant effects on the designed landscape due to proximity and intervisibility with the Development.
Ardkinglas and Strone GDL	No	No	Included	Potential for significant effects on the designed landscape due to proximity and intervisibility with the Development.
Ardanaiseig House GDL	No	No	Included	Potential for significant effects on the designed landscape due to proximity and intervisibility with the Development.
Crarae GDL	No	No	Excluded	Unlikely for significant effects on the designed landscape due to distance and a lack of intervisibility.
Achnacloich GDL	No	No	Excluded	Unlikely for significant effects on the designed landscape due to distance and a lack of intervisibility.
Ardchattan Priory GDL	No	No	Excluded	Unlikely for significant effects on the designed landscape due to distance and a lack of intervisibility.
North Argyll LLA	No	Yes – Ben Lui and Loch Etive Mountains	Included	Potential for significant effects on the landscape qualities due to proximity and intervisibility with the Development.
West Loch Fyne (Coast) LLA	No	No	Included	Potential for significant effects on the landscape qualities due to proximity and intervisibility with the Development.
East Loch Fyne (Coast) LLA	No	No	Included	Potential for significant effects on the landscape qualities due to proximity and intervisibility with the Development.
Knapdale / Melfort LLA	No	No	Excluded	Unlikely for significant effects on the landscape qualities due to distance and a lack of intervisibility.
North West Argyll (Coast) LLA	No	No	Excluded	Unlikely for significant effects on the landscape qualities due to distance and a lack of intervisibility.
LCT 34: Steep Ridges and Mountains	No	Yes – Ben Lui	Included	Potential for significant effects on the key characteristics due to proximity and intervisibility with the Development.
LCT 35: Rugged Mountains	No	Yes – Ben Lui and Loch Etive Mountains	Included	Potential for significant effects on the key characteristics due to proximity and intervisibility with the Development.
LCT 37: Upland Glens – Argyll	No	No	Included	Potential for significant effects on the key characteristics due to proximity and intervisibility with the Development.

Receptor	Within Loch Lomond and The Trossachs National Park (in Study Area)	Within Wild Land Area (in Study Area)	Inclusion or exclusion of landscape assessment	Rationale for inclusion or exclusion
LCT 39: Plateau Moor and Forest – Argyll	No	No	Included	Potential for significant effects on the key characteristics due to proximity and intervisibility with the Development.
LCT 40: Craggy Upland – Argyll	No	Yes – Ben Lui	Included	Potential for significant effects on the key characteristics due to proximity and intervisibility with the Development.
LCT 43: Upland Parallel Ridges – Argyll	No	No	Excluded	Unlikely for significant effects on the key characteristics due to distance and a lack of intervisibility.
LCT 53: Rocky Coastland – Argyll	**No**	**No**	**Included**	**Potential for significant effects on the key characteristics due to proximity and intervisibility with the Development.**
LCT 57: Craggy Coast and Islands	No	No	Excluded	Unlikely for significant effects on the key characteristics due to distance and a lack of intervisibility.
LCT 250: Steep Ridges and Hills	Yes	No	Excluded	Unlikely for significant effects on the key characteristics due to distance and a lack of intervisibility.
LCT 251: Highland Summits	Yes	Yes – Ben Lui	Excluded	Unlikely for significant effects on the key characteristics due to distance and a lack of intervisibility.
LCT 252: Upland Glens – Loch Lomond and the Trossachs	Yes	No	Excluded	Unlikely for significant effects on the key characteristics due to distance and a lack of intervisibility.
LCT 253: Straths and Glens	Yes	No	Excluded	Unlikely for significant effects on the key characteristics due to distance and a lack of intervisibility.
LCT 265: Settled Coastal Fringe	Yes	No	Excluded	Unlikely for significant effects on the key characteristics due to distance and a lack of intervisibility.

5.6.4 Landscape Designations

The landscape of certain parts of the Study Area have been designated or defined due to their scenic qualities or historic landscape qualities as shown on *Volume 3 Figures, Figure 5.4 Landscape Designations and Operational Zone of Theoretical Visibility.* The ZTVs have been used to identify landscape designations and defined areas within the Study Area that may have visibility of the Development. Any designations and defined areas that are not within the ZTVs are scoped out of the LVIA and are not included within the baseline section as there is no potential for the Development to result in effects on receptors outside the ZTVs.

5.6.4.1 Inveraray Castle GDL

Inveraray Castle GDL encompasses part of the Development Site near to Inveraray. The GDL is located within North Argyll LLA and West Loch Fyne (Coast) LLA. There are several local paths and core paths through the GDL.

Inveraray Castle GDL is a designed estate landscape with Inveraray Castle as its focal point incorporating an 18th century improvement landscape (parklands, garden buildings and vast woodland plantations) and the planned town of Inveraray. Inveraray GDL provides the setting for over one hundred listed buildings, with many listed buildings ancillary to the castle, and is described as one of the most culturally significant designed landscapes in Scotland.

The focal point of the designed landscape is Inveraray Castle, located at the mouth of the River Aray on the north-western shores of Loch Fyne. The planned town of Inveraray is located 600 m north-west of the castle. The GDL has an outstanding nature conservation value. Three fingers of naturally low-lying land extend outward from the castle. These low-lying areas form the parklands and pastures of the designed landscape. Loch Fyne, one of Scotland's largest sea-lochs, borders the designed landscape to the southeast. The boundary of the Inveraray GDL broadly follows the sloping contours of plantation surrounding these three flatland areas including Ballantyre Wood, Brackley Wood, Dub-Loch Wood and the plantations at Sron-ghabh and Tom-breac. The Woodlands, covering more than four thousand acres, are a key component of the landscape intervention.

To the north-west of Inveraray Castle, within the GDL, Dun Na Cuaiche (the hill of the cup) and the watchtower on its summit, are key in the local topography and contribute to the overall experience of the designed landscape. Viewpoints include the introductory view of the town from the Garron Bridge at the mouth of Glen Shira and the view of the town and castle simultaneously from the Aray Bridge. Key views across the designed landscape are from the watchtower at the summit of Dun Na Cuaiche, including elevated views of the castle, town, parklands and plantations with the loch, moorland and mountains of Argyll forming the wider backdrop. Long-range views include the hills of Strachur and Cruach-nan-Capull and the A815 road along the opposite side of Loch Fyne.

The landscape value of Inveraray Castle GDL is deemed to be **Very High**.

5.6.4.2 Ardkinglas and Strone GDL

Ardkinglas and Strone GDL is located within the Study Area on the southern side of Loch Fyne. The GDL is located within the North Argyll LLA. There are several local paths through the GDL.

Ardkinglas and Strone GDL is of outstanding horticultural interest for its woodland garden collections. As well as mixed woodland, the GDL consists of large specimen trees, historic buildings (including Ardkinglas House), areas of parkland and formal gardens. The woodlands include a series of woodland trails. Ardkinglas House is located on a terrace overlooking Loch Fyne, with its gardens, estate buildings and parks on the surrounding flat ground. Woodlands extend along the shore to the southwest, up onto the higher ground behind Ardkinglas House, and either side of the deeply incised Kinglas Water, which flows into Loch Fyne at Cairndow.

In views across and along Loch Fyne, the extensive woodlands and parkland are an important scenic element of the Ardkinglas and Strone GDL, with the canopy and large specimen trees providing visual contrast with the adjacent surrounding uplands. There are also views south over Loch Fyne from the various woodland trails within the GDL.

The landscape value of Ardkinglas and Strone GDL is deemed to be **Very High**.

5.6.4.3 Ardanaiseig House GDL

Ardanaiseig House GDL is located within the Study Area on the western side of Loch Awe. The GDL is located within the North Argyll LLA. A minor road and woodlands form the northern and southern boundaries of Ardanaiseig House GDL. The GDL is an 18th century designed landscape at the lochside comprising mainly woodland, walled gardens, parkland and architectural features. The gardens contain a notable collection of trees and shrubs. The GDL includes built form, including Ardanaiseig House which has framed views of Loch Awe through shelter woodlands and a loch side timber structure.

There are extensive panoramas of the upland scenery from various locations, especially to Ben Cruachan and east across Loch Awe to Ben Lui. There are several local walks through the woodlands.

The landscape value of Ardanaiseig House GDL is deemed to be **Very High**.

5.6.4.4 Local Landscape Areas (LLAs)

LDP2 identifies a suite of LLAs (formerly known as Areas of Panoramic Quality) as areas of regional importance in terms of their landscape quality. There are no descriptions of the LLAs or the defining characteristic within LDP2, but it does note that they are important for "*their physical landforms and scenic value, but also for the environmental assets that they represent*". A combination of field survey and the Argyll and Bute Landscape Wind Energy Capacity Study (**Ref 12**) has been used to inform landscape value.

There are five LLAs within the Study Area as listed below and shown on *Volume 3 Figures, Figure 5.4 Landscape Designations and Operational Zone of Theoretical Visibility.* Those LLAs that are scoped into the landscape assessment include a description and landscape value judgement, those scoped out are explained in *Table 5.5 Landscape Assessment Scope.*

- North Argyll LLA;

- West Loch Fyne (Coast) LLA;
- East Loch Fyne (Coast) LLA;
- Knapdale / Melfort LLA; and
- North West Argyll (Coast) LLA.

North Argyll LLA

The LLA is located within the northern, eastern and south-eastern parts of the Study Area.

Within the Study Area, the LLA spans several LCTs, including the rugged mountains comprising the summits of Ben Cruachan and Ben Lui, which fall towards the craggy coast and islands and craggy upland, upland glens and finally the rocky coastland. The LLA also includes the northern part of Loch Awe and lies adjacent to the boundary of Loch Fyne. There are dramatic, panoramic outward views available from the higher parts of the LAA, including Ben Cruachan, across this varied landscape of forestry plantations and open moorland with sparse built form, pockets of woodland vegetation including along glens, mature loch side vegetation and open water expanses of the lochs. There are views of wind turbines and overhead power lines which run through the LLA.

The LLA is located within the Inveraray GDL, Ardkinglas and Strone GDL, Ardanaiseig House GDL, Ben Lui WLA and Loch Etive Mountains WLA. Despite some detracting features in the landscape, there is high scenic quality, sense of identity, wildness and tranquillity, cultural and natural heritage value and recreational opportunities. Taking all of this into account, the landscape value of this LLA in the Study Area is deemed to be **Very High**.

West Loch Fyne (Coast) LLA

The LLA is located within the central and southern part of the Study Area.

Within the Study Area, the LLA is located within two LCTs, comprising the plateau moor and forest and rocky coastland. The LLA has outward views towards expansive upland landscapes, including the rugged mountains which forms a backdrop to views. Where views are restricted by landform and woodland, outward views are focused on opposite loch shores. The LLA comprises recreational opportunities and is relatively more settled and farmed than the upland landscapes. There are detracting features including transport routes alongside lochs and views of forestry plantation, overhead lines and wind farms.

The LLA is located within the Inveraray GDL and Crarae GDL. Despite some detracting features in the landscape, there is high scenic quality, cultural and natural heritage value and recreational opportunities. Taking all of this into account, the landscape value of this LLA in the Study Area is deemed to be **High**.

East Loch Fyne (Coast) LLA

The LLA is located within the central and southern part of the Study Area.

Within the Study Area, the LLA is located within several LCTs, comprising the steep ridges and mountains, rocky coastland and plateau moor and forest. The LLA has outward views towards expansive upland landscapes, including the rugged mountains which forms a backdrop to views. Where views are restricted by landform and woodland, outward views are focused on opposite loch shores. The LLA comprises recreational opportunities and is relatively more settled and farmed than the upland landscapes. There are detracting features including transport routes alongside lochs and views of plantation forests and wind farms.

The LLA is not located in any other landscape designations within the Study Area. Despite some detracting features in the landscape, there is high scenic quality, natural heritage value and recreational opportunities. Taking all of this into account, the landscape value of this LLA in the Study Area is deemed to be **High**.

5.6.5 Wild Land Areas (WLAs)

WLAs are identified as nationally important in NPF4 but are not covered by a statutory designation. There are two WLAs located within the Study Area.

- WLA 06 Ben Lui; and
- WLA 09 Loch Etive Mountains.

These WLAs are shown on *Volume 3 Figures, Figure 5.3 Wild Land Areas and Operational Zone of Theoretical Visibility.* It has been agreed with NatureScot to scope out potential effects on the special qualities of WLA 06 Ben Lui due to the lack of intervisibility between WLA 06 Ben Lui and the Development Site.

For WLA 09 Loch Etive Mountains, an appreciation of potential effects on the special qualities is included within the landscape assessment as agreed with NatureScot.

5.6.5.1 WLA 09 Loch Etive Mountains

The Loch Etive Mountains WLA is located within the northern part of the Study Area.

The key attributes and qualities of the Loch Etive Mountains WLA are as follows:

- "*Arresting, steep, high mountains with precipitous rocky tops and ridges that offer panoramic views of elevated tops continuing far into the distance.*
- *A series of deep glens carved through the mountains, with arresting side slopes and spectacular geological features that contribute to a strong sense of naturalness.*
- *A high number of visitors that seek different wild land qualities and are able to experience a wide range of remoteness, risk and physical challenge"*.

Other aspects of the published WLA description that are relevant to the Study Area are set out as follows:

- "*The WLA is largely uninhabited, although there are a few isolated estate buildings within some of the glens*".
- "*Land use is used mainly for deer stalking, fishing, woodland, recreation and nature conservation*".
- "*Many people view the WLA from outside its edges*".
- "*Although views into the interior are limited due to the screening effect of the adjacent slopes, it is nonetheless possible to experience some of the wild land qualities of the area, including a perception of naturalness and ruggedness*".
- "*The area is bordered by extensive forest plantations to the south, west and north that create a more obvious edge*".
- "*In combination with evidence of dynamic erosion and weathering processes such as rock falls, this contributes to a strong sense of naturalness*".
- "*It is difficult to see the full profile of the mountains from their tops or bases due to visual foreshortening or landform screening; however, their arresting forms are clearer where seen against an open space*".
- "*The steep glen slopes create dramatic framed views through the landscape, but these also limit visibility in opposite directions*".
- "*Native woodland occurs within some of the glens*".
- "*The trees create shelter within the landscape and contribute to the sense of naturalness. In some places, this is influenced by deer fences that indicate human intervention in grazing regimes and thus diminish the sense of naturalness, as well as appearing as a human artefact*".
- "*The main access routes within and just outside this WLA run through glens. This includes some key infrastructure corridors around the outside containing roads, railway lines and/or power lines that appear as human artefacts, whilst their associated activity and noise diminishes the sense of sanctuary*".
- "*Large forest plantations extend from outside the north, west and southern edges of this WLA, whilst isolated blocks are located within some of the glens within the interior. These diminish the perception of naturalness and represent contemporary land use*".

The landscape value of Loch Etive Mountains WLA is deemed to be **Very High.**

5.6.6 Landscape Character Types

In 2019, NatureScot published national LCTs. The LCTs represent areas of consistent and recognisable landscape character. There are thirteen LCTs within the Study Area as listed below and shown on *Volume 3 Figures, Figure 5.5 Landscape Character Types and Operational Zone of Theoretical Visibility.* Any LCTs that are not within the ZTVs are scoped out of the LVIA and are not included within the baseline section as there is no potential for the Development to result in effects on receptors outside the ZTV. Other LCTs are either scoped into the landscape assessment and include a landscape value judgement or further information is given in *Table 5.5 Landscape Assessment ScopeError! Reference source not found.* as to why the LCT is scoped out of the landscape assessment.

- LCT 34 Steep Ridges and Mountains;
- LCT 35 Rugged Mountains;
- LCT 37 Upland Glens – Argyll;
- LCT 39 Plateau Moor & Forest – Argyll;
- LCT 40 Craggy Upland – Argyll;
- LCT 43 Upper Parallel Ridges – Argyll;
- LCT 53 Rocky Coastland – Argyll;
- LCT 57 Craggy Coast and Islands (not included in the baseline as not within the ZTVs);
- LCT 250 Steep Ridges and Hills;
- LCT 251 Highland Summits;
- LCT 252 Upland Glens – Loch Lomond and the Trossachs (not included in the baseline as not within the ZTVs);
- LCT 253 Straths and Glens; and
- LCT 265 Settled Coastal Fringe.

<u>LCT 34 Steep Ridges and Mountains</u>

This LCT is within the eastern part of the Study Area. The LCT consist of two compartments and occupies much of the land at the head of Loch Fyne. This LCT is characterised as having a strong sense of seclusion where access is predominantly limited to loch side roads. There are several power stations and a few reservoirs and dams located within the LCT and views of onshore wind farms. Dundarave Castle is noted as being a distinctive local landmark and that buildings on the loch shore are often prominent due to being painted white. The key characteristics are as follows:

- "*Dramatic mountain ridges with steep, plummeting slopes and numerous rocky outcrops.*
- *Ribbon lochs and meandering rivers on narrow floodplains form dramatic contrast to surrounding slopes.*
- *Extensive conifer forests on lower slopes and open moorland, with bare rock faces on upper slopes and summits.*
- *Contrast between open land on upper slopes beyond the head dyke, and large fields enclosed by stone walls within lower glens.*
- *Scattered birch woodland alongside burns and on upper slopes and oak woodland on sheltered lower slopes.*
- *Settlement confined to narrow strip along loch edge and concentrated in small bays and at heads of lochs*".

Within the Study Area, the LCT is located within the Ben Lui WLA, the North Argyll LLA, East Loch Fyne (Coast) LLA, Inveraray Castle GDL and Ardkinglas and Strone GDL. Within the Study Area, the LCT also comprises part of the Loch Lomond and Cowal Way and occupies the land just outside the western boundary of the Loch Lomond and the Trossachs National Park. Despite the presence of power stations and onshore wind farms, there is a strong sense of identity, scenic quality, wildness, tranquillity and range of recreational opportunities. Taking all of this into account, the landscape value of this LCT in the Study Area is deemed to be **High**.

<u>LCT 35 Rugged Mountains</u>

This LCT is within the northern and eastern parts of the Study Area. The LCT is located to the north and further east of Loch Awe and is divided in the northern part by Loch Etive. The LCT includes the summit of Ben Cruachan, which forms part of a highly scenic backdrop to more settled landscapes and comprises open moorland. The LCT is described as being an open, exposed landscape and with national importance for nature conservation. The key characteristics are as follows:

- "*Rugged, steep sided mountain ranges with a massive scale.*

- *Diverse landform with gullies, scarp slopes and rocky screes.*
- *Striking exposed rock faces, with scrubby birch-oak woodland in gullies.*
- *Relatively wide glens between mountain ranges.*
- *Fast-flowing burns, waterfalls and small upland lochs are distinctive features.*
- *Extensive conifer forests on some lower slopes.*
- *Inaccessible and relatively uninhabited, with strong wildness qualities.*
- *Dramatic mountain scenery*".

Within the Study Area, the LCT occupies areas within the Ben Lui WLA and Loch Etive Mountains WLA. The LCT has a strong sense of identity, wildness, tranquillity and functional in terms of being a highly scenic backdrop to coastal and settled landscapes which are indicators of high landscape quality and condition. There is also strong recreational value including Walking Routes to summits such as Ben Cruachan. Taking all of this into account, the landscape value of this LCT in the Study Area is deemed to be **Very High**.

<u>LCT 37 Upland Glens – Argyll</u>

There are several compartments of this LCT within the Study Area, one of which borders a very small section of the Development Site at the A82, near Clachan. The LCT typically consist of linear strips of relatively flat land along the floor of narrow glens and is typically of a small-scale which contrast with the surrounding moorland ridges of mountains. There are examples within the Study Area of where the LCT is located near to castles, including Dunderave Castle and Kilchurn Castle. The LCT includes detracting elements such as quarries, substations and overhead transmission lines (OHLs) and runs adjacent to roads, including the A85 and A83. The key characteristics are as follows:

- "*Flat glen floor of narrow, linear mountain glens with a sharp break of slope at glen sides.*
- *Long ribbon lochs in lower glen; glacial moraine creates uneven landform with small, rounded lochs on floor of upper glen.*
- *Mudflats and winding creeks at loch heads and at the mouth of the glen.*
- *Meandering river, fringed with groups of trees, contrasts with rectangular pastures drained by straight ditches.*
- *Small blocks of woodland and some conifer plantations.*
- *Linear settlements strung out along lanes at the foot of the steep side slopes.*
- *Castles and estates are important local landmarks*".

Within the Study Area, the LCT is located within the Inveraray GDL and the North Argyll LLA. Despite some detracting features, including the influence of infrastructure and nearby roads, there are strong cultural associations and sense of identity, the contrast in scale differs from the wider moorland and mountains, and it is served by a range of core paths, recreational pursuits within the wooded glens and upland vantage points. Taking all of this into account, the landscape value of this LCT in the Study Area is deemed to be **High**.

<u>LCT 39 Plateau Moor & Forest – Argyll</u>

This LCT occupies a central part of the Study Area, between Inveraray and Tullich. There are two compartments separated by a narrow band of the Rocky Coastland Argyll LCT along the A819 corridor. The LCT consists of extensive blocks of plantation forest and upland moor with smaller pockets of pasture. Wind farms and an OHL are prominent features within this LCT. The key characteristics are as follows:

- "*Upland plateau with rounded ridges, craggy outcrops and an irregular slope profile.*
- *Upland lochs.*
- *Winding narrow glens and wider glens with rivers.*
- *Extensive, large-scale mosaic of open moorland and forestry.*
- *No field boundaries.*
- *Very few buildings; occasional isolated dwellings on edges of moor.*

- *Small, enclosed pastures and occasional farms and houses on lower hill slopes at the transition with adjacent character types and within the narrow glens which dissect these uplands.*
- *Little access roads follow shorelines*".

Within the Study Area, the LCT is located within the Inveraray GDL, Craeae GDL, East Loch Fyne (Coast) LLA, West Loch Fyne (Coast) LLA and North Argyll LLA. However, the quality and condition of the special landscape qualities associated within these designations are not prevalent within this LCT and Study Area. The LCT includes several core paths. This upland landscape forms the backdrop to Loch Fyne. The large scale nature of plantation, forestry operations and electrical infrastructure limits the overall quality and condition of landscape elements within the Study Area. Taking all of this into account, the landscape value of this LCT in the Study Area is deemed to be **Medium**.

<u>LCT 40 Craggy Upland – Argyll</u>

This LCT occupies two compartments across most of the central and western part of the Study Area. The landscape is characterised by remote upland moor with pockets of plantations forest between. The LCT comprises multiple wind farms but is predominantly '*wild'* and of *'natural character*". The key characteristics are as follows:

- "*Upland moor with irregular, rather amorphous landform.*
- *Rounded knolls, rock outcrops and numerous lochs in low-lying hollows and glens.*
- *Open moorland predominates, but extensive conifer plantations camouflage the landscape pattern in some areas.*
- *Oak-birch woodland on lower slopes.*
- *Stone walls enclose an irregular patchwork of pastures within glens on margins of moorland.*
- *Isolated farmsteads and small villages in sheltered sites within glens.*
- *Numerous archaeological remains, often concentrated on rounded knolls on lower slopes.*
- *Historic intricate, irregular landscape pattern in glens*".

Within the Study Area, the LCT is located within the North Argyll LLA, Knapdale / Melfort LLA and Ben Lui WLA. However, the quality and condition of the special landscape qualities associated within these designations are not prevalent within this LCT and Study Area. Recreational routes include several local paths and part of the Caledonia Way cycle route. Wind farms and forestry operations curtail the otherwise prevailing sense of wildness, however, accessible parts of the upland moor offer higher levels of scenic quality. Taking all of this into account, the landscape value of this LCT in the Study Area is deemed to be **Medium.**

<u>LCT 53 Rocky Coastland – Argyll</u>

This LCT is within several parts of the Study Area. The LCT is located in linear coastal bands either side of Loch Etive, Loch Awe and Loch Fyne. The LCT is described as being located on the more settled and farmed shores of Loch Etive and Loch Awe. The LCT is also described as having a wild, natural character with managed woodland being a common land use. Recreation is important for the LCT, including highly scenic views across lochs. The LCT includes the town of Inveraray, which is described as being one of the finest examples of 18th century estate town planning and lies adjacent to the A83 and A819. The key characteristics are as follows:

- "*Uneven, hummocky landform with rocky outcrops and narrow glens.*
- *Raised beaches, cliffs and distinctive rounded knolls.*
- *Rocky, indented coastline with offshore islands and small sandy bays.*
- *Relatively small-scale landscape with a diverse mix of colours and textures.*
- *Steep wooded cliffs and hummocky, gorse-covered slopes.*
- *Stone walls provide partial enclosure.*
- *Relatively well-settled, with scattered isolated farm buildings and small villages in sheltered sites.*
- *A wide variety of archaeological sites.*
- *Complex transitional landscape*".

Within the Study Area, the LCT is located within the Inveraray GDL, Ardanaiseig House GDL, Achnacloich House (Stonefield) GDL, Ardchattan Priory GDL, Crarae GDL, East Loch Fyne (Coast) LLA, West Loch Fyne (Coast) LLA and North Argyll LLA. The LCT includes local paths and a core path near to Inveraray. The LCT also includes the Caledonia Way cycle route. The LCT has cultural heritage value in terms of archaeological sites, scenic quality of views across the lochs, recreational value, sense of identity in terms of the various GDLs present, natural heritage value in terms of the trees and woodland and functional value as a transitional landscape from moorland to the loch. Wildness and tranquillity are limited due the settled nature of the landscape and proximity of loch side roads but it is also described as being wild and natural in places. Taking all of this into account, the landscape value of this LCT in the Study Area is deemed to be **High.**

5.6.7 Visual Baseline

5.6.7.1 Visual Receptors

Visual receptors within the scope of this assessment are described in the following section and are grouped into the following categories:

- Residential, comprising those in residential dwellings;
- Recreational, including walkers and users of promoted cycling routes;
- Visitors to places of interest, including those visiting summits;
- Road users, including users of the local transport network; and
- Rail users, including users of the local transport network.

The visual receptors included within this scope of assessment are those located within the ZTVs as those outside of this area are not considered to be affected by the Development.

Residential

There are a limited number of settlements and scattered properties within the Study Area where residents experience a range of views that have the potential to be affected by the Development.

Inverinan: This is a very small settlement that is located on the northern side of Loch Awe. The majority of the small number of residential properties form ribbon development along the length of loch side in close proximity to the loch shore of Loch Awe. Inverinan is in close proximity to the Development Site. The majority of the residential properties have been orientated to take advantage of the wide-angle views towards the loch and the upland hills that form the backdrop of the view which is partly screened by mature vegetation along the loch shore of Loch Awe.

Dalavich: This is a small settlement that is located on the northern side of Loch Awe and is set behind mature loch side vegetation. The residential properties are clustered into a compact settlement pattern between the road and Loch Awe. The settlement is set on low lying ground and although immediately adjacent to Loch Awe, lower storey views are generally screened by mature loch side vegetation which is present around the settlement and between the settlement and Loch Awe. Upper storey views from residential properties have more open and expansive views of the surrounding landscape.

Balliemeanoch: This is a small cluster of caravans that is located on the southern side of Loch Awe and is also located within the Development red line boundary. The small cluster of properties are along either side of the B840 on the edge of Loch Awe, with views both across Loch Awe and inland along the rising craggy upland. The properties are generally situated within or near to mature loch side vegetation.

Inveraray: This settlement is located on the northern shore of Loch Fyne. Inveraray town is a planned town with low lying parklands and pastures surrounded by woodlands. Inveraray Castle and its associated formal gardens and wider gardens and designed landscape setting contribute to the views of, and throughout, Inveraray.

Individual properties and farmsteads: Residential receptors are scattered throughout the Study Area including along the edges of Loch Awe and Loch Fyne. Views from such properties are sometimes screened partially by mature loch side vegetation but often, at least from upper stories, have expansive views across lochs and the rising craggy upland, steep ridges and mountains and plateau moor and forest in the wider landscape. Such properties include scattered properties alongside the A815 on the southern side of Loch Fyne where views are orientated across Loch Fyne towards Inveraray.

Views experienced from residential receptors are represented by Viewpoints 2, 4 and 6, as shown within *Volume 4: Visualisations.*

Recreational

Recreational routes and core paths are shown on *Volume 3 Figures, Figure 5.6 Recreational Routes and Core Paths and Operational Zone of Theoretical Visibility* and are described below. The recreational routes, core paths and local paths, as shown on the Scottish Record of Walking Routes, are evaluated further in *Volume 2 Main Report, Chapter 16: Socio-Economic, Recreation and Tourism* in terms of their recreational merit.

Core Paths: There is a network of core paths within the Study Area, mainly concentrated to the north of Loch Awe. The network of core paths includes routes alongside the various lochs in the Study Area, including Loch Avich and Loch Awe, as well as across the craggy upland landscape and near to settlements including Inveraray. Views experienced vary due to the network of forestry plantations and landform within the Study Area, which restricts views in places. In other places, there are wide panoramic views comprising lochs, rising land and a backdrop of rugged mountains. Views experienced from recreational receptors on core paths are represented by Viewpoints 1, 3, 4, 6 and 16, as shown within *Volume 4: Visualisations.*

Recreational routes: There are two recreational routes within the Study Area, including the Loch Lomond and Cowal Way and Three Lochs Way, in the south-eastern part of the Study Area. The routes within the Study Area are often within or adjacent to forestry and woodland vegetation which restricts long distance views.

Local walking paths and informal tracks: There is a network of local walking paths within the Study Area, which are shown on the Scottish Record of Walking Routes and informal tracks. This includes through blocks of plantation forest, along the loch edges and in and around Inveraray. There are local walking paths in close proximity and within the red line boundary of the Development, including adjacent to several of the proposed Access Tracks and adjacent to the temporary Marine Facility. Due to the coverage of local walking paths across the Study Area, there is varied visibility from such routes, including those restricted by forestry cover and landform and others with panoramic views across lochs, rising land and a backdrop of rugged mountains. Views experienced from recreational receptors on local walking paths are represented by Viewpoints 5, 8 and 12, as shown within *Volume 4: Visualisations.*

Cycling routes: The Caledonia Way, a promoted cycle route, lies on the northern side of Loch Awe through the Study Area. Views from this route in the Study Area include views across Loch Awe and the rising craggy upland, which is partially screened by forestry vegetation and loch shore vegetation in the foreground and middle ground in places. Views experienced from recreational receptors on The Caledonia Way is represented by Viewpoints 3 and 6, as shown within *Volume 4: Visualisations.*

Recreational watercraft: There are several lochs within the Study Area which allow recreational use, including boating, fishing and kayaking on Loch Awe and Loch Fyne. Views from the lochs are typically expansive, comprising the loch waterbody and rocky coastland, the rising craggy upland and plateau moor and forest and then the rugged mountains and steep ridges and mountains in the backdrop. Views experienced from recreational receptors on recreational watercraft is represented by Viewpoint 17, as shown within *Volume 4: Visualisations.*

Visitors to places of interest

Elevated local landmarks and viewpoints: There are several elevated local landmarks and viewpoints within the Study Area, including Dun Na Cuaiche to the north-east of Inveraray, of which some of the lower sections of the Dun Na Cuaiche Walk also include Sweetie Seat Walk, Kilmaha viewpoint and the Duncan Bann Macintyre Monument. Receptors at such locations typically experience elevated, panoramic views with minimal screening elements across the various lochs and surrounding landscape including rocky coastland, craggy upland, rugged mountains, steep ridges and mountains and plateau moor and forest. Views experienced from visitors to places of interest at elevated local landmarks and viewpoints are represented by Viewpoints 1, 3 and 16, as shown within *Volume 4: Visualisations.*

Low-lying places of interest: There are several low-lying places of interest within the Study Area, including Dorlin Point picnic area on the loch shore of Loch Avich, scenic rest stops along the A85 and Ardanaiseig GDL on the loch shore of Loch Awe. Receptors at such locations typically have open views across the loch and rocky coastland and the wider landscape of rising craggy upland, rugged mountains, steep ridges and mountains and plateau moor and forest. Views experienced from low-lying places of interest are represented by Viewpoints 9, 10 and 11, as shown within *Volume 4: Visualisations.*

Mountain summits: There are numerous mountain summits within the Study Area, including Ben Cruachan, Stob Garbh, Ben Eunaich, Beinn a' Chleibh and Ben Lui. Receptors at such locations have views focused on their surroundings and these are typically panoramic views across the landscape. Views experienced from mountain summits are represented by Viewpoints 8, 12, 13, 14 and 15, as shown within *Volume 4: Visualisations.*

Road users

The existing roads within the Development Boundary and wider Study Area are shown on *Volume 3 Figures, Figure 1.1 Location Plan.*

A83: This road is located along the northern side of Loch Fyne and along the edge of the town of Inveraray. Within the Study Area, the A83 broadly follows the alignment of Loch Fyne, with some sections further inland, and continues eastwards at the head of Loch Fyne towards Loch Goil. The A83 lies immediately to the north of the temporary Marine Facility and the inland Access Tracks near to the Marine Facility extend from the A83. Views from road users along parts of the A83 experience expansive and attractive views along and across Loch Fyne to the steep ridges and mountains, rugged mountains and steep ridges and hills beyond, as well as facilitating views towards Inveraray town and Inveraray Castle GDL. However, large sections of the road are enclosed by mature loch side vegetation and forestry plantation, which limits outward views.

A815: This road is located on the southern side of Loch Fyne and extends from the A83 near to the head of Loch Fyne. The road then broadly follows the alignment of Loch Fyne before continuing eastwards at Strachur towards Loch Eck. The road is largely enclosed by mature loch side vegetation and forestry plantation, which limits outward views. Where views are available on small sections of the road, including several laybys, there are views across Loch Fyne towards the rising plateau moor and forest, craggy upland and steep ridges and mountains.

A819: This road is the main road between Dalmally and Inveraray. The A819 extends south from the A85 at the head of Loch Awe and joins the A83 within the town of Inveraray. The northern part of the road, including adjacent to where the northern Access Track to the Headpond extends off, has varied outward views. There are sections of the road that is enclosed by mature vegetation and nearby plantation and landform screens distant views, however, other long sections of the road have expansive outward views to the surrounding landscape. Closer to Inveraray, the southern part of the road is comparatively more enclosed due to surrounding plantation which limits outward views.

B840: This road is located on the southern side of Loch Awe. It extends off the A819 at Cladich and broadly follows the alignment of Loch Awe within the Study Area. The B840 lies within the red line boundary of the Development and passes directly through the part of the Development associated with the Tailpond. The road has a mixed outward visibility, with some sections enclosed by mature loch side vegetation, plantation forest and steep landform rising from the edge of Loch Awe, However, other sections of the road allow expansive views both across Loch Awe towards the craggy upland and rugged mountains in the distance, as well as in the opposite direction towards the rocky coastland and rising craggy upland, plateau moor and forest and steep ridges and mountains.

A85: This road is located in the northern part of the Study Area near to the head of Loch Awe and is the main route east to west between Taynuilt and Dalmally. Due to the undulating landscape in the part of the Study Area where the road passes through, long distance views are sometimes truncated. However, there are long stretches of the road allowing long distance views across Loch Awe with the steep ridges and mountains in the distance. There are also a series of scenic rest stops along the route, which are covered above in the 'Visitors to places of interest' section. Refer specifically to Viewpoint 11 within *Volume 5 Appendices, Appendix 5.3 Visual Assessment.*

Local roads: There is a smaller network of local roads traversing the landscape linking farmsteads and settlements to the main transport corridors. Views from these roads range from more open views across the moorland plateau landscape and lochs to being enclosed and contained by woodland planting and blocks of forestry plantation. The local roads include the local network through Inverinan and Dalavich on the opposite side of Loch Awe to the Development (refer specifically to Viewpoints 2, 3 and 6 within *Volume 5 Appendices, Appendix 5.3 Visual Assessment*).

Rail users

West Highland Line: The West Highland Line runs through two parts of the Study Area, including through the northern part broadly adjacent to the A85 and in the south-eastern part broadly adjacent to the A814. Both sections exhibit parts which have more open views of the wider landscape and others where outward views are screened due to intervening vegetation and landform.

5.6.8 Representative Viewpoints

A total of 19 representative viewpoints have been selected in consultation with NatureScot and Argyll and Bute Council to represent the visual receptors within the Study Area most likely to be significantly affected by the construction and operation of the Development. Viewpoint locations are shown on *Volume 3 Figures, Figure 5.7 Representative Viewpoints and Operational Zone of Theoretical Visibility* and baseline photography and visualisations for each is provided in *Volume 4: Visualisations.*

It is acknowledged that part of the landscape within the Study Area is comprised of plantation forests at different felling stages. It is assumed that this would be remain to some degree within the description and value judgements for each representative viewpoint below. Where any planned felling would affect views, this has been considered at the assessment phase.

Table 5.6 Representative Viewpoints

ID	Viewpoint	Receptor Groups	Relevant LCT	Easting	Northing
1	Dun Na Cuaiche, Inveraray	Recreational and visitors to places of interest	Within LCT 53 Rocky Coastland – Argyll	210013	710137
2	Minor road – near A815	Residential and road users	Within LCT 34 Steep Ridges and Mountains	210296	705864
3	Kilmaha	Recreational, visitors to places of interest and road users	Within LCT 40 Craggy Upland – Argyll	194065	708443
4	Dalavich Jetty	Recreational and residential	Within LCT 40 Craggy Upland – Argyll	197049	712740
5	Loch shore off coastal road between Inverinan and Dalavich	Recreational	Within LCT 40 Craggy Upland – Argyll	199618	715747
6	Inverinan	Residential, recreational and road users	Within LCT 53 Rocky Coastland – Argyll	199949	717718
7	Eilean na Moadail peninsula	Recreational	Within LCT 53 Rocky Coastland – Argyll	200840	716917
8	Ben Cruachan	Recreational and visitors to places of interest	Within LCT 35 Rugged Mountains	206969	730472
9	Dorlin Point	Recreational and visitors to places of interest	Within LCT 40 Craggy Upland – Argyll	191510	713749
10	Ardanaiseig GDL	Recreational and visitors to places of interest	Within LCT 40 Rocky Coastland – Argyll	209356	724557
11	A85	Road users and visitors to places of interest	Within LCT 53 Rocky Coastland – Argyll	209914	725862
12	Stob Garbh	Recreational and visitors to places of interest	Within LCT 35 Rugged Mountains	209558	730246
13	Ben Eunaich	Recreational and visitors to places of interest	Within LCT 35 Rugged Mountains	213563	732797
14	Beinn a' Chleibh	Recreational and visitors to places of interest	Boundary of LCT 35 Rugged Mountains and LCT 251 Highland Summits	225046	725606
15	Ben Lui	Recreational and visitors to places of interest	Boundary of LCT 35 Rugged Mountains and LCT 251 Highland Summits	226631	726297
16	Duncan Bann Macintyre Monument	Recreational and visitors to places of interest	Within LCT 40 Craggy Upland – Argyll	214415	725855
17	Loch Awe watercraft	Recreational	Between LCT 40 Craggy Upland – Argyll and LCT 53 Rocky Coastland – Argyll	199815	716025
18	A815 – St Catherines	Residential and road users	Within LCT 34 Steep Ridges and Mountains	211787	707197

ID	Viewpoint	Receptor Groups	Relevant LCT	Easting	Northing
19	A83 lay-by	Road users and recreational	Within LCT 53 Rocky Coastland – Argyll	208540	707183

5.6.8.1 Viewpoint 1 – Dun Na Cuaiche, Inveraray

This viewpoint is representative of views experienced by recreational visitors to the watchtower at the summit of Dun Na Cuaiche, Inveraray. The watchtower is located in the central part of the Study Area. The view is an elevated expansive open view south over the Loch Fyne with the waterbody of Loch Fyne and the steep ridges and mountains beyond framing the view south to the head of the loch. The skyline is clearly defined by distant gently undulating landforms. Despite there being a panoramic view from the elevated position, the focus of the view is across Loch Fyne. The loch side comprises a series of inward and outward curved edges creating headlands, including the low-lying settlement of Inveraray which extends across two headlands.

In the middle distance, due to the elevated positioning of receptors, the top of Inveraray Castle and Inveraray town near to the shoreline are visible. The tall Inveraray Bell Tower is visible, however, is not prominent from the elevated position as it does not break the skyline and is set against existing built form within Inveraray. Small fishing vessels are present adjacent to Inveraray within Loch Fyne.

The southern part of the Inveraray Castle GDL is also visible and the parkland vegetation associated with the Inveraray Castle GDL and mature, deciduous loch side vegetation is distinctly different from the upland moorland, plantation and pockets of woodland further inland. This is separated by relatively open pastoral land. The mature loch side vegetation has several small breaks but has the perception from this elevated position of being continuous, except the low-lying settlement of Inveraray. There is little movement in the view, except vehicles along the road network, however, this is largely screened by vegetation adjacent to the local road network. Further in the middle and long distance, there are several small jetties and slipways extending into Loch Fyne.

Aside from the focus of the view along Loch Fyne, elsewhere in the middle distance and long distance comprises a patchwork of forestry at various felling cycle stages, a prominent overhead line and associated tracks across the plateau moor and forest and craggy upland.

The historic landscape setting of Inveraray Castle in the view is an important Cultural Heritage consideration (detailed further in *Volume 2 Main Report, Chapter 13: Cultural Heritage*).

This is an iconic view with strong cultural associations and very few notable detractors in the focus of the view across Loch Fyne resulting in a very high scenic quality. The value of the view is deemed to be **very high**.

5.6.8.2 Viewpoint 2 – Minor road near A815

This viewpoint is representative of views experienced by scattered residential properties on the loch shore to the west of the A815 and vehicular travellers along a minor road, also the west of the A815. This is located within the central part of the Study Area. The viewpoint is representative of intermittent and partially screened views from users of the A815, which is elevated in comparison to the viewpoint location due to intervening mature loch side vegetation. The receptors are located on the southern side of Loch Fyne.

This view consists of a framed view across Loch Fyne through a gap in mature loch side vegetation along the adjacent shoreline. The view across the loch is characterised by the expanse of water of Loch Fyne. The view includes the distinct white buildings of the town of Inveraray on the far shoreline in the middle distance surrounded by mature loch side vegetation and Inveraray Castle, however, this is not prominent due to some screening by loch side vegetation and the backdrop of the plantation beyond. The mature loch side vegetation continues along the loch edge with some breaks. The rising landform beyond is characterised by plateau moor and forest and craggy upland and includes forestry plantations at various felling cycle stages and an overhead line set against the wooded backdrop.

The view contains a typical loch side landscape, with some detracting features including forestry plantations and an overhead line. The value of the view is deemed to be **medium**.

5.6.8.3 Viewpoint 3 – Kilmaha

This viewpoint is representative of views experienced by those recreational receptors visiting the Kilmaha viewpoint and local walking trails. This viewpoint is located at a small car park located on high ground near the northern shore of Loch Awe within the western part of the Study Area. The car park is used by walkers and those using the Caledonia Way cycle route and is surrounded by dense plantation forest. The viewpoint is also representative of those using the local road network.

The view comprises middle-distance and long-distance views across Loch Awe to the northeast, which are incidental to the focus of the view. The foreground is dominated by the adjacent plantation vegetation, which largely screens views along the loch. Owing to the elevation there is a heavily restricted view of the waterbody of the loch. This restricted view means that the eye is drawn to the craggy upland on the far side of the loch, with plantation and moorland. There are also filtered views to isolated residential dwellings along the loch shore, interspersed between mature loch side vegetation. There is minimal movement within the view. It should be noted that further along the local road network, there are pockets of forestry plantation removal which allows open views towards the loch and rising craggy upland on the far side of the loch. From these locations, views typically include small moving turbines on moorland in the long distance and very distant wind turbines against the horizon.

The view contains a typical loch side landscape. Due to mature vegetation in the foreground, longer distance views down the loch are not appreciated and the focus of the view is on rising plantation vegetation. The Kilmaha viewpoint is mapped as a scenic viewpoint, however vegetation has restricted open expansive views across the loch. Taking this into account the value of the view being deemed to be **medium.**

5.6.8.4 Viewpoint 4 – Dalavich Jetty

This viewpoint is representative of views experienced by recreational users as they use the edge of Loch Awe for recreational purposes and those staying in tourist camping pods on the loch shore. The viewpoint is representative of residential receptors on the edge of Dalavich on elevated land just west of the Loch Awe shoreline, which have upper storey views across the loch. Dalavich Jetty is located off a stony beach along the northern side of Loch Awe in close proximity to the settlement of Dalavich and is located in the western part of the Study Area.

This view comprises an open expansive view along Loch Awe with the craggy upland in the distance forming the skyline. The view is dominated by the expansive water body of Loch Awe in the foreground with mature loch side vegetation also visible. The rocky coastline and craggy upland make up the majority of this view across Loch Awe in the middle and long distance. There are patches of forestry plantation at various felling cycle stages, moorland and several small wind turbines visible on the rising craggy upland. As the eye is drawn down the loch, the vegetation on the craggy upland is predominantly deciduous and moorland dominates.

The view contains a typical loch side landscape, with the focus of the view being Loch Awe set against a backcloth of rising moorland and forestry plantation. There are few perceptible detracting features as the eye is drawn down the loch, as such the value of the view is deemed to be **high**.

5.6.8.5 Viewpoint 5 – Loch shore off coastal road between Inverinan and Dalavich

This viewpoint is representative of views from recreational receptors along the shoreline of Loch Awe. This is located within the western part of the Study Area. This includes walkers who use the various tracks to the loch edge. It also includes filtered views through mature loch side vegetation from walkers, just west of the loch edge.

This view comprises an open view across Loch Awe with craggy uplands defining the skyline. The foreground is dominated by the expansive water body of Loch Awe where it meets mature loch side vegetation, with some breaks, in the middle distance. Loch Awe has minimal activity on the loch in this location. There are also several caravans along the loch shore set within mature vegetation and minor roads visible. Further in the middle and long distance, the view is characterised by rising pastoral fields, moorland and deciduous vegetation following the course of glens as they flow down into the loch. There is a pocket of plantation forestry on the horizon, however, it comprises a small part of the overall panorama.

The view contains a typical loch side landscape, with the focus of the view being Loch Awe set against a backcloth of rising moorland and vegetated glens. Any detracting features do not diminish the scenic quality of the view, such that the value is deemed to be **high**.

5.6.8.6 Viewpoint 6 – Inverinan

This viewpoint is representative of views experienced by residents of properties in Inverinan through upper storey windows that are orientated towards Loch Awe. Lower storey windows of properties are largely screened by mature loch shore vegetation in the foreground. Inverinan is located on the north side of Loch Awe. The residential properties form ribbon development along the length of the road through Inverinan. The viewpoint is also representative of road users along the local road network through Inverinan and those using the Caledonia Way cycle route. This is located within the western part of the Study Area.

This view comprises views across Loch Awe, however, such views are largely screened by mature loch shore vegetation in the foreground. The foreground also comprises a wood pole line, which detracts from the scenic composition of the view. The skyline is formed by the rising craggy uplands across Loch Awe. This landscape comprises mature loch side vegetation, with some breaks, and pastoral fields, as well as moorland and vegetated glens on the rising landform. There is a pocket of plantation vegetation on the horizon, however, this does not form a prominent part of the view.

The view contains a typical loch side landscape with rising craggy upland comprising pastoral land, moorland and vegetation. However, views of the expansive Loch Awe are screened somewhat by foreground vegetation and there are detracting features in the view. The value of the view is deemed to be **medium**.

5.6.8.7 Viewpoint 7 – Eilean na Maodail peninsula

This viewpoint is representative of views experienced by recreational users. This includes walkers who use the various tracks to the loch edge. The Eilean na Maodail Peninsula is located along the southern side of Loch Awe to the north-west of Balliemeanoch and is located in the western part of the Study Area.

This view comprises an open view across Loch Awe with craggy uplands defining the skyline. The foreground is dominated by the expansive water body of Loch Awe where it meets mature loch side vegetation, with some breaks, in the middle distance. Loch Awe has minimal activity on the loch in this location. There is one residential property visible amongst the trees in the centre of the view, as well as several caravans along the loch shore set within mature vegetation and minor roads visible. There are also views of large-scale agricultural buildings closer to the visual receptor, which is set back from the loch edge and partially screened by mature loch side vegetation. Further in the middle and long distance, the view is characterised by rising pastoral fields, moorland and deciduous vegetation following the course of glens as they flow down into the loch. There is a pocket of plantation forestry on the horizon, however, it comprises a small part of the overall panorama.

The view contains a typical loch side landscape, with the focus of the view being Loch Awe set against a backcloth of rising moorland and vegetated glens. Any detracting features do not diminish the scenic quality of the view, such that the value is deemed to be **high**.

5.6.8.8 Viewpoint 8 – Ben Cruachan

This viewpoint is representative of views experienced by recreational users to the summit of Ben Cruachan. Ben Cruachan is located in the northern part of the Study Area and is within the southern part of the Loch Etive Mountains WLA.

This view is an elevated, expansive and open view across rugged mountains in the foreground and middle ground which fall towards the rocky coastline and Loch Awe. The edge of Loch Awe consists of mature loch side vegetation with some breaks. There are pockets of development visible along the loch shore, however, they are not the focus of the view. From Loch Awe, the rocky coastline rises to craggy upland and plateau moor and forest in the long distance. The rugged mountains and craggy upland landscape, which dominate the view, comprises of pockets of forest plantation at various felling cycles, deciduous vegetation, vegetated glens and moorland. Several lochs are visible in this landscape, including Loch Tromlee and Loch na Gealaich, which typically are adjacent to blocks of mature vegetation. The Beinn Ghlas Wind Farm is visible in the long distance, against a wooded backcloth.

The view is from an elevated position from within a Wild Land Area and has a high scenic quality despite the pockets of forestry plantation. The value of the view is deemed to be **very high**.

5.6.8.9 Viewpoint 9 – Dorlin Point

This viewpoint is representative of views experienced by recreational users at Dorlin Point. Dorlin Point is a small picnic area located on flat ground on the northern shore of Loch Avich. Dorlin Point is located within the western part of the Study Area.

This view comprises Loch Avich in the foreground with a small, well vegetated, island. The middle ground comprises rising craggy upland from the mature loch side vegetation at the loch edge, containing both forestry plantation and deciduous woodland. The craggy upland contains moorland and forestry plantation at different felling cycle stages. Distant views are screened by rising landform at the head of Loch Avich at Tom an t-Saighdeir and landform and vegetation in the foreground and middle distance.

The view contains a typical loch side landscape, with the focus of the view being Loch Avich set against a backcloth of rising moorland and plantation vegetation. Detracting features include the extensive forestry plantation and limited distant views, such that the value is deemed to be **medium**.

5.6.8.10 Viewpoint 10 – Ardanaiseig GDL

This viewpoint is representative of views experienced by recreational users of the loch side, including walkers, and visitors to Ardanaiseig House. Ardanaiseig House GDL is situated on the western headland of Loch Awe where the River Awe joins the loch and is located within the northern part of the Study Area. Ardanaiseig House GDL is a

Lochside estate with formal gardens and terraces around Ardanaiseig House and a wider setting of parkland and woodland beyond.

This view is dominated by the expansive waterbody of Loch Awe in the foreground, and this extends into the long distance. The view contains mature loch side vegetation both within the foreground and visible in the long-distance, which is mixed deciduous and plantation vegetation. Beyond the rocky coastland, there are views of rising craggy upland. This landscape is dominated by moorland and the upper parts by large-scale blocks of plantation vegetation. The rising craggy upland restricts views further to the distance.

The view contains a typical loch side landscape, with the focus of the view being Loch Awe set against a backcloth of rising moorland and mixed vegetation. Detracting features include the extensive forestry plantation and limited distant views. The view has cultural associations as it is from a GDL and North Argyll LLA, such that the value is deemed to be **high**.

5.6.8.11 Viewpoint 11 – A85

This viewpoint is representative of transient views experienced by vehicular travellers as they move along the A85. Along this part of the A85, there are a series of scenic rest stops which are focused on Loch Awe. The A85 is in the northern part of the Study Area at the northern end of Loch Awe. In the locality, the A85 follows the shoreline and is the main route east to west between Taynuilt and Dalmally.

This view is dominated by the expansive waterbody of Loch Awe in the foreground, and this extends into the long distance. This includes several vegetated islands in Loch Awe in the middle distance, which restrict some views of the long distance, and includes the woodland canopy associated with Ardanaiseig House GDL which contributes to the Loch Awe shoreline scenery. The view contains mature loch side vegetation in the long-distance, which is mixed deciduous and plantation vegetation. Beyond the rocky coastland, there are views of rising craggy upland. This landscape is dominated by moorland and the upper parts by large-scale blocks of plantation vegetation. The rising craggy upland restricts views further to the distance.

The view contains a typical loch side landscape, with the focus of the view being Loch Awe set against a backcloth of rising moorland and mixed vegetation. Detracting features include the extensive forestry plantation and limited distant views. The view has cultural associations as it contains a GDL and North Argyll LLA in the middle distance, such that the value is deemed to be **high**.

5.6.8.12 Viewpoint 12 – Stob Garbh

This viewpoint is representative of views experienced by recreational users to the summit of Stob Garbh. Stob Garbh is located in the northern part of the Study Area and is within the southern part of the Loch Etive Mountains WLA.

This view is an elevated, expansive and open view across rugged mountains in the foreground and middle ground which fall towards the rocky coastline and Loch Awe. The edge of Loch Awe consists of mature loch side vegetation with some breaks. There are pockets of development visible along the loch shore, however they are not the focus of the view. From either side of Loch Awe, the rocky coastline rises to craggy upland. On the eastern side of Loch Awe, the craggy upland rises to plateau moor and forest in the long distance, however this is screened somewhat by intervening landform in the foreground. The rugged mountains and craggy upland landscape, which dominate the view, comprises of pockets of forest plantation at various felling cycles, deciduous vegetation, vegetated glens and moorland. Several lochs are visible in this landscape, including Loch Tromlee and Loch na Gealaich, which typically are adjacent to blocks of mature vegetation. The Beinn Ghlas Wind Farm is visible in the long distance, against a wooded backcloth.

The view is from an elevated position from within a Wild Land Area and has a high scenic quality despite the pockets of forestry plantation. The value of the view is deemed to be **very high**.

5.6.8.13 Viewpoint 13 – Ben Eunaich

This viewpoint is representative of views experienced by recreational users to the summit of Ben Eunaich. Ben Eunaich is located within the northern part of the Study Area and is within the southern part of the Loch Etive Mountains WLA.

This view is an elevated view across rugged mountains in the foreground which foreshorten views to the south-west. Loch Awe is visible in the long-distance, part of which is screened by intervening landform in the foreground. The land rises away from Loch Awe to the east, comprising the rocky coastland, craggy upland and then plateau moor and forest in the long distance. The rugged mountains and craggy upland landscape, which dominate the view, comprises of pockets of forest plantation at various felling cycles, deciduous vegetation, vegetated glens and moorland. Tracks through the landscape are also visible. In the long distance, Loch Fyne is visible in a very small part of the wider panorama. There is one small loch visible in the long distance which lies adjacent to a block of plantation vegetation and the An Suide Wind Farm in the long distance, set against rising moorland and vegetation.

The view is from an elevated position from within a Wild Land Area and has a high scenic quality despite the pockets of forestry plantation. The value of the view is deemed to be **very high**.

5.6.8.14 Viewpoint 14 – Beinn a' Chleibh

This viewpoint is representative of views experienced by recreational users to the summit of Beinn a' Chleibh. Beinn a' Chleibh is located within the north-eastern part of the Study Area and is within the northern part of the Ben Lui Wild Land Area.

This view is an elevated view across rugged mountains in the foreground. This landform falls across steep ridges and mountains, craggy upland, plateau moor and forest and rocky coastland towards Loch Awe in the long distance. Across Loch Awe, the rocky coastland and craggy upland rise to the distance. The rugged mountains and craggy upland landscape, which dominate the view, comprises of pockets of forest plantation at various felling cycles, deciduous vegetation, vegetated glens and moorland. Tracks through the landscape are also visible, as well as the summit of Ben Cruachan. The Carraig Gheal Wind Farm and Beinn Ghlas Wind Farm are visible in the long distance, set against the rising moorland.

The view is from an elevated position from within a Wild Land Area and has a high scenic quality despite the pockets of forestry plantation. The value of the view is deemed to be **very high**.

5.6.8.15 Viewpoint 15 – Ben Lui

This viewpoint is representative of views experienced by recreational users to the summit of Ben Lui. Ben Lui is located within the north-eastern part of the Study Area and is within the northern part of the Ben Lui Wild Land Area.

This view is an elevated view across rugged mountains in the foreground. This landform falls across steep ridges and mountains, craggy upland, plateau moor and forest and rocky coastland towards Loch Awe in the long distance. Across Loch Awe, the rocky coastland and craggy upland rise to the distance. The rugged mountains and craggy upland landscape, which dominate the view, comprises of pockets of forest plantation at various felling cycles, deciduous vegetation, vegetated glens and moorland. Tracks through the landscape are also visible, as well as the summit of Ben Cruachan. The Carraig Gheal Wind Farm and Beinn Ghlas Wind Farm are visible in the long distance, set against the rising moorland.

The view is from an elevated position from within a Wild Land Area and has a high scenic quality despite the pockets of forestry plantation. The value of the view is deemed to be **very high**.

5.6.8.16 Viewpoint 16 – Duncan Ban Macintyre Monument

This viewpoint is representative of recreational users visiting the Duncan Ban Macintyre Monument and walkers in the local area. This is located within the northern part of the Study Area.

This view comprises pockets of forestry plantation at various felling cycle stages dominating the foreground and middle distance to the south-west. The craggy upland continues into plateau moor and forest in the long distance and falls towards the rocky coastland towards Loch Awe, which is visible in part of the view in the long distance. The craggy upland and plateau moor and forest landscape, which dominate the view, comprises of pockets of forest plantation at various felling cycles, deciduous vegetation, vegetated glens and moorland. Tracks through the landscape are also visible. The Carraig Gheal Wind Farm is prominent on the skyline in the distance. There is an overhead line visible but set against the rugged mountains rising towards the summit of Ben Cruachan. The focus of the view is towards the various WLAs, the Loch Etive Mountains to the north and Ben Lui to the east.

The view is from an elevated position and comprises a typical view across the vegetated landscape and lochs in this location. Detracting features include the domination of forestry plantation. The value of the view is deemed to be **high** due to cultural associations of the Duncan Ban Macintyre Monument and the scenic qualities of the North Argyll LLA.

5.6.8.17 Viewpoint 17 – Loch Awe watercraft

This viewpoint is representative of recreational users of watercraft travelling on Loch Awe. This is located within the western part of the Study Area.

This view comprises an open view across Loch Awe with craggy uplands defining the skyline. The foreground is dominated by the expansive water body of Loch Awe where it meets mature loch side vegetation, with some breaks, in the short to middle distance dependent on location within Loch Awe. Loch Awe has minimal activity on the loch in this location. There are also several caravans along the loch shore set within mature vegetation and minor roads visible. Beyond the loch edge, the view is characterised by rising pastoral fields, moorland and deciduous vegetation following the course of glens as they flow down into the loch. There is a pocket of plantation forestry on the horizon, however it comprises a small part of the overall panorama.

The view contains a typical loch side landscape, with the focus of the view being Loch Awe set against a backcloth of rising moorland and vegetated glens. Any detracting features do not diminish the scenic quality of the view, such that the value is deemed to be **high.**

5.6.8.18 Viewpoint 18 – A815 – St Catherines

This viewpoint is representative of views experienced by residential properties along the loch shore of Loch Fyne adjacent to the A815. Such properties typically have open views across Loch Fyne due to breaks in mature loch side vegetation. The viewpoint is also representative of road users along the A815, however, noting that visibility is varied along the road network due to mature loch side vegetation restricting views in parts. This is located within the central part of the Study Area. The receptors are located on the southern side of Loch Fyne.

This view consists of an open view across Loch Fyne along part of the A815 where there is a break in mature loch side vegetation along the adjacent shoreline. The view across the loch is characterised by the expanse of water of Loch Fyne. The view includes the distinct white buildings of the town of Inveraray on the far shoreline in the middle distance surrounded by mature loch side vegetation and Inveraray Castle, however, this is not prominent due to some screening by loch side vegetation and the backdrop of the plantation beyond. The mature loch side vegetation continues along the loch edge with some breaks. The rising landform beyond is characterised by plateau moor and forest and craggy upland and includes forestry plantations at various felling cycle stages. There is also an overhead line which is predominantly set against the wooded backdrop but does break the skyline in several places.

The view contains a typical loch side landscape, with some detracting features including forestry plantations and an overhead line. The value of the view is deemed to be **medium**.

5.6.8.19 Viewpoint 19 – A83 lay-by

This viewpoint is representative of views experienced by road users along the A83 in close proximity to the southern edge of Inveraray. The viewpoint is also representative of users of the local walking track just to the west of the viewpoint location which continues into Inveraray. Such receptors are likely to be shortly within the town context of Inveraray or having just left. This is located within the central part of the Study Area. The viewpoint is taken from a break in mature loch side vegetation. The receptors are located on the northern side of Loch Fyne.

This view consists of an open view across Loch Fyne. The view across the loch is characterised by the expanse of water of Loch Fyne with bands of mature loch side vegetation on the loch shore both in the middle ground and long distance on the opposite side of Loch Fyne. The loch shore on the northern side of Loch Fyne comprises a series of inward and outward curved edges creating headlands. The view includes built form on the loch shore in pockets, including towards ribbon development along the A886 near to Strachur and a caravan park along the loch shore also off the A886 in the distance. The rising steep ridges, mountains and hills are interspersed in the central part of the view by a rising glen near to Strachur. This landform comprises a mixture of moorland and pockets of forestry at various felling cycle stages.

The view contains a typical loch side landscape, with some detracting features including forestry plantations. The value of the view is deemed to be **medium**.

5.7 Assessment of Effects

This section presents the findings of the landscape and visual impact assessment for the construction and operational phases of the Development. The key components of the Development are detailed in *Volume 2 Main Report, Chapter 2: Project and Site Description.*

It is acknowledged that part of the landscape within the Study Area is forestry plantation at different felling stages. The landscape and visual assessment assumes that this would remain to some degree.

5.7.1 Summary of Assessment of Effects

This section presents the findings of the landscape and visual impact assessment for the construction and operational phases of the Development. A detailed assessment of landscape and visual effects is provided in *Volume 5 Appendices, Appendix 5.2 Landscape Assessment* and *Volume 5 Appendices, Appendix 5.3 Visual*

Assessment. The following section provides a summary of the likely significant effects during construction and operation on the landscape and visual resource.

5.7.1.1 Summary of Construction Effects

Effects on Landscape Designations during Construction

Loch Etive Mountains Wild Land Area

At construction, activity would not directly affect the landscape elements of the WLA, as such effects would be limited to the setting and perceptual qualities of the WLA. Based on ZTV coverage, the intervisibility and impression of construction activity associated with the Headpond and associated compounds and Access Tracks would be concentrated in a limited area in the southern part of the WLA. Construction of the Tailpond inlet / outlet and Marine Facility would not affect the WLA. The panoramic views from the WLA would be affected by the intensity of the construction activity however such activity would not block long distance views. The Development is likely to result in a slight alteration to the key attribute and quality of the WLA in a limited area in the southern part of the WLA.

The magnitude of effect, assessed alongside the **very high** sensitivity would result in a **moderate adverse** effect, which is considered to be **significant**.

Inveraray Castle GDL

Construction activity would result in direct but slight change to the landscape components, setting and perceptual associations of this GDL. Intervisibility of most construction operations would be limited to the immediate context of the Marine Facility and elevated parts of the landscape at Dun Na Cuaiche where the scenic quality and views are closely associated with the landscape setting of the parklands and woodlands of the GDL. The Marine Facility would occupy a small part of the GDL and within the loch. The intensity and nature of construction and operation of the jetty including the movement of plant and watercraft on Loch Fyne would be in contrast to the adjacent parkland setting, scenic quality and parkland pattern of this GDL. Associated lighting would extend the influence of light spill and impression of character within the context of Inveraray. Overall, there would be a partial alteration to the landscape receptor however there would be limited change to the most valued aspects of the landscape components, scenic quality and artistic interest of Inveraray Castle GDL.

The magnitude of effect, assessed alongside the **very high** sensitivity would result in a **moderate adverse** effect, which is considered to be **significant**.

North Argyll LLA

Construction would result in direct effects to the landscape fabric in a very small part of LLA comprising the northern Access Track to the Headpond and the junction of the A83 to the inland track north-east of the Marine Facility. Construction would result in signage erected on the local paths affected by construction access. The movement of plant and materials would increase the sense of activity but would not be dissimilar to existing forestry management in the local landscape and in small parts of the LLA. Construction activity associated with the Headpond and within Loch Awe would result in a noticeable and incongruent change to the western setting, scenic quality, sense of remoteness and isolation within northern and upland parts of the LLA where there is intervisibility. The impression of change would be limited to upland summits where the construction footprint occupies a small part of the wider landscape setting or dramatic, panoramic views associated with this LLA. Overall, the scale, location and intensity of construction activity would be a marked contrast with the existing setting.

The magnitude of effect, assessed alongside the **very high** sensitivity would result in a **moderate adverse** effect, which is considered to be **significant**.

West Loch Fyne (Coast) LLA

Construction within this LLA is limited to construction, operation, and demobilisation of the Marine Facility west of Inveraray and nearby Access Tracks. There would be direct changes to the landscape fabric of this LLA. The operation of the Marine Facility throughout most of the construction phase would introduce new and uncharacteristic activity and plant into a localised part of the landscape. Effects to the scenic quality in particular the effect of lighting associated with the jetty would be pronounced along the loch shore and in contrast to the dawn and dusk setting. The widening and operation of existing tracks to transport plant and materials and the construction of small section of new track across part of the pastoral field would increase intensity of activity but would not be dissimilar to other transport and forestry operations within the LLA and within the context of the A83 and A819. Overall, the construction would affect a very small geographic area but one that is important to the special qualities and setting of this LLA.

The magnitude of effect, assessed alongside the **high** sensitivity would result in a **moderate adverse** effect, which is considered to be **significant**.

Landscape Effects during Construction

Significant landscape effects are predicted for three of the six LCTs assessed. These are the Rugged Mountains, Craggy Upland – Argyll, and Rocky Coastland - Argyll. The other three LCTs would not result in significant landscape effects during construction.

LCT 35 Rugged Mountains

At construction, activity would be located in other LCTs in the Study Area, as such effects would be limited to the setting and perceptual qualities of this LCT. The intervisibility and impression of construction activity associated with the Headpond and associated compounds and Access Tracks would be concentrated in an upland and steeply rising landscape north of the A85.

The scale and geographical extent of construction activity would result in a noticeable change during peak periods of construction. The intensity of construction would contrast with the strong sense of wildness and tranquillity experienced within elevated areas at the periphery of this LCT. The activity has the potential to partially alter the high levels of tranquillity and wildness within the LCT. However, construction would also be evident within the context of forestry operations including felling and wind farms.

Most of the key characteristics of the LCT would remain intact, but the impression of construction activity on the southern setting within a relatively inaccessible part of the landscape would be in marked contrast to the scenic qualities and more distant landscape setting to the south.

The magnitude of effect, assessed alongside the **very high** sensitivity would result in a **moderate adverse** effect, which is considered to be **significant**.

LCT 40 Craggy Upland – Argyll

At construction, the Headpond site construction would be located within this LCT and result in direct effects to the landscape fabric of the upland moor. Despite only directly affecting a small geographic area of the overall LCT, which occupies most of the Study Area, it would become a dominate feature.

Upland moorland, Lochan Airigh and peat bog would also be replaced with the Headpond infrastructure as part of the construction of the Headpond, which are characteristic, yet common, features of the LCT. The irregular landform of the upland moorland would be affected which would be at odds with the natural landscape. The landform and plantation associated with Plateau Moor and Forest Argyll LCT to the south-east of the Headpond, would assist in restricting and softening the intervisibility with the construction activity from the Study Area and limit the extent of change to the setting and perceptual qualities.

Construction activity associated with the northern Access Track to the Headpond would result in the loss of moorland and peat bog and plantation. However, the majority of construction activity associated with other Access Tracks within this LCT would be contained within existing forestry tracks and plantation. Construction activity associated with Access Track between the Headpond and Tailpond would include direct effects on the LCT and would result in signage erected on the local paths affected by construction access.

There would also be a scale of movement in an otherwise natural landscape. Operations at the Tailpond would also affect the setting to the west of this LCT.

The overall scale of construction operations would substantially affect the tranquillity of the more wild and natural aspects of the upland moorland. However, there would be no direct change to the highest quality landscape elements including the oak-birch woodland on lower slopes, stone walls, isolated farmsteads and small villages and the integrated landscape pattern of the glens.

Due to the openness of the moorland, despite only directly affecting a small geographic area of the overall LCT, there would be a wider influence, however, noting some restriction of this due to surrounding plantation forests.

The high magnitude of effect, assessed alongside the **medium** sensitivity would result in a **major adverse** effect, which is considered to be **significant**.

LCT 53 Rocky Coastland – Argyll

At construction, there would be direct effects on the LCT localised to the Tailpond site and the Marine Facility. Such changes associated with the Tailpond would be located within the small-scale landscape at the loch edge and would involve the removal of mature loch-side vegetation which is a contributing factor to the character of the landscape in the LCT. The upgrade of Access Tracks between the Tailpond and Headpond would also partially be located within this LCT.

Changes to the setting and perceptual associations would affect the same part of the LCT and the opposite bank of Loch Awe by construction activity leading from the Tailpond towards the Headpond on rising landform. Construction activity associated with the underground elements of the Development and the activity around the Headpond borrow pit would affect the impression tranquillity and natural aspects of the LCT for a short duration.

There would also be direct effects within another compartment of this LCT associated with the Marine Facility. Construction activity associated with a temporary construction Access Track through agricultural land to the west of the jetty to connect into the Upper Avenue existing track would result in the removal of a small part of forestry plantation, which is typical in the surrounding area. Construction plant and activity would displace pastoral fields, which are characteristic of the farmed shores of the loch.

The activity and plant would also affect the aesthetic aspect of the LCT as the construction activity would affect the highly scenic views across Loch Awe and Loch Fyne. This would avoid construction traffic travelling through minor settlements and the local road network near to the Tailpond. During construction, there will likely be localised disruption to public access along the B840 as a result of the increased vehicle movements. A diversion of the B840 will be necessary during construction works. The combination of temporary buildings, laydown areas and the intensity of activity would highly contrast with the existing landscape features.

Overall, the changes during construction are likely to affect some of the key characteristics of the LCT which are integral to the distinctive character of the LCT, including ancient woodland on the loch shore, scenic views across the loch, the small-scale landscape and displacement of the pastoral landscape and uneven landform. However, direct and indirect changes would be localised and limited to two parts of the local landscape.

The high magnitude of effect, assessed alongside the **high** sensitivity would result in a **major adverse** effect, which is considered to be **significant**.

Visual Effects during Construction

11 of the 17 representative viewpoints would experience significant adverse effects during construction. Full details of the visual assessment are contained within *Volume 5 Appendices, Appendix 5.3 Visual Assessment*. A summary of the visual effects based on receptor groups is provided below.

<u>Residential</u>

Views experienced from significantly affected residential receptors are considered to be of high sensitivity.

Dalavich: Views from Dalavich would be significantly affected by construction activity due to activity and plant introduced into the view associated with the Headpond Embankment 1 and Access Track upgrades would be apparent across a small part of the horizontal and vertical extent of the view in the long distance and set against the rising craggy upland. Construction activity associated with the Access Tracks between the Headpond and Tailpond would be visible and extend the influence of activity small part of the horizontal extent of the view. Construction activity in views would include removal of vegetation, upgrade of an existing track north of the Allt Beochlich glen, transportation of materials to and from the Headpond and tunnel portals. The loss of vegetation within open craggy moorland would be particularly obtrusive.

Inverinan: Views from Inverinan would be significantly affected by construction activity and plant introduced into the view associated with the Tailpond would result apparent across the view in the middle distance from upper storeys. The removal of loch side vegetation, large-scale excavation and earthworks to enable the construction of the inlet/outlet structure would be highly incongruent and dominate the focus of views. However, foreground vegetation would screen views from lower levels. Other construction activities include new and upgraded Access Tracks, temporary Construction Compounds, laydown areas and associated lighting.

Individual properties and farmsteads: Views from individual residential properties alongside the A815 on the southern side of Loch Fyne would be significantly affected by construction activity. The construction, operation, and demobilisation of the Marine Facility would be apparent across a small part of the background on the opposite loch shore. The jetty would facilitate the movement of vehicles and watercraft on the loch would appear the wooded backdrop of plateau moor and forest. However, the scale and movement of watercraft and associated lighting along the jetty would become an additional focus of views. Activities during demobilisation would be like those at construction and the jetty piles would be left in situ just above the high tide water level. Construction activity associated with a temporary Construction Compounds and Access Track through agricultural land to the west of the jetty would be visible.

Residential receptors represented by **Viewpoint 2** (Minor road near A815) with a **high** sensitivity, **Viewpoint 4** (Dalavich Jetty) with a **high** sensitivity and **Viewpoint 18** (A815 – St Catherines) with a **high** sensitivity, assessed alongside the magnitude of effect, would result in a **moderate adverse** effect and residential receptors represented by **Viewpoint 6** (Inverinan) with a **high** sensitivity, assessed alongside the magnitude of effect, would result in a **major adverse** effect which are considered to be **significant**.

<u>Recreational</u>

Views experienced by recreational receptors range from high to very high sensitivity.

Core Paths: Views from those using short sections of core paths within the Study Area would be significantly affected by construction activity typically at higher elevation in locations which are not enclosed by vegetation and low-lying locations where gaps exist in mature loch side vegetation. This includes from Dun Na Cuaiche, Inveraray, which is an elevated view which is not enclosed by vegetation. During the construction phase of the Development, the construction, operation and demobilisation of the Marine Facility would be an apparent addition within the focus of views along Loch Fyne and the contrast in scale and appearance highly incongruent. Recreational receptors along core paths near to Dalavich Jetty would be significantly affected at construction due to activity and plant introduced into the view associated with the Headpond Embankment 1 and Access Track upgrades would be apparent across a small part of the horizontal and vertical extent of the view in the long distance and set against the rising craggy upland. There would also be significant effects at construction from sections of core paths in very close proximity to construction activity associated with the Marine Facility and with clear views towards the Tailpond infrastructure which has the potential to become the main focus of views in places at construction.

Local walking paths and informal tracks: Views from those using sections of local walking paths within the Study Area would be significantly affected by construction activity, including those that are in close proximity to the Development such as to the north-east of the Headpond, near to the Marine Facility and in close proximity and on the opposite side of Loch Awe to the Tailpond inlet / outlet structure and tunnel portals. Significantly affected receptors would also include those along the loch shore off the coastal road between Inverinan and Dalavich in which the scale and intensity of construction activity associated with the Tailpond and Access Tracks would occupy a considerable part of the horizontal extent and substantial change to the visual composition. Significantly affected receptors would also include those routes in the rugged mountains near Ben Cruachan and Stob Garb, where introduction of activity and plant into a highly scenic view with very minimal detracting features would be incongruous and a pronounced change to the composition of the view. Significantly affected receptors would include those on the network on the western edge of Inveraray in close proximity to the construction, operation and demobilisation of the Marine Facility. Significantly affected receptors would also include local walking tracks in close proximity to the construction of the Development, including from the Eilean na Maodail peninsula in which the construction activity and plant associated with the Tailpond and Access Tracks would dominate the central part of the view and in marked contrast with the composition and balance of features in the view.

Recreational watercraft: Views from those using recreational watercraft would be significantly affected by construction activity dependent on the location of the receptor on the loch, proximity to the parts of the Development and the focus of the view. This would include along Loch Awe near to the Tailpond part of the Development. In this location, the scale and intensity of construction activity associated with the Tailpond and tracks would occupy a considerable part of the horizontal extent and substantial change to the visual composition.

Recreational receptors represented by **Viewpoint 4** (Dalavich Jetty) with a **high** sensitivity, assessed alongside the magnitude of effect, and **Viewpoint 8** (Ben Cruachan) with a **very high** sensitivity would result in a **moderate adverse** effect and recreational receptors represented by **Viewpoint 1** (Dun Na Cuaiche, Inveraray) with a **very high** sensitivity, **Viewpoint 5** (Loch shore off coastal road between Inverinan and Dalavich) with a **high** sensitivity, **Viewpoint 6** (Inverinan) with a **high** sensitivity, **Viewpoint 7** (Eilean na Maodail peninsula) with a **high** sensitivity, **Viewpoint 12** (Stob Garb) with a **very high** sensitivity, **Viewpoint 17** (Loch Awe watercraft) with a **high** sensitivity and **Viewpoint 19** (A83 lay-by) with a **high** sensitivity, assessed alongside the magnitude of effect, would result in a **major adverse** effect, which are considered to be **significant**.

<u>Visitors to places of interest</u>

Views experienced from significantly affected viewpoints by visitors to places of interest are considered to be very high sensitivity.

Elevated local landmarks and viewpoints: Views from visitors to elevated local landmarks and viewpoints which would be significantly affected by construction activity is likely to be limited to those visiting Dun Na Cuaiche, Inveraray. The location of construction activity and plant associated with the Marine Facility would occupy a small but key part of the view focused along Loch Fyne and the contrast in scale and appearance highly incongruent.

Mountain summits: Views from mountain summits which would be significantly affected by construction activity is likely to be limited to those visiting the summits of Ben Cruachan and Stob Garb, where the construction activity and plant associated with the Headpond, and tracks would occupy a small part of the horizontal extent of the otherwise panoramic view. The introduction of activity and plant into a highly scenic view with very minimal detracting features would be incongruous and a pronounced change to the composition of the view.

Visitors to places of interest represented by **Viewpoint 8** (Ben Cruachan) with a **very high** sensitivity, assessed alongside the magnitude of effect would result in a **moderate adverse** effect and **Viewpoint 1** (Dun Na Cuaiche, Inveraray) with a **very high** sensitivity and **Viewpoint 12** (Stob Garb) with a **very high** sensitivity, assessed alongside the magnitude of effect, would result in a **major adverse** effect which are considered to be **significant**.

5.7.1.2 Summary of Effects at Operation Year 1

Effects on Landscape Designations during Operation Year 1

No significant effects on landscape designations are anticipated during operation year 1.

Landscape Effects at Operation Year 1

At opening, the Development would result in significant effects for two of the six LCTs assessed. These are the Craggy Upland - Argyll and Rocky Coastland – Argyll. The other four LCTs assessed would not result in significant landscape effects during year 1 of operation.

<u>LCT 40 Craggy Upland – Argyll</u>

At operation year 1, the open moorland, peat bog and Lochan Airigh would be replaced with the Headpond infrastructure. These landscape elements are characteristic of the LCT but are common features. The new additions to the landscape would be located within a small part of the LCT but due to the open moorland, would have perceptual affects in a wider area, however, this is limited in places due to pockets of forestry plantation in the LCT. The permanent compounds would be small-scale and detracting from the open and naturalistic nature of the upland moor in this part of the LCT.

The Headpond reservoir would appear similar within the context for larger waterbodies in the local landscape such as Loch Nant. The new Headpond infrastructure, including the presence of Embankments, would highly contrast with the landscape perception of wildness of the LCT and would be incongruent in the landscape. Maintenance associated with the Headpond would include a very occasional vehicle movement, which in a landscape with some local farm traffic and access to nearby wind farms, would be a very slight alteration to the landscape receptor.

At operation, the northern Access Track to the Headpond and permanent compounds would introduce new infrastructure within open moorland. Operational tracks within plantation would be similar to existing forestry activity within the local landscape. The widened and new tracks between the Tailpond and Headpond would appear scarring, with occasional maintenance traffic. This would be partially contained by existing vegetation along glens rising on the craggy upland and would introduce some uncharacteristic features in an otherwise natural landscape. The Tailpond would be located in the neighbouring LCT to the west on the loch shore and has some localised influence on the setting.

Embedded mitigation measures are detailed within *Volume 5 Appendices, Appendix 5.4 Outline Landscape and Ecology Management Plan;* and include peat bog / upland rehabilitation, heathland sowing and broadleaf woodland planting.

The addition of new infrastructure associated with the Headpond would be uncharacteristic in the open moorland landscape. On balance, the scale and extent of change to the impression of character within a small part of this large-scale LCT at year 1 of operation would have a partial alteration to the landscape receptor.

The magnitude of effect, assessed alongside the **medium** sensitivity would result in a **moderate adverse** effect, which is considered to be **significant**.

<u>LCT 53 Rocky Coastland – Argyll</u>

At operation year 1, direct effects on the landscape fabric of this LCT would result from the operational Tailpond infrastructure and the occasional movement of vehicles on Access Tracks. The Marine Facility would be demobilised, temporary compounds restored to the existing condition, and associated tracks enclosed by woodland. There would be very limited intervisibility with the Headpond within this LCT and effects on the setting would be barely perceptible.

At the Tailpond, the inlet/outlet structure would occupy a small area on the loch shore and into the loch between pockets of mature woodland. Upgraded tracks would appear as scarring on the landscape and contrast with the existing tone. Together with occasional maintenance traffic they would increase the presence of characteristic manmade features within the landscape. The network of operational tracks that extend beyond this LCT to the east would affect the perceptual associations and setting within both located area of both compartments of this LCT that line Loch Awe.

Embedded mitigation measures are detailed within *Volume 5 Appendices, Appendix 5.4 Outline Landscape and Ecology Management Plan* and include large-scale native woodland planting and translocation of ground flora to mitigate partially against the loss of ancient woodland.

Although the geographical extent of direct and indirect change within this LCT is limited relative to its scale, the contrast in land use between the natural character and breaks in the woodland vegetation with the new infrastructure would be pronounced and uncharacteristic in the pastoral and moorland landscape.

The magnitude of effect, assessed alongside the **high** sensitivity would result in a **moderate adverse** effect, which is considered to be **significant**.

Visual Effects at Operation Year 1

Eight of the 17 representative viewpoints would experience significant adverse effects during year 1 of operation. Full details of the visual assessment are contained within *Volume 5 Appendices, Appendix 5.3 Visual Assessment*. A summary of the visual effects based on receptor groups is provided below.

<u>Residential</u>

Views experienced from the significantly affected residential receptors are considered to be of high sensitivity.

Dalavich: Views from Dalavich would be significantly affected by operational activity at year 1. There would be views of the Headpond Embankment 1 across a small part of the horizontal and vertical extent of the view in the distant background. This would be partially set against the rising craggy upland, but part of the Embankment edge would appear as a straight line across an undulating skyline, which would be a small but unnatural addition as well as bare ground. The other permanent infrastructure in view would include small-scale permanent structures, the appearance of upgraded and new Access Tracks leading to the Headpond with occasional maintenance traffic. These additions would be less perceptible in the long distance and screened in places from receptors by intervening landform. New planting and habitat restoration would be discernible on the rising hillside leading to the Headpond.

Inverinan: Views from Inverinan would be significantly affected due to filtered views from lower levels of new infrastructure associated with the Tailpond at the loch shore in the middle distance. Views from upper stories would be uninterrupted and the inlet/outlet structure would be a noticeable addition in middle distance views. Views from upper stories would be uninterrupted and the inlet/outlet structure would be a noticeable addition in middle distance views. Where visible, the scarring associated with the ground plane of new tracks and track upgrades would remain and would contrast in colour to the surrounding moorland and loch side vegetation. Embedded mitigation measures in particular native woodland planting would result in the introduction of whips and fencing into views.

Residential receptors represented by residential receptors represented by **Viewpoint 4** (Dalavich Jetty) with a **high** sensitivity and **Viewpoint 6** (Inverinan) with a **high** sensitivity, assessed alongside the magnitude of effect, would result in a **moderate adverse** effect which are considered to be **significant**.

<u>Recreational</u>

Views experienced by the significantly affected recreational receptors range from high to very high sensitivity.

Core Paths: Views from those using short sections of core paths within the Study Area would be significantly affected by operation at year 1 which would be typically at higher elevation in locations which are not enclosed by vegetation and low-lying locations where gaps exist in mature loch side vegetation. Recreational receptors along core paths near to Dalavich Jetty would be significantly affected at operation due to scale and nature of the Headpond Embankment 1 and the upgraded track would appear incongruous within a high-quality part of a wider angled view. New planting and habitat restoration would be discernible on the rising hillside leading to the Headpond.

Local walking paths and informal tracks: Views from those using sections of local walking paths within the Study Area would be significantly affected at operation year 1, including those that are in close proximity to the Development such as to the north-east of the Headpond, and in close proximity on the opposite side of Loch Awe to the Tailpond and tunnel portals. Significantly affected receptors would also include those along the loch shore off the coastal road between Inverinan and Dalavich in which views of the new infrastructure and scarring of tracks would be a pronounced change to the composition of the view in the middle distance. The operational effects would be located across the focus of the view as the craggy upland rises from the loch edge. Significantly affected receptors would also include those routes in the rugged mountains near Ben Cruachan and Stob Garb, in which the introduction of the Headpond and the associated scarring as a result of exposed rock within the Headpond, Embankments and tracks would result in a small but noticeable change in a small part of the composition of the panoramic view in the long distance. Significantly affected receptors would include those on the network on the western edge of Inveraray due to the scarring associated with the Marine Facility from the construction phase, which would be noticeable in the composition of the view due to proximity and little other detracting features in this part of the view, other than the alignment of the road. Significantly affected receptors would also include local walking tracks in close proximity to the construction of the Development, including from the Eilean na Maodail peninsula in which the construction activity and plant associated with the Tailpond and Access Tracks would dominate the central part of the view and in marked contrast with the composition and balance of features in the view.

Recreational watercraft: Views from those using recreational watercraft would be significantly affected at operation year 1 dependent on the location of the receptor on the loch, proximity to the parts of the Development and the focus of the view. This would include along Loch Awe near to the Tailpond part of the Development. In this location, the new infrastructure and scarring of tracks would be a pronounced change to the composition of the view in the middle distance. The operational effects would be located across the focus of the view as the craggy upland rises from the loch edge. Embedded mitigation measures, in particular native woodland, would introduce new features, including whip tubes and associated fencing, which would also be visible within the context of the Tailpond on the rising hillside.

Recreational receptors represented by **Viewpoint 4** (Dalavich Jetty) with a **high** sensitivity, **Viewpoint 6** (Inverinan) with a **high** sensitivity, **Viewpoint 8** (Ben Cruachan) with a **very high** sensitivity, **Viewpoint 12** (Stob Garb) with a **very high** sensitivity and **Viewpoint 19** (A83 lay-by) with a **high** sensitivity, assessed alongside the magnitude of effect, would result in a **moderate adverse** effect and recreational receptors represented by **Viewpoint 5** (Loch shore off coastal road between Inverinan and Dalavich) with a **high** sensitivity, **Viewpoint 7** (Eilean na Maodail peninsula) with a **high** sensitivity, and **Viewpoint 17** (Loch Awe watercraft) with a **high** sensitivity, assessed alongside the magnitude of effect, would result in a **major adverse** effect, which are considered to be **significant**.

<u>Visitors to places of interest</u>

Views experienced by the significantly affected visitors to places of interest are considered to be of very high sensitivity.

Mountain summits: Views from mountain summits which would be significantly affected at operation year 1 are likely to be limited to those visiting the summits of Ben Cruachan and Stob Garb, where the introduction of the Headpond and the associated scarring as a result of exposed rock within the Headpond, Embankments and tracks would result in a small but noticeable change in a small part of the composition of panoramic views in the long distance.

Visitors to places of interest represented by **Viewpoint 8** (Ben Cruachan) with a **very high** sensitivity and **Viewpoint 12** (Stob Garb) with a **very high** sensitivity, assessed alongside the magnitude of effect, would result in a **moderate adverse** effect, which are considered to be **significant**.

5.7.1.3 Summary of Effects at Operation Year 15

Effects on Landscape Designations during Operation Year 15

At year 15 of operation once reinstatement planting has established, no significant effects on landscape designations are predicted. Full details can be found within *Volume 5 Appendices, Appendix 5.2 Landscape Assessment.*

Landscape Effects at Operation Year 15

At year 15 of operation once reinstatement planting has established, no significant landscape effects are predicted. Full details can be found within *Volume 5 Appendices, Appendix 5.2 Landscape Assessment*. New infrastructure would be more assimilated into the landscape due to new planting, natural regeneration and bog rehabilitation. The colour of new, and widening of existing, Access Tracks would be less contrasting to the wider landscape. Deciduous tree planting would have also established associated with the track upgrades, which would replace former plantation vegetation.

Visual Effects at Operation Year 15

One of the 17 representative viewpoints would experience significant adverse effects during year 15 of operation. Full details of the visual assessment are contained within *Volume 5 Appendices, Appendix 5.3 Visual Assessment*. A summary of the visual effects based on receptor groups is provided below.

<u>Residential and Recreational</u>

Views experienced from the significantly affected residential and recreational receptor is considered to be of high sensitivity.

Dalavich: Views from Dalavich would be significantly affected at operation year 15. Views of the Headpond Embankment 1 and part of the waterbody infrastructure and surrounding permanent infrastructure would remain. Over time the material appearance of the Embankment would recede and appear less contrasting than at year 1. The occasional movement of plant would appear like that of other farming and forestry operations. Embedded mitigation measures, including the establishment of native woodland on rising slopes and glens and bog restoration would help to assimilate the appearance of tracks and slightly reduce the scale of the contrast of the Headpond into the view. However, the appearance of the Headpond would remain noticeable and in contrast to the composition and balance of features in views.

Residential and recreational receptors represented by **Viewpoint 4** (Dalavich Jetty) with a **high** sensitivity, assessed alongside the magnitude of effect, would result in a **moderate adverse** effect, which is considered to be **significant**.

5.8 Cumulative Effects

The following section provides and assessment of potential cumulative landscape and visual effects. The approach and methodology for the cumulative landscape and visual assessment is detailed in *Volume 5 Appendices, Appendix 5.2 Landscape Assessment and Volume 5 Appendices, Appendix 5.3 Visual Assessment.*

5.8.1 Inter-Cumulative Effects

The assessment of likely cumulative effects is based on the cumulative schemes identified in *Volume 2 Main Report, Chapter 4: Approach to EIA.* Best practice guidance states that a landscape and visual cumulative assessment should focus on the most significant cumulative effects and conclude with a clear assessment of those which are likely to influence decision making. Therefore, only the relevant cumulative schemes have been considered within this assessment.

The following cumulative schemes set out in *Volume 2 Main Report, Chapter 4: Approach to EIA* have been excluded from the landscape and visual cumulative assessment. The schemes have been excluded due to reasons including a combination of the type of development proposed, distance, lack of intervisibility and a lack of shared landscape receptors. Therefore, it is unlikely that there would be significant landscape or visual cumulative effects.

- Inverawe Hydro Scheme;
- Lochan Shira Reservoir;
- Clachan Flats Wind Farm;
- Coille Bhraghad Mineral Exploitation Drilling;
- Corr Chnoc Wind Farm;
- Cruach Mhor Wind Farm;
- Crarae Substation; and
- Crarae Substation OHL Connection.

Two cumulative scenarios have been defined based on their status and these are set out below and shown on *Volume 3 Figures, Figure 5.8 Cumulative Schemes (Scenario 1) and Operational Zone of Theoretical Visibility* and *Volume 3 Figures, Figure 5.9 Cumulative Schemes (Scenario 2) and Operational Zone of Theoretical Visibility*.

- **Cumulative Scenario 1:** The cumulative baseline for this scenario includes schemes which have been consented and/or are under construction in addition to existing operational schemes, and
- **Cumulative Scenario 2:** The cumulative baseline for this scenario includes schemes at application stage in addition to existing operational schemes and those which have been consented and/or are under construction.

The assessment of cumulative magnitude of change and significance of effects involves consideration of the additional change resulting from the Development to each cumulative baseline scenario. Once the Development is in operation, the principal parts of the Development that influence the landscape are limited to the Headpond and Tailpond, therefore the assessment of cumulative effects focuses on these parts of the Development.

For the purposes of this assessment the following assumptions have been made:

- Beinn Ghlas Wind Farm: Scenario 1 is comprised of 14 existing turbines up to 54.1 m tip height. In Scenario 2, 18 new turbines at 180 m tip height would entirely replace the existing turbines and is referred to as Beinn Ghlas Wind farm Repowering.
- Blarghour Wind Farm - Consented: Scenario 1 is comprised of 17 turbines at 136.5 m tip height. In Scenario 2, 17 new turbines at 180 m tip height would entirely replace the existing turbines and is referred to as Blarghour Wind Farm – Variation.
- The Development will have a grid connection to Creag Dhubh substation. Although overhead lines are not part of these proposals a worst-case straight-line connection has been assumed at this stage and is included as Balliemeanoch PSH Grid connection.

Table 5.7 Landscape and Visual Cumulative Schemes below sets out the cumulative schemes considered for each of the scenarios.

Table 5.7 Landscape and Visual Cumulative Schemes

Cumulative Scheme	Status (as of 12/09/2023)	Approx. distance to Tailpond and tunnel portals (km)	Approx. distance to Headpond (km)	Cumulative Scenario 1	Cumulative Scenario 2
Beochlich Hydro Scheme	Operational	1.43	1.35	✓	✓
Cruachan Hydro Scheme	Operational	10.69	11.02	✓	✓
Cruachan Expansion	Consented	10.67	11.00	✓	✓
Nant Hydro Scheme	Operational	8.44	8.81	✓	✓
Blarghour Wind Farm - Consented	Consented	1.10	0.17	✓	✗*
Blarghour Wind Farm - Variation	Scoping	1.78	0.17	✗	✓
Blarghour Wind Farm OHL Connection	Screening	3.08	2.01	✗	✓
Beinn Ghlas Wind Farm	Operational	9.08	9.94	✓	✗*
Beinn Ghlas Wind Farm Repowering	Scoping	8.92	9.90	✗	✓
An Suidhe Wind Farm	Operational	6.35	7.06	✓	✓
Carraig Gheal Wind Farm	Operational	4.59	6.22	✓	✓
Ladyfield Wind Farm	Scoping	4.83	4.12	✗	✓
Creag Dhubh Substation OHL Connection	Consented	3.71	3.67	✓	✓
An Suidhe Substation OHL Connection	Consented	10.54	9.76	✓	✓

Cumulative Scheme	Status (as of 12/09/2023)	Approx. distance to Tailpond and tunnel portals (km)	Approx. distance to Headpond (km)	Cumulative Scenario 1	Cumulative Scenario 2
Creag Dhubh to Dalmally OHL	Consented	4.25	4.20	✓	✓
Creag Dhubh to Inveraray OHL	Consented	4.07	2.47	✓	✓
An Carr Dubh Wind Farm	Application submitted	2.33	2.70	✗	✓
Dalmally OHL	Consented	0.03	1.92	✓	✓
Barachander Wind Farm	Scoping	7.49	7.90	✗	✓
Creag Dhubh Substation	Consented	4.08	4.04	✓	✓
Eredine Wind Farm	Scoping	9.29	10.04	✗	✓
Inveraray to Crossaig OHL	Consented	7.07	5.00	✓	✓
An Suidhe Substation	Consented	10.61	9.93	✓	✓
Balliemeanoch PSH Grid connection	**	0.33	0.33	✗	✓

** Beinn Ghlas Wind Farm: Scenario 1 is comprised of 14 existing turbines up to 54.1 m tip height. In Scenario 2, 18 new turbines at 180 m tip height would entirely replace the existing turbines and is referred to as Beinn Ghlas Wind farm Repowering. Blarghour Wind Farm - Consented: Scenario 1 is comprised of 17 turbines at 136.5 m tip height. In Scenario 2, 17 new turbines at 180 m tip height would entirely replace the existing turbines and is referred to as Blarghour Wind Farm – Variation.*

*** Balliemeanoch PSH Grid connection has been included in Scenario 2 as the Development will require connection to the grid, although the Applicant expects this to be an underground connection. However, the worst-case scenario of an OHL has been assumed from the Development to the Creag Dhubh substation (consented scheme) solely for the purposes of this assessment. Any overhead line would be subject to its own separate consenting process under the Electricity Act and this does not form part of the current proposals.*

The approximate development extent of each of the cumulative schemes outlined above are shown on *Volume 3 Figures, Figure 5.8 Cumulative Schemes (Scenario 1) and Operational Zone of Theoretical Visibility* and *Volume 3 Figures, Figure 5.9 Cumulative Schemes (Scenario 2) and Operational Zone of Theoretical Visibility* in different formats dependent on the development type. This is generally set out as follows:

- Wind farms – development extent shown as the main cluster of turbines as a polygon;
- Overhead line connections – development extent shown as lines; and
- Other types of development e.g. substations – development extent shown as points centred in the main part of the development.

The approximate development extent of each of the relevant cumulative schemes outlined above are also shown within *Volume 4: Visualisations* for each of the representative viewpoints. The approximate development extents are depicted by a line for wind farms and overhead line connections and arrows for other types of development.

5.8.1.1 Cumulative Landscape Effects

Potential significant cumulative effects would occur where the addition of the Development to the cumulative baseline would increase the prominence of energy infrastructure to the extent that they would potentially become either an influential characteristic or character-defining feature of a landscape.

As a result of the restricted nature of potential visibility and the limited nature of change resulting from the Development identified in the LVIA, it is considered that there is very limited potential for significant cumulative landscape effects on the landscape receptors found within the Study Area. The cumulative landscape assessment therefore takes a targeted approach, focusing on those landscape designations and LCTs where the potential for significant cumulative landscape effects is greatest:

- North Argyll LLA;

- LCT 34 Steep Ridges and Mountains;
- LCT 35 Rugged Mountains;
- LCT 40 Craggy Upland – Argyll; and
- LCT 53 Rocky Coastland – Argyll.

The full cumulative landscape assessment is set out in *Volume 5 Appendices, Appendix 5.2 Landscape Assessment*. In addition, the appraisal of potential cumulative landscape effects on the WLA 09 Loch Etive Mountains is also set out within *Volume 5 Appendices, Appendix 5.2 Landscape Assessment*. The following sections provide a summary of the assessment of cumulative effects on landscape designations and landscape character for the focused receptors as set out above.

5.8.1.2 Summary of the Assessment of Cumulative Effects on Landscape Designations

It is considered that there would be no significant cumulative effects on landscape designations as a result of the addition of the Development into the cumulative baseline scenario.

<u>North Argyll LLA</u>

For both Scenario 1 and 2, the addition of the Development into the cumulative scenario would affect the perceptual associations across the southern setting of this LLA. The addition of the Development would increase the influence of energy generation infrastructure on the southern setting of the LLA, but that would be isolated to the most upland areas of the landscape and most key characteristics would remain unchanged.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **very low**. Taking account of the **high** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

5.8.1.3 Summary of the Assessment of Cumulative Effects on Landscape Character

It is considered that there would be no significant cumulative effects on landscape character as a result of the addition of the Development into the cumulative baseline scenario.

<u>LCT 34 Steep Ridges and Mountains</u>

For both Scenario 1 and 2, the addition of the Development into the cumulative scenario would affect the perceptual associations across the western setting the LCT. The concentration of energy infrastructure within a large-scale landscape to the west would slightly reduce the scenic quality experienced from a very small, elevated part of this LCT. However, most of the key characteristics would remain unchanged.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **very low**. Taking account of the **high** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

<u>LCT 35 Rugged Mountains</u>

For both Scenario 1 and 2, the addition of the Development into this cumulative scenario would affect the perceptual associations across the southern setting of the LCT. Development into this cumulative scenario would affect the perceptual associations and scenic quality experienced from a small, elevated part of the southern area of the LCT. Most of the key characteristics of the LCT would remain unchanged.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **very low**. Taking account of the **high** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

<u>LCT 40 Craggy Upland – Argyll</u>

For Scenario 1, the Headpond is located within this LCT which has the potential for direct cumulative change. The addition of the Development would increase the influence of energy generation infrastructure within a small geographic area of the LCT consistent with the existing pattern of energy infrastructure. The perceptual effects from the addition of the Development would be experienced over a larger area of the LCT, however, the scenic quality of the LCT is not considered to be an integral characteristic of the LCT.

For Scenario 2, the likely intervisibility between the Development and cumulative schemes would slightly increase the impression of energy infrastructure compared to Scenario 1 as there would be a greater number of energy infrastructure schemes within the LCT due to additional wind farms. The addition of the Development would increase the area of the pocket, but it would retain separation from other concentrated pockets of energy infrastructure in this LCT due to intervening forestry plantation and landform.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **low.** Taking account of the **medium** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

<u>LCT 53 Rocky Coastland – Argyll</u>

For both Scenario 1 and 2, the addition of the Development into the cumulative scenario would introduce additional energy infrastructure into the LCT, locally increasing energy infrastructure into a small geographic area of the LCT. The proposed Tailpond would be located in part of the LCT with existing influence from a small section of OHL and the B840. The proximity of the Tailpond to existing energy infrastructure would be consistent with the existing pattern of energy infrastructure in the wider setting of the LCT concentrated in pockets. The addition of the Development into this cumulative scenario would affect the perceptual associations across the LCT and the setting of the LCT, including the addition of both the Headpond and Tailpond. This would affect scenic quality focused along the loch and its background.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **low**. Taking account of the **high** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

5.8.1.4 Cumulative Visual Effects

Potential significant cumulative effects would occur where the addition of the Development to the cumulative baseline would increase the prominence of energy infrastructure to the extent that they would potentially become either an influential characteristic or character-defining feature in views across the landscape.

As a result of the restricted nature of potential visibility and the limited nature of change resulting from the Development identified in the LVIA, it is considered that there is very limited potential for significant cumulative visual effects on the visual receptors found within the Study Area. The cumulative visual assessment therefore takes a targeted approach, focusing on those representative viewpoints where the potential for significant cumulative visual effects is greatest:

- Viewpoint 4;
- Viewpoint 5;
- Viewpoint 6;
- Viewpoint 7;
- Viewpoint 8; and
- Viewpoint 17.

The full cumulative visual assessment is set out in *Volume 5 Appendices, Appendix 5.3 Visual Assessment.* The following sections provide a summary of the assessment of cumulative effects on representative viewpoints for the focused receptors as set out above.

5.8.1.5 Summary of the Assessment of Cumulative Effects on Visual Amenity

It is considered that there would be no significant cumulative effects on visual amenity as a result of the addition of the Development into the cumulative baseline scenario.

<u>Viewpoint 4</u>

For Scenario 1, the addition of the Development into the cumulative scenario would introduce the influence of energy infrastructure into part of the view that would include the Blarghour Wind Farm – Consented scheme. The Blarghour Wind Farm – Consented scheme would be located within plantation and immediately south of the Development and would filter views of the Headpond.

For Scenario 2, the addition of the Development would add to the presence of energy infrastructure in a small part of the horizontal field of view.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **low**. Taking account of the **very high** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

<u>Viewpoint 5</u>

For both Scenario 1 and 2, the addition of the Development into this cumulative scenario would extend the influence of energy infrastructure across the horizontal extent of the view. However, the appearance inlet/outlet structure is unlikely to be associated with scale and mass of the cumulative schemes.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **low**. Taking account of the **high** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

Viewpoint 6

For Scenario 1, the addition of the Development into this cumulative scenario would concentrate energy infrastructure across the central part of the view between the two wind farms. The addition of the Development would intensify the influence of energy infrastructure in a small part of the horizontal field of view in a panorama that has some screening from existing foreground vegetation.

For Scenario 2, the addition of the Development would intensify the influence of energy infrastructure in a small part of the horizontal field of view in a panorama that has some screening from existing foreground vegetation. The other cumulative schemes in the view would be separated from the Development as they would generally be located in the distance within the craggy upland.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **low**. Taking account of the **high** sensitivity, the significance of cumulative effects is judged to be **minor adverse** (**not significant**).

Viewpoint 7

For Scenario 1, the addition of the Development into this cumulative scenario would slightly extend the influence of energy infrastructure in the horizontal extent of view. The Development would be in a small part of the view, where visible through foreground vegetation which would create separation from the other cumulative schemes. The remainder of the rising rocky coastland and craggy upland in the view would remain unaffected.

For Scenario 2, the addition of the Development would intensify the influence of energy infrastructure in a small part of the horizontal field of view in a panorama. This would be within the horizontal extent of view already influenced by wind farms, albeit separated somewhat as these would be located in the craggy upland.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **low**. Taking account of the **High** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

Viewpoint 8

For Scenario 1, addition of the Development into this cumulative scenario would slightly increase the influence of energy infrastructure into part of the horizontal extent of the view that would include the Blarghour Wind Farm – Consented scheme in the craggy upland and an OHL. However, the Development would be concentrated within part of the view affected by energy infrastructure and is less likely to be associated with the scale and mass of windfarms.

For Scenario 2, there would be additional wind farms and OHLs in the view, however the Development other than OHLs would remain to be concentrated in pockets from the elevated view. The addition of the Development is unlikely to alter the overall balance of features in this part of the views.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **low**. Taking account of the **very high** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

Viewpoint 17

For both Scenario 1 and 2, the addition of the Development into this cumulative scenario would extend the influence of energy infrastructure across the horizontal extent of the view. The Development would be in a small part of the view and would be located at the loch shore, which would create separation from the other cumulative schemes. Overall, the addition of the Development would intensify the influence of energy infrastructure in a small part of the horizontal field of view and the remainder of the rising rocky coastland and craggy upland in the view would remain unaffected.

For both Scenario 1 and 2, the magnitude of cumulative change resulting would be **low**. Taking account of the **high** sensitivity, the significance of cumulative effect is judged to be **minor adverse** (**not significant**).

5.8.2 Intra-Cumulative Effects

The Chapters where there is the potential for intra-relationship effects include the following:

- **Volume 2, Chapter 6: Terrestrial Ecology** – There would be combined effects on landscape habitats, including the craggy upland and plateau moor and forest landscapes, at construction and operation.
- **Volume 2, Chapter 13: Cultural Heritage** – There would be combined effects on the visual amenity experienced within the Inveraray Castle GDL, Ardkinglas and Strone GDL and Ardanaiseig House GDL and on the setting of the designations.
- **Volume 2, Chapter 14: Access, Traffic and Transport** – Combined effects would be experienced by users of the road network during the construction phase where the sense of activity would increase.
- **Volume 2, Chapter 15: Noise and Vibration** - Combined effects would be experienced by landscape and visual receptors in close proximity to construction activity through the construction phase where the sense of activity would increase.
- **Volume 2, Chapter 16: Socio-Economic, Recreation and Tourism** – Combined effects would be experienced by recreational users of the designated routes and core paths within the Study Area, where there would be intervisibility of the Development and where there are also diversions proposed.

5.9 Mitigation and Monitoring

5.9.1 Embedded Mitigation

Embedded mitigation measures, which have been incorporated within the design of the Development or which are standard practice measures that have been committed to, are summarised in *Volume 2 Main Report, Chapter 3: Evolution of Design and Alternatives*. All mitigation measures for the landscape and visual impact assessment are embedded and are detailed in the outline Landscape and Ecological Management Plan (oLEMP) (refer to *Volume 5 Appendices, Appendix 5.4 Outline Landscape and Ecology Management Plan).*

The habitat restoration principles are as follows and are further expanded upon within *Volume 5 Appendices, Appendix 5.4 Outline Landscape and Ecology Management Plan:*

- Blanket bog / upland rehabilitation;
- Native woodland planting;
- Wet woodland planting;
- Heathland seeding (Embankments);
- Meadow Grassland and Loch Fyne Coastal Grassland Seeding;
- Ancient woodland management;
- Woodland management;
- Notable habitat management;
- Protected species mitigation; and
- Invasive Non-native Species Management (INNS).

Whilst residual significant effects remain for some of the landscape and visual receptors, no additional mitigation is available that would be effective in further reducing effects.

5.10 Residual Effects

As all mitigation is embedded in the Development and there is no additional mitigation, all effects described in the section above are residual. The following tables therefore present a summary of the landscape and visual impact assessment.

The construction phase of works falls into two phases, pre-construction and construction. For the purposes of the LVIA, impacts associated with the two phases are considered as a single construction phase of works with sequenced activities extending over the seven-year construction period.

The following tables demonstrate that there are no expected residual significant effects at operation on local landscape designations as noted in Policy 4 of NPF4 (**Ref 2**).

Table 5.8 Summary of Effects: Construction

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Inveraray Castle GDL	Effect on landscape character	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Ardkinglas and Strone GDL	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Ardanaiseig House GDL	Effect on landscape character	Neutral	N/A (All mitigation is embedded)	Neutral	Not significant
North Argyll LLA	Effect on landscape character	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
West Loch Fyne (Coast) LLA	Effect on landscape character	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
East Loch Fyne (Coast) LLA	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
WLA 09 Loch Etive Mountains	Effect on landscape character	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
LCT 34 Steep Ridges and Mountains	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
LCT 35 Rugged Mountains	Effect on landscape character	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
LCT 37 Upland Glens - Argyll	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
LCT 39 Plateau Moor & Forest - Argyll	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
LCT 40 Craggy Upland - Argyll	Effect on landscape character	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
LCT 53 Rocky Coastland - Argyll	Effect on landscape character	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 1 - Dun Na Cuaiche, Inveraray	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 2 - Minor road - near A815	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Viewpoint 3 - Kilmaha	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 4 - Dalavich Jetty	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Viewpoint 5 - Loch shore off coastal road between Inverinan and Dalavich	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 6 - Inverinan	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 7 - Eilean na Moadail peninsula	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 8 - Ben Cruachan	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Viewpoint 9 - Dorlin Point	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 10 - Ardanaiseig GDL	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 11 - A85	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 12 - Stob Garbh	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 13 - Ben Eunaich	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 14 - Beinn a' Chleibh	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 15 - Ben Lui	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 16 - Duncan Bann Macintyre Monument	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 17 - Loch Awe watercraft	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 18 - A815 – St Catherines	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Viewpoint 19 - A83 lay-by	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**

Table 5.9 Summary of Effects: Operation Year 1

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Inveraray Castle GDL	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Ardkinglas and Strone GDL	Effect on landscape character	Neutral	N/A (All mitigation is embedded)	Neutral	Not significant
Ardanaiseig House GDL	Effect on landscape character	Neutral	N/A (All mitigation is embedded)	Neutral	Not significant
North Argyll LLA	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
West Loch Fyne (Coast) LLA	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
East Loch Fyne (Coast) LLA	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
WLA 09 Loch Etive Mountains	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
LCT 34 Steep Ridges and Mountains	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
LCT 35 Rugged Mountains	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
LCT 37 Upland Glens - Argyll	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
LCT 39 Plateau Moor & Forest - Argyll	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
LCT 40 Craggy Upland - Argyll	Effect on landscape character	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
LCT 53 Rocky Coastland - Argyll	Effect on landscape character	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Viewpoint 1 - Dun Na Cuaiche, Inveraray	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 2 - Minor road - near A815	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 3 - Kilmaha	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 4 - Dalavich Jetty	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Viewpoint 5 - Loch shore off coastal road between Inverinan and Dalavich	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 6 - Inverinan	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Viewpoint 7 - Eilean na Moadail peninsula	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 8 - Ben Cruachan	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Viewpoint 9 - Dorlin Point	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 10 - Ardanaiseig GDL	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 11 - A85	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 12 - Stob Garbh	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Viewpoint 13 - Ben Eunaich	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 14 - Beinn a' Chleibh	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 15 - Ben Lui	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 16 - Duncan Bann Macintyre Monument	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 17 - Loch Awe watercraft	Effect on visual amenity	Major adverse	N/A (All mitigation is embedded)	Major adverse	**Significant**
Viewpoint 18 - A815 – St Catherines	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 19 - A83 lay-by	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**

Table 5.10 Summary of Effects: Operation Year 15

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Inveraray Castle GDL	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Ardkinglas and Strone GDL	Effect on landscape character	Neutral	N/A (All mitigation is embedded)	Neutral	Not significant
Ardanaiseig House GDL	Effect on landscape character	Neutral	N/A (All mitigation is embedded)	Neutral	Not significant
North Argyll LLA	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
West Loch Fyne (Coast) LLA	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
East Loch Fyne (Coast) LLA	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
WLA 09 Loch Etive Mountains	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
LCT 34 Steep Ridges and Mountains	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
LCT 35 Rugged Mountains	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
LCT 37 Upland Glens - Argyll	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
LCT 39 Plateau Moor & Forest - Argyll	Effect on landscape character	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
LCT 40 Craggy Upland - Argyll	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
LCT 53 Rocky Coastland - Argyll	Effect on landscape character	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 1 - Dun Na Cuaiche, Inveraray	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 2 - Minor road - near A815	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 3 - Kilmaha	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 4 - Dalavich Jetty	Effect on visual amenity	Moderate adverse	N/A (All mitigation is embedded)	Moderate adverse	**Significant**
Viewpoint 5 - Loch shore off coastal road between Inverinan and Dalavich	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 6 - Inverinan	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 7 - Eilean na Moadail peninsula	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 8 - Ben Cruachan	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 9 - Dorlin Point	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Viewpoint 10 - Ardanaiseig GDL	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 11 - A85	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 12 - Stob Garbh	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 13 - Ben Eunaich	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 14 - Beinn a' Chleibh	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 15 - Ben Lui	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 16 - Duncan Bann Macintyre Monument	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 17 - Loch Awe watercraft	Effect on visual amenity	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
Viewpoint 18 - A815 – St Catherines	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant
Viewpoint 19 - A83 lay-by	Effect on visual amenity	Negligible adverse	N/A (All mitigation is embedded)	Negligible adverse	Not significant

5.11 References

Ref 1 Council of Europe (2000). Council of Europe Landscape Convention (ETS No. 176).

Ref 2 Scottish Government, (2023). National Planning Framework 4.

Ref 3 Scottish Natural Heritage, (2000). Planning Advice Note 60 – Planning for Natural Heritage (PAN 60).

Ref 4 Argyll and Bute Council (2015). Local Development Plan 2 [Online]. Available: https://www.argyll-bute.gov.uk/planning-and-building/planning-policy/local-development-plan-2 (Accessed: 22/03/2024).

Ref 5 Landscape Institute and Institute of Environmental Management and Assessment. (2013). Guidelines for Landscape & Visual Impact Assessment (Third Edition). Routledge.

Ref 6 NatureScot. (2021). Guidance - Assessing the cumulative landscape and visual impact of onshore wind energy developments [Online]. Available: https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments (Accessed: 22/04/2024).

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Ref 8 NatureScot. (2020). Assessing impacts on Wild Land Areas - technical guidance [Online]. Available: https://www.nature.scot/doc/assessing-impacts-wild-land-areas-technical-guidance (Accessed: 22/03/2024).

Ref 9 Landscape Institute. (2021). Assessing landscape value outside national designations Technical Guidance Note 02/21 [Online]. Available: https://www.landscapeinstitute.org/publication/tgn-02-21-assessing-landscape-value-outside-national-designations/ (Accessed: 01/03/2024).

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Ref 11 Landscape Institute. (2019). Visual Representation of Development Proposals Technical Guidance Note 06/19 [Online]. Available: https://www.landscapeinstitute.org/visualisation/ (Accessed: 01/03/2024).

Ref 12 Argyll and Bute Council. (2017). Landscape wind energy capacity study [Online]. Available: https://www.argyll-bute.gov.uk/planning-and-building/planning-policy/landscape-wind-energy-capacity-study (Accessed: 22/03/2024).

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Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 6: Terrestrial Ecology

ILI (Borders PSH) Ltd

July 2024

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

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6. Terrestrial Ecology

6.1 Introduction

This chapter addresses the potential impacts and effects of the construction, operation (including maintenance) / restoration of the Development on terrestrial ecology features. Where appropriate, it provides details of committed mitigation and/or enhancement measures identified to minimise or compensate for adverse effects on these features.

This chapter concerns terrestrial ecological features, including designated nature conservation sites, habitats and species. Features that are exclusively freshwater (as opposed to amphibious features such as otter *Lutra lutra*, which are addressed in this terrestrial ecology chapter), marine features and ornithological features are separately addressed in the following respective chapters:

- *Chapter 07: Aquatic Ecology;*
- *Chapter 08: Marine Ecology; and,*
- *Chapter 09: Ornithology.*

This chapter is supported by the following Appendices within Volume 5 Appendices:

- *Appendix 6.1: Method for Ecological Impact Assessment*
- *Appendix 6.2: Statement to inform Habitats Regulations Appraisal (Confidential Version within Volume 6 Confidential Appendices)*
- *Appendix 6.3: Habitats;*
- *Appendix 6.4: Mammals;*
- *Appendix 6.5: Bats;*
- *Appendix 6.6: Butterflies and Dragonflies.*

The following figures accompany this chapter:

- *Figure 6.1: European Sites;*
- *Figure 6.2: Ancient Woodland;*
- *Figure 6.3: Phase 1 Habitats;*
- *Figure 6.4: National Vegetation Classification (NVC) and notable plants;*
- *Figure 6.5: Potential Groundwater Dependent Terrestrial Ecosystems (GWDTE);*
- *Figure 6.6: Invasive Non-Native Species;*
- *Figure 6.7: Mammal survey areas and camera trap locations;*
- *Figure 6.8: Otter survey results and incidental records;*
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- *Figure 6.10: Pine marten, badger and red squirrel survey results and incidental records;*
- *Figure 6.11: Bat survey areas, transect routes and static detector locations;*
- *Figure 6.12: Bat Roost Suitability assessment results;*
- *Figure 6.13: Bat transect survey results;*
- *Figure 6.14: Butterfly and dragonfly survey results.*

Also relevant to this chapter is the Statement to Inform Habitats Regulations Appraisal submitted as part of the Section 36 application in support of the Development. This sets out the assessment to test for adverse effects from the Development on qualifying features of European sites, which comprise Special Areas of Conservation (SAC) and Special Protection Areas (SPA). SAC are relevant to this chapter, but SPA are designated for the conservation of bird species and are therefore dealt with in Chapter 09: Ornithology. Where appropriate, reference is made in this chapter to analysis in the Statement to Inform Habitats Regulations Appraisal.

In this chapter, animal and vascular plant species are given their common and scientific names when first referred to and their common names only thereafter. Common names of bryophytes are not well-known therefore only scientific names are used. Animal scientific names follow those used by the National Biodiversity Network. Vascular plant scientific names follow Stace (2019), and Atherton *et al.* (2010) for bryophytes. All distances are cited as the shortest distance 'as the crow flies', unless otherwise specified.

6.2 Legislation and Policy

6.2.1 Legislation

The following nature conservation legislation is potentially relevant to the Development and has been considered during the preparation of this chapter:

- Convention on Wetlands of International Importance ('Ramsar Convention');
- Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the 'Habitats Regulations');
- Wildlife and Countryside Act 1981 (as amended) (the 'WCA');
- Nature Conservation (Scotland) Act 2004 (as amended);
- Wildlife and Natural Environment (Scotland) Act 2011 (as amended) (the 'WANE Act');
- Protection of Badgers Act 1992 (as amended);
- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) ('CAR');
- Water Environment and Water Services (Scotland) Act 2003 ('WEWS Act').

6.2.2 Planning Policy

Detailed information on relevant planning policy can be found in the Planning Statement which has been submitted as part of the Section 36 application for the Development. However, a brief summary of national and local planning policy relevant to conservation is given under the following sub-headings:

6.2.2.1 National Planning Policy

National Planning Framework 4 (NPF4) was formally adopted by Scottish Ministers on 13 February 2023. NPF4 includes the following statements of policy intent: "*To protect, restore and enhance natural assets making best use of nature-based solutions*" and "*To protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks*". Wherever possible and proportionate to the scale and nature of the project, the Development has therefore sought to deliver benefits for biodiversity, in addition to protecting existing biodiversity. NPF4 also states that major development will only be supported where nature networks "*are in a demonstrably better state than without intervention*" using best practice and including future monitoring and management where appropriate.

Prior to the UK's exit from the European Union (EU), Scotland's SACs and SPAs were part of a wider European network of such sites known as the 'Natura 2000 network'. They were consequently referred to as 'European sites'. Now that the UK has left the EU, Scotland's SACs and SPAs are no longer part of the Natura 2000 network but form part of a UK-wide network of designated sites referred to as the 'UK site network'. However, it is current Scottish Government policy to retain the term 'European site' to refer collectively to SACs and SPAs (Scottish Government, 2020).

6.2.2.2 Local Planning Policy

Local Development Plan 2 (LDP2) for Argyll and Bute was adopted in February 2024. Planning policy relevant to nature conservation and the Development contained within LDP2 is summarised in Table 6.1. Further detail can be found in LDP2 at https://www.argyll-bute.gov.uk/planning-and-building/planning-policy/local-development-plan-2.

Table 6-1 Summary of Potentially Relevant Policies within the Argyll and Bute LDP2

Planning Policy	Summary of Purpose
Policy 30 – The Sustainable Growth of Renewables	The Council will support renewable energy developments where consistent with the principles of sustainable development and it can be demonstrated that there would be no unacceptable environmental effects, including on ecological features.
Policy 73 – Development Impact on Habitats, Species and Biodiversity	The Council will consider nature conservation legislation, the Argyll and Bute Biodiversity Strategy and Action Plan and the Scottish Biodiversity Strategy when assessing developments. Where a development is likely to have effects on important habitats or species, the Council will require the developer to undertake appropriate surveys and, if necessary, to prepare a mitigation plan. Development proposals likely to have an adverse effect on protected species and habitats will only be permitted where it can be justified in accordance with the relevant protected species legislation.
Policy 74 – Development Impact on Sites of International Importance	This policy sets out the strict requirements for developments potentially affecting European sites, including compliance with the Habitats Regulations.
Policy 75 – Development Impact on Sites of Special Scientific Interest and National Nature Reserves	This policy sets out requirements for developments affecting Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR). Where adverse effects on these are possible, developments must demonstrate that integrity of the sites/interests would not be compromised, or that social, economic or environmental benefits of national important clearly outweigh adverse effects on the sites/interests, and that there no suitable alternative locations.
Policy 76 – Development Impact on Local Nature Conservation Sites	Development having a significant effect on Local Nature Conservation Sites (LNCS) will not be supported unless demonstrated that clear social, economic or environmental benefits outweigh the adverse effects and sufficient mitigation is provided to conserve and enhance the site interests.
Policy 77 – Forestry, Woodland and Trees	There is a strong presumption in favour of protecting these resources, particularly ancient semi-natural woodland, native or long-established woods, hedgerows and trees with high nature conservation value. Developments affecting these must demonstrate clear public benefits and provide adequate compensation.
Policy 78 – Woodland Removal	Woodland removal and compensation will be assessed using Scottish Government's Control of Woodland Removal Policy and Argyll and Bute Woodland and Forestry Strategy. Compensatory planting is preferred on-site, secondarily off-site in Argyll and Bute and least preferably elsewhere in Scotland.

6.3 Consultation

The assessment of impacts on terrestrial ecological features has been informed and influenced by consultation held with several statutory and non-statutory stakeholders. A summary of the consultation held, the information / recommendations provided by consultees, and details of how this EIA has responded to consultee feedback is provided in *Table 6-2 Summary of Consultation*.

Table 6-2 Summary of Consultation

Consultee	Summary of Response	Action Taken
NatureScot	In summary, where relevant to terrestrial ecology, the scoping response expected: • impacts on nationally-important peatland habitat and deep peat / carbon-rich soils to be addressed; • the EIAR to set out how such impacts would be avoided, mitigated or compensated; • inclusion of a Peatland Management Plan and Habitat Management Plan; • consideration of operational hydrology impacts; • impacts on groundwater dependent terrestrial ecosystems (GWDTE) to be addressed; • habitat and National Vegetation Classification (NVC) surveys to cover sufficient area to assess impacts on hydrological bog units; • cumulative assessment to consider any upgrade of Blarghour Wind farm Access Tracks, and the Blarghour Land Management Plan (involving conversion of 95ha conifer plantation to a mosaic of native woodland and open ground suitable for notable breeding birds);	This EIA has responded to this advice provided by NatureScot as follows: • impacts on peatland habitats have been considered in detail; • impacts on deep peat have been minimised as far as possible by moving infrastructure elements; • mitigation and compensation of peatland impacts has been considered; • a Preliminary Peat Management Plan (PMP) and Outline Landscape and Ecological Management Plan (oLEMP) have been developed; • GWDTE and hydrological impacts have been considered; • with local exceptions, habitat and NVC surveys generally extended to at least 200m from infrastructure; • Blarghour Wind Farm Access Track, if constructed, will not be upgraded and therefore does not require assessment, and

Consultee	Summary of Response	Action Taken
	• impacts on wild deer to be considered, stating whether impacts are possible, and if so a deer management statement to be included; • inclusion of a Biosecurity Management Plan; • demonstration of biodiversity enhancement, considering measures by nearby developments.	the Blarghour Land Management Plan has been considered; • impacts on wild deer have been considered; • habitat enhancement has been considered, with consideration of proposals by nearby developments.
Argyll and Bute Council	No specific terrestrial ecology issues were raised in the scoping response.	N/A
Royal Society for the Protection of Birds (RSPB)	In summary, where relevant to terrestrial ecology, the scoping response recommended: • detailed peat mapping; • planting low-density native scrub and woodland to extend and link existing native woodland (constituting temperate 'rainforest'), which would also expedite carbon offsetting of peatland impacts, replace lost ancient woodland, and support raptor prey species and black grouse *Tetrao tetrix*; • inclusion of mitigation and enhancement for priority species and habitats, with appropriate timing constraints; • consideration of construction lighting impacts; • inclusion of actions to achieve positive biodiversity effects in line with NPF4; • avoidance of Class 1 and 2 peatland wherever possible; • setting out whether the Development Site interfaces with habitat management plans by nearby developments.	This EIA has responded to this advice provided by RSPB as follows: • detailed peat mapping has been carried out; • a oLEMP has been produced including extensive and sensitive native tree planting expanding existing ancient woodland; • mitigation/enhancement for priority species/habitats has been included where appropriate; • lighting impacts have been considered; • a range of measures have been included in the oLEMP to achieve positive effects; • peatland loss has been minimised as far as possible, e.g. by routing Access Tracks on shallower peat; • consideration has been given to habitat management plans of nearby developments.
Scottish Forestry	In summary, where relevant to terrestrial ecology, the scoping response recommends: • not removing large woodland areas; • minimising woodland removal and emphasising replanting efforts where felling is necessary; • addressing woodland management and tree felling within the EIA.'	This EIA has responded to this advice provided by Scottish Forestry as follows: • no large woodland areas will be removed; • infrastructure refinements have been made to minimise woodland removal; • the oLEMP includes planting and woodland management measures, including extensive native planting in appropriate places in accordance with biodiversity and landscape enhancement principles.
SEPA	In summary, where relevant to terrestrial ecology, the scoping response recommends: • peat depth surveys to inform development design; • avoidance of pristine/near-natural peatland, with compensatory restoration and enhancement where impacts on such habitat are unavoidable; • responsible handling of excavated catotelmic peat by reusing it within a functional peatland below the water table and covered with reinstated turves; • minimising Access Tracks, and designing floating tracks over areas of deep peat.	This EIA has responded to this advice provided by SEPA as follows: • peat depth surveys have been carried out and have been used to locate infrastructure to minimise impacts on deeper peat; • as far as possible higher quality peatland has been avoided, such as by avoiding deeper peat and known locations of scarce sphagnum species, however the Headpond unavoidably impacts some higher quality wetter peatland (although not with known scarce sphagnum species); • a Peatland Management Plan has been produced with catotelmic peat management; • existing forestry and other Access Tracks have been used as far as possible; • floating tracks will be used over all peat of 1m or greater depth, which has also been avoided by design as far as possible.

6.4 Study Area

The Zone of Influence (ZoI) of the Development is the area over which an ecological effect might extend as a result of construction and/or operation . This will vary for different ecological features and effects, depending on their sensitivity to environmental change. It is therefore appropriate to identify different ZoI for different features and effects. As recommended by the Chartered Institute of Ecology and Environmental Management in CIEEM (2022), professionally accredited or published studies and guidance, where available, were used to help determine the likely ZoI, as well as professional judgement. However, CIEEM also highlight that establishing the ZoI should be an iterative process informed by both desk study and field survey. Where limited information was available, the Precautionary Principle (UNESCO, 2005) was adopted and a ZoI estimated on that basis.

The desk study and field survey areas were designed to allow sufficient data to be collected to establish the baseline condition of ecological features and determine the impacts of the Development. However, the ZoI can extend beyond a development and beyond the survey area. However, at a distance from a development its impacts might not result in *significant effects* (these being the focus of Ecological Impact Assessment (EcIA) according to CIEEM guidance), and even where a significant effect might occur over a large distance this does not necessarily require the field survey to extend to such distances (e.g., loss of individuals of a nationally rare plant could be considered to have a significant effect at a national scale). The field survey areas adopted for this assessment were sufficiently precautionary to allow assessment of potentially significant effects from the Development on ecological features, including within the wider ZoI beyond the field survey areas.

6.5 Methods

6.5.1 Guidance and Standards

The following principal guidance informed the scope and method of the assessment, including field survey:

- *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2022);
- *Assessing the Cumulative Impact of Onshore Wind Energy Developments* (Scottish Natural Heritage (SNH), 2018).

Where other specific guidance for specific ecological features has been referenced, this is stated further below in this chapter and in the accompanying appendices.

6.5.2 Assessment Scope

The scope of survey and assessment described in this chapter was informed by the guidance listed in Section 6.5.1, desk study results and published guidance for specific ecological features (as referenced where appropriate below), the responses of consultees (as set out in *Table 6-2 Summary of Consultation*), and professional expertise.

EcIA guidelines (CIEEM, 2022) advise that only those features that are ‘important’ and that could be significantly affected by the Development require detailed assessment, stating that “*it is not necessary to carry out detailed assessment of ecological features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable*”. Consequently, for the purposes of the desk study, field survey and assessment described in this chapter, important ecological features were taken to include:

- Qualifying non-avian features of SACs or other international designations within 10km (or further where connectivity exists) of the Proposed Development;
- Notified non-avian features of Sites of Special Scientific Interest (SSSIs) or other national designations within 2km (or further where connectivity exists) of the Proposed Development;
- Species listed on Schedules 2 and 4 of the Habitats Regulations;
- Species listed on Schedules 5 and 8 of the WCA;
- Badger *Meles meles*, afforded protection under the Protection of Badgers Act;
- Priority species and habitats listed on the Scottish Biodiversity List SBL;
- Species or habitats listed or indicated to be priorities in the Argyll and Bute LBAP;
- Invasive non-native species listed on Schedule 9 of the WCA (although this no longer legally applies in Scotland) and those considered to be of European Union (EU) concern under the Invasive Alien Species Regulation.

Other species or habitats, that may be rare, scarce or otherwise notable, have been included where deemed appropriate through available information and/or professional judgement.

In further regard to the scope of assessment, the following apply:

- Decommissioning was scoped out of assessment as the decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of such facilities. Potential decommissioning effects are therefore considered to be similar to and associated with the components described in the project construction phase, and are not separately assessed. However, a decommissioning survey and plan would be produced when required;
- The Development will not construct an Access Track from Three Bridges (such an Access Track will only be used if already consented and constructed by Blarghour Wind Farm and the necessary land rights have been secured). Therefore, the Three Bridges Access Track was excluded from assessment of construction effects.

6.5.3 Baseline Data Collection

6.5.3.1 Desk Study

A desk study was carried out to identify nature conservation designations and records of protected and notable species potentially relevant to the Development. A stratified approach was taken, based on the possible ZoI of the Development on different ecological features. Accordingly, the desk study sought to identify:

- International nature conservation designations within 10km of the Development Site (or further where there is connectivity, e.g. hydrologically);
- National nature conservation designations within 2km of the Development Site (or further if there is connectivity, e.g. hydrologically);
- Local nature conservation designations within 1km of the Development Site;
- Records of protected and notable species within 1km of the Development Site.

The desk study was carried out using the data sources detailed in *Table 6-3 Desk Study Data Sources.*

Table 6-3 Desk Study Data Sources

Data Source	Date Last Accessed	Data Obtained
Argyll and Bute Council website (https://www.argyll-bute.gov.uk/)	30 October 2023	• Local Development Plan policies relevant to nature conservation; • Argyll and Bute LBAP information; • Information on relevant planning applications for cumulative assessment.
Argyll and Bute Council Open Data website (https://data-argyll-bute.opendata.arcgis.com/datasets/d05f7337b41e48b4af933404dc0592a2/explore)	06 July 2023	• Information on local non-statutory nature conservation designations.
Highland Biological Records Group (HBRG)	11 August 2023	• Records of protected and notable species, obtained via the NBN (see below – HBRG advised that records were uploaded to NBN and should be obtained from there).
NatureScot SiteLink and Open Data Hub (https://sitelink.nature.scot/home; https://opendata.nature.scot/)	02 August 2023	• Extents of and information on international and national statutory designations; • Ancient Woodland Inventory; • Other relevant information e.g. Wildcat Priority Areas.
NBN Atlas Scotland (https://scotland.nbnatlas.org/)	11 August 2023	• Commercially-available records of protected and notable species from the last twenty years (i.e. since 2003).
Ordnance Survey (OS) 1:25,000 maps	31 October 2023	• Habitats and connectivity relevant to interpretation of planning policy and potential presence of important features that could be used by protected and notable species.
OS 1:50,000 maps and Bing aerial (https://www.bing.com/maps/)	31 October 2023	

6.5.3.2 Field Survey – Habitats and Flora

The habitat surveys were carried out in the periods 8-12 July 2019, 22-24 July 2019, 09-20 August 2021 and 29 September-01 October 2021, by an AECOM ecologist with extensive habitat survey experience, including in upland NVC.

Phase 1 habitats and National Vegetation Classification (NVC) types were recorded concurrently. For Phase 1 classification, the standard survey method published by the Joint Nature Conservation Committee (JNCC, 2010) was employed, and ecological notes were taken, including recording of notable plant species. The NVC survey followed the classification set out in the original NVC volumes (Rodwell 1991a, 1991b, 1992, 1995, 2000), with reference also to other NVC guidance (Averis et al, 2004; Hall et al, 2004) that describe some additional vegetation types.

Further details on the habitat survey methods are given in *Appendix 6.3 Habitats (Volume 5 Appendices).*

6.5.3.3 Field Survey – Terrestrial Mammal Surveys

The mammal surveys took place between April 2019 and May 2023. They comprised:

- Otter and water vole walkover surveys;
- Badger, pine marten *Martes martes* and wildcat *Felis sylvestris* walkover surveys;
- A camera trap survey to record mammal activity in woodland by Allt a' Chrosaid near Loch Awe, at a ruined shieling in the Headpond area, on the edge of conifer plantation north of the Headpond, at a discovered otter holt beside Lochan Airigh in the Headpond area, and at a stream/forest track near Inveraray.

For details of the mammal survey methods refer to *Appendix 6.4 Mammals (Volume 5 Appendices)*.

6.5.3.4 Field survey – Bat Surveys

The bat surveys took place between May 2019 and May 2023. They comprised:

- Ground level roost assessment of trees (there were no relevant structures);
- Aerial/endoscope inspections of specific trees identified by the ground level assessment;
- Emergence/re-entry surveys of specific trees identified by the ground level assessment;
- Transect activity surveys in the Headpond and Inveraray parts of the Development;
- Static bat detector activity monitoring (by Lochan Airigh in Headpond area, by the Allt Beochlich in the Headpond area, by the existing reservoir below the Headpond area, and near the Allt a' Chrosaid beside woodland and pasture near Loch Awe).

For details of the bat survey methods refer to Appendix 8.3.

6.5.3.5 Field Survey – Terrestrial Invertebrate Survey

Walkover surveys to look for and identify butterfly and dragonfly species in and near the Headpond area were carried out monthly between April and August in 2019 in the Headpond vicinity, and in 2021 in the Inveraray area. The surveys took place as far as possible in favourable weather conditions, although as a result of the exposed upland nature of the site in a western Scotland location it was not possible to carry out the surveys in continuously sunny weather, and wind speed was not always very low. However, strong wind and rain were avoided, and the surveys are considered sufficient to judge the nature and value of the apparently limited butterfly and dragonfly populations in and near the Headpond area. Incidental records of such species were also recorded during other surveys. Full Details of the terrestrial invertebrate surveys are provided in *Appendix 6.6 Butterflies and Dragonflies (Volume 5 Appendices*).

6.5.3.6 Exclusions From Survey Scope

Red squirrel *Sciurus vulgaris* is the only squirrel species in the Development vicinity and can be assumed to use all established woodland. However, the Development would have limited impact on woodland. Where Access Tracks pass through woodland for the northern (Upper Sonachan) route and at Inveraray, they largely use existing forestry tracks. Although there will be localised woodland loss at the Tailpond, this will be small in comparison to the woodland resource along and inland of this part of Loch Awe. Impacts on red squirrel will therefore be limited, with no effect on local conservation status, and possible impacts on individual dreys can be addressed by standard temporal avoidance and pre-construction checks. Therefore no survey was carried out for red squirrel.

The Development Site is not located in a region where great crested newt *Triturus cristatus* is present, and waterbodies are in unfavourable habitat such as extensive upland blanket bog and wet heath, and for this reason are themselves liable to be unfavourably acidic. Therefore great crested newt has been assumed absent. Other amphibians present in this part of Scotland receive no protection relevant to Development activities and are widespread. Therefore no surveys were carried out for great crested newt or other amphibians.

Only common reptile species (excepting non-native introductions) occur in Scotland and none are specially-protected. The upland habitats dominating the Development Site can reliably be assumed to support such reptiles and standard mitigation can be implemented to reduce impacts on them. Therefore no reptile surveys were carried out.

6.5.4 Assessment Methodology

The assessment of impacts and effects on ecological features followed CIEEM EcIA guidelines (CIEEM, 2022). The principal steps involved in the CIEEM approach can be summarised as:

- Determine baseline conditions through targeted desk study and field survey, to identify important ecological features that might be affected;
- Evaluate the importance of identified ecological features on a geographic scale, determining those that need to be considered further;
- Describe potential impacts on relevant ecological features, considering best practice, legislation and embedded design measures;
- Assess and quantify (as far as possible) likely effects (adverse or beneficial) on relevant ecological features;
- Develop measures to avoid, reduce or if necessary compensate for predicted significant effects, in conjunction with other elements of the design (including mitigation for other environmental disciplines);
- Report residual effects taking into account developed mitigation or compensation;
- Identify opportunities for biodiversity enhancement.

When baseline conditions have been determined, it can become apparent that there is no possibility of effect on certain ecological features, and in this case such features are scoped out of further assessment.

In line with CIEEM EcIA guidelines (CIEEM, 2022), this chapter draws a distinction between ‘impact’ and ‘effect’:

- Impact – action resulting in change to an ecological feature (e.g. loss of a bat roost);
- Effect – the outcome of an impact on the conservation status or structure and/or function of an ecological feature (e.g. loss of a bat roost may have an adverse effect on conservation status at a particular scale).

Impacts are assessed in view of the conservation status of the ecological feature under consideration. Conservation status is defined as follows:

- Habitats – the sum of influences acting on it that may affect its extent, structure/functions, distribution and typical species within a given geographical area (CIEEM, 2022);
- Species – the sum of influences acting on it that may affect its long-term distribution and abundance within a given geographical area (CIEEM, 2022). Similarly, conservation objectives for European sites indicate that to contribute to favourable conservation status the following must be maintained: the population as a viable component of its habitats, distribution, and sufficiency of supporting habitats, processes and prey.

NatureScot recommends that the concept of the favourable conservation status for species should be applied at a national (Scottish) level to determine the level of significance of an effect (SNH, 2018). However, consideration of effects at all scales is important (CIEEM, 2022), and where an impact may not affect conservation status at the national level, the potential for effects on conservation status at regional and local scales has been considered.

For the purposes of this EIA and, residual effects predicted to be significant at the Regional or higher geographic scale are considered ‘Significant’ in broader EIA terms, whereas those predicted to be significant at Local or Negligible scales are considered ‘Not Significant’. The latter does not, however, necessarily imply that mitigation is not required.

A detailed description of the CIEEM method for impact assessment is provided in *Appendix 6.1: Method for Ecological Impact Assessment (Volume 5 Appendices).*

6.5.5 Limitations And Assumptions

Information obtained during the desk study is dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for particular species does not necessarily mean they do not occur in the study area. Likewise, the presence of records for a particular species does not automatically mean that these still occur within the area of interest or are relevant to the Development.

The design of the Development changed several times during the period that the habitat surveys were carried out, and also after they were completed. Therefore the following points should be noted:

- The main habitat survey visits took place before it was confirmed that the Development would not construct or upgrade an Access Track from Three Bridges to the Headpond (an Access Track here would only be used if already constructed for Blarghour Wind Farm and the necessary land rights have been secured). As a result, the habitat survey extended to Three Bridges in the vicinity of this possible third-party Access Track. Although this area will now not be impacted by the Development, this habitat information has been retained because it provides useful contextual information;
- Although in most places the habitat survey area extends to at least 200m from proposed infrastructure, including the entirety of the Headpond, small sections of infrastructure (such as small compounds and associated Access Track) locally extend beyond the habitat survey area as a result of late alterations to the design.

The likelihood of deviations from baseline conditions increases with elapsed time since survey. While the baseline is not expected to change sufficiently to alter the impact assessment by the time of construction, the precise situation regarding protected/notable species may nevertheless differ (for example, new otter holts may become established). It is not likely that baseline habitats would significantly change for several years at least, acknowledging however that the proposed Blarghour Wind Farm proposes a small area of blanket bog restoration within the survey area (and beyond Development infrastructure).

Further limitations regarding the habitat, mammal, bat and butterfly/dragonfly surveys are stated in *Appendix 6.3 Habitats, Appendix 6.4 Mammals, Appendix 6.5 Bats* and *Appendix 6.6 Butterflies and Dragonflies (Volume 5 Appendices)* respectively.

There were no other significant limitations to the desk study, field survey or subsequent analysis which could affect the reliability of this impact assessment.

6.6 Baseline Environment

6.6.1 Designated Nature Conservation Sites

6.6.1.1 Statutory Designated Sites

There are two international statutory designations with terrestrial ecology interests within 10km of the Development Site, summarised in *Table 6.4 Statutory Designated Sites* and shown on *Figure 6.1 European Sites* (*Volume 3 Figures*) (for designations with ornithological interests, see *Chapter 09 Ornithology*, and for designations with aquatic or marine interests see *Chapter 07 Aquatic Ecology* and *Chapter 08 Marine Ecology*). There are no national or local statutory designations within 2 km of the Development Site.

Table 6.4 Statutory Designated Sites

Designation	Reason(s) for Designation	Relationship to the Development
Loch Etive Woods SAC	Supports the following qualifying features: • Tilio-Acerion forests of slopes, screes and ravines; • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) • Otter	A multi-part site of which two parts are within 10km of the Development Site. These are approximately 6.3 km north-west and 6.8 km north-east of the Development Site at closest, on the opposite bank of Loch Awe. There is intervening mountainous terrain of moorland and forestry, and separation by Loch Awe. The SAC is also supplied by a different water catchment.
Glen Shira SAC	The sole qualifying feature is: • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles.	A two-part site on opposite sides of a watercourse in Glen Shira. The closest point is approximately 5.5 km from the Development Site. There is intervening highly mountainous terrain of moorland and forestry, and the SAC is in a different water catchment.

There is distant connectivity between the Development and Loch Etive Woods SAC for otter via Loch Awe, but no other hydrological or other connectivity from the Development to the above two SACs, nor to SACs, SSSIs or other statutory designations further afield.

6.6.1.2 Non-statutory Designated Sites

There are no non-statutory designated sites within 1km of the Development Site. The nearest are Local Nature Conservation Sites (LNCS) comprising small islands in the northern end of Loch Awe, and an oak *Quercus* sp. wood beside Loch Fyne opposite Cairndow. There is no connectivity to these or other LNCS.

6.6.2 Habitats

Further details of terrestrial habitats and flora are given in *Appendix 6.3 Habitats (Volume 5 Appendices*). The below information is a summary.

6.6.2.1 Ancient Woodland

Within 1km of the Development footprint, there are strips and patches of ancient semi-natural woodland (ASNW) in the AWI along Loch Awe and extending in places inland. In the vicinity of Inveraray, the AWI shows further localised extents of ASNW, and also more extensive long-established plantation.

Loch Awe

Within 1km of the Development footprint at Loch Awe there are ten ASNW polygons and one long-established plantation. The total extents of these particular AWI polygons amount to approximately 18.8ha of ASNW and 1.86ha of long-established plantation. In order of most relevance, these woods (grouped where appropriate) are as follows:

- Wood_ID 14169 – ASNW determined from 1860 mapping. The northern tip is within the Tailpond works area. It extends southwards from the Tailpond works area for 570m between Loch Awe and the B840, and inland along the Allt a' Chrosaid for approximately 1km; south of this watercourse it also extends substantially east of the B840. Part of this wood within and south of the Tailpond area is actually not woodland but caravans, gardens or hard-standing, and the width along the Allt a' Chrosaid is narrower than the AWI shows (compare the AWI data on *Figure 6.2 Ancient Woodland (Volume 3 Figures*) with the habitat map on *Figure 6.3 Phase 1 Habitats (Volume 3 Figures)).* The Native Woodland Survey of Scotland (NWSS) classifies most of this wood beside Loch Awe as Wet Woodland – however, whilst field survey for this EIA did find NVC type W7 here, drier Upland Oakwood (including NVC types W11 and W10) and occasionally Upland Mixed Ashwood (NVC type W9) also occur (see further details in *Appendix 6.3 Habitats (Volume 5 Appendices));*
- Wood_ID 14170 and 14172 – contiguous ASNW determined from 1750 and 1860 mapping respectively, along the Allt Beochlich. It is somewhat narrower in places than the AWI indicates. At closest approximately 60m from the nearest infrastructure (an upgrade of the existing Access Track from Balliemeanoch farm) but mostly much further. The NWSS classifies it as Upland Oakwood or unidentifiable – the latter however is known from field survey to include related upland woodland types such as NVC types W17, W11 and (in limited extent) W9 (see further details in *Appendix 6.3 Habitats (Volume 5 Appendices*));
- Wood_ID 14173, 14174 and 13451: together forming a continuous block of ASNW determined from 1750 mapping, mostly above the B840 and at closest approximately 400m south of the Development footprint beyond the Allt Beochlich. The NWSS classifies it mainly as Upland Mixed Ashwood, with some Upland Oakwood;
- Wood_ID 14164, 14165, 14166, 14167 and 14168: mostly ASNW (one long-established plantation at 14166) north of the Development footprint, beside Loch Awe, on the adjacent hillside and along the Allt Mor. ASNW at 14168 is determined from 1750 mapping, but the others are from 1860 mapping. 14168 is closest, at 500m from the nearest part of the Development (temporary compound TC01), but uphill. The NWSS classifies 14168 and connected woodland as Upland Oakwood, and along the Allt Mor there is further Upland Oakwood followed (uphill) by Upland Birchwood.

Inveraray

There is extensive woodland listed in the AWI around Inveraray. The below concentrates on relevant woodland within the two red line boundaries at Inveraray (that encompass proposed Access Tracks, temporary compounds and jetty):

- Northern section: there is extensive long-established plantation in this area. Two of the relevant polygons (Wood_ID 14071 and 14783) are determined from 1750 mapping, and the others (Wood_ID 14069, 14070 and 14774) are from 1860 mapping. In places these are shown as continuous across the red line boundary area, but in reality there is an existing substantial forestry/estate track that the Development would use. The NWSS identifies a thin wedge near the northern tip as native – this however is clearly a plantation of two very uniform parallel rows of yew *Taxus baccata* (for which reason it is <u>not</u> considered to constitute the

Annex I habitat H91J0 *Taxus baccata* woods of the British Isles, which are known in the UK only in England and Wales – see Yew-dominated woodland (Taxus baccata woods of the British Isles) - Special Areas of Conservation (jncc.gov.uk[1])). However this small yew plantation does support a rather sparse native flora including ramsons *Allium ursinum*, and thus still corresponds reasonably well to NVC type W13b. Other long-established plantation in this area is often classed by NWSS as native or nearly-native, although field survey found it to be mostly plantation with limited semi-natural areas;

- Southern section: according to the AWI, a substantial amount of the woodland through this area is ASNW determined from 1750 mapping, with smaller amounts of long-established plantation determined from 1860 mapping. Again, the AWI polygons are continuous but in reality there is an existing substantial forestry track that the Development would largely use, and also an existing quarry in which a temporary compound is proposed. However, the NWSS indicates that most of this ASNW is actually Plantation on Ancient Woodland (PAWS). This was largely confirmed during field survey, which found areas of young, mature and felled conifer plantation with poor floras. There is also a more restricted extent of mature broadleaved plantation (often of beech *Fagus sylvatica* but including scattered mature oaks) in which there are patches of native woodland flora including patchy carpets of bluebell *Hyacinthoides non-scripta*, sparse enchanter's nightshade *Circaea* sp., primrose *Primula vulgaris*, remote sedge *Carex remota*, wood sedge *Carex sylvatica*, and rarely (close to the southern edge of the broadleaved plantation) dog's mercury *Mercurialis perennis* and yellow pimpernel *Lysimachia nemorum*. There is also some apparently semi-natural birch *Betula* sp. (wet and dry) with native flora towards the western end of this red line boundary (see *Figure 6.3 Phase 1 Habitats (Volume 3 Figures)*). A limited amount of long-established plantation would be crossed by the proposed Access Track to reach the proposed jetty, which is ecologically poor (dense Sitka spruce *Picea sitchensis*, and, locally, dense mature beech).

6.6.2.2 Other Woodland

Other woodland not encompassed by ASNW or long-established plantation includes small areas of broadleaved woodland near Loch Fyne and plantation of Sitka spruce (the dominant habitat at Upper Sonachan, and frequent near Inveraray). The former is generally neutral in character, occasionally acidic, mature with a variety of canopy species, and is most natural within the surveyed area along part of the shore of Loch Fyne. However, this same shore also includes a substantial amount of broadleaved woodland dominated beneath by Japanese knotweed *Reynoutria japonica*.

There are various acid, neutral and wet woodlands in the vicinity of Three Bridge, which are now less relevant since the Development will not construct an Access Track here.

6.6.2.3 Blanket Bog and Associated Habitats

Blanket bog dominates the Headpond area and is also extensive beyond it. It is often degraded to variable degrees by overgrazing and in places burning, and it is likely that burning has taken place in various places historically beyond those locations where obvious evidence (remains of burnt vegetation) was evident at the time of survey. The most clearly degraded bog has been classed as modified bog and symbolised as such on *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*. There are localised areas of peat hagging with some bare peat. However, there are also extensive areas of intact wet blanket bog.

The drier bog is commonly NVC type M19, with hare's-tail cottongrass *Eriophorum vaginatum*, heather *Calluna vulgaris*, bilberry *Vaccinium myrtillus* and reduced sphagnum cover and abundance (as is typical of M19). It is often M19c with cowberry *Vaccinium vitis-idaea*, in places M19b (with no particular distinguishing features) or M19a (slightly wetter and transitional towards wetter oceanic M17 bog). It is the drier bog that most often exhibits degradation, with reduced or sub-optimal ericoid cover, occasionally going so far as to form M20 vegetation. The overgrazing/burning is most evident in the south/west part of the Headpond and beyond it. This bog very rarely contains cloudberry *Rubus chamaemorus* and bog bilberry *Vaccinium uliginosum*, which can be frequent in such bog, and the abundant availability of suitable habitat for these species is also suggestive of adverse management (overgrazing and/or burning).

The wetter bog is mainly NVC type M17a. In places it supports *Sphagnum medium* as well as *Sphagnum papillosum* (although on overall floristic grounds most *S. medium* occurrences were considered M17 rather than M18), and more rarely other notable bog species such as few-flowered sedge *Carex pauciflora*, white beak-sedge *Rhynchospora alba* and (in small quantity at one location only, near Lochan Airigh, cranberry *Vaccinium* sp.). *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*. indicates the extents of wetter bog, dominated by M17a.

[1] https://sac.jncc.gov.uk/habitat/H91J0/

Within the blanket bog complex in the southern part of the Headpond area, there is a very wet area classed as basin mire. This may have included a lochan in the past, and there is some open water in addition to treacherous extents of acid-flush related vegetation with rushes and common sphagna. Some of this vegetation equates to Annex I transition mire. Similar vegetation also occurs locally outside the Development footprint at Blarghour (at the limits of the surveyed area for the Development but included in surveys for Blarghour Wind Farm (Ramboll/ESB/Coriolis Energy, 2018)). Another wetter patch, also classed partly as basin mire, in the north of the Headpond area, includes some vegetation that is transitional between bog and flush.

Acid flush vegetation corresponding to NVC type M6, mainly M6d with sharp-flowered rush *Juncus acutiflorus*, is scattered through the blanket bog and along watercourses, and sometimes also in other upland habitat such as wet heath. It is typical, not species-rich and not notable.

6.6.2.4 Heath and Grassland

Both dry heath and wet heath occur in the Headpond area and beyond it. Dry heath is much more localised, on steeper drier slopes. Typical forms with heather/bilberry and heather/bell heather *Erica cinerea* occur. Locally on the mountain slopes at the north-west side of the Headpond H10d occurs, in which bell heather is accompanied by thyme *Thymus drucei* and other species. Wet heath is more common, all corresponding to NVC type M15 with typical but variable mixes of purple moor-grass *Molinia purpurea*, deer-grass *Trichophorum germanicum*, cross-leaved heath *Erica tetralix*, acid grasses and in places the moss *Racomitrium lanuginosum*. More locally there is flushed wet heath (M15a), which is mostly not of particular note (sometimes only carnation sedge *Carex panicea* providing a distinction) but very locally it is species-rich (at Target Note 19; see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*). On the lower moorland towards Loch Awe, the wet heath tends to be degraded by overgrazing and has in places been converted to species-poor purple moor-grass with negligible ericoid cover.

Grassland in the Headpond area and beyond it is localised and typically comprises forms of the acid grasslands U5 and U6 with abundant mat-grass *Nardus stricta* and heath rush *Juncus squarrosus* respectively. The latter sometimes contains sphagnum and is almost certainly in those cases derived from blanket bog by overgrazing and/or burning. Locally, U5c occurs, often not notable and distinguished mainly by abundant carnation sedge, but very locally more species-rich (e.g. rarely containing northern bedstraw *Galium boreale*).

Very locally there are small extents of basic grassland (CG10), with thyme. Occasionally this is damp with sedges (CG10b), and these examples (some within and some beyond the Headpond) often contain a wide range of species – see further information below under other notable habitats.

On the lower ground in the vicinity of Loch Awe and at Inveraray, there are typical improved pastures, patches of grazed rushy neutral grassland, and areas of amenity grassland. There are also marshy grasslands, quite extensive west of Inveraray and scattered near Loch Awe, generally dominated by sharp-flowered rush with typical neutral wetland herbs. Rarely, this such marsh is accompanied by small amounts of iris *Iris pseudacorus*-dominated vegetation, a common vegetation type in western Scotland. Some marshy grassland above Loch Awe is purple moor-grass grassland likely derived from wet heath by overgrazing, but very locally this is more species-rich.

6.6.2.5 Species-rich Ledge/Ravine Vegetation

A few rocky ledge and ravine locations were noted with notably species-rich vegetation. Two significant examples occur outside of the Development footprint west of the southern Headpond Embankment (Embankment 1), at Target Notes 2 and 3 (see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*), on a tributary of the Allt Beochlich at Target Note 2, and on a tributary of it at Target Note 3. A wide variety of species are present in vegetation that includes U17 species-rich ledge, a very small amount of W9 basic woodland, CG10b flushed basic grassland and H10d basic heath.

Two other species-rich ledge locations were found. One is in the Headpond area at Target Note 37, a small amount of U17 along the upper Allt Beochlich (Buinne Dubh). The other is near the Three Bridges Access Track at Target Note 54, a very species-rich small, narrow ravine including U17, CG10 and H10d, with a wide range of species.

6.6.2.6 Other Notable Habitats

A number of species-rich habitats that are localised in the survey area (and elsewhere in highland Scotland outside of particularly obviously base-rich regions) were recorded, as follows:

- Basic flushes – several of these were recorded at 18 locations (see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*), of which eight are within the Development footprint. There are likely to be others sparsely scattered through the surrounding landscape especially north-west of the Headpond. Frequently encountered species include alpine meadow-rue *Thalictrum* *alpinum*, dioecious sedge *Carex dioica*, few-flowered spikerush *Eleocharis quinqueflora* and base-indicative mosses. A few flushes (Target Notes 6, 9 and 32) also contain frequent yellow saxifrage *Saxifraga aizoides*;

- Flushed wet heath – very localised; discussed above in Section 6.6.2.4;
- Basic grassland and basic heath – NVC type CG10 occurs in small quantity on the mountain slopes at and beyond the west side of the Headpond, however it is not generally of special note. Similarly, U5c also occurs in this area but is mostly not particularly diverse, often being separated from more typical acid U5 primarily by an abundance of carnation sedge. Five locations were recorded with more notable diverse flora:
  - CG10b and U5c with alpine meadow-rue, thyme, lesser clubmoss *Selaginella selaginoides* and northern bedstraw *Galium boreale*, at Target Notes 8 and 11 (see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*). The latter is within the Development footprint;
  - CG10b and U5c with northern bedstraw, thyme, bird's-foot trefoil *Lotus corniculatus*, eyebright *Euphrasis* sp. and common dog-violet *Viola riviniana*, at Target Note 14 (see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*). This is within the Headpond area;
  - U5c with lesser clubmoss, carnation sedge, tawny sedge *Carex hostiana*, flea sedge *Carex pulicaris*, eyebright and a little thyme, at Target Note 29 (see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*). This is just beyond the Headpond freeboard; and,
  - H10d with northern bedstraw, thyme and the lady's-mantle *Alchemilla filicaulis*. This is within the Headpond area at Target Note 13.

6.6.2.7 Other Habitats

At the edge of Loch Fyne in the proposed jetty vicinity, there is a very thin strip of poor quality discontinuous saltmarsh, of the typical sort found widely in such situations around Scottish sea lochs (NVC type SM16), and of no note. There is also a very thin strip of coastal grassland, also of poor quality being ruderal in nature and including scattered Japanese knotweed.

Japanese knotweed also occurs by Loch Fyne as a large dense stand, east of the proposed jetty.

Built-up areas, roads, tracks and other artificial land uses are localised in the Loch Awe and Inveraray vicinities.

6.6.3 Notable Flora

More detailed information on notable flora is given in *Appendix 6.3 Habitats (Volume 5 Appendices*). The below information is a summary.

6.6.3.1 Desk Study Information

The desk study found records of 22 priority SBL lichen species. The nearest is *Lobaria pulmonaria* shortly north of Inveraray. The species concerned mainly occur in high quality well-established semi-natural woodland. Suitable habitat for such species appears largely limited to ancient semi-natural woodland along Loch Awe.

There were also records of two priority SBL moss species, beyond the Development footprint. The species concerned could occur in the Development Site but are also widespread in Scotland and not under threat.

The Environmental Statement for Blarghour Wind Farm (Ramboll/ESB/Coriolis Energy, 2018) noted that a sedge that may have been tall bog-sedge *Carex magellanica* was found in the wetter blanket bog approximately 200m south-west of permanent compound PC09. This was not seen during field survey for the Development but could easily have been missed if very localised (as is the case) and especially if grazed (as is quite possible). Tall bog-sedge is not rare or scarce, but is sparsely distributed.

6.6.3.2 Notable Recorded Sphagna

Two notable sphagnum species were found during the field surveys, both at single locations:

- *Sphagnum austinii* – three hummocks in wet M17a blanket bog at Target Notes 30/31 (see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*), a watershed area approximately 85m from the limit of the eastern Headpond freeboard (located downslope), and 100m from the nearest Access Track (located upslope); and,
- *Sphagnum fuscum* – two small hummocks between the southern edge of the Headpond and nearest Access Track, at the junction of drier M19c blanket bog and damp M17b blanket bog (Target Note 49 on

Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)); this location is approximately 60m from the Headpond (located very slightly downslope) and 80m from the nearest Access Track (located upslope).

These two sphagnum species are rare in the Argyll West and Islands Natural Heritage Zone (NHZ 14) and were not found anywhere else in the surveyed area, nor were they reported in surveys for Blarghour Wind Farm. They are very likely equally rare in the wider area.

Sphagnum medium was also recorded at fourteen locations (see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*). This species is not rare or scarce but does tend to be local and is associated with wetter and usually higher quality bog habitat. In all but one case (where a small amount of cranberry was recorded – see above) the vegetation is more akin to M17a than M18. Of these fourteen locations, eight are within the Development footprint (mainly the Headpond). The Environmental Statement for Blarghour Wind Farm (Ramboll/ESB/Coriolis Energy, 2018) indicates that *S. medium* also occurs occasionally in bog elsewhere in the local area.

6.6.3.3 Notable Recorded Vascular Plants

A number of notable vascular plants were recorded during the field survey. None of these are rare or scarce nationally, but are either noticeably and probably unnaturally scarce locally, or indicate higher quality habitat. Distribution and habitat information in this section is taken from the Botanical Society of the British Isles (BSBI) Plant Atlas 2020 (https://plantatlas2020.org/).

Cloudberry and bilberry, and possibly cranberry, are probably very scarce at the Development Site owing to degradation of the blanket bog, mainly by grazing but in places by burning (which almost certainly occurred more widely historically but would leave no obvious sign other than likely contributing to species-poverty). The locations of these species are shown on *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*.

Several other species, also not rare or scarce nationally but localised in the Development vicinity, were also recorded:

- Bog orchid *Hammarbya paludosa* – an inconspicuous under-recorded species found in several hectads in NHZ 14, which was found in an M10 basic flush approximately 18m north of the northern Headpond Embankment (Embankment 2) and 35m from the nearest Access Track (Target Note 34; see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*);
- Fragrant orchid *Gymnadenia conopsea* – a widespread but localised species, found once only in U4 acid grassland with thin bracken, beyond the Development footprint (Target Note 1; see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*);
- Lesser twayblade *Neottia cordata* – widespread including in NHZ 14, also inconspicuous and under-recorded. It was found beyond the Development footprint under Sitka spruce at the edge of Upper Sonachan plantation (Target Note 18; see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*
- Few-flowered sedge – widespread in wetter blanket bog in highland Scotland. It was only found twice in the survey area, at the northern end of the Headpond area (Target Note 15; see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*), and also rarely in the wet M17 bog north-east of Lochan Airigh;
- Stone bramble *Rubus saxatilis* – widespread in highland Scotland, including NHZ 14, but localised, found once in small quantity on a rock ledge in the Headpond area (Target Note 38; see *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*).

A number of other species were recorded that are not rare or scarce but occur in species-rich habitats that are localised in the survey area (and elsewhere in highland Scotland outside of particularly obviously base-rich regions). These are discussed under species-rich ledge/ravine vegetation and other notable habitats above.

6.6.4 Otter

Detailed results of the otter desk study and surveys are given in *Appendix 6.4 Mammals (Volume 5 Appendices*). A brief summary is given below:

- There were nine desk study records of otter, all near Inveraray;

- Moorland zone (which includes the Headpond) – seven holts and fourteen lay-ups were found in this area. Spraints and rarely other evidence were found along the majority of watercourses, including far up minor tributaries, with larger concentrations at or near refuges. Most of the holts are along the Allt Beochlich (Buinne Dubh). Five holts, four on the Allt Beochlich and one at Lochan Airigh, are within the Headpond or associated compound footprints. The other two holts are beyond the Development footprint and not likely to be disturbed either. The holt at Lochan Airigh was considered potentially viable as a natal holt, and this holt was used frequently by otter during camera monitoring, and bedding was seen to be carried inside. However, no evidence of use for breeding was recorded or observed, and the holt entrance(s) physically changed during the monitoring period, at times rendering the holt less suitable for natal purposes. Other holts were considered unsuitable in various ways to be of likely value as natal holts.
- Loch Awe – one holt and five lay-ups were found near Loch Awe, and several spraints sites. The holt is along the Allt a' Chrosaid, is not considered viable for natal purposes and would be liable to disturbance from temporary compound TC02. However, neither the holt nor any of the lay-ups would be directly impacted.
- Inveraray – five holts and six lay-ups were found, mainly along the River Aray but occasionally on smaller watercourses. The locations of all the holts and lay-ups, and given that none of the holts were considered viable as natal holts, are such that neither destruction or disturbance of these otter refuges is likely.
- Upper Sonachan – a single spraint was found on a small watercourse, but no refuges or other evidence.

Additionally, six holts and six lay-ups were found in the Three Bridges area, and three lay-ups in the Blarghour area. However, since the Development will not construct the Three Bridges Access Track, there will be no direct impact on these refuges by the Development.

The Development vicinity is highly suitable for use by otter, with suitable watercourses and standing water that contain fish prey resources (including brown trout and including Lochan Airigh and adjacent watercourses).

6.6.5 Bats

Detailed results of the bat desk study and surveys are given in *Appendix 6.4 Mammals (Volume 5 Appendices*). A brief summary is given below:

- There were no desk study records within 2 km;
- Bat roosts – the key results of the Bat Roost Suitability (BRS) assessment and follow-on surveys are set out below:
  - Allt a' Chrosaid – one High BRS and six Low BRS trees within 30 m of the Development. Two roosts were confirmed (a Daubenton's bat *Myotis 15aubentoniid* maternity roost that subsequently moved, as can often occur with *Myotis* species, in the High suitability tree, and a single bat in a Low suitability tree). None are within the Development footprint, the closest is 7 m from an Access Track, and the confirmed roosts are 30m or more from the Development footprint. Several other trees with BRS were also recorded that (following Development redesign) are now more than 30 m from the Development footprint;
  - Loch Awe – six High BRS, six Moderate BRS and eight Low BRS trees within 30 m of the Development. Of these, three High BRS, three Moderate BRS and four Low BRS trees are within the Tailpond works area;
  - Inveraray – six High BRS, fourteen Moderate BRS and eleven Low BRS trees within 30m of the Development. However, three (large mature oaks) are immediately adjacent to the proposed Access Track along the forestry track west of Inveraray, and two others (sycamore *Acer pseudoplatanus* and beech) are immediately adjacent to the proposed Access Track along the forestry track north-east of Inveraray. Several other trees with BRS were also recorded that (following Development redesign) are now more than 30m from the Development footprint.
- The moorland and Loch Awe parts of the Development were considered together as having Moderate suitability for bats in general. The transect found very low bat activity in the vicinity of the Headpond. This was consistent with the findings of the static bat detector monitoring. Static detector monitoring at Allt a' Chrosaid (near Loch Awe) recorded the highest activity, consistent with the lowland setting, mature broad-leaved woodland and riparian habitat and known roosts nearby. Transects along the B840 and lower part of the western (Balliemeanoch) Access Track expectedly found the most bat activity, mainly moderate levels of common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle *Pipistrellus pygmaeus*, rarely *Myotis* sp. (potential Natterer's bat *Myostis nattereri* as well as Daubenton's bat).

- The Inveraray parts of the Development were assigned High suitability for bats in general. The transect recorded soprano pipistrelle, common pipistrelle and a small minority of *Myotis* sp., most likely Daubenton's bat and Natterer's bat, with passes recorded frequently throughout the length of the route, and particularly concentrated along the northern section of the forestry track west of Inveraray (the majority of the few *Myotis* sp. calls were from this location, and from the bridge crossing the River Aray or nearby).

6.6.6 Water Vole

Detailed results of the water vole desk study and surveys are given in *Appendix 6.4 Mammals (Volume 5 Appendices*). A brief summary is given below:

- There were no desk study records of water vole within 2 km;
- The most optimal water vole habitat and most consistently-recorded evidence of water vole between years was found at Lochan Romach, at closest 150m from the nearest infrastructure (permanent compound PC19 and associated Access Track). Several burrows (approximately ten, counting potential burrows as well as those with confirmatory latrine/dropping evidence) and multiple latrines were found here, in particular along the outflowing stream which is highly suitable for water vole with deep, slow-flowing water, deep diggable banks and plentiful rushy vegetation for foraging;
- Seven water vole locations were found in the Headpond area, sparsely spread across it, in which approximately 24 burrows (including those in all survey years and those without confirmatory evidence (latrines or droppings)) and one possible nest were found. However, the evidence at each location was not found in every survey year, and in some years was absent or comprised very little evidence, and the number of water voles in the Headpond area appears unlikely to much exceed 10-20 individuals;
- A very few additional water vole burrows were found outside the Headpond area;
- No evidence of water vole was found by or near Loch Awe or at Inveraray, where habitat is at best sub-optimal.

6.6.7 Pine Marten

Detailed results of the pine marten desk study and surveys are given in *Appendix 6.4 Mammals (Volume 5 Appendices*). A brief summary is given below:

- There was one desk study record of pine marten;
- The moorland part of the Development, especially the Headpond area, is not particularly favourable for pine marten, being mostly distant from woodland and with no dens having been found here and potential features for dens sparse. However, one scat was found in the Headpond area, indicating at least occasional presence, and two were found at Lochan Romach which could indicate use of the known water voles here as a prey resource;
- Scats were most frequent beside Loch Awe and along tracks at Inveraray;
- There is anecdotal evidence of pine marten regularly occurring beside Loch Awe including in the Tailpond vicinity, and pine marten was seen at Three Bridges and two other places outside the wider Development Site but within the local region;
- Two potential pine marten dens were found. One is in a mature oak near Loch Awe and the Allt a' Chrosaid, very close to pine marten sightings reported by a local resident, and 24m from temporary compound TC02 on the opposite side of the B840. The other is amongst tree roots beside a small watercourse, 21 m from the Access Track north-east of Inveraray (and only slightly further from the A819) – this contained a very old scat.

6.6.8 Wildcat

Detailed results of the wildcat desk study and surveys are given in *Appendix 6.4 Mammals (Volume 5 Appendices*). A brief summary is given below:

- The desk study found recent reporting referring to one publicly-submitted but unverified record of wildcat north of Loch Fyne, but the nearest verified record was 40 km away and there was stated to be 'scant evidence' of wildcat in the entirety of Argyll and the Trossachs. There is no Wildcat Priority Area covering or near the Development. Commercially-available NBN records of wildcat include two from 1985 and 1994 from the hectad containing the Development, but none more recent;

- No evidence of wildcat was found during the surveys, including a lack of potential den sites. Surveys for Blarghour Wind Farm reported no evidence either;
- The extensive open upland moorland habitat in the Headpond area constitutes unfavourable habitat, particularly given an apparent absence of rabbit *Oryctolagus cunniculus* and hares *Lepus* spp. as prey resources, and lack of denning potential.

6.6.9 Red Squirrel

Detailed results of the red squirrel desk study and field records are given in *Appendix 6.4 Mammals (Volume 5 Appendices*). A brief summary is given below:

- There are numerous desk study records of red squirrel, including by Loch Awe at Portsonachan and near Inveraray. Grey squirrel *Sciurus caroliensis* is absent from the study area. Red squirrels can be assumed to be present in all established woodland in and near the Development;
- Sitka spruce plantation, as occurs in places within and near the Development, is the least favourable woodland type for red squirrel with published studies indicating low densities in Sitka-dominated plantations. Semi-natural woodland along Loch Awe is likely to support higher red squirrel densities.
- No specific squirrel drey or other squirrel survey was carried out, since presence can be reliably assumed and impacts on woodland will be slight. However, no dreys were found during surveys of trees for bat roost suitability, and no red squirrels were recorded on trail cameras located in woodland, although several incidental observations of red squirrel were made near Inveraray and along public roads beyond but approaching the Development Site.

6.6.10 Badger

Detailed results of the desk study and survey are given in *Appendix 6.4 Mammals (Volume 5 Appendices*). A brief summary is given below:

- There were no desk study records of badger in the study area;
- A small number of latrines and snuffle holes demonstrated presence of badger in the Inveraray area, but no badger setts were found. No badger evidence at all was found anywhere else, and badger is assumed likely absent from the Development vicinity except at Inveraray.

6.6.11 Other Notable Mammals

Detailed information for other notable mammals is given in *Appendix 6.4 Mammals (Volume 5 Appendices*). A brief summary is given below:

- The initial desk study did not find any records of other notable mammals within the study area apart from hedgehog *Erinaceus europaeus* near Inveraray and Portsonachan;
- Further desk study found that mountain hare *Lepus timidus* was historically present in the Development vicinity, but there are no records more recent than 1960 from this area, and the nearest post-2000 record is in the hectad north of that containing the Development and hence likely from north of Loch Awe.
- No notable mammals, including mountain hare, were seen during any of the extensive field surveys. Surveys for Blarghour Wind Farm (Ramboll/ESB/Coriolis Energy, 2018) similarly did not find any mountain hares or other notable mammals.

6.6.12 Wild Deer

Deer are not an important ecological feature in the sense of CIEEM (2022) and do not warrant detailed impact assessment from a conservation perspective. However, they can impact habitat through grazing pressure, and the following points are noted:

- Trail cameras recorded red deer *Cervus elaphus*, roe deer *Capreolus capreolus* and possibly sika deer *Cervus nippon*. A camera nearest Balliemeanoch farm recorded roe deer only. A camera at Upper Sonachan recorded roe deer, red deer and possibly sika deer (image quality insufficient to be certain). A camera at Inveraray recorded frequent red deer;

- Deer were also the most common mammals recorded on trail cameras deployed for the nearby Blarghour Wind Farm, where 24% of recording days/nights captured red deer, and red deer accounted for 66% of all recordings (Ramboll/ESB/Coriolis Energy, 2018);
- Red deer were occasionally noted during field surveys, sometimes in large numbers, however details were not recorded given that they are not protected or notable species;
- As noted elsewhere, overgrazing is evident is several parts of the Headpond area, and deer (primarily red deer in that location) would be a significant contributing factor.

6.6.13 Amphibians and reptiles

There were no great crested newt records within the initial desk study search area. Looking further afield, the nearest were very distant, in the Glasgow area. Great crested newt is therefore taken as absent from the Development Site and surrounding area.

The desk study found four records of common toad *Bufo bufo* and three of common lizard *Zootoca vivipara* within 2 km of the Development. There are hectad records for slow-worm *Anguilis fragilis*.

No amphibians or reptiles were incidentally recorded during field surveys. However, given the desk study records at least common lizard and slow-worm are likely to occur in the Development vicinity. Despite lack of records, there is also some potential for adder *Viperus berus*, particularly on the lower moorland area towards Loch Awe where there are small areas of bracken, rushes and rougher grassland (often on steeper or damper ground) amongst more heavily-grazed habitats; however, habitat in the Headpond area is often less favourable for adder owing to grazing levels having often reduced ericoid cover.

6.6.14 Terrestrial invertebrates

Details of the findings of the butterfly and dragonfly transects, and incidental records, are given in *Appendix 6.6: Butterflies and Dragonflies (Volume 5 Appendices*), along with desk study information.

The desk study highlighted the possibility of several priority SBL species occurring at the Development Site, potentially including marsh fritillary *Euphydryas aurinia*, a protected species under Schedule 5 of the WCA whose limited distribution includes Argyll and Bute, and certain other species of limited distribution such as large heath *Coenonympha tullia*, mountain ringlet *Erebia epiphron*, pearl-bordered fritillary *Boloria euphrosyne* and the brilliant emerald dragonfly *Somatochlora metallica*, most of which are also priority LBAP species.

However, the field survey did not find any of the above-named species, and the only priority SBL species found was small heath *Coenonympha pamphilus*. However, this species remains widespread across Scotland including NHZ 14, was found somewhat more frequently outside rather than within the Headpond area, and is likely to occur similarly frequently throughout the similar moorland habitats beyond the immediate Development footprint. The other recorded species are common and widespread in highland Scotland, including within NHZ 14. Butterflies were recorded considerably more frequently along and near the western (Balliemeanoch) Access Track than within the more upland and exposed Headpond area. Recorded dragonflies and damselflies, which were expectedly most often recorded at or near watercourses or standing waters, comprised species that are common in highland Scotland, the most frequent being common blue damselfly *Enallagma cyathigera*, and the recorded species being generally found as frequently outside the Headpond area as within it, and likely to be similarly distributed across the similar moorland habitat in the local area.

6.6.15 Invasive Non-Native Species

The desk study did not find any invasive non-native species (INNS) within the study area.

The field surveys recorded botanical INNS in both sections of the Development near Inveraray. These are shown on *Figure 6.6 Invasive Non-Native Species (Volume 3 Figures*). They comprise:

- Japanese knotweed – recorded at Loch Fyne, very densely (both in broadleaved woodland and in the open around it) to the east of the proposed jetty, and also scattered through the narrow and ruderal coastal grassland strip at and either side of the proposed jetty;
- Rhododendron *Rhododendron ponticum* – scattered at occasional to abundant levels (and locally dense) throughout much of the plantation along both sections of the Development near Inveraray;

- Salmonberry *Rubus spectabilis* – scattered through several sections of plantation in the Development section north-east of Inveraray.

6.6.16 Future Baseline

6.6.16.1 Baseline at Time of Construction

Construction of the Development is expected to start in 2027 and last up to 7 years including the pre-construction works.

At the time construction would start, it is anticipated that the consented Blarghour Wind Farm may have been constructed or be under construction. The majority of Blarghour Wind Farm is outside the Development Site, however the Access Track from Three Bridges is within it, although as mentioned elsewhere it would not be constructed by the Development and would only be used by it if already constructed by Blarghour Wind Farm and necessary land rights secured. It is possible that the Access Track from Three Bridges may have been constructed when construction of the Development commences (in which case it would be used). Offshoot Access Tracks and turbine pads may also have been constructed within the Blarghour Wind Farm development boundary, part of which overlaps the part of the Development Site covering the Three Bridges Access Track. Therefore there may, at the time of construction of the Development, be very slightly reduced extents of blanket bog, and to a lesser extent other associated habitats, within the habitat survey area (which included a wide strip along Three Bridges Access Track).

No other major land use changes are expected within the Development Site prior to commencement of construction.

Minor changes in the distribution of some species, or their places of shelter, may occur due to small-scale changes in habitat structure as a result of ecological succession or other natural processes. Given the relatively short period of time before construction would be expected to start, and that significant changes in land management practices (such as grazing regimes) are unlikely in the intervening period, any such changes are likely to be within the range of normal short-term variation in the distribution and abundance of species and species activity.

It is therefore expected that, with the exception of possible construction of Blarghour Wind Farm (the majority of which is outside the Development Site), the current baseline conditions will remain largely unchanged at the time of construction of the Development.

6.6.16.2 Baseline in the Absence of the Development

In the absence of the Development, and for this purpose taking a point 30 years in the future, there are unlikely to be significant changes from the current baseline. This is because current land management practices would be likely to continue as at present, and significant changes of land use are unlikely, especially in the more upland Headpond part of the Development Site. Small changes might occur in the more lowland parts of the Development Site, such as possible implementation of biodiversity measures (e.g., planting of new woodland), but would likely be of small impact in view of the size of the Development Site. Some impact from climate change could occur, however it would probably be minor and it is difficult to predict the direction of change on habitats, since the effects of possible drier and hotter periods but also increased rainfall (e.g., on blanket bog) could counteract. In summary, the future baseline in the absence of the Development is likely to be similar to current baseline.

6.7 Assessment of Effects

6.7.1 Embedded Mitigation

Embedded mitigation measures are incorporated into the design of a development and aim to avoid or reduce adverse effects, including those on ecological features. Embedded mitigation can be considered at the impact assessment stage, whereas specific mitigation measures which are not part of the design, or which are otherwise needed to meet legislative requirements, and are developed after the initial impact assessment, are assessed at a later stage when considering the residual effects.

6.7.1.1 Infrastructure Design

The Development has sought to reduce impacts on ecological features as far as possible by a number of infrastructure refinements embedded into the design, as set out below:

- Access tracks have been minimised as far as possible, and as far as possible travel over shallower peat to avoid deeper peat (which typically supports better quality bog habitat);

- Access tracks across peat of 1m depth or more will be designed as floating tracks;
- The northern Access Track from the A819 has been located largely along existing forestry tracks, minimising the requirement for construction of new track infrastructure and avoiding impacts on non-forestry habitats;
- The Access Track from Balliemeanoch has been adjusted to avoid impacting ancient semi-natural woodland along the Allt a' Chrosaid, and to largely follow the existing Access Track with minimal other habitat impacts;
- Access tracks in the Inveraray area have been repositioned almost entirely along existing forestry tracks, avoiding or very much minimising felling requirements in long-established plantation and PAWS, and also largely avoiding impacts on wetland habitat that was crossed in previous design iterations;
- No Access Track will be constructed as part of the Development from Three Bridges – access will only be taken from Three Bridges if an Access Track has already been constructed by Blarghour Wind Farm and necessary land rights secured, otherwise access will be taken only from the north and Balliemeanoch;
- New Access Tracks throughout have been adjusted as far as possible to run though the shallowest peat, thereby also avoiding deeper, wetter and more intact blanket bog habitat;
- The temporary Access Track just north of the northern Headpond Embankment 2 has been adjusted to avoid a base-rich flush containing bog orchid;
- The Tailpond works extent has been adjusted to reduce the extent of woodland loss beside Loch Awe to a minimum;
- The permanent track/bridge near permanent compound PC09 has been moved to avoid possible impact on a rocky species-rich riparian strip;
- Permanent compounds PC13 and PC14 have been moved to avoid shallower gradients further north with deep peat;
- Permanent compound PC20 and Access Track have been moved to avoid deep peat;
- Temporary Construction Compound TC02 has been reduced in size to be confined only to agricultural improved pasture, with no impact on woodland and other habitats west of the B840 beside Loch Awe;
- Temporary Construction Compound TC04 has been relocated to avoid impact on a substantial rushy wetland that constitutes a potential GWDTE with greater floristic diversity than the heavily-grazed species-poor grassland that TC04 now occupies;
- Temporary Construction Compound TC07 has been re-shaped so that it no longer impinges on an existing grazing exclusion area by Lochan Romach with ungrazed blanket bog and native tree patches, and is now confined to habitats degraded by over-grazing, mainly wet heath and acid grassland;
- Temporary compound TC11 and associated Access Track was moved to avoid significant deep peat that also supports the only known location in the area with the notable sphagnum species *Sphagnum austinii*; subsequently, these elements have been further adjusted to avoid an additional bog area with substantial bog pools and a steep slope with local species-rich vegetation;
- Temporary Construction Compound TC21 has been adjusted to impact only an existing quarry, rather than adjacent long-established plantation.

6.7.1.2 Environmental Protection During Construction

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. These are well-developed and have been successfully implemented on infrastructure projects across the country, and there is a high degree of confidence in their success. They can therefore be treated as embedded mitigation. These will include:

- All personnel involved in the construction, operation of the Development will be made aware of relevant ecological features and the mitigation measures and working procedures that must be adopted. This will be achieved as part of the induction process and/or through Toolbox Talks;
- An Ecological / Environmental Clerk of Works (EcoW / ECoW) will be employed for the duration of construction. The EcoW / ECoW will advise on and monitor implementation of mitigation measures and compliance with legislation concerning ecological features;
- The EcoW / ECoW or other suitably qualified and experienced ecologist will carry out pre-construction surveys for relevant protected species in suitable habitat, including otter and water vole, and search for red squirrel dreys in any suitable trees requiring felling. In line with NatureScot guidance, the pre-construction

surveys will take place no more than three months before commencing works (including facilitating works such as vegetation clearance);

- A Construction Environmental Management Plan (CEMP) will be prepared and submitted for approval by Argyll and Bute Council, in consultation with SEPA and NatureScot where necessary, prior to commencement of construction. The CEMP will set out all environmental management measures and the roles and responsibilities of construction personnel. An Outline CEMP can be found within *Appendix 3.1 Outline CEMP (Volume 5 Appendices*);
- During all phases of the Development, pollution prevention measures will be adopted, following SEPA Guidance on Pollution Prevention (GPP) or Pollution Prevention Guidelines (PPG), including the following:
  - Controls and contingency measures to manage run-off from construction areas and sediment;
  - All oils, lubricants and other chemicals will be stored in appropriate secure containers in suitable storage areas, with spill kits at the storage location and at places across the Development Site;
  - all refuelling and servicing of vehicles and plant will be carried out in a designated bunded area with an impermeable base, located at least 50m from any watercourse;
- Works near or at any retained native trees or semi-natural woodland will follow tree protection guidance set out in British Standard 5837:2012 (British Standards Institution, 2012);
- Any artificial lighting required for construction works will be directional to avoid or minimise light spill beyond immediate works areas and will be turned off when not needed.

6.7.2 Features Scoped Out of Further Assessment

Relevant ecological features are those that are 'important' and have the potential to be significantly affected by the Development (CIEEM, 2022). In view of the baseline data obtained through desk study and field survey, and consideration of the Development, the features in *Table 6.5 Ecological Features Scoped Out of Further Assessment* have been excluded from further assessment because: a) available data indicates that they are likely absent from the ZoI of the Development; b) it is clear that no impact from the Development is possible; and/or c) they are features that, although 'important' by the criteria given in this chapter, are sufficiently common and widespread that their conservation status even locally is clearly not threatened by the Development.

Table 6.5 Ecological Features Scoped Out of Further Assessment

Ecological Feature	Rationale for Exclusion from Further Assessment
European sites more than 10 km from the Development	There is very limited to zero connectivity for the two European sites within 10 km, which is discussed in the impact assessment below. Moreover, the Statement to Inform Habitats Regulations Appraisal concluded no adverse effects on site integrity for any European sites.
National statutory designated sites	There are no national statutory designated sites for nature conservation (including SSSIs) within 2 km of the Development. Further afield, there is no connectivity to any stage of the Development and thus no possibility of impacts on the notified features of any such site.
Local designated sites	There are no local designated sites (statutory or otherwise) for nature conservation within 1km of the Development. Further afield, there is no connectivity to any stage of the Development and thus no possibility of impacts on the notified features of any such site.
Woodland that is neither semi-natural nor long-established plantation	All such woodland comprises non-native commercial conifer plantation, mainly of Sitka spruce. This is ubiquitous, floristically very poor and of very low value as a terrestrial habitat.
Common habitats that are neither SBL priorities nor Annex I habitats	This includes agriculturally-improved grassland (present by Loch Awe and Inveraray); typical more species-poor acid grassland; plantation woodland (including felled plantation) that is neither long-established plantation nor Plantation on Ancient Woodland Sites (PAWS); dense bracken; and very limited extents of ruderal ('weed') vegetation, amenity grassland and poor quality coastal grassland of ruderal nature infested with Japanese knotweed.
Wildcat	There is no recent reliable evidence of wildcat in the Development vicinity or NHZ 14, and reportedly 'scant evidence' in the entirety of Argyll and the Trossachs (see *Appendix 6.4 Mammals (Volume 5 Appendices)*). No evidence was found during the field surveys (including on camera traps), as was also reported by surveys for Blarghour Wind Farm (Ramboll/ESB/Coriolis Energy, 2018). The larger part of the Development (the Headpond) contains exposed upland moorland habitat that is unfavourable for wildcat. Therefore wildcat is assumed to be absent.
Badger	No badger setts were found during any field surveys. Evidence found (two latrines and two snuffle pits – see *Appendix 6.4 Mammals (Volume 5 Appendices)*) was only found north of Inveraray, was not very close to the proposed access route, and the proposed access route here follows an existing substantial forestry/estate track. Therefore there would be negligible to zero impact on

Ecological Feature	Rationale for Exclusion from Further Assessment
	badgers. Embedded mitigation including standard animal protection measures, ECoW appointment and pre-construction survey will be sufficient to address legal obligations.
Mountain hare and hedgehog	There is no evidence of mountain hare in or near the Development Site except historically, from desk studies and field surveys for both the Development and the nearby Blarghour wind farm (see *Appendix 6.4 Mammals (Volume 5 Appendices)*). The bulk of the Development Site is upland and unsuitable for hedgehog, which although an SBL priority species also remains widespread in Scotland, therefore there is likely to be negligible impact on its conservation status (including locally), and standard animal protection measures embedded in the CEMP (such as provision of means of escape from excavations) will be sufficient to minimise risk of harm at the limited lowland works.
Wild deer	Wild deer are not under any threat from the Development. They are briefly mentioned in the baseline only to inform consideration of possible wild deer impacts on retained habitats, following loss of deer habitat to the Development (primarily the Headpond).
Great crested newt and common amphibians / reptiles	There is no evidence of great crested newt near the Development, the closest records being near Glasgow. Other amphibians in this part of Scotland receive no protection relevant to Development and are widespread. Only common reptile species with no special protection are present in Scotland, and can be assumed to be present (potentially including adder on the lower moorland parts of the Development Site). Standard mitigation can be implemented to reduce impacts on common amphibians and reptiles.
Terrestrial invertebrates	The baseline results for butterflies and dragonflies found only one priority SBL species, which remains widespread in Scotland and NHZ 14, and other found species are common and widespread in Scotland. Butterflies and dragonflies were recorded more often outside the Headpond area than within it, impacts on relevant habitats outside the Headpond area will be minimal, and the recorded species can expected to be similarly distributed throughout nearby similar habitat beyond the Development. The dominant terrestrial habitats in the main upland part of the Development Site are generally species-poor acidic bog and heath, often in sub-optimal condition, and thus not likely to support notable assemblages of other terrestrial invertebrates. Therefore impacts on terrestrial invertebrates are taken as not significant.

6.7.3 Importance of Ecological Features

The assessed importance of baseline ecological features that have not been screened out above is set out in *Table 6.6 Importance of Ecological Features,* together with rationale. Importance has been assessed considering geographic scale, in accordance with CIEEM (2022) guidelines.

With regard to geographic scale, NatureScot has devised 21 ‘Natural Heritage Zones’ (NHZ) covering the whole of Scotland, which reflect biogeographical differences across the country and are therefore often well-suited to ecological assessment. Regional importance (both initially and during impact assessment) is defined in this assessment as referring to the extent of the Argyll West and Islands Natural Heritage Zone 14 (NHZ 14). Local importance is defined as referring to the area within 10 km of the Development.

Table 6.6 Importance of Ecological Features

Ecological Feature	Importance	Rationale
Loch Etive Woods SAC and Glen Shira SAC	International	These are European sites, which were selected and remain legally protected for the international importance of their qualifying features.
Ancient semi-natural woodland	National	Ancient woodland is considered irreplaceable in national policy, and ancient semi-natural woodland holds the most value of any woodland.
Long-established plantation	Regional	Although listed in the AWI, long-established plantation within the Development Site and nearby is widespread in the area and frequently exhibits a full or partial non-native canopy with a poor flora, therefore Regional importance is considered most appropriate. This category includes Plantation on Ancient Woodland (PAWS) where there is localised evidence of remnant ancient woodland (in plantation west of Inveraray, beside the forestry track) comprising mature oaks and patches of (native) bluebell.
Other semi-natural woodland	Local	Other semi-natural woodland is uncommon in the surveyed area, mainly comprising small amounts near Inveraray in sub-optimal condition (this excludes an extremely narrow and small amount of W9 amongst species-rich ledge vegetation, which is covered by the latter below).
Blanket bog	Regional	Blanket bog is SBL priority habitat and Annex I habitat, with significant carbon as well as habitat value. Intact (not significantly degraded) peat-forming bog is priority Annex I habitat (i.e. a priority on a European scale). For these purposes, the two local areas classed as basin mires are considered part of the wider bog. There are 48ha of wetter NVC bog types with abundant ‘good’ bog sphagna within the Headpond area – for comparison, peat-forming bog exceeding 25ha is amongst the SSSI criteria for bog

Ecological Feature	Importance	Rationale
		(JNCC, 1994), as is presence of particular sphagna known to occur very rarely in the surveyed area. However, substantial parts of the bog are degraded or in suboptimal condition through overgrazing and burning, and blanket bog is widespread locally and regionally. There are also estimated to be 1.8 million hectares of blanket bog in Scotland (https://www.nature.scot/landscapes-and-habitats/habitat-types/mountains-heaths-and-bogs/blanket-bog). On balance, therefore, Regional importance is considered most appropriate.
Species-rich ledge / ravine vegetation	Regional	This habitat, which includes NVC type U17, is extremely rare and very limited in extent within the surveyed area (including the wide surveyed strip along the Three Bridges Access Track), requiring appropriate steep rocky slopes with very low or absent grazing pressure (whereas grazing pressure is often high across the surveyed area). They are likely to be similarly scarce across the wider NHZ 14 and support significant plant diversity.
Other SBL priority and Annex I habitats, and potential GWDTE	Local	This includes all wet and dry heath – although these are SBL and Annex I habitats, it must be taken into account that typical forms are ubiquitous throughout upland Scotland including NHZ 14, and more local flushed forms are also widespread in the uplands. Other habitats in this group include acid species-poor flushes (frequent in this area and the uplands in general), and a variety of more localised habitats of small to very limited extent comprising basic / species-rich flushes, basic (calcareous) grassland, and rush-pasture (with wetland species). These habitats, although of some note, are sufficiently widespread in the surveyed area and upland Scotland generally that Regional importance would be disproportionate. Regional importance is also disproportionate for the very small amount of discontinuous low quality saltmarsh within the surveyed area at Loch Fyne – such unremarkable vegetation is scattered around the loch, and the only substantial notable extent is 11 km away at its head (see saltmarsh data at https://map.environment.gov.scot/sewebmap/).
Notable flora – *Sphagnum austinii* and *Sphagnum fuscum*	Regional	These two sphagnum species, which are good indicators of higher quality bog, are extremely rare in the surveyed area (probably as a result of the poorer condition of much of the blanket bog), and given the similar appearance of habitat further afield are likely to be rare throughout the local area. However, they are also scarce throughout NHZ 14 (as demonstrated by the distribution maps given for each species at https://www.britishbryologicalsociety.org.uk/learning/species-finder/), and the records in the surveyed area appear to be new hectad records.
Other notable flora	Local	The other notable (mainly vascular) plants recorded during field survey are sufficiently widespread that Regional importance would be disproportionate. They do however appreciably contribute to local biodiversity, especially given the generally species-poor nature of the dominant moorland habitats in and around the Development Site.
Otter	Local	Otter is a European Protected Species and remains strictly protected under the Habitats Regulations. Otter evidence is common in the Development Site, including a number of holts, and rivers, streams and standing waters (including the Headpond area) contain suitable fish prey resources. However, otters are widespread, including in NHZ 14, with around 8,000 individuals in Scotland (https://www.nature.scot/plants-animals-and-fungi/mammals/land-mammals/otter). Otter home ranges are also very large, extending to around 15km or more of typical freshwater watercourse for females and much more for males (Harris and Yalden, 2008).
Bats	Local	The bat surveys very largely recorded soprano, common pipistrelle and (locally) Daubenton's bat, all of which are common. Activity was low to very low in the Headpond area, and not especially high elsewhere. Possible but uncertain Natterer's bat, a scarcer species which is nevertheless widespread, is represented here by a very few bat call passes. Two roosts including a Daubenton's maternity roost were confirmed and there are 60 trees within 30 m of the Development with some level of roost suitability, however there will be a great many more in the extensive woodland near Loch Awe and Inveraray. Habitat-wise, the Site is typical of NHZ 14, and recorded bat activity also appears typical. Regional importance would therefore be disproportionate.
Water vole	Regional	Water vole evidence was recorded locally in and near the Headpond. Abundance within the Headpond area appears low, and the only other known water vole area at Lochan Romach is also small. However, there are only seven post-1990 commercially-available hectad records of water vole in NHZ 14, and the records are localised within each hectad. Therefore despite low numbers, the local population is considered of Regional importance.
Pine marten	Local	Pine marten is widespread and frequent across much of Scotland, in particular highland Scotland and including NHZ 14. Therefore Regional importance would be disproportionate.
Red squirrel	Local	Red squirrel is widespread and frequent across most of Scotland, in particular highland Scotland and including NHZ 14. Therefore Regional importance would be disproportionate.

Invasive non-native plant species are not included in the above table because they do not have positive biodiversity importance, but can adversely affect habitats or sites that are themselves of variable geographic importance. Standard mitigation can be implemented to avoid spreading invasive plants (of which for this Development the most critical is the Japanese knotweed at the edge of Loch Fyne).

6.7.4 The Potential Impacts of the Development

The following broad categories of impact could arise during construction and operation of the Development and are considered, where potentially relevant, for each ecological feature not excluded from the scope of further assessment for the reasons given in *Table 6.5 Ecological Features Scoped Out of Further Assessment*:

- Indirect impacts on the qualifying features of Loch Etive Woods SAC or Glen Shira SAC;
- Limited direct loss of ancient semi-natural woodland and long-established plantation;
- Direct loss of blanket bog, and of smaller extents of potential GWDTE and other priority or Annex I habitats;
- Indirect hydrological impact on blanket bog and potential GWDTE (including wet woodland);
- Loss of notable flora directly or via adverse effect on supporting habitat;
- Direct harm to protected species;
- Direct damage or loss of refuges of protected species;
- Disturbance or displacement of protected species;
- Loss or fragmentation of supporting habitat of protected species;
- Spread of invasive non-native species;
- Cumulative impacts arising in combination with multiple Development aspects or other developments.

There are no likely pathways for pollution of surface water, groundwater, soils or vegetation given that industry-standard good practice pollution control measures incorporated into a CEMP will be implemented at all stages of the Development to meet legal and regulatory requirements, as described in *Section 6.7.1.2 Environmental Protection During Construction.* Therefore, waterborne pollution effects are not considered further.

Whilst plant and vehicle emissions would occur during construction, significant adverse effects on habitats arise through long-term exposure. Moreover, impacts from gaseous vehicular emissions of vehicles are not considered significant beyond 200 m, nor where traffic flow is less than 1000 vehicles or 200 heavy vehicles per day (Highways England, 2019), whereas there are estimated to be average movements during construction of 154 cars/light vehicles and 152 heavy vehicles per day. The CEMP will also include dust suppression measures to be implemented when required in dry weather conditions. For these reasons, airborne pollution effects as a result of construction are likely to be negligible. The functioning of the Development during operation, and infrequent small-scale maintenance attendance, will not incur any other appreciable airborne pollution emissions. Therefore airborne pollution effects are not considered further.

6.7.5 Impacts on Loch Etive Woods SAC

6.7.5.1 Construction Phase

A detailed assessment of the potential impacts and effects of the Development on Loch Etive Woods SAC is provided in the Statement to Inform Habitats Regulations Appraisal (*Appendix 6.2: Statement to inform Habitats Regulations Appraisal (Volume 5 Appendices) (Confidential version within Volume 6 Confidential Appendices*)). This found (given substantial separation, and the nature of the Development) that there were no likely significant effects on qualifying habitats from construction. It also found that although there could be very minor construction impacts on qualifying otter associated with the SAC (given the very large home range of otters), if these occurred they would be so minimal that the SAC conservation objectives would in no way be compromised and there would again be no likely significant effects. It therefore concluded no adverse effect on the integrity of Loch Etive Woods SAC from construction of the Development.

An EIA could theoretically arrive at a conclusion of significant effect on a European site even where an HRA concludes no adverse effect on site integrity, for example if a there is a beneficial effect. However, there is no beneficial effect from the Development in this case, and no other reason to conclude any significant negative impact. Consequently, there will be **Negligible effect** on Loch Etive Woods SAC during construction, which is **Not Significant**.

6.7.5.2 Operational Phase

A detailed assessment of the potential impacts and effects of the Development on Loch Etive Woods SAC is provided in the Statement to Inform Habitats Regulations Appraisal (*Appendix 6.2: Statement to inform Habitats Regulations Appraisal (Volume 5 Appendices) (Confidential version within Volume 6 Confidential Appendices*)). This found (given substantial separation, and the nature of the Development) that there were no likely significant effects on qualifying habitats from operation of the Development, including from changes in water level in Loch Awe (given that the qualifying habitats do not approach the shore of Loch Awe closer than 50 m). It also found that operational impacts on qualifying otter associated with the SAC are highly improbable, and if these occurred they would be so minimal that the SAC conservation objectives would in no way be compromised and there would again be no likely significant effects. It therefore concluded no adverse effect on the integrity of Loch Etive Woods SAC from operation of the Development.

An EIA could theoretically arrive at a conclusion of significant effect on a European site even where an HRA concludes no adverse effect on site integrity, for example if there is a beneficial effect. However, there is no beneficial effect from the Development in this case, and no other reason to conclude any significant negative impact. Consequently, there will be **Negligible effect** on Loch Etive Woods SAC during operation, which is **Not Significant**.

6.7.6 Impacts on Glen Shira SAC

6.7.6.1 Construction Phase

A detailed assessment of the potential impacts and effects of the Development on Glen Shira SAC is provided in the Statement to Inform Habitats Regulations Appraisal. This found (given substantial separation, complete lack of connectivity, and the nature of the Development) that there was no possibility of likely significant effects during construction of the Development on the sole qualifying feature (woodland habitat beside a stream in a different water catchment at closest 5.5 km from the Development with intervening mountainous terrain). It therefore concluded no adverse effect on the integrity of Glen Shira SAC from construction of the Development.

An EIA could theoretically arrive at a conclusion of significant effect on a European site even where an HRA concludes no adverse effect on site integrity, for example if a there is a beneficial effect. However, there is no beneficial effect from the Development in this case, and no other reason to conclude any significant negative impact. Consequently, there will be **No effect** on Glen Shira SAC during construction.

6.7.6.2 Operational Phase

A detailed assessment of the potential impacts and effects of the Development on Glen Shira SAC is provided in the Statement to Inform Habitats Regulations Appraisal. This found (given substantial separation, complete lack of connectivity, and the nature of the Development) that there was no possibility of likely significant effects during operation of the Development on the sole qualifying feature (woodland habitat beside a stream in a different water catchment at closest 5.5km from the Development with intervening mountainous terrain). It therefore concluded no adverse effect on the integrity of Glen Shira SAC from operation of the Development.

An EIA could theoretically arrive at a conclusion of significant effect on a European site even where an HRA concludes no adverse effect on site integrity, for example if a there is a beneficial effect. However, there is no beneficial effect from the Development in this case, and no other reason to conclude any significant negative impact. Consequently, there will be **No effect** on Glen Shira SAC during operation.

6.7.7 Impacts on Ancient Semi-Natural Woodland and Long-established Plantation

6.7.7.1 Construction Phase

Whilst some works would take place near retained ASNW or long-established plantation, tree protection measures are embedded within the CEMP, therefore this is not further discussed.

Direct Loss of Ancient Semi-Natural Woodland

No existing ASNW would be impacted at Inveraray – all ASNW along the proposed Access Tracks is PAWS with extensive non-native canopy species including conifers and beech. The broadleaved plantation section around temporary compound TC21 (in an existing quarry; see *Figure 6.3 Phase 1 Habitats (Volume 3 Figures*)) is mostly beech-dominated with consequent impoverished flora, although there are scattered mature oaks and sparse good quality woodland indicators (such as enchanter's nightshade, primrose, native bluebell, wood sedge and remote sedge). Dog's-mercury and yellow pimpernel were also locally recorded near the southern edge of the plantation.

However, the proposed Access Track will largely follow the existing forestry / estate Access Track. Limited felling may be required along the existing off-shoot track to temporary compound TC21, which is estimated to require felling of at most 0.30 ha of PAWS. The total broadleaved PAWS in the survey area in this vicinity is 3.8 ha, thus 92% of current broadleaved PAWS would be retained, including the best parts south of the main existing forestry track with the scattered mature oaks and the best patches of woodland flora.

There would however be loss of ASNW beside Loch Awe. By reference to the AWI, but excluding land that is in reality not woodland but rather caravans, gardens or hard-standing, there is 0.20 ha of ASNW within the Tailpond area. Given the frequent small-scale inaccuracy of the AWI, and on a precautionary basis, continued similar semi-natural woodland around the edge of and slightly north of the relevant AWI polygon (Wood_ID 14169) is also treated here as ASNW. This gives 0.42 ha of ASNW within the Tailpond works area. Although in reality it is possible that construction processes may allow a small amount of this to remain, it is assumed in a worst-case scenario that all of this 0.42 ha would be lost.

To place this in context, an estimation was made of ASNW up to approximately 1 km inland around Loch Awe (similarly to the ASNW in the Development vicinity). Areas of ASNW in the AWI that the NWSS identifies as PAWS were excluded (PAWS are former ASNW that was felled and replanted with non-native trees, often Sitka spruce, typically in the 1950s to 1980s – limited remnant ancient woodland flora may persist in PAWS but its survival, including seedbank, appears unlikely after 25 years of canopy closure (Ferris and Simmons, 2000) and least likely in acidic and wetter conditions (Brown *et al.*, 2015) as is the case with typical Sitka plantation). This indicates that there is approximately 660ha of ASNW around Loch Awe. This comprises, according to the NWSS, a mix of woodland types including those identified in the Development vicinity (Upland Oakwood, Upland Birchwood, Upland Mixed Ashwood and Wet Woodland). It is thus estimated that ASNW lost to the Development at the Tailpond would in the worst case equate to 0.06% of the ASNW resource around Loch Awe, and that 99.14% would be retained. There is far more ASNW in NHZ 14 as a whole. However, lost ASNW is not fully replaceable, owing to its antiquity (noting that this refers to temporal continuity of native woodland cover, not the age of trees, which have usually been felled and regrown historically in ASNW across the UK and Scotland), and associated ancient woodland ground flora, soil ecosystem, etc.

Consequently, loss of ASNW (including the minor PAWS impact) is considered a **Permanent Adverse effect of Regional Significance**, which is **Significant**. This can however be partially mitigated by proposed oLEMP measures (see *Section 6.9 Mitigation and Monitoring*).

Direct Loss of Long-established Plantation

The only loss of long-established plantation would be a limited amount near the western end of the Inveraray section, for the Access Track to reach the proposed jetty at Loch Fyne. The loss would amount to approximately 0.2ha of mature non-native Sitka spruce and (locally) beech with negligible flora and of ecologically very low value. There is extensive long-established plantation around Inveraray – the total area of long-established plantation polygons that cross the Development Site at Inveraray is approximately 335 ha, and in places this is of appreciably higher quality (i.e. with at least some native canopy species and elements of native woodland flora). No native woodland specialists were recorded amongst the negligible flora of the affected long-established plantation, and if there is any remaining seedbank of such species in this section of plantation it will likely be poor, and potentially absent, given that such seedbanks are known to be unreliable after 25 years of canopy closure (Ferris and Simmons, 2000) and least likely to persist in acidic and wetter conditions (Brown *et al.*, 2015) as is applicable to dense Sitka spruce plantation in western Scotland.

As such, the very minimal loss of ecologically-poor long-established plantation is considered a **Negligible effect**, which is **Not Significant**.

6.7.7.2 Operation Phase

Waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development,* in part owing to embedded mitigation within the CEMP.

Hydrological Impact on Retained ASNW and Long-established Plantation

Hydrological impact could occur through changes to water levels or flows in retained water features with immediately adjacent ASNW or long-established plantation that is wet in character. However, in this regard it is important that the embedded design of the Development includes a continuous supply of sufficient water to maintain normal flow along the retained part of the Allt Beochlich (Buinne Dubh) downstream of the Headpond (however, natural flow ceases approximately 1km downstream of permanent compound PC09, which will house the water supply mechanism, owing to a small existing hydroelectric dam). As such, there would be no effect on downstream wet ancient woodland corresponding to NVC type W7. Although Loch Awe will be subject to water level fluctuation, this would have negligible hydrological impact on the known wet ASNW beside it and along the B814, which is primarily made wet from contributing terrestrial slopes (rather than through inundation by Loch Awe itself).

With regard to wet woodland further afield by Loch Awe, it has already been noted that ASNW within Loch Etive Woods SAC (which includes some wet woodland – see *Section 6.7.5 Impacts on Loch Etive Woods SAC*) is not immediately adjacent to Loch Awe but 50 m or more inland and upslope, and would therefore not be liable to effects from fluctuation in Loch Awe water level. Out of 179 NWSS polygons that for some part of their edges meet the shore of Loch Awe, 64 are identified as native wet woodland, of which 32 contain a proportion of ASNW. These include the woodlands within the surveyed area for the Development, which as stated are actually only partly wet and where wet comprise NVC type W7 which is not heavily waterlogged and made wet by contributing terrestrial slopes rather than by Loch Awe. Current contour data and historic bathymetry data (https://maps.nls.uk/bathymetric/loch_order.html) indicate that in most places the shores of Loch Awe are often similarly sloping, suggesting that most other NWSS-identified wet woodland around Loch Awe is also likely to be made wet by contributing slopes rather than loch inundation. The north end of Loch Awe includes areas of shallowly-sloping depths, within which lie several small wooded islands, however the NWSS identifies these islands as mainly upland birchwood (occasionally upland oakwood and native pinewood) and not wet woodland. For these reasons, ASNW wet woodland (and other non-ASNW wet woodland) that is significantly waterlogged and made so by inundation from Loch Awe appears likely to be rare.

The properties of some woodland can depend on humidity, which might also be affected by fluctuations in Loch Awe. This would potentially be particularly the case for ‘temperate rainforest’, typically comprising NVC type W17 with rocks and abundant and diverse bryophytes. Such woodland would be expected to generally be classed as upland oakwood in the NWSS dataset. Out of 179 NWSS polygons that for some part of their edges meet the shore of Loch Awe, there are 28 upland oakwoods, of which 19 contain a proportion of ASNW. Almost all of these (whether containing ASNW or not) are substantial polygons that extend significantly inland from Loch Awe. Therefore the interior humidity of these woods appears to be largely not dependent on Loch Awe, but rather the effects of the canopy, the local wet climate and water from contributing slopes (including watercourses).

Consequently, there is likely to be **Negligible effect** on retained ASNW or long-established plantation through hydrological effect, which is **Not Significant**.

Impact of Loss of Wild Deer Habitat on Retained ASNW and Long-established Plantation

A possible operational impact would be increased deer pressure on retained ASNW and long-established plantation. This could arise owing to loss of open grazing habitat used by deer (primarily to the Headpond, and primarily concerning red deer given the open upland habitat), and further loss from the peatland / upland rehabilitation zone around the Headpond (from which deer would be excluded) as proposed in the oLEMP. The loss of such open deer habitat to infrastructure amounts to 2.3 km^2 (including habitats lost to all parts of the Development other than improved/poor semi-improved grassland, woodland, coastal habitats, artificial habitats and open water / rivers), and the rehabilitation zone would extend to approximately 3km^2 around the Headpond. Passage for wild deer would be maintained to the north and south of the rehabilitation zone, so that red deer could still freely move through the region. However, during operation the combined loss of open deer habitat will be approximately 5.9km^2. For some form of comparison, there is an estimated 75 km^2 of open upland habitat between Portsonachan in the north, Inveraray / Eredine Forest in the south, the B840 in the east and the A819 in the west. There might therefore be a minor degree of increased grazing pressure locally beyond the Development, potentially including on retained ASNW and long-established plantation. However, most of this woodland is on lower ground close to Loch Awe rather than on the higher upland ground that red deer predominantly use, and at least in some cases it is deer-fenced (including a large part of the surveyed woodland beside the B814). Therefore impacts by this means on retained ASNW and long-established plantation are considered likely to be very slight (there may also be some balancing if deer numbers in the area decrease as a result of the reduction in their habitat).

Consequently, there is considered likely to be a **Negligible effect** on retained ASNW or long-established plantation through increased grazing pressure, which is **Not Significant**.

6.7.8 Impacts on Other Semi-natural Woodland

6.7.8.1 Construction Phase

Direct Loss of Other Semi-natural Woodland

There will be no loss of other semi-natural woodland, and therefore **No effect**.

6.7.8.2 Operation Phase

Waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP.

Hydrological Impacts on Retained Other Semi-natural Woodland

Hydrological impact on other semi-natural woodland along Loch Awe could arise through fluctuations in water level induced by operation of the Development. However, such effects are discussed in *Section 6.7.7.2 Operational Phase* which covers other semi-natural woodland as well as ASNW. The conclusion is the same, i.e. that there is likely to be **Negligible effect** on retained other semi-natural woodland, which is **Not Significant**.

Impact of Loss of Wild Deer Habitat on Retained Other Semi-natural Woodland

For the same reasons given for ASNW and long-established plantation in *Section 6.7.7.2 Operational Phase* there is considered likely to be **Negligible effect** on retained ASNW or long-established plantation through increased grazing pressure, which is **Not Significant**.

6.7.9 Impacts on Blanket Bog

6.7.9.1 Construction Phase

Direct Loss of Blanket Bog

By reference to the NVC survey, and accounting for NVC bog communities in mosaic with other vegetation types (such as wet heath and acid grassland) the Development will incur loss of 165 ha of blanket bog, the great majority in the Headpond area. This is just under one third of the extent within the surveyed area (599 ha, although following Blarghour Wind Farm construction this would be slightly reduced). For comparison, Scotland is estimated to hold 1.8 million hectares of blanket bog (https://www.nature.scot/landscapes-and-habitats/habitat-types/mountains-heaths-and-bogs/blanket-bog), and it is widespread in NHZ 14 (SNH, 2002; and also suggested by the frequency of Class 1 and 2 peat (https://map.environment.gov.scot/sewebmap/) which commonly comprises blanket bog).

Of the blanket bog that would be lost, 37 ha is significantly degraded, by overgrazing and/or recent burning and probably past burning, with significantly reduced ericoid growth. 82 ha is of drier bog forms, mainly forms of M19 (particularly M19c, that are often quite dry with naturally limited sphagnum cover and little sphagna other than *Sphagnum capillifolium*, which is not confined to bog and not a key peat-forming species) and M17b (which here is drier than the M17a and not as sphagnum-rich). This 82 ha of drier bog forms, although not classed as degraded bog, are quite often still in less than optimal condition with less ericoid growth than would be expected under more favourable conditions. Species that can be at least frequent in M19c (especially cloudberry, also bog bilberry in this area, as discussed in *Section 6.7.14 Impacts on Other Notable Flora*) are present but extremely rare, to a degree that appears difficult to explain except by the effects of unfavourable management including overgrazing and burning. Such issues were also noted in the Blarghour Wind Farm and Balliemeanoch Wind Farm surveys (carried out by Alba Ecology and Highland Ecology respectively, in Ramboll/ESB/Coriolis Energy (2018)).

However, 50 ha of the blanket bog that would be lost is intact wetter blanket bog (nearly all M17a) with extensive cover of sphagnum including *Sphagnum papillosum* and locally *Sphagnum medium. Figure 6.3 Phase 1 Habitats (Volume 3 Figures*) indicates the wetter blanket bog, and Figure 6.4 includes known locations of *Sphagnum medium*. SSSI selection criteria for bogs (JNCC, 1994 – revised version not yet available) states that *Sphagnum medium* (better known under its former name *Sphagnum magellanicum*) is a key peat-forming species, and stipulates a minimum area of peat-forming bog of 25 ha. Owing to overall floristics, most occurrences of *S. medium* were considered part of the surrounding M17a rather than M18, except very locally where cranberry was also found near Lochan Airigh. For comparison, within the surveyed area there is 107ha of such wetter blanket bog, that is intact and not degraded (which may be slightly reduced by construction of Blarghour Wind Farm). Surveys for Blarghour Wind Farm and Balliemeanoch Wind Farm (Ramboll/ESB/Coriolis, 2018) confirm that areas of wetter blanket bog also occur outside the surveyed area, in places also with *S. medium*, although no *S. fuscum* or *S. austinii* were reported (however, as discussed in *Section 6.7.13 Impacts on Sphagnum austinii and Sphagnum fuscum*), the two known locations of *S. fuscum* and *S. austinii* are outside the Development footprint and are not considered to be at risk). The blanket bog that will be lost also includes an area of very wet and largely inaccessible vegetation, with some open water and abundant sphagnum and rushes, some of which equates to Annex I transition mire.

On balance, considering the above points, loss of blanket bog to construction of the Development is considered to remain significant at the level of importance assigned to it prior to further mitigation, i.e. a **Permanent Adverse effect of Regional Significance**, which is **Significant**.

Hydrological Impact on Retained Blanket Bog

It is embedded into the design that where new Access Tracks will pass over peat of 1 m depth or more, they will be designed as floating tracks, which will minimise hydrological effects on adjacent blanket bog and associated habitat by maintaining substrate and hydrological connectivity under the track. Moreover, the Access Tracks and compounds (both temporary and permanent) have been routed and sited to largely avoid deeper peat, which often corresponds to wetter blanket bog vegetation. In the majority of cases, blanket bog affected by Access Tracks and compounds comprises drier forms, such as M19c, that are less prone to hydrological effects than obviously wet blanket bog (the primary extents of which are shown on *Figure 6.3 Phase 1 Habitats (Volume 3 Figures*)).

For these reasons, hydrological impact on blanket bog is likely to be slight and of far less consequence than direct loss (set out above). Therefore hydrological construction impacts are considered a **Permanent Adverse effect of Local Significance**, which is **Not Significant**.

6.7.9.2 Operation Phase

Waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 The Potential Impacts of the Development*, in part owing to embedded measures within the CEMP. Possible hydrological impact arises initially during construction and is discussed in the preceding section.

Impact of Loss of Wild Deer Habitat on Retained Blanket Bog

A possible operational impact would be increased deer pressure on retained blanket bog. This could arise owing to loss of open grazing habitat used by deer (primarily to the Headpond, and primarily concerning red deer given the open upland habitat), and further loss from the peatland / upland rehabilitation zone around the Headpond (from which deer would be excluded) as proposed in the oLEMP. As explained in *Section 6.7.7.2 Operation Phase*, the loss of open deer habitat would amount to approximately 5.9 km^2. For some form of comparison, there is an estimated 75 km^2 of open upland habitat between Portsonachan in the north, Inveraray/Eredine Forest in the south, the B840 in the east and the A819 in the west. There might therefore be a minor degree of increased grazing pressure on the dominating blanket bog beyond the Development, which could cause slight further deterioration, such as further slight reduction in ericoid cover (there may however be some balancing if deer numbers in the area decrease as a result of the reduction in their habitat).

Consequently, there is considered to be, at worst, a **Permanent Adverse effect of Local Significance** on retained blanket bog beyond the Development, as a result of a possible but uncertain minor increase in wild deer pressure, which is **Not Significant** for the purposes of EIA.

6.7.10 Impacts on Species-rich Ledge/Ravine Habitat

6.7.10.1 Construction Phase

Direct Loss of Species-rich Ledge/Ravine Habitat

Of the four species-rich ledge/ravine locations known within the survey area, only the smallest and least diverse (at Target Note 37; see *Appendix 6.3 Habitats (Volume 5 Appendices)* and *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures*)) would be directly lost to the Development (to the Headpond). The other three would be retained.

The effect of this loss will be consequential locally rather than at the Regional level of importance assigned to species-rich ledge/ravine habitats as a whole, because the majority would remain and the retained examples are larger and overall more diverse than the single lost example. Consequently, there will be a **Permanent Adverse effect of Local significance**, which is **Not Significant**.

Hydrological Impact on Retained Species-rich Ledge/Ravine Habitat

The small ravine near the Three Bridges Access Track would not be subject to hydrological construction impacts by the Development because the Development will not construct this Access Track.

Of the two locations along watercourses west of the southern Headpond Embankment 1, the best example is on the small tributary of the Allt Beochlich at Target Note 2 (See *Appendix 6.3 Habitats (Volume 5 Appendices)* and *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures*)). The physical characteristics chiefly maintaining the shelter and humidity that support the floristic diversity (steep-sided to vertical tall rocky slopes in a narrow ravine) will be unchanged at this location, and there is separation of at minimum 50 m from the nearest infrastructure (temporary compound TC08). The majority of the water-contributing area supplying the small watercourse in the ravine will be maintained, thus flows and humidity would be similar to baseline. Any hydrological construction effects would therefore be negligible.

The remaining example, on the Allt Beochlich, would also retain the key steep rocky slopes unchanged. Although the Allt Beochlich is blocked upstream by the southern Headpond Embankment 1, the watercourse below the Headpond would be continually supplied with sufficient water to maintain flows similarly to typical baseline flow, using water control equipment installed at permanent compound PC09 (see *Chapter 2: Project and Site Description).* Therefore any hydrological construction effects would be negligible.

Consequently, there will be **Negligible effect** on species-rich ledge/ravine habitats through hydrological construction impacts, which is **Not Significant**.

6.7.10.2 Operation Phase

There are not considered to be any operational effects on species-rich ledge / ravine habitats. Waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP. Possible hydrological impact arises initially during construction and is discussed in section *6.7.10.1 Construction Phase*. There is no possibility of impact from a minor increase in wild deer grazing pressure caused by a reduction in their open upland habitat, because these features exist in the first place by virtue of their inaccessibility to deer within an otherwise often overgrazed environment.

6.7.11 Impacts on GWDTE

6.7.11.1 Construction Phase

Direct Loss of GWDTE

The underlying geology of the Development Site is non-sedimentary and therefore not permeable to water except potentially locally and to a small extent through fractures, forming a 'low productivity aquifer' (see *Chapter 11 Water Environment).* This much reduces the likelihood of *potential* GWDTE (as defined using NVC communities in SEPA (2017)) being groundwater dependent. This is especially so for potential GWDTE located amongst blanket bog, since the blanket bog is itself primarily ombrogenous (rain-fed), the bog vegetation by definition is on significant peat, and associated potential GWDTE (mostly acid rushy flushes generally corresponding to M6) are either also on this peat or in close proximity to and fed by it. Potential GWDTE located on steep non-peaty slopes, which include small and local base-rich flushes (M10, rarely M11) as well as more widespread wet heath, are probably also primarily kept wet by rain, either directly (given the regional climate) or indirectly via the blanket bog typically found above those slopes. Where (as is often the case) acid or occasionally neutral rushy vegetation (M6 and M23) is closely associated with small streams, it is likely to be primarily fed by the watercourse. For these reasons, *potential* GWDTE indicated on *Figure 6.5 Potential Groundwater Dependent Terrestrial Ecosystems (GWDTE) (Volume 3 Figures*) are considered likely in most cases to *not* be groundwater-dependent.

Risk to GWDTE from the Development is therefore low, but sensitivity would be highest for those NVC types considered in SEPA (2017) to be potentially of High groundwater-dependency *and* not associated with blanket bog or otherwise unlikely to be groundwater-dependent for the reasons given in the previous paragraph. This leaves several localised wetland types in the vicinity of Loch Awe and beside the lower part of the western (Balliemeanoch) Access Track. These comprise M6 and M23 flush/rush pasture (often in mosaic with other vegetation types), a single occurrence of flushed U6, and W7 wet neutral woodland. By Development design, compounds (permanent and temporary) largely avoid these vegetation types. Unavoidable loss will however occur to M6 and M23 at permanent compound PC06 (containing a tunnel portal), and to M23 and W7 at the Tailpond. The loss of W7 to the Tailpond would be approximately 0.27 ha (compared to 7.58ha of W7 in the surveyed area, with other wet woodland scattered around Loch Awe in the NWSS data, that is also likely to be W7). The loss of mosaic M6/M23 to PC06, and M23 to the Tailpond, would total approximately 0.33 ha, these habitats being widespread locally, regionally and throughout highland Scotland. Other direct losses to these habitats, and potentially to flushed U6, may occur during improvements to the lower western (Balliemeanoch) Access Track, but would be minor.

Consequently, construction losses to potentially sensitive GWDTE are considered a **Permanent Adverse effect of Local Significance**, which is **Not Significant**.

Hydrological Impact on Retained GWDTE

For the reasons set out in the previous section, most recorded *potential* GWDTE is not likely to be groundwater dependent, and the potentially most sensitive GWDTE are the above-described M6, M23, flushed U6 and W7 beside or near Loch Awe and the lower part of the western (Balliemeanoch) Access Track. The relevant habitats are often upslope (north) of this Access Track and PC06, and in these cases hydrological impact is unlikely. Since the Access Track already exists, the habitats downslope of it are already subject to hydrological impact, which may be significant. Improvements to the Access Track are therefore not likely to have a significant effect on potentially sensitive GWDTE beyond that which already occurs. Retained W7 woodland beside Loch Awe and outside the Tailpond works is separated from the works southwards by approximately 30 m of non-woodland habitat (bracken and neutral grassland), whilst northwards the Tailpond works do not extend beyond an existing non-woodland area (of amenity grassland, garden and semi-permanent caravans). Therefore hydrological impact on retained W7 is likely to be very slight, if any.

Consequently, hydrological construction impacts on retained potentially sensitive GWDTE are considered a **Negligible effect**, which is **Not Significant**.

6.7.11.2 Operation Phase

Waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP. Possible hydrological impact arises initially during construction and is discussed in *Section 6.7.11.1 Construction Phase*.

Impact of Loss of Wild Deer Habitat on Retained GWDTE

As explained in *Section 6.7.7.2 Operational Phase*, there may be a minor increase in deer grazing pressure beyond the Development as a result of loss of open deer habitat. As with other open habitats accessible to deer, which would include the rushy flushes that dominate the potential GWDTE, there might therefore be a minor degree of increased grazing pressure on the potential GWDTE beyond the Development, which could cause slight further deterioration such as a slight reduction in flowering vascular plants (there may however be some balancing if deer numbers in the area decrease as a result of the reduction in their habitat).

Consequently, there is considered to be, at worst, a **Permanent Adverse effect of Local significance** on retained potential GWDTE beyond the Development, as a result of a possible but uncertain minor increase in wild deer pressure, which is **Not Significant**.

6.7.12 Impacts on Other Notable Habitat

6.7.12.1 Construction Phase

Direct Loss of Other Notable Habitats

Wet and dry heath are both priority SBL habitats and Annex I habitats. Losses to wet and dry heath will be approximately 20 ha and 6 ha respectively (with 76 ha and 13 ha each in the whole surveyed area). These comprise forms that are common and/or widespread in highland Scotland. Of most note are M15a (flushed wet heath) and H10d (more diverse basic heath with thyme, etc.), of which 5.7 ha and 0.9 ha would be lost respectively, with 12.7 ha and 0.9 ha in the surveyed area. Although these two forms can be floristically more diverse than the other heaths, they are still widespread in the uplands, and the examples in the surveyed area are mostly not specially-notable. In particular, the M15a was often only separated from other M15 by abundant carnation sedge, although one small more diverse example (at Target Note 19) would be lost. One more diverse localised example of H10d with northern bedstraw (at Target Note 13) would also be lost.

Eighteen locations with small basic flushes (constituting priority SBL and Annex I habitat) were identified of which eight would be lost. The lost basic flushes are not otherwise notably different from the ten retained basic flushes, and there are almost certainly more such basic flushes in the irregular and locally rocky upland ground north-west of the Headpond. Most of these flushes are M10, with a few at higher altitude corresponding to M11. Both these forms of flush are widespread across highland Scotland.

There are localised occurrences of grassland with basic influence, mostly at or near the steep slopes west of the Headpond. These partly correspond to basic grassland, a priority SBL habitat, and both constitute Annex I habitat. They include CG10 and U5c of relatively low diversity and no special note, and a few occurrences of more notably diverse CG10b and U5c. Of the four more diverse examples, two would be lost. The losses to CG10 and U5c would amount to 40% of the total in the surveyed area. U5c was reported by the Blarghour Wind Farm surveys (Ramboll/ESB/Coriolis Energy, 2018), and CG10 as well as other U5c is highly likely to occur locally in the irregular and locally rocky upland ground north-west of the Headpond. These types of vegetation are not normally extensive (with exceptions, such as the Breadalbanes) but are widespread.

A minority of recorded low-quality lowland meadow near the proposed jetty at Loch Fyne would be lost. Nearly all of this is in fairly homogenous agricultural pasture fields which have probably been sown and are subject to grazing. Although lowland meadow is a priority SBL habitat, and is quite localised, the low quality and probable artificial sown origin of the majority within these fields make them poor examples of negligible note. The amount lost would be 11% of the total in the surveyed area, and a very small amount of more natural MG5 lowland meadow would be unaffected.

Poor quality discontinuous and very thin saltmarsh, an SBL priority habitat and Annex I habitat, occurs along the edge of Loch Fyne in the jetty vicinity. Approximately 10% of the mapped area would be lost. However, this type of fragmentary very thin patchy saltmarsh is not uncommon around Scottish sea lochs including Loch Fyne, with the only substantial notable example in Loch Fyne at its head.

Acid flush is a priority SBL habitat. Most recorded acid flush (all corresponding to forms of M6 and not species-rich, as is typical) sits within blanket bog and associated habitats. Losses to M6 amount to approximately 35% of the total in the surveyed area. M6 is ubiquitous in upland areas of Scotland, as was found (for example) in surveys for Blarghour Wind Farm (Ramboll/ESB/Coriolis Energy, 2018).

Rush-pasture is a priority SBL habitat. Losses to localised M23 rush-pasture would amount to approximately 6% of the total in the surveyed area, the retained M23 including the majority of more diverse lowland M23 near Loch Awe. M23 is common in the Scotland and regionally.

Approximately 3% of recorded swamp habitat, an SBL habitat, would be lost. The lost forms comprise very common bottle sedge *Carex rostrata* and reed canary-grass *Phalaris arundinacea* swamps.

In view of the above, losses to other notable habitats are considered a **Permanent Adverse effect of Local Significance**, which is **Not Significant**.

Hydrological Impact on Retained Other Notable Habitats

Hydrological impact via groundwater is considered under GWDTE in *Section 6.7.11 Impacts on GWDTE* above.

Hydrological impact from construction could also cause impacts on certain habitats by altering surface water movement (including watercourse flows). Other notable habitats that could be impacted in this way most obviously include basic flush, acid flush and rush-pasture, but also CG10b/U5c grasslands and possibly wet heath. However, the Headpond sits in a topographical basin, and as a result retained terrestrial habitats above it would generally not suffer from inhibited surface water flows towards them. As stated elsewhere, it is also an element of the design that normal water flow would be maintained in the retained part of the Allt Beochlich (Buinne Dubh), and other retained watercourses will still receive water from the majority or all of contributing slopes. For these reasons, impacts on other notable habitats by altered surface water movements are unlikely or will be very slight.

A possible exception is the basic flush containing bog orchid (at Target Note 16) just north of the northern Headpond Embankment 2. Although not directly impacted, it is at possible risk of harm given proximity (at closest 18 m) to the Embankment, and with a temporary Access Track passing around it upslope with potential to affect flow of water towards it. However, as noted above bog orchid is not rare in this part of Scotland and also under-recorded, and ten known examples of this type of basic flush would be retained, with others highly likely to be present west of the Headpond.

Consequently, hydrological construction impact on other notable habitats is considered a **Negligible effect**, which is **Not Significant**.

6.7.12.2 Operation Phase

Waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP. Possible hydrological impact arises initially during construction and is discussed in *Section 6.7.12.1 Construction Phase*.

Impact of Loss of Wild Deer Habitat on Retained Other Notable Habitat

As explained in *Section 6.7.7.2 Operation Phase*, there may be a minor increase in deer grazing pressure beyond the Development as a result of loss of open deer habitat. As with other open habitats accessible to deer, which would include the other notable habitats mentioned above, there might therefore be a minor degree of increased grazing pressure on the such habitats beyond the Development, which could cause slight further deterioration such as a slight reduction in ericoid cover or flowering vascular plants (there may however be some balancing if deer numbers in the area decrease as a result of the reduction in their habitat). If such impacts occurred they would, of these habitats, mostly affect wet heath, since this is by far the most extensive of the other notable habitats. Further grazing pressure on wet heath might, in some cases, convert it to species-poor purple moor-grass swards, as already exist in places along the western (Balliemeanoch) Access Track owing to existing grazing pressure (which may be primarily due to livestock at that location, but if so would be exacerbated by deer). None of the relevant habitats are, however, considered of more than Local importance.

Consequently, at worst, there would be a **Permanent Adverse effect of Local significance** on retained other notable habitat beyond the Development, as a result of a possible but uncertain minor increase in wild deer pressure, which is **Not Significant**.

6.7.13 Impacts on *Sphagnum austinii* and *Sphagnum fuscum*

6.7.13.1 Construction Phase

Direct Loss of *Sphagnum austinii* and *Sphagnum fuscum*

Sphagnum austinii and *Sphagnum fuscum* are rare in NHZ 14. However, the Development footprint does not impinge upon the locations of these species, with distances of at minimum 60 m to the nearest proposed infrastructure. There will therefore be no direct loss of these species, and therefore **No effect**.

Hydrological Impact on *Sphagnum austinii* and *Sphagnum fuscum*

S. austinii at the one known location (at Target Notes 30 and 31, which are very close together; see *Appendix 6.3 Habitats (Volume 5 Appendices*) and *Figure 6.4 National Vegetation Classification (NVC) and notable plants (Volume 3 Figures)*) is in a very wet watershed area of M17a blanket bog, which is primarily rain-fed. Water will also enter this area from surrounding slopes, however a) the nearest point of the Headpond freeboard is 85 m west and slightly downslope, b) the nearest other infrastructure is an Access Track at the top of a largely dry 20 m high steep slope 100 m to the east, and c) this Access Track soon travels on to slopes that dip away from the *S. austinii* bog. For these reasons, there is not likely to be sufficient if any hydrological impact on the habitat supporting *S. austinii*, and thus no loss or reduction in *S. austinii* by this means.

S. fuscum at the one known location (at Target Note 49; see *Appendix 6.3 Habitats (Volume 5 Appendices)* and *Figure 6.4 National Vegetation Classification (NVC) and notable habitats (Volume 3 Figures*)) is in contrast not located in very wet blanket bog but rather at the junction of drier bog types. This, in combination with 60 m separation from the slightly-downslope southern Headpond Embankment 1, and 80 m separation from the upslope nearest Access Track, also indicates that there would not be sufficient if any hydrological construction impact on the habitat supporting *S. fuscum* to adversely affect it.

It is therefore concluded there will not be adverse hydrological construction impacts on *S. austinii* or *S. fuscum*, and therefore **No effect**.

6.7.13.2 Operation Phase

There are not considered to be any operational effects on *Sphagnum austinii* or *Sphagnum fuscum*. Waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP. Possible hydrological impact arises initially during construction and is discussed in *Section 6.7.13.1 Construction Phase*.

6.7.14 Impacts on Other Notable Flora

6.7.14.1 Construction Phase

Direct Loss of Other Notable Flora

There are no known other plant species within the surveyed area that are nationally rare, nationally scarce, red-listed (meaning listed on the GB red list for plants under a category of threat, rather than those included on the red list but classed as ‘Least Concern’, which are not threatened) or priority SBL species.

Other species recorded as notable by professional judgement are either notable by being locally very scarce and likely indicating habitat degradation, but not otherwise of special note in NHZ 14 (cloudberry, bog bilberry and cranberry), or indicate localised higher floristic diversity (bog orchid, fragrant orchid, lesser twayblade, few-flowered sedge, stone bramble and aggregations of locally-scarce species in localised species-rich habitats). However, none of the species concerned are rare specifically in NHZ 14, and in all cases it is very likely that they occur similarly sparsely beyond the surveyed area, given similar surrounding habitat. The known locations of fragrant orchid and lesser twayblade are well beyond the Development footprint and will not be lost. The loss of several but not all of the known locations of the other named species above within the surveyed area, with likely occurrences beyond it that would not be affected, would not be of more than local consequence. The localised species-rich habitats are discussed in *Sections 6.7.12 Impacts on Other Notable Habitats* above, which concludes locally-significant impacts only.

Consequently, direct losses to other notable flora would constitute a **Permanent Adverse effect of Local significance**, which is **Not Significant**.

Hydrological Impact on Other Notable Flora

Known instances of the notable vascular plants listed in *Section 6.6.3 Notable Flora* that are not within the Development footprint are mostly too far from it to be impacted hydrologically. A possible exception is bog orchid – although infrastructure avoids the actual basic flush containing the bog orchids, it lies between the northern Headpond Embankment 2 and the nearby temporary Access Track to the north. It is possible, if water flow through the flush is reduced by the upslope temporary Access Track, that conditions in the flush may become unsuitable for bog orchid. However, as noted above and in *Appendix 6.3 Habitats (Volume 5 Appendices*) bog orchid is widespread in western Scotland, not rare in NHZ 14, and almost certainly under-recorded owing to its diminutive nature.

Consequently, possible loss by hydrological impact during construction would constitute a **Negligible effect**, which is **Not Significant**.

6.7.14.2 Operation Phase

There are not considered to be any operational effects on other notable flora. Waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP. Possible hydrological impact arises initially during construction and is discussed in *Section 6.7.14.1 Construction Phase*.

6.7.15 Impacts on Otter

6.7.15.1 Construction Phase

Direct Loss of Otter Habitat and Refuges

The only loss of known otter refuges will be at the Headpond, which will incur loss of five holts, as well as thirteen lay-ups. Of the five holts, four are considered unsuitable for natal purposes. One (at Lochan Airigh), initially considered to have potential for use as a natal holt, did not exhibit any evidence of such use during monitoring (however, this does not fully preclude possible future use of this holt, or future holts that might be established at Lochan Airigh, for breeding purposes). Approximately 8.6 km of watercourse would be lost to the Headpond, as well as Lochan Airigh, all known to be used by otter, along which the five holts and thirteen lay-ups were found. The home range of a female otter along freshwater watercourses is known from limited studies to be around 15km or more of watercourse, with one study finding riverine female otter using 23 holts (Harris and Yalden, 2008). For male otters, the home range in such habitat could be around 40 km or more, and the same study found male otter using 37 holts (Harris and Yalden, 2008). Given these home ranges and the numbers of known holts, it is very likely that otters occurring in the Headpond area also use Loch Awe and intervening/nearby watercourses and standing waters. The extent of lost water features, and the holts and lay-ups along them, therefore appear to potentially represent around one quarter of those in the home range of a female otter, or one eighth of those in the home range of a male otter. However, considering the small size of the watercourses apart from the Allt Beochlich (Buinne Dubh), it is likely that these water features and refuges along them represent less than these proportions of local otter home ranges.

Since otter home ranges overlap, especially those of males/females (Harris and Yalden, 2008), the home ranges of at least two and possibly more adult otters would likely be impacted, and this could include breeding female(s). Therefore there would likely be a minor reduction in carrying capacity for otter in the Development vicinity, as a result of loss of these refuges and the associated water features. However, as explained in the previous paragraph the home range of otters using the Headpond area would extend far beyond it and they would be expected to have numerous alternative refuges, and there are several other good foraging resources (particularly Loch Awe but also other unaffected nearby lochans and watercourses) within the home range of otters using the Headpond area. Any contraction in carry capacity would not be significant at the regional scale of NHZ 14, which encompasses abundant suitable otter habitat (including Loch Awe, numerous other substantial lochs, lochans and rivers, and extensive suitable maritime coastlines) and would hold a significant proportion of the estimated 8,000 otters in Scotland (https://www.nature.scot/plants-animals-and-fungi/mammals/land-mammals/otter). Note that the continued suitability of the Headpond for fish prey resources (such as brown trout *Salmo trutta*) as it floods (and thereafter), which would otherwise provide some balancing, is not likely, owing to the great fluctuation in water level, and that fish would be liable to be drawn into the Headpond turbines.

Consequently, otter population change through direct losses to otter habitat and refuges is considered a **Permanent Adverse effect of Local Significance**, which is **Not Significant**.

Mortality of Otter

Direct harm to otters during construction is very unlikely owing to a) their high degree of mobility including in water (except when recently-born), b) low plant / vehicle speeds in the construction area, c) the embedded standard mitigation of overnight means of escape from excavations and capping of pipes that otters might enter, and d) the embedded standard mitigation of pre-construction surveys/ECoW appointment. Through the latter, otter holts or lay-ups and their status at the time of construction will be confirmed, and derogation licensing put in place with any required proportionate mitigation. Under standard licensing procedures this will include supervision by the ECoW of any necessary destruction of otter refuges, with prior monitoring.

Consequently, direct mortality of otter during construction is considered a **Negligible effect**, which is **Not Significant**.

Disturbance of Otter

Any otters using the known refuges in the Headpond area would be subject to disturbance during construction of the Headpond and associated infrastructure, and also during blasting. The blasting would take place in the south-eastern part of the Headpond to create a large quarry / borrow pit (which would later be flooded). Disturbance from blasting can occur over hundreds of metres, whereas for 'normal' construction activity (and where there is no indication that a holt is a natal holt) disturbance of otters at refuges is typically considered possible at up to 30m. This means that the majority of otter holts and lay-ups in the Headpond area are likely to be subject to construction disturbance. The exact distribution of otter holts may differ at the time of construction but, where in or near the Headpond, disturbance would occur. Disturbance would be over prolonged periods, given a construction timescale of 7 years, although it would occur at various times and locations within the construction area, depending on precise construction activity at any point. It would largely occur in daylight outside the key crepuscular activity periods of otter, however this is not relevant to those otter refuges occupied during the day. Nevertheless, given the abundance of otters in Scotland and regionally, the net effect of disturbance in the Headpond area would be similar to the eventual complete removal of the refuges and associated water features within it, as discussed in the previous section and considered an adverse effect of local significance.

Disturbance of known otter refuges near Loch Awe would not occur from construction of Development infrastructure where this involves normal construction activity, given that all such refuges are well over 30 m from permanent infrastructure. However, sheet piling is required in the Tailpond area for the coffer dam, and it is therefore likely that the otter lay-up shortly north of the Tailpond area would be subject to short-term disturbance during piling activity (assuming a disturbance distance of approximately 100 m for piling). Additionally, the refuges along the Allt a' Chrosaid, including the single holt, may be subject to on-going but low level disturbance from general activity within nearby temporary compound TC02. Since otters have many refuges within their home range (for example, one study found that males and females used 37 and 23 holts respectively (Harris and Yalden, 2008)), it is very likely that otters using this area have alternative refuges further upstream along the Allt a' Chrosaid, along other streams running into Loch Awe nearby, and along the less-disturbed parts of nearby Loch Awe itself. Disturbing activities would largely take place in daylight, outside the key crepuscular activity periods of otter, and would not therefore be likely to disturb actively foraging and commuting otters to a significant degree. Given these points, otter disturbance in the Loch Awe area is likely to be of less than local consequence.

Known otter refuges in the Inveraray area are all beyond possible construction disturbance. The most relevant works would be those for the jetty at Loch Fyne, and any improvement works to the existing forestry / estate track over the River Aray. These would predominantly, if not entirely, take place during daylight and outside the key crepuscular activity periods of otter. It is also relevant that the jetty at Loch Fyne occupies an extremely small part of the coastline of this very large sea loch.

Consequently, disturbance of otter during construction is considered a **Temporary Adverse effect of Local Significance**, which is **Not Significant**.

6.7.15.2 Operation Phase

Impact on Retained Supporting Habitats of Otter

With regard to supporting habitats, waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP.

Hydrological impact could occur through changes to water flows in retained water features used by otter. However, in this regard it is important that the embedded design of the Development includes a continuous supply of sufficient water to maintain normal flow along the retained part of the Allt Beochlich (Buinne Dubh) downstream of the Headpond (however, natural flow ceases approximately 1 km downstream of permanent compound PC09, which will house the water supply mechanism, owing to a small existing hydroelectric dam). The top end of a small tributary of the Allt Beochlich (Buinne Dubh) will be lost to the northern end of the southern Headpond Embankment 1, however this stream will continue to receive water from the majority of contributing slopes such that flow is not expected to significantly change in this stream (see *Chapter 12: Water Resources and Flood Risk*). Small tributaries of the Allt Beochlich south and south-east of the Headpond also retain all or the great majority of contributing land and will similarly be negligibly affected. Lochans beyond the Headpond will not be hydrologically-affected by the Development, and although Loch Awe will be subject to water level fluctuation this would likely have negligible hydrological impact on wetter terrestrial habitats used or potentially used by otters that are primarily made wet from contributing terrestrial slopes (rather than through inundation by Loch Awe itself, as discussed for woodland in *Section 6.7.7.2 Operation Phase*). Changes in water level within Loch Awe itself are not expected to significantly impact the fish prey resource within it (see *Chapter 07 Aquatic Ecology*).

Consequently, impacts on retained supporting habitats of otter during operation are considered to result in a **Negligible effect**, which is **Not Significant**.

Mortality of Otter

There is no possibility of otter entering the Loch Awe inlet or outlet system because a screen to prevent fish being drawn in will be fitted, which will clearly also prevent otter access. The velocity of water taken into the inlet at Loch Awe will be (at maximum) 0.3 ms^{-1}. The underwater swimming speed of otter is given as approximately 0.26 ms^{-1} in Harris and Yalden (2008), however, this is the speed of searching otter – maximum speed horizontally was measured for young (yearling) otter as 1.2 ms^{-1}, rising to 1.5 ms^{-1} for adult otter; vertical descent speed for yearling otter averaged 0.54 ms^{-1} (Nolet *et al.*, 1993). Otters would therefore generally be more than able to swim against the operating intake at Loch Awe, rather than be dragged against it. There is consequently negligible risk to foraging or commuting otters in the vicinity of the operating intake at Loch Awe.

The Headpond will not support a significant fish population owing to unsuitability caused by the very large degree of water level fluctuation in the operating Headpond, and also that fish in the Headpond would be liable to be taken into the turbine system. Therefore otters are likely to make little use of the operating Headpond. However, the approach velocity of water at the Headpond intake (at maximum) is estimated to average 1.1-1.2 ms^{-1}, which (given the above information) most otters would be able to swim against. More importantly, however, the water level in the Headpond will seldom be at or near minimum operating level (close to the turbine intake level) but mostly considerably higher (up to approximately 50 m higher than the turbine intake), which very much reduces the likelihood of otters closely approaching the Headpond intake. For these reasons, otter mortality at the Headpond by its operation its likely to occur very rarely if at all.

Consequently, mortality of otter as a result of operation is considered a **Negligible effect**, which is **Not Significant**.

Disturbance of Otter

Security lighting at the Loch Awe inlet and outlet will be required but this will be low level and will be directed away from Loch Awe to avoid illuminating the shoreline and water's edge. This will therefore have very limited impact on otter.

Maintenance attendance will be infrequent, small-scale and largely in daylight, and not liable to cause any appreciable disturbance of otter.

Consequently, disturbance of otter as a result of operation is considered a **Negligible effect**, which is **Not Significant**.

6.7.16 Impacts on Bats

6.7.16.1 Construction Phase

Direct Loss of Bat Habitat and Roosts

The principal habitat loss to the Development will be of exposed moorland habitat at the Headpond, particularly blanket bog, of negligible value to bats. The principal streams, Lochan Airigh and rushy flush habitat beside watercourses and elsewhere in the Headpond area offer some potential for foraging and commuting bats, but there was limited bat activity in this area – Lochan Airigh averaged 26.2 static detector passes per night, whilst the Allt

Beochlich (Buinne Dubh) downstream of it averaged only 9.3 passes per night, compared to 112.6 passes per night at expectedly far more favourable habitat at the Allt a' Chrosaid near Loch Awe (see *Appendix 6.5 Bats (Volume 5 Appendices)).* Moreover, the static monitoring locations in and near the Headpond were in the best habitat available, and it can be reliably expected that bat activity over the dominating blanket bog away from the water features would be extremely low, as was borne out by the transect in this area. A 1 km stretch of the Allt Beochlich (the Buinne Dubh) and the existing reservoir further downstream (which averaged 40 passes per night) would remain, as well as all the Allt Beochlich downstream of the reservoir. The loss of woodland to the Tailpond is very small compared to the extents of woodland extending beyond it along Loch Awe and in various places inland. There would be negligible impact on bat habitat elsewhere, including at Inveraray (owing to use of existing forestry / estate tracks, and negligible impact by the proposed jetty at a loch-side location without trees and very little terrestrial habitat at all). Therefore losses to good bat habitat would be extremely minor in comparison with the available local resource. For each known recorded bat species the core sustenance zone (BCT, 2020) is at least 2 km in radius and mostly more, such that the minor extents of impacted good bat habitat would constitute an insignificant part of the habitat resource used by each bat.

The only location where bat roosts might be lost is at the woodland in the Tailpond area. Subject to possible change at the time of construction (e.g. if potential roost features are lost or created by natural events such as tree windblow or bough breakage), three High BRS, three Moderate BRS and four Low BRS trees would be lost from the Tailpond area. In comparison, there are currently known to be thirteen High BRS, 26 Moderate BRS trees and 25 Low BRS trees within 30 m of the Development, another fourteen High BRS, 30 Moderate BRS and 30 Low BRS trees in surveyed areas that were within 30m of an earlier design iteration, and abundant similar woodland beyond the surveyed areas at Loch Awe and Inveraray that without doubt will hold very many further trees with roost suitability. The only two known structures with BRS (a possible old ice house in woodland and a tall stone wall near Inveraray) will not be impacted.

Although survey limitations (see *Appendix 6.5 Bats (Volume 5 Appendices*)) meant that the trees with BRS that would be lost to the Tailpond have not been subject to surveys to confirm whether roosts are present, bat calls recorded by the activity surveys are almost entirely of common species, apart from a very few potential calls of Natterer's bat, the separation of which from the common Daubenton's bat is not certain owing to bat call analysis limitations for *Myotis* species. However, Natterer's bat is still moderately widespread in Scotland and regarded as of 'least concern' under International Union for the Conservation of Nature (IUCN) criteria both nationall and globally, and more importantly most known summer and winter roosts are in old built structures or caves / mines respectively (https://www.bats.org.uk/about-bats/what-are-bats/uk-bats/natterers-bat).

For the above reasons, impacts on bat habitat and roosts are likely to be negligible, with no expected appreciable change to the local (or higher-scale) conservation status of any bat species.

Consequently, losses to bat habitats and roosts is considered a **Negligible effect**, which is **Not Significant**.

Mortality of Bats

There is no means by which the Development could reasonably be expected to cause bat mortality during construction except by roost destruction. However, as noted above there will be little direct impact on potential roost sites, and the embedded mitigation of pre-construction surveys and ECoW appointment (with licensing, if required, and associated mitigation) will ensure that bat mortality is unlikely to occur.

Consequently, bat mortality during construction is considered a **Negligible effect**, which is **Not Significant**.

Disturbance of Bats

Construction disturbance of bats is likely to be slight given that works would be mainly in daylight, when bats are not active, and that the greatest works would be in the Headpond area where bat activity was found to be very limited. For typical works at the Tailpond, there is only one known tree with BRS (and only Low BRS) within 30 m of the works. Sheet piling for the coffer dam at the Tailpond could incur disturbance at greater distance, however significant vibrations are not likely to propagate through the water / terrestrial substrate interface, terrestrial substrate itself, and thence vertically into tree trunks and branches to known or potential roost sites, and sound disturbance will be reduced for potential roost sites that face away from the piling location. Disturbance of trees with BRS beside the access routes at Inveraray is not likely to be major given that disturbance would arise only from vehicles passing by, and that these access routes almost entirely follow forestry / estate tracks that are already used by forestry and other vehicles (and, north of Inveraray, have been recently used by construction vehicles during other works). If lighting is used at the Tailpond during construction, there could be some impact on foraging / commuting bats, but this would be very limited in effect given the small extent of the Tailpond works compared to the abundance of good bat habitat in this vicinity (including extensive semi-natural woodland along and near Loch Awe, frequent watercourses with suitable riparian habitat, and occasional marshy open habitat).

Consequently, disturbance to bats during construction is likely to constitute a **Negligible effect**, which is **Not Significant**.

6.7.16.2 Operation Phase

Impact on Retained Supporting Habitats of Bats

With regard to supporting habitats, waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP.

Hydrological impact could occur through changes to water flows in retained water features used by bats. However, in this regard it is important that the embedded design of the Development includes a continuous supply of sufficient water to maintain normal flow along the retained part of the Allt Beochlich (Buinne Dubh) downstream of the Headpond. The watercourse and riparian habitat, and associated low levels of bat activity recorded here, would therefore be maintained. Natural flow ceases approximately 1 km downstream of permanent compound PC09 (which will house the water supply mechanism), owing to a small existing hydroelectric dam. The top end of a small tributary of the Allt Beochlich (Buinne Dubh) will be lost to the northern end of the southern Headpond Embankment 1, however this stream will continue to receive water from the majority of contributing slopes such that flow is not expected to significantly change in this stream (see *Chapter 12: Water Resources and Flood Risk*), therefore similarly the watercourse and riparian habitat likely to be used by bats will be maintained. Small tributaries of the Allt Beochlich south and south-east of the Headpond also retain all or the great majority of contributing land and will similarly be negligibly affected, therefore associated low levels of bat activity would also be maintained. Lochans beyond the Headpond will not be hydrologically-affected by the Development, and although Loch Awe will be subject to water level fluctuation this would have negligible hydrological impact on wetter terrestrial habitats used or potentially used by foraging or commuting bats that are primarily made wet from contributing terrestrial slopes (rather than through inundation by Loch Awe itself, as discussed for woodland in *Section 6.7.7.2 Operation Phase*).

Consequently, impacts on retained supporting habitats of bats during operation are considered to result in a **Negligible effect**, which is **Not Significant**.

Mortality of Bats

There is no mechanism by which operation of the Development could result in bat mortality. Therefore there is **No effect**.

Disturbance of Bats

External lighting at the Loch Awe inlet and outlet will be required for access but this will only be used when needed rather than continuously from dusk to dawn. This will therefore have very limited impact on bat activity, especially in view of the great extents of good bat habitat in this vicinity (including extensive semi-natural woodland along and near Loch Awe, frequent watercourses with suitable riparian habitat, and occasional marshy open habitat). Navigational lights fitted to the Marine Facility at Loch Fyne are unlikely to have any effect on bats, given that the shoreline at this point constitutes poor habitat for bats with negligible trees/shrubs and only a very thin strip of disturbed vegetation immediately beside the A83, and that the navigational lights will be on the seaward parts of the proposed jetty.

Maintenance attendance will be infrequent, small-scale and largely in daylight, and not liable to cause any appreciable disturbance of bats.

Consequently, disturbance of bats as a result of operation is considered a **Negligible effect**, which is **Not Significant**.

6.7.17 Impacts on Water Vole

6.7.17.1 Construction Phase

Direct Loss of Water Vole Habitat and Refuges

As demonstrated in *Appendix 6.4 Mammals (Volume 5 Appendices)*, water voles are localised within the Headpond area, with significant variability in occurrence of burrow and other evidence between years, and a metapopulation within the Headpond area thought unlikely to much exceed 10-20 individuals. The sparsely-spread locations within the Headpond area where water vole evidence was found (some tentatively without confirmatory latrine / dropping evidence) will be lost. However, the most consistently-recorded evidence of water vole over different years was at and near Loch Romach, in an area that will be retained unaffected (including by disturbance, given that it is at closest 150 m from the nearest above-ground infrastructure (PC19 and associated Access Track)). The Lochan Romach water vole location was also reported in the Blarghour Wind Farm surveys (Ramboll/ESB/Coriolis Energy, 2018), demonstrating longer-term existence of water voles at this location prior to the surveys for this EIA, which no doubt reflects the better habitat quality for water voles at this location (most significantly, a long, deep and slow-flowing outflowing watercourse with deep banks suitable for burrow excavation and plentiful rushy vegetation). In comparison, habitat at the recorded water vole locations within the Headpond area is less optimal for water voles. Very minor impact could also occur to one known other burrow outside the Headpond, at the Access Track directly south of it. There are no known water voles elsewhere that could be affected by the Development.

Given the above, loss of water vole habitat and refuges to the Headpond would not result in loss of water voles from the local area and would not involve a large population, and the most consistent, longer-term and better-quality habitat for water voles would remain unaffected at Lochan Romach. The effect would therefore be of lower significance than the Regional level of importance assigned to the overall water vole population in this area.

Consequently, loss of water vole habitat and refuges during construction is considered a **Permanent Adverse effect of Local Significance**, which is **Not Significant**.

Mortality of Water Vole

Mortality of water vole during construction is inextricably associated with loss of their habitat and refuges as discussed in the previous section, and without mitigation would initially result in the same degree of ecological effect. Whilst for some causes of species mortality, a local retained population could often recruit replacement individuals through breeding in the relatively short-term, the habitat which water voles occupied in the Headpond area would be permanently lost, therefore carrying capacity of the local area would be reduced and the reduced level of the water vole population would likely be permanent, thus recruitment to replace lost individuals is not particularly relevant.

Consequently, mortality of water voles during construction is considered a **Permanent Adverse effect of Local Significance**, which is **Not Significant**.

Disturbance of Water Vole

Disturbance of water voles would only be likely to occur during loss of their habitat and burrows, and is only likely for this species over short distances of tens of metres, either during elements of construction of the Headpond (depending on the precise location of works compared to the distribution of water voles at the time), or during licensed mitigation to remove water voles by, for example, displacement. Disturbance is of much less consequence than the actual loss of water vole habitat and burrows.

Therefore disturbance of water vole during construction is considered a **Negligible effect**, which is **Not Significant**.

6.7.17.2 Operation Phase

Impact on Retained Supporting Habitats of Water Vole

With regard to supporting habitats, waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP.

Retained known water vole habitat primarily comprises the best quality water vole habitat in the surveyed area, at Lochan Romach. As mentioned, this is 150m from the nearest infrastructure (permanent compound PC19 and associated Access Track). Given this separation, and that the majority of water vole evidence at Loch Romach is downstream of it along the outflowing watercourse, there is no realistic possibility of adverse hydrological impact on this retained water vole habitat during operation. The only other known retained water vole habitat is an area at and beyond the Access Track south of the Headpond where two widely-separated possible water vole burrows were found in single years only and with no confirmatory evidence (i.e. no latrines or droppings) – one of these possible burrows is not likely to be retained since it will likely be lost during construction, and the other is in an up-slope zone approximately 180 m from the Access Track and thus will not be hydrologically affected.

Consequently, there will be **Negligible effect** during operation on retained supporting habitat of water vole, which is **Not Significant**.

Mortality of Water Vole

There is no mechanism by which operation of the Development could realistically result in water vole mortality. Therefore there is **No effect**.

Disturbance of Water Vole

There is no mechanism by which operation of the Development could result in disturbance of water vole, given that the retained water vole habitats (primarily at Lochan Romach) are at minimum 150m from the nearest infrastructure. Therefore there is **No effect**.

6.7.18 Impacts on Pine Marten

6.7.18.1 Construction Phase

Direct Loss of Pine Marten Habitat and Refuges

The only two known potential pine marten dens are close to Loch Awe and the Access Track north-east of Inveraray. These are 24m from temporary compound TC02 and 21m from the existing well-used Access Track respectively. There is therefore no possibility of these potential dens being lost. No other potential or actual pine marten dens are known in the survey area. This includes the small amount of woodland beside Loch Awe that will be lost to the Tailpond. The woodland and adjacent habitats along Loch Awe, and extending a few kilometres inland, contain excellent pine marten habitat, especially the semi-natural woodland, and the losses to the Tailpond will be insignificant in this context. There will be negligible loss of woodland at Inveraray because the Access Tracks largely follow existing well-used forestry / estate tracks. Habitat lost to the Headpond does not constitute good pine marten habitat because it is open and exposed, not near woodland and does not appear to support abundant foraging resources (owing to dominance of blanket bog). No potential or actual pine marten dens were found in this area, and the general lack of pine marten evidence at the Headpond area is probably a true reflection (despite the greater difficulty in finding pine marten scats away from tracks) of the likely infrequent presence of pine marten in this area. Pine marten scats were found by Loch Romach (where pine marten may prey on the water voles known to occur there) but this area will remain intact.

Consequently, loss of pine marten habitat (with no loss of known potential or actual dens) during construction is considered a **Negligible effect**, which is **Not Significant**.

Mortality of Pine Marten

Direct harm to pine martens during construction is unlikely owing to a) their high degree of mobility (except when recently-born), b) low plant/vehicle speeds in the construction area, c) the embedded standard mitigation of overnight means of escape from excavations and capping of pipes that pine martens might enter, and d) the embedded standard mitigation of pre-construction surveys / ECoW appointment. Through the latter, a check will be made for possible pine marten dens and their status confirmed prior to construction, and derogation licensing (in the unlikely event that this is found necessary) put in place with any required proportionate mitigation. Under standard licensing procedures this will include supervision by the ECoW of any necessary destruction of pine marten refuges, with prior monitoring.

Consequently, direct mortality of pine marten during construction is considered a **Negligible effect**, which is **Not Significant**.

Disturbance of Pine Marten

The potential den by Loch Awe is approximately 24 m from temporary compound TC02, very close to residential properties and on the other side of the B840. The potential den north of Inveraray is approximately 21 m from the nearest Access Track, which already exists and is very well-used by forestry and estate traffic, and approximately 27m from the A819, and liable to be subject to a degree of existing disturbance from both sources. There are no actual construction works within kilometres of the potential den north of Inveraray, and the potential den by Loch Awe is 190m from the Tailpond construction area. As such, there is no realistic possibility of construction causing significant disturbance of pine martens at either of these potential dens.

Although other dens might be established prior to construction, and these might be within disturbance distance of works, the embedded standard mitigation of pre-construction survey and appointment of ECoW will address this and (in the unlikely event it is found necessary) enable licensing with proportionate mitigation.

Construction activity would largely take place in daylight outside the primary nocturnal activity period of pine marten. There is abundant suitable pine marten habitat (particularly woodland) near and beyond the Development in the

Loch Awe and Inveraray vicinities, and pine marten occurrence in the Headpond area is likely to be rare for the reasons set out under loss of pine marten habitat above.

Consequently, disturbance of pine marten during construction is considered a **Negligible effect**, which is **Not Significant**.

6.7.18.2 Operation Phase

Impact on Retained Supporting Habitats of Pine Marten

With regard to supporting habitats, waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP.

Retained supporting habitats of pine marten primarily comprises the woodlands along and near Loch Awe, extending in places inland, and at Inveraray, and associated mosaic open habitats at lower altitude, and not the open moorland more distant from woodland. The habitats that pine martens tend to use are not especially wet and are not therefore vulnerable to hydrological impact. Moreover, although some of the woodland beside Loch Awe that is probably used by pine marten is wet woodland (NVC type W7), it is made wet from contributing terrestrial slopes (rather than through inundation by Loch Awe itself, as discussed for woodland in *Section 6.7.7.2 Operation Phase).*

Consequently, there is considered to be **No effect** on retained supporting habitats of pine marten.

Mortality of Pine Marten

There is no mechanism by which operation of the Development could realistically result in pine marten mortality. Therefore there is **No effect**.

Disturbance of Water Vole

There is no mechanism by which operation of the Development could result in appreciable disturbance of pine marten. Therefore there is **No effect**.

6.7.19 Impacts on Red Squirrel

6.7.19.1 Construction Phase

Direct Loss of Red Squirrel Habitat and Dreys

There will be negligible impact on red squirrel habitat. Minor loss to established semi-natural woodland will occur at the Tailpond, and also to small parts of the Sitka spruce plantations (of known lower value to red squirrels, as explained in *Appendix 6.4 Mammals (Volume 5 Appendices*)) at Upper Sonachan and Inveraray where the Access Tracks will very locally need to cut through plantation. These losses will be inconsequential given the extensive amounts of other semi-natural woodland around Loch Awe and in places extending inland, and the very large coniferous and broadleaved plantations around Inveraray and Loch Fyne more widely. Therefore there would be negligible effect on red squirrel habitat.

Given the small amount of felling required by the Development, the proportion of dreys of the local population that might be lost (if any) would be very small, thus any such loss would similarly be inconsequential to local conservation status.

Consequently, loss of red squirrel habitat and dreys during construction is considered a **Negligible effect**, which is **Not Significant**.

Mortality of Red Squirrel

Direct harm to red squirrels during construction is unlikely owing to a) their high degree of mobility, b) low plant / vehicle speeds in the construction area, and c) the embedded standard mitigation of pre-construction surveys / ECoW appointment, which will include drey checks. It is acknowledged that dreys in Sitka spruce plantation (although there would be fewer dreys in such woodland, which is the least favourable for red squirrels, as explained in *Appendix 6.4 Mammals (Volume 5 Appendices*)) are very difficult to locate, therefore there remains a possibility that a small number of impacted dreys (given the very limited amounts of Sitka spruce plantation that require felling) might go undetected. However, the impact of this on local conservation status would be slight given the very great extents of established suitable woodland at Loch Awe, Upper Sonachan and Inveraray. It is also relevant that squirrel populations will necessarily have survived periodic felling of the plantations and associated drey loss across very much larger areas than would be required for the very localised felling for the Development.

Consequently, mortality of red squirrel during construction is considered a **Negligible effect**, which is **Not Significant**.

Disturbance of Red Squirrel

Disturbance of red squirrels in dreys is only considered generally possible by NatureScot at up to 50m from the disturbance source for active breeding dreys, and 5m for non-breeding dreys or all dreys in the non-breeding season. Dreys within these distances of the limited felling areas would be few in number, and similarly to mortality of red squirrel, worst-case maximum disturbance of these dreys would not impact the local conservation status of red squirrel, given the very large extents of suitable established woodland at Loch Awe, Upper Sonachan and Inveraray.

Consequently, disturbance of red squirrel during construction is considered a **Negligible effect**, which is **Not Significant**.

6.7.19.2 Operation Phase

Impact on Retained Supporting Habitats of Red Squirrel

With regard to supporting habitats, waterborne and airborne pollution impacts have been scoped out as discussed in *Section 6.7.4 Potential Impacts of the Development*, in part owing to embedded measures within the CEMP.

Although Loch Awe will be subject to water level fluctuation, this would have negligible hydrological impact on wetter established woodland beside Loch Awe potentially used by red squirrels, because these are NVC type W7 that are not strongly waterlogged and are primarily made wet from contributing terrestrial slopes (rather than through inundation by Loch Awe itself). Therefore any such woodland used by red squirrel would be negligibly affected. No other woodland habitat used by red squirrels near the Development is particularly prone to hydrological impact.

Consequently, impacts on retained supporting habitats of red squirrel during operation are considered to result in a **Negligible effect**, which is **Not Significant**.

Mortality of Red Squirrel

There is no mechanism by which operation of the Development could result in red squirrel mortality. Therefore there is **No effect**.

Disturbance of Red Squirrel

There is no mechanism by which operation of the Development could result in appreciable disturbance of red squirrel. Therefore there is **No effect**.

6.8 Cumulative Effects

6.8.1 Inter-Cumulative Effects

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location (CIEEM, 2022). For this Chapter, the inter-cumulative assessment has been considered in the context of the Argyll West and Islands NHZ (NHZ 14). It considers the schemes identified in *Chapter 4: Approach to EIA*, that are reasonably foreseeable but not yet under construction or constructed at the time of assessment, and are relevant to terrestrial ecology.

The closest such development is Blarghour Wind Farm, which will be located nearby to the south-west of the Headpond, and includes construction of Access Tracks (including an Access Track from Three Bridges), and typical wind farm infrastructure such as turbine pads, turbines and small ancillary infrastructure. Cumulative effects with Blarghour Wind Farm on terrestrial ecological features are discussed below:

- Blanket bog – a total of 9.8ha of blanket bog is stated in the Blarghour Wind Farm EIA Main Report to be permanently lost, nearly all considered unmodified (this excludes areas of flush and acid grassland within the bog areas). This is insignificant compared to the 165ha that would be lost to the Development (including all blanket bog whether or not considered sufficiently overgrazed and/or burnt to be classed as degraded bog). This small increase in overall loss of blanket bog would not increase the assessed (unmitigated) scale of effect for the Development to national level, and it remains as a **Permanent Adverse Effect of Regional Significance**, which is **Significant**. Limited hydrological impacts on retained blanket bog at Blarghour Wind

Farm would not increase the slight degree of effect from the Development, which is minor in comparison to the loss;

- Effects of Blarghour Wind Farm on other habitats are still less in magnitude than for blanket bog, and are stated to be negligible. The small degrees of loss involved would not cumulatively change the degree of significance from those of the Development alone, which are set out above and are all of **Local Significance** or **Negligible**, and remain **Not Significant**. Moreover, under the Outline Habitat Management Plan for Blarghour Wind Farm there would be increases in semi-natural woodland and restoration of areas of blanket bog, that would work to counter the losses;
- For otter, all effects of Blarghour Wind Farm were stated to be negligible with the exception of Low magnitude effect from pollution. However, standard pollution control measures (regardless that these were considered additional rather than embedded mitigation for Blarghour Wind Farm) would be implemented during construction similarly to the Development. The implementation of pollution controls in both cases would render this effect also negligible. Given also that surveys for Blarghour Wind Farm did not locate any otter holts or foraging areas that were considered important, the cumulative effect on otters would not exceed the maximum of **Local Significance** stated above for the Development alone, which remains **Not Significant**;
- For bats, the effects of Blarghour Wind Farm were stated to be negligible with the exception of Minor magnitude for habitat loss. The effects of the Development on bats are however all negligible, including for habitat loss, therefore it is Blarghour Wind Farm that would bear the main responsibility for bat habitat loss, having a non-negligible minor effect. However, the Outline Habitat Management Plan for Blarghour Wind Farm would result in increases in semi-natural woodland that would almost certainly balance the stated minor effect. Therefore the cumulative impact would likely remain **Negligible** for all bat effects, which is **Not Significant**;
- There are no stated effects for any other terrestrial species for Blarghour Wind Farm, and therefore no cumulative change to other impacts discussed above for the Development.

In summary for Blarghour Wind Farm, there are no cumulative effects that would exceed in significance that stated for the effects of the Development alone, because cumulative contributions from Blarghour Wind Farm are either considerably less than those of the Development alone, or both are sufficiently negligible to remain so cumulatively.

There are several other proposed wind farms within the cumulative impact study area. However, for similar reasons given for Blarghour Wind Farm above it is unlikely that any significant cumulative impacts would arise with the Development. In particular, any habitat impacts of other wind farms are likely to be very much less than habitat losses incurred by the Development (particularly to the Headpond). Any cumulative habitat loss effect with the smaller habitat impacts of these wind farms is not likely to exceed the Regional significance already assigned to blanket bog loss by the Development (i.e. no cumulative habitat impact is considered likely to reach National significance). Terrestrial species impacts would similarly be likely to be minor for wind farms, and are not expected to result in higher effect significances than those assigned for the Development alone.

There are proposals in the planning system for upgrading Blarghour and Beinn Ghlas Wind Farms to install slightly fewer but larger turbines. If consented, and given the prior existence of these wind farms and that impacts on terrestrial ecology will have largely already occurred, these upgrades are likely to have negligible cumulative impact with the Development.

There are a number of overhead lines (OHL) and substations proposed within the cumulative impact study area. These will have small habitat impacts and likely minor terrestrial species impacts, and are thus not likely to incur significant cumulative impacts with the Development.

Cruachan Expansion (to the hydroelectric scheme) does not involve expansion of its Headpond and thus there is unlikely to be any cumulative impact with the Development.

6.8.2 Intra-Cumulative Effects

It is possible for different aspects of a single Development to combine to produce greater effects.

With regard to habitats, given in this case a) the significant degree of habitat loss to the Headpond with minor additional losses elsewhere, and b) that construction losses are far more pronounced in effect than operational effects (where there are any, which involves only minor hydrological effects in some cases), there is not considered to be any extent of intra-cumulative effect that would change the degrees of significance stated above for these habitat effects alone.

For otter, the combination of loss of habitat and refuges to the Headpond, combined with disturbance, could theoretically result in a slightly greater cumulative effect, with the disturbance effect occurring over a prolonged period prior to eventual habitat loss. However, for the same reasons given individually for these effects on otter, the combined effects would remain only locally significant, primarily owing to the abundance of otter in the region (NHZ 14) and nationally (Scotland). This applies similarly to the other assessed species, for which no combination of effects is considered to result in a cumulative effect that exceeds the levels of significance stated for the individual effects (which are all locally significant only or negligible, or in some cases lack any effect at all).

It is concluded that there are no intra-cumulative effects that would exceed in significance that stated for the individual effects alone.

6.9 Mitigation and Monitoring

6.9.1 Embedded Mitigation

Embedded design mitigation and standard environmental measures are set out in *Section 6.7.1 Embedded Mitigation* and have been accounted for in the above impact assessments.

6.9.2 Additional Mitigation, Compensation and Enhancement

6.9.2.1 Landscape and Ecological Management Plan

An Outline Landscape and Ecological Management Plan (oLEMP) has been drafted for the Development and submitted as part of the Section 36 Application. The oLEMP sets out a range of measures that will be implemented by the Development. This is intended to a) **mitigate** landscape and ecological impacts, and b) beyond this deliver biodiversity and general environmental **enhancement**. In summary, these measures primarily comprise:

- Establishment of a substantial peatland and upland habitat rehabilitation zone around the Headpond, covering approximately 3 km^2. This would be deer-fenced to exclude wild deer grazing, and only conservation-level livestock grazing would be permitted, to improve the condition of over-grazed upland habitats. Burning of blanket bog (and other habitats) would also cease. On steeper slopes on lower ground within this area, natural tree regeneration may occur and would not be prevented as long as it comprised native species such as birch, willow *Salix* spp., rowan *Sorbus aucuparia* and hazel *Corylus avellana* (as already exist in extremely small quantity in small retained ravine-like locations south-west of the Headpond);
- Restoration of localised blanket bog exhibiting bare peat exposure, and infilling of drainage grips where locally present;
- Extensive ecologically-appropriate planting of woodland to expand native woodland beside Loch Awe and nearby, in places also providing visual screening of Tailpond infrastructure;
- Rehabilitation of the caravan zone near the Tailpond by a) removal of caravans, non-native plants, ruderal vegetation and hard-standing; b) planting of appropriate native trees (as standards rather than saplings) to suit and expand the existing thin strip of ancient woodland here; and c) translocation of turves (including deep soil) of ancient woodland ground flora from the Tailpond area to this rehabilitation zone, to replace existing soil/vegetation where currently degraded, under existing trees or planted standards;
- Sowing of the exposed faces of the two Headpond Embankments with appropriate heathland seed mixes;
- Provision of a green roof sown with lowland meadow over the Tailpond infrastructure at the edge of Loch Awe.

The oLEMP will be updated pre-construction, including through preparation of Method Statements where necessary, to provide the full level of detail needed to ensure successful delivery of all mitigation and enhancement measures.

6.9.2.2 Ancient Semi-Natural Woodland Mitigation

Mitigation to partially address the small loss of ASNW to the Tailpond is summarised under oLEMP above, for which a key measure is the translocation of entire turves of woodland flora and soil, and any small saping or shrubs, to the nearby degraded zone with existing caravans etc. (following removal of caravans and low quality vegetation / soil). Sympathetic adjacent planting of native trees, including standards, that match the existing narrow strip of nearby retained ASNW, will also partially mitigate the loss. The oLEMP itself includes significant detail on the methods to be used for this translocation, with cognisance of recent guidance under produced as part of the 'HS2 Learning Legacy' (https://learninglegacy.hs2.org.uk/document/ancient-woodland-soils-translocation/).

For retained ASNW close to works and at possible risk of incursion by works activity, the ECoW will supervise appropriate demarcation and signposting to exclude plant, vehicles, materials or personnel, and will monitor the exclusion zones to ensure compliance and to take action in the event of non-compliance. This will be additional to standard tree protection measures already included as embedded mitigation.

6.9.2.3 Blanket Bog Compensation and Enhancement

Measures to compensate for loss of blanket bog, and to provide enhancement retained blanket bog over a substantial area, are summarised under the oLEMP above, for which the primary measure is establishment of an upland rehabilitation zone of approximately 3 km^2 around the Headpond, accompanied by local bare peat restoration and drainage grip filling. Deer would be excluded from the rehabilitation zone and only conservation-level livestock grazing permitted, and burning will not be permitted. The total area of lost semi-natural terrestrial habitats (excluding non-native conifer plantation, improved agricultural pasture, amenity grassland, built-up areas, roads, tracks and quarries, which amount to 0.1 km^2) is 2.4 km^2. Therefore the rehabilitation zone is approximately 0.6 km^2 larger than the area of all lost semi-natural habitats.

The restoration of areas of bare peat within blanket bog proposed in the Blarghour Wind Farm Outline Habitat Management Plan will complement the proposed upland rehabilitation zone and similar bare peat restoration by the Development, together helping to improve the condition of upland habitat, especially blanket bog, in the wider local area.

6.9.2.4 Protection of Other Notable Habitats

For all potential GWDTE (including flushes) and other wetland the following measures will be implemented:

- Infrastructure such as Access Tracks and compounds will be micro-sited as far as possible, under ECoW guidance, to avoid potential GWDTE and other wetlands, aiming where possible for a buffer of 20 m;
- Where such avoidance is not possible, and under ECoW guidance, infrastructure will be located as far as possible to minimise the impact (e.g. by siting it lower down the hydraulic gradient or peripherally);
- Access tracks or compounds affecting potential GWDTE or other wetlands will be made permeable, through use of coarse aggregate bases and/or installation of culverts/cross drains at regular intervals to ensure that water flows and hydrological connectivity are maintained;
- Retained potential GWDTE or other wetland features near proposed infrastructure will be demarcated and/or signposted as appropriate under ECoW guidance, and no plant, vehicles, materials and personnel will be permitted to enter these areas; the ECoW will monitor to ensure compliance and to take action in the event of non-compliance.

This is additional to the embedded mitigation measures of use of floating tracks through deep peat areas and standard pollution controls that would protect such features and terrestrial ecology in general.

With regard to other notable habitat features, the following will be implemented:

- all retained species-rich ravines and other notable habitat features (including all retained CG10 and U5c grassland) will be demarcated and/or signposted as appropriate under ECoW guidance, and no plant, vehicles, materials and personnel will be permitted to enter these areas; the ECoW will monitor to ensure compliance and to take action in the event of non-compliance.

6.9.2.5 General Habitat Reinstatement

The following general habitat reinstatement measures will be implemented:

- Where applicable, reinstatement of habitats directly impacted by construction works will follow the Good practice during Wind Farm construction guidelines (NatureScot, 2019), which would generally be applicable to temporary Access Track etc.
- For Access Tracks that are not floating on deep peat, and where Access Tracks will be sufficiently short-term, removed vegetation and substrate holding the seedbank will be stripped (where practical as whole turves) and carefully set aside (vegetation side up) for use in reinstatement as soon as possible on removal of the temporary infrastructure. Where necessary (e.g., during hot and dry weather), stored turves will be watered.
- Where temporary infrastructure will not be sufficiently short-term, such that turves are likely to decompose or become less viable prior to reinstatement, the reinstatement areas will be covered with a layer of previously excavated soil or peat, of a depth matching the surroundings. The areas will then be landscaped to grade into the natural landscape, seeded with appropriate species as stipulated in the oLEMP or (if

needed) as directed by the ECoW, and where necessary fenced off to prevent grazing by animals until established.

6.9.2.6 Protection of *Sphagnum austinii* and *Sphagnum fuscum*

The two known locations of *S. austinii* and *S. fuscum* are outside the footprint of the Development and as stated above are not considered to be at risk of hydrological or other indirect impacts. However, to ensure that these species (which are rare in NHZ 14) and the supporting habitats around them remain intact, the following will be implemented:

- The ECoW will supervise installation of an exclusion zone covering the habitats around the *Sphagnum austinii* and *Sphagnum fuscum*, extending out to the limits of the nearest infrastructure or as otherwise appropriate;
- The exclusion zones will be appropriately marked out (e.g. with rope tied to stakes) and signposted, and no plant, vehicles, materials or personnel will be permitted to enter them;
- The ECoW will monitor the exclusion zones to ensure compliance and to take action in the event of non-compliance.

6.9.2.7 Otter

Embedded mitigation already includes pre-construction survey and ECoW appointment, through which otter holts and lay-ups would be confirmed and licensing obtained as necessary. However, given that there is some potential for otter breeding at Loch Airigh or nearby, the following will also be implemented:

- The ECoW or other suitably qualified and experienced ecologist will carry out monitoring, including use of camera traps, of the holt at Loch Airigh (if still present) and any others found within the Headpond area that offer potential for use by breeding otter, for a period of approximately one year prior to construction;
- If evidence of breeding activity is found, the ECoW will liaise with NatureScot and consideration shall be given to additional otter mitigation;
- A species protection plan will be produced by the ECoW (and will be required for licensing purposes);
- Watercourse crossings will be constructed as clear-span structures and the natural bed and channel of watercourses retained, as per SEPA Engineering in the water environment: Good practice guide for river crossings (SEPA, 2010), so as to remain passable to otter (and fish) under most conditions. Where possible, riparian habitat will be retained but where this cannot be achieved or the extent of habitat is too small and may be routinely impassable (e.g., during periods of higher water), a mammal ledge will be incorporated into the structure, or an alternative tunnel near to the bridge will be provided. The final design details of watercourse crossings will be included in the CEMP and species protection plan;
- If construction lighting is required, at the Tailpond especially, but also elsewhere, it will be directional, directed only at the works and not at Loch Awe, watercourses or riparian vegetation, and will be turned off when not required.

6.9.2.8 Bats

As noted in *Appendix 6.5 Bats (Volume 5 Appendices*), there are limitations to the bat surveys, including in regard to the small number of trees with bat roost suitability that would be lost to the Tailpond. For the reasons set out in the assessment of impacts on bats, it is not likely that loss of bat roosts in these trees (if any) at the time of construction would have a significant impact on the local conservation status of bats. However, the following will be implemented:

- In the bat activity season prior to removal of the woodland for construction of the Tailpond, the ECoW or other suitably qualified and experienced ecologist will carry out surveys of the relevant trees to a) check for any changes to potential roost features (as may be caused by e.g. tree windblow or bough breakage), and b) carry out additional survey as necessary to determine presence and character of any roosts, in line with Bat Conservation Trust guidance in use at that time;
- For trees containing roosts that will be removed (if any) at the Tailpond (or elsewhere), and also in the unlikely event that piling for the coffer dam is considered close enough to roost(s) to also require it, licensing will be obtained and any required mitigation for the licensing implemented;
- If bat roosts will be affected, a species protection plan will be produced prior to construction (and will be required for licensing purposes);

- If and where construction lighting is required at the Tailpond especially, but also elsewhere, it will be directional, directed only at the works and not at Loch Awe, watercourses or riparian vegetation, or woodland edges, and will be turned off when not required.

6.9.2.9 Water Vole

In addition to standard pre-construction surveys as already stipulated as embedded mitigation, the following will be implemented:

- Watercourse crossing design will be as stipulated for otter above, which will also normally maintain waterborne passage for water vole;
- Following the pre-construction surveys (which should take place in spring and autumn, and the timing of which will be dependent on construction timing), a species protection plan will be prepared (and will be required for licensing purposes), unless water voles are found to be absent from the Headpond area prior to construction;
- The species protection plan will set out required mitigation and the approach to any water voles present in the Headpond (or other infrastructure) area at the time of construction; it may be appropriate to displace water voles by habitat removal (as per Dean *et al.* (2016)), however the best approach will be determined following the pre-construction surveys.

6.9.2.10 Common amphibians and reptiles

Although no significant effects are predicted for common amphibians and reptiles, the following standard and best practice mitigation will be adopted:

- Any features identified by the ECoW during pre-construction checks as possible terrestrial refugia or hibernacula for amphibians/reptiles will be carefully dismantled by hand or under a watching brief by the ECoW, in the summer months (when amphibians and reptiles are active) closest to the construction period of the infrastructure in question;
- Any amphibians or reptiles found will be captured and relocated to suitable retained habitat elsewhere;
- The dismantled refugia/hibernacula will be rebuilt in similar suitable retained habitat that will not be affected by the construction works, under ECoW supervision.

6.9.2.11 Other species

No additional mitigation is proposed for other species, further to the existing embedded mitigation of pre-construction surveys (including for badger and pine marten, and for red squirrel dreys in directly affected and adjacent woodland) and appointment of an ECoW, with follow-on licensing and associated mitigation if found necessary.

6.9.2.12 Invasive Non-Native Species Management

There is risk of construction of the Development causing the spread of INNS 'in the wild' (which includes road verges where not in built-up areas, and almost all habitats other than private gardens and built-up areas) if appropriate best practice precautionary measures are not taken, which would constitute offence(s) under Scottish legislation. The risk of spreading INNS is highest for Japanese knotweed, since it occurs in the works area for the proposed jetty at Loch Fyne. There is less risk of spreading the recording rhododendron or salmonberry, because the Development in the relevant areas primarily uses existing forestry / estate tracks, however precautions will also be required for these species wherever infested woodland requires felling for any local widening of existing Access Tracks or short sections of new Access Track.

Best practice measures to be implemented during construction will be set out in a Biosecurity Management Plan (BMP), to be produced prior to commencement of construction and used to inform Method Statements for works in the vicinity of recorded INNS.

6.10 Residual Effects

In summary, with mitigation in place there are not considered to be any residual effects that exceed Local significance, thus all effects are **Not Significant** (however, it should be noted that the amelioration of the effect of blanket bog loss by the proposed rehabilitation of retained blanket bog, as set out in the oLEMP, is estimated to come to fruition in approximately 20 years, thus there would still be a medium-term effect of Regional Significance, which would be Significant).

The residual effects of those pre-mitigation effects whose significance is given above as Negligible or No effect remain so.

Residual effects for those pre-mitigation effects that are non-negligible are as follows:

- Direct loss of ancient semi-natural woodland – minor loss to the Tailpond will be partially mitigated by the translocation of ground flora / soil to nearby retained woodland and adjacent ground currently degraded by caravans, and associated sympathetic planting of appropriate tree species as standards. The residual effect is therefore considered a **Permanent Adverse effect of Local Significance**, which is **Not Significant**;
- Direct loss of blanket bog – the proposed mitigation, primarily the oLEMP measure of a peatland/upland habitat rehabilitation zone of 3 km^2 around the Headpond, with exclusion of deer, conservation-level livestock grazing and cessation of all burning, is considered to result in eventual amelioration of the unmitigated effect of blanket bog loss. Therefore, there would be a **medium-term Temporary Adverse effect of Regional Significance**, which would be **Significant**, but which is considered ameliorated to a **Permanent Adverse effect of Local Significance in approximately 20 years**, which is **Not Significant**;
- Hydrological impact on retained blanket bog – this effect was considered relatively slight compared to direct loss, and the above oLEMP measure of a peatland/upland habitat rehabilitation zone is considered to reduce it to a **Negligible effect**, which is **Not Significant**;
- Impact of loss of wild deer habitat on retained blanket bog – the uncertain minor increase in deer pressure on retained blanket bog beyond the Development, through loss of 5.9 km^2 of grazing habitat to the Headpond and peatland/upland rehabilitation zone, is considered to remain (at worst) a **Permanent Adverse effect of Local Significance**, which is **Not Significant**;
- Direct loss of species-rich ledge/ravine habitat – the residual effect for loss of the smallest and least diverse of the four recorded species-rich ledge/ravine habitats will remain a **Permanent Adverse effect of Local significance**, which is **Not Significant**;
- Direct loss of GWDTE – the mitigation will protect retained GWDTE as far as possible, but the losses will not be compensated, therefore the residual will remain a **Permanent Adverse effect of Local significance**, which is **Not Significant**;
- Impact of loss of wild deer habitat on retained GWDTE – the uncertain minor increase in deer pressure on retained GWDTE beyond the Development, through loss of 5.9km^2 of grazing habitat to the Headpond and peatland/upland rehabilitation zone, is considered to remain (at worst) a **Permanent Adverse effect of Local Significance**, which is **Not Significant**;
- Direct loss of other notable habitats – the residual will remain a **Permanent Adverse effect of Local significance**, which is **Not Significant**;
- Impact of loss of wild deer habitat on retained other notable habitats – the uncertain minor increase in deer pressure on retained other notable habitats beyond the Development, through loss of 5.9km^2 of grazing habitat to the Headpond and peatland/upland rehabilitation zone, is considered to remain (at worst) a **Permanent Adverse effect of Local Significance**, which is **Not Significant**;
- Direct loss of other notable flora – the residual will remain a **Permanent Adverse effect of Local significance**, which is **Not Significant**;
- Direct loss of otter habitat and refuges – the mitigation will protect otters from direct harm, protect retained refuges and minimise disturbance in retained habitat, however the loss of otter habitat and refuges to the Headpond will remain, therefore the residual will remain a **Permanent Adverse effect of Local significance**, which is **Not Significant**;
- Disturbance of otter – primarily owing to significant disturbance of otter refuges prior to their above loss at the Headpond, the residual will remain a **Temporary Adverse effect of Local significance**, which is **Not Significant**;
- Direct loss of water vole habitat and refuges – the mitigation will protect retained water vole habitat and refuges (including the best known habitat with the most consistent evidence in the surveyed area), but the losses to the Headpond will remain, therefore the residual will remain **Permanent Adverse effect of Local Significance**, which is **Not Significant**;
- Mortality of water vole during construction – the mitigation will ensure that, prior to construction, the current distribution of water vole burrows in the Headpond will have been determined, and a licensed mitigation approach (such as displacement) will have been developed to discourage water vole presence in the

Headpond area. Therefore mortality of water voles, although it may still infrequently occur, is likely as a residual effect to constitute a **Negligible effect**, which is **Not Significant**;

Table 6.7 Summary of Effects: Construction and *Table 6.8 Summary of Effects: Operation*, below summarise the impact assessment for construction and operation, showing the pre-mitigation effect, residual effect and final significance (significant or not significant). Effects for which the pre-mitigation effect is negligible are included in these tables, but those where there is predicted to be no pre-mitigation effect at all are excluded.

Table 6.7 Summary of Effects: Construction

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effect	Significance
Loch Etive Woods SAC	Possible very minimal effect on qualifying otter	Negligible	None	Negligible	Not significant
Woodland listed in the AWI	Direct loss of ancient semi-natural woodland	Permanent Adverse effect of Regional Significance	Expansion of native woodland with ecologically-appropriate planting; translocation of ASNW turves from Tailpond to adjacent degraded ancient woodland with sympathetic adjacent planting of native trees as standards; protection of retained ASNW.	Permanent Adverse effect of Local Significance	Not significant
	Direct loss of long-established plantation	Negligible	None	Negligible	Not significant
Blanket bog	Direct loss	Permanent Adverse effect of Regional Significance	3km^2 peatland / upland habitat rehabilitation zone with deer exclusion, conservation-level livestock grazing and no burning; and local restoration of bare peat and drainage grip filling.	Medium-term Temporary Adverse effect of Regional Significance; ameliorating to Permanent Adverse effect of Local Significance in ~20 years.	**Initially Significant**; ameliorating to **Not significant in ~20 years**.
	Hydrological impact on retained blanket bog	Permanent Adverse effect of Local Significance		Negligible effect	Not significant
Species-rich ledge / ravine	Direct loss	Permanent Adverse effect of Local Significance	Retained areas demarcated / signposted as needed under ECoW guidance to exclude any entry / damage, and monitored.	Permanent Adverse effect of Local Significance	Not significant
	Hydrological impact on retained species-rich ledge / ravine	Negligible	None	Negligible	Not significant
GWDTE	Direct loss	Permanent Adverse effect of Local Significance	Micro-siting Access Tracks / compounds as far as possible; tracks / compounds to be permeable where GWDTE affected; retained areas demarcated / signposted as needed under ECoW guidance to exclude any entry / damage, and monitored.	Permanent Adverse effect of Local Significance	Not significant
	Hydrological impact on retained GWDTE	Negligible	None	Negligible	Not significant
Other notable habitat	Direct loss	Permanent Adverse effect of Local Significance	Retained areas demarcated / signposted as needed under ECoW guidance to exclude any entry / damage, and monitored.	Permanent Adverse effect of Local Significance	Not significant
	Hydrological impact on retained GWDTE	Negligible	None	Negligible	Not significant
Sphagnum austinii and	No effects are likely	None	Located beyond footprint and indirect harm unlikely, but to ensure no harm of these	None	Not significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effect	Significance
Sphagnum fuscum			sphagna and surrounding habitat, exclusion zone to be installed / monitored by ECoW.		
Other notable flora	Direct loss	Permanent Adverse effect of Local Significance	None	Permanent Adverse effect of Local Significance	Not significant
	Hydrological impact on retained other notable flora	Negligible		Negligible	Not significant
Otter	Direct loss of habitat and refuges	Permanent Adverse effect of Local Significance	ECoW survey / monitoring; preparation of species protection plan; licensing; appropriate design of watercourse crossings / construction lighting (plus embedded mitigation including pre-construction survey, best-practice protection measures during construction and low construction vehicle speeds).	Permanent Adverse effect of Local Significance	Not significant
	Mortality	Negligible		Negligible	Not significant
	Disturbance	Temporary Adverse effect of Local Significance		Temporary Adverse effect of Local Significance	Not significant
Bats	Direct loss of habitat and roosts	Negligible	Further survey of Tailpond trees; if necessary, licensing and preparation of species protection plan; appropriate design of construction lighting.	Negligible	Not significant
	Mortality	Negligible		Negligible	Not significant
	Disturbance	Negligible		Negligible	Not significant
Water vole	Direct loss of habitat and refuges	Permanent Adverse effect of Local Significance	Watercourse crossing design; licensing and preparation of species protection plan to remove or displace water voles (plus embedded mitigation including pre-construction survey).	Permanent Adverse effect of Local Significance	Not significant
	Mortality	Permanent Adverse effect of Local Significance		Negligible effect	Not significant
	Disturbance	Negligible		Negligible	Not significant
Pine marten	Direct loss of habitat and refuges	Negligible	None (embedded mitigation sufficient – including pre-construction survey; best-practice protection measures during construction).	Negligible	Not significant
	Mortality	Negligible		Negligible	Not significant
	Disturbance	Negligible		Negligible	Not significant
Red squirrel	Direct loss of habitat and refuges	Negligible	None (embedded mitigation sufficient – including pre-construction drey survey; licensing if necessary).	Negligible	Not significant
	Mortality	Negligible		Negligible	Not significant
	Disturbance	Negligible		Negligible	Not significant

Table 6.8 Summary of Effects: Operation

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Loch Etive Woods SAC	Possible very minimal effect on qualifying otter	Negligible	None	Negligible	Not significant
Woodland listed in the AWI	Hydrological impact on retained ASNW and long-established plantation	Negligible	None	Negligible	Not Significant
	Impact of loss of wild deer habitat on retained ASNW and long-established plantation	Negligible	None	Negligible	Not Significant
Other semi-natural woodland	Hydrological impact on retained other semi-natural woodland	Negligible	None	Negligible	Not Significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
	Impact of loss of wild deer habitat on retained other semi-natural woodland	Negligible	None	Negligible	Not Significant
Blanket bog	Impact of loss of wild deer habitat on retained blanket bog	Permanent Adverse effect of Local Significance	None	Permanent Adverse effect of Local Significance	Not significant
GWDTE	Impact of loss of wild deer habitat on retained GWDTE	Permanent Adverse effect of Local Significance	None	Permanent Adverse effect of Local Significance	Not significant
Other notable habitat	Impact of loss of wild deer habitat on retained other notable habitat	Permanent Adverse effect of Local Significance	None.	Permanent Adverse effect of Local Significance	Not significant
Otter	Impact on retained supporting habitat	Negligible	None	Negligible	Not Significant
	Mortality	Negligible	None	Negligible	Not Significant
	Disturbance	Negligible	None	Negligible	Not Significant
Bats	Impact on retained supporting habitat	Negligible	None	Negligible	Not Significant
	Disturbance	Negligible	None	Negligible	Not Significant
Water vole	Impact on retained supporting habitat	Negligible	None	Negligible	Not Significant
Red squirrel	Impact on retained supporting habitat	Negligible	None	Negligible	Not Significant

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 7: Aquatic Ecology

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

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7. Aquatic Ecology

7.1 Introduction

As part of the overall Environmental Impact Assessment for the Development, this chapter addresses the findings from aquatic ecology surveys that have taken place between 2019 and 2023.

This chapter assesses the ecological impacts and effects of the Development on aquatic habitats, namely Loch Awe, Loch Fyne, smaller lochs, and watercourses throughout the Development Site. It addresses the potential impacts and effects of the construction, operation (including maintenance) and decommissioning / restoration of the Development on aquatic ecology features. Where appropriate, it provides details of committed mitigation and/or enhancement measures identified to minimise or compensate for adverse effects on these features.

This chapter concerns aquatic ecological features, including designated nature conservation sites, habitats, and species – features that are exclusively freshwater (excluding amphibious features such as otter *Lutra lutra*, which are addressed in *Chapter 6: Terrestrial Ecology*). For the overall ecological assessment, terrestrial ecology, marine features, and ornithological features are separately addressed in the following respective chapters:

- Chapter 6: Terrestrial Ecology (including terrestrial invasive non-native species (INNS));
- Chapter 8: Marine Ecology; and,
- Chapter 9: Ornithology.

Due to the interdisciplinary nature of effects, this chapter cross references to other chapters including:

- Chapter 11: Water Environment.

This chapter is supported by *Appendix 7.1 Aquatic Ecology Baseline Report (Volume 5: Appendices)* and *Figure 7.1 Aquatic Survey Sites (Sheets 1-4)(Volume 3 Figures).*

Also relevant to this chapter is *Appendix 6.2 Statement to Inform Habitats Regulations Appraisal (Volume 5: Appendices)* submitted as part of the Section 36 application in support of the Development. This sets out the assessment to test for adverse effects from the Development on qualifying features of European sites, which comprise Special Areas of Conservation (SAC) and Special Protection Areas (SPA). The latter are designated for the conservation of bird species and are therefore dealt with in *Chapter 9: Ornithology*.

Studies have been undertaken to identify potential impacts on aquatic receptors and protected species such as Atlantic salmon *Salmo salar* and freshwater pearl mussel (FWPM) *Margaritifera margaritifera.*

Where appropriate, this chapter provides details of proportionate mitigation and/or enhancement measures. This chapter is related to aquatic ecology only.

Chapter 2: Project and Site Description provides a detailed description of the Development and the works required to implement it, including the layout of the Development (the 'Site') and the red line boundary.

Throughout this chapter, species are given their Latin names when first referred to and their common names only thereafter. Vascular plant scientific names follow Stace (2019), and Atherton *et al.* (2010) for bryophytes. All distances are cited as the shortest boundary to boundary distance 'as the crow flies' unless otherwise specified.

7.2 Legislation and Policy

This assessment has been undertaken within the context of the following relevant legislative instruments, planning policies and guidance documents and legislative instruments.

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive');
- Council Directive 2000/60/EC establishing a framework for Community action in the field of water policy (the 'Water Framework Directive');
- Regulation 1143/2014 on invasive alien species;

- Convention on Wetlands of International Importance (‘Ramsar convention’);
- Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the ‘Habitats Regulations’);
- Wildlife and Countryside Act 1981 (as amended) (the ‘WCA’);
- Wildlife and Natural Environment (Scotland) Act 2011 (as amended) (the ‘WANE Act’);
- Nature Conservation (Scotland) Act 2004 (as amended);
- Wildlife and Natural Environment (Scotland) Act 2011 (as amended);
- Scottish Planning Policy (SPP) 2014;
- Argyll & Bute Local Development Plan 2 (LDP2);
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003;
- Argyll and Bute Local Biodiversity Action Plan (LBAP);
- Wildlife & Natural Environment (Scotland) Act 2011 (as amended) (WANE Act).
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd Edition (CIEEM, 2016);
- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR);
- Water Environment and Water Services (Scotland) Act 2003 (‘WEWS Act’).

The above legislation has been considered when planning and carrying out the ecological impact assessment (EcIA), using the methods described herein. Compliance with legislation may require obtaining of relevant protected species licences prior to the implementation of the Development.

7.2.1 Planning Policy

Detailed information on relevant planning policy can be found in the Planning Statement which has been submitted as part of the Section 36 application for the Development. However, a brief summary of national and local planning policy relevant to the conservation of aquatic species is given under the following sub-headings.

7.2.2 National Planning Policy

National Planning Framework 4 (NPF4) was formally adopted by Scottish Ministers on 13 February 2023. NPF4 includes the following statements of policy intent: “*To protect, restore and enhance natural assets making best use of nature-based solutions*” and “*To protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks*”. Wherever possible and proportionate to the scale and nature of the project, the Development has therefore sought to deliver benefits for biodiversity, in addition to protecting existing biodiversity. NPF4 also states that major development will only be supported where nature networks “*are in a demonstrably better state than without intervention*” using best practice and including future monitoring and management where appropriate.

Prior to the UK’s exit from the European Union (EU), Scotland’s SACs and SPAs were part of a wider European network of such sites known as the ‘Natura 2000 network’. They were consequently referred to as ‘European sites.’ Now that the UK has left the EU, Scotland’s SACs and SPAs are no longer part of the Natura 2000 network but form part of a UK-wide network of designated sites referred to as the ‘UK site network’. However, it is current Scottish Government policy to retain the term ‘European site’ to refer collectively to SACs and SPAs (Scottish Government, 2020).

7.2.3 Local Planning Policy

The Argyll and Bute Local Development Plan 2 (LDP) was adopted in February 2024. Planning policy relevant to nature conservation and the Development contained within LDP2 is summarised in *Table 7.1 Summary of Potentially Relevant Policies within the Argyll and Bute LDP2,* below. Further details are presented in the standalone Planning Statement submitted with the application for the Development, and are available from the Argyll and Bute Council website (https://www.argyll-bute.gov.uk/planning-and-building/planning-policy/local-development-plan-2).

Table 7.1. Summary of Potentially Relevant Policies within the Argyll and Bute LDP2

Planning Policy	Summary of Purpose
Policy 30 – The Sustainable Growth of Renewables	The Council will support renewable energy developments where consistent with the principles of sustainable development and it can be demonstrated that there would be no unacceptable environmental effects, including on ecological features.
Policy 73 – Development Impact on Habitats, Species and Biodiversity	The Council will consider nature conservation legislation, the Argyll and Bute Biodiversity Strategy and Action Plan and the Scottish Biodiversity Strategy when assessing developments. Where a development is likely to have effects on important habitats or species, the Council will require the developer to undertake appropriate surveys and, if necessary, to prepare a mitigation plan. Development proposals likely to have an adverse effect on protected species and habitats will only be permitted where it can be justified in accordance with the relevant protected species legislation.
Policy 74 – Development Impact on Sites of International Importance	This policy sets out the strict requirements for developments potentially affecting European sites, including compliance with the Habitats Regulations.
Policy 75 – Development Impact on Sites of Special Scientific Interest and National Nature Reserves	This policy sets out requirements for developments affecting Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR). Where adverse effects on these are possible, developments must demonstrate that integrity of the sites/interests would not be compromised, or that social, economic or environmental benefits of national important clearly outweigh adverse effects on the sites/interests, and that there no suitable alternative locations.
Policy 76 – Development Impact on Local Nature Conservation Sites	Development having a significant effect on Local Nature Conservation Sites (LNCS) will not be supported unless demonstrated that clear social, economic or environmental benefits outweigh the adverse effects and sufficient mitigation is provided to conserve and enhance the site interests.
Policy 77 – Forestry, Woodland and Trees	There is a strong presumption in favour of protecting these resources, particularly ancient semi-natural woodland, native or long-established woods, hedgerows and trees with high conservation value. Developments affecting these must demonstrate clear public benefits and provide adequate compensation.
Policy 78 – Woodland Removal	Woodland removal and compensation will be assessed using Scottish Government's Control of Woodland Removal Policy and Argyll and Bute Woodland and Forestry Strategy. Compensatory planting is preferred on-site, secondarily off-site in Argyll and Bute and least preferably elsewhere in Scotland.

The Argyll and Bute Local Biodiversity Action Plan (LBAP) (2015 to 2020) contributes to the biodiversity conservation aims, objectives and actions described at a national level and to the delivery of a number of other strategies and plans relevant to the biodiversity of the Council area. Specifically, it details six ecosystem works programmes to be delivered by the plan and lists habitats and species selected for action. Habitats selected for action that may be relevant to the Development include blanket bog, upland heathland, rivers, and oligotrophic and dystrophic lakes (Loch Awe and Lochan Airigh). Priority species for conservation action include Atlantic salmon *Salmo salar*, black grouse *Tetrao tetrix*, golden eagle *Aquila chrysaetos*, red squirrel *Scurius vulgaris*, otter *Lutra lutra* and soprano pipistrelle *Pipistrellus pygmaeus*. The 2010 to 2015 LBAP has not yet been superseded but is currently being re-drafted.

Argyll and Bute biodiversity guidance states the following regarding the freshwater environment, which is considered of direct relevance to this assessment:

The freshwater environment in Argyll is varied, ranging from large lochs and rivers with medium water chemistries to tiny nutrient-poor, peat-stained lochans. Argyll contains the longest freshwater loch in Scotland (Loch Awe – 41 kms) and the loch with the greatest surface area (Loch Lomond – 71 kms²). The Freshwater Pearl Mussel (Margaritifera margaritifera) an internationally important species, the Atlantic salmon (Salmo salar) and the Powan (Coregonus lavaret) are three such species associated with some of our river and loch systems. These freshwater inhabitants are good examples of why Argyll is important for biodiversity, but also why action is required to protect these resources.

The above planning policy has been considered when assessing potential ecological constraints and opportunities identified by the ecological impact assessment.

7.3 Consultation

The assessment of impacts on terrestrial ecological features has been informed and influenced by consultation held with several statutory and non-statutory stakeholders. A summary of the consultation held, the information / recommendations provided by consultees, and details of how this EIA has responded to consultee feedback is provided in *Table 7.2 Consultee Responses to Scoping Report*, below.

Table 7.2 Consultee Responses to Scoping Report

Consultee	Summary of Response	Action Taken
SEPA	Scope of information which should be provided in the EIA including: Map and assessment of all engineering activities in or impacting on the water environment including proposed buffers, details of any flood risk assessment and details of any related CAR applications. Schedule of mitigation including pollution prevention measures. Borrow Pit Site Management Plan of pollution prevention measures. SEPA do not support the proposed two Access Tracks. Their rationale is that Access Tracks should be kept to a minimum and is not clear why two Access Tracks are required to the same location. Alternatives should be considered, and a single track considered to reduce overall footprint and impacts on the environment. All tracks should be kept to a minimum 10 m away from any waterbody with the exception of watercourse crossing which should be minimised. As long as watercourse crossings are designed to accommodate the 1 in 200-year flow and other infrastructure is located well away from watercourses we do not foresee a need for detailed information on flood risk to be provided. All watercourse crossings must be designed as traditional style bridges or bottomless arched culverts.	Detail of engineering activities is presented in other reports and appendices accompanying the EIAR. Detail of pollution prevention measures is presented in *Chapter 11: Water Environment* and cross-referenced in this report. Potential impacts from Access Tracks, for example by watercourse crossings including culverting, has been assessed in this chapter. A standard approach to avoiding impacts to water bodies, including appropriate buffer zones / stand-offs and minimising watercourse crossings, has been taken in this chapter and in *Chapter 11: Water Environment.* It is recommended in this EIAR that best practice guidance is followed for all watercourse crossings, including culvert design.
NatureScot	In summary, where relevant to aquatic ecology, the scoping response expected: • consideration of operational hydrology impacts; • a Biosecurity Management Plan; • demonstration of biodiversity enhancement, considering measures by nearby developments.	This EIAR has responded to the advice provided by NatureScot as follows: Hydrological impacts have been considered in parallel with *Chapter 11: Water Environment*; Habitat enhancement has been considered, with consideration of proposals by nearby developments.
Argyll and Bute Council	ABC requested that a pre-commencement walkover Scottish Fisheries Coordination Centre (SFCC) fish habitat assessment should be undertaken on the Allt Beochlich watercourse and main tributary watercourses of Loch Awe and Loch Fyne. The assessment should aim to quantify and evaluate the condition of freshwater habitats utilised for recruitment by fish, and in particular salmonids prior to the commencement of the Construction Phase. ABC advised that the applicant consult with Argyll Fisheries Trust (AFT), Argyll District Salmon Fishery Board (ADSFB) and the Awe District River Improvement Association (ADRIA) in the first instance for further advice on survey methods.	The requested surveys have been completed and appropriate mitigation has been included within the EIAR. Engagement was undertaken with these stakeholders and surveys were completed to the advised methods (Scottish Government, 2019), including fish habitat assessments and semi-quantitative electric fishing surveys. Surveys were initially completed in 2021 under sub-optimal conditions and were repeated in 2023.
Argyll District Salmon Fishery Board	Argyll District Salmon Fishery Board ADSFB represent the interests of local fishery managers in the Awe Catchment including the Awe District River Improvement (ADRIA) and Loch Awe Improvement Association (LAIA) who administer the protection order for fish on Loch Awe. The Argyll Fisheries Trust inform the ADSFB of the habitats of different species of fish within the area of the Development. AFT fish and habitat surveys suggest the lower reaches are accessible to Atlantic Salmon, Brown Trout and Brook Lamprey and are used for spawning and juvenile nursery habitat. It is not [clear] if there is an intention to abstract water from other watercourses in the development area (apart from Lochan Airigh). ADSFB urge walkover habitat surveys to inform the location of monitoring sites for the pre-development stages to ensure that key sites are monitored during and after the proposed	A comprehensive desk study has been undertaken, including data requests to the relevant bodies and stakeholders, to provide accurate information on fish species present within the Site and the study area. The suggested surveys and desk study have been undertaken, as presented in the EIAR. The design has considered the fish species present and designed accordingly. Fish habitat assessment, electric fishing surveys, macroinvertebrate surveys (both updated in 2023), and quarterly eDNA sampling for fish in Loch Awe, have been undertaken and are also still in progress, with final samples being collected in June 2024.

	scheme is developed. Monitoring of macroinvertebrates should also be undertaken to ensure water quality is maintained. Note eDNA sampling should be conducted regularly over a period of a year. The design of the scheme should also consider the potential to draw fish into the pump storage scheme. ADSFB highlights Balliemeanoch should be assessed as an addition to existing impacts on aquatic resources as fish habitat and population in the awe catchment is already affected by a variety of renewable energy schemes.	An assessment of the effects of the inlet/outlet structure on Loch Awe in relation to fish has been completed. Fish habitat assessment, electric fishing surveys, macroinvertebrate surveys (both updated in 2023), and quarterly eDNA sampling for fish in Loch Awe, have been undertaken or are in progress. An assessment of the effects of the inlet/outlet structure on Loch Awe in relation to fish has been undertaken. Quarterly eDNA sampling is being undertaken over a period of 12 months in Loch Awe, with the first season's results presented in this EIAR. In addition, a cumulative assessment has been included within the EIAR.
Argyll District Salmon Fishery Board	ADSFB advised that the developer should undertake the following surveys: • provide a full audit of the habitat and fish species present in the development area so that all potential effects on the habitat and fish resources can be considered and minimised. • walkover habitat surveys inform the location of monitoring sites for the predevelopment stages to ensure that key sites are monitored during and after the proposed scheme is developed. • Monitoring of macroinvertebrates should also be undertaken to ensure water quality is maintained. • Noted that eDNA sampling is proposed for the tailrace site at Loch Awe and suggested that the study should be conducted regularly over a period of a year. • Stated the design of the scheme should also consider the potential to draw fish into the pump storage scheme. • Requested that the additional risks of the Balliemeanoch scheme are not assessed in isolation within the EIA but as an addition to the existing impact on aquatic resources within the catchment.	The suggested surveys and desk study have been undertaken, as presented in the EIAR. The design has considered the fish species present and designed accordingly. Fish habitat assessment, electric fishing surveys, macroinvertebrate surveys (both updated in 2023), and quarterly eDNA sampling for fish in Loch Awe, commenced in spring 2019. eDNA survey is still in progress with final eDNA samples being collected in June 2024. An assessment of the effects of the inlet/outlet structure on Loch Awe in relation to fish has been undertaken. Finally, a cumulative assessment has been included within the EIAR.
Marine Scotland Science	Impacts on fish, surveys, fish resilience, cumulative impacts, methodology, design to consider migratory fish and water quality. MSS advise that the developer should consider all potential impacts (e.g., entrainment, impingement, and impediment to fish migration) which are regulated by SEPA under the Controlled Activity Regulations (CAR). MSS note the fish surveys carried out to date and we agree with ADSFB that further surveys should be carried out to provide sufficient information to inform an assessment of the potential impacts of the proposed development on all fish species and associated fisheries in all water bodies likely to be at risk. MSS further advise that the developer should consider the likely resilience of the fish populations, particularly salmon and trout, to any impacts. Similar to ADSFB, we advise that this assessment should also consider the potential cumulative impact on the fish populations, particularly in relation to the change in water quantity and quality in Loch Awe, as a result of the present proposal and other adjacent developments (operational and consented) including Cruachan, Inverawe, Nant and Beochlich hydro schemes and fish farms. MSS requested that full details regarding fish surveys including methodology (e.g., electrofishing, eDNA, smolt/adult trapping, acoustic tracking), selection of monitoring sites (as outlined in the response from ADSFB) and results should be presented in the EIA report. MSS agree with ADSFB that proposed sampling/monitoring should consider the seasonal use by fish species within all water bodies that are likely to be at risk from the development. MSS stated that in addition to the advice provided by SEPA relating to the design of the watercourse crossings MSS advise that the developer should consider the uninhibited	Potential impacts upon fish and their habitats have been assessed within this EIAR. This has been included within the EIAR. Fish habitat assessment, electric fishing surveys, macroinvertebrate surveys (both updated in 2023), and quarterly eDNA sampling for fish in Loch Awe, have been undertaken or are in progress. An assessment of the effects of the inlet/outlet structure on Loch Awe in relation to fish has been completed. See response above. In addition, a cumulative assessment has been included within the EIAR. See responses above regarding surveys undertaken and underway; all survey methods are included within *Appendix 7.1 Aquatic Ecology Baseline Report (Volume 5: Appendices)*, and sampling/monitoring for seasonal species carried out. Recommendations are made in the EIAR for further monitoring prior to construction as appropriate. It was considered that smolt/adult trapping or acoustic tracking was not required to inform the impact assessment, given the comprehensive fish population data available for Loch Awe and the nature of water bodies within the Site. The design team have considered migratory fish within the design such as best practice design of watercourse crossings and culverts, as informed by the findings of fish surveys.

	passage of migratory fish in the design of all watercourse crossings. MSS advised that full details regarding proposed survey/monitoring of water quality (including macroinvertebrate sampling as advised by the ADSFB) and fish populations and appropriate mitigation measures should be provided in the EIA report.	This is included within this EIAR and associated *Appendix 7.1 Aquatic Ecology Baseline Report (Volume 5 Appendices)* – macroinvertebrate surveys have been completed as part of the Aquatic Ecology assessment, and water quality is assessed in *Chapter 11: Water Environment*.
Fisheries Management Scotland	Fisheries Management Scotland endorse the comments on the proposed development made by the Argyll District Salmon Fisheries Board. In particular, we note that the Scottish Government have recognised that Atlantic Salmon are in crisis and published a wild salmon strategy in January 2022. This situation should be fully taken into account in both the screening and scoping and any subsequent licence decisions.	See responses above. The assessment has included a robust assessment of Atlantic salmon and appropriate mitigation measures have been made to ensure there are no significant impacts to this Near Threatened species.
Peel Port Group	Invasive Non-Native Species have been considered however we would like to see a risk assessment undertaken as part of further environmental assessments.	INNS have been considered in the EIAR and appropriate mitigation has been included to ensure the implementation of biosecurity measures and to control the risk of spreading INNS.
Public	Having seen the proposed size of the upper reservoir (it looks more akin to Loch Avich than to the Cruachan reservoir) I'm very concerned about the effect so much water may have on Loch Awe. Most the time (circa 9/10ths the year) the loch stays within about a 0.5 m range, and generally changes less than 50 mm in a day.	Potential impacts on the aquatic ecology (and notably fisheries) in Loch Awe as a result of the development have been assessed in the EIAR. Development design and predictions of the effects on levels in Loch Awe have informed the assessment.

Further comments received from Mowi Scotland and Dawnfresh Fish Farming (which is a wholly owned subsidiary of Mowi Scotland) subsequent to submission of the scoping report are addressed below.

MOWI Scotland Response:

'*MOWI has an interest in this development given the presence of operational fish farms on Loch Awe. 3rd April 2024 – whilst the Loch Awe fish farms have previously raised Rainbow trout, a consultation process is underway with stakeholders and regulators on the potential transition of the Loch Awe fish farms to rear Atlantic salmon smolts.*

Concerned that no specific assessments on the potential effects to the operation of the fish farms has been scoped for inclusion in the EIAR. We would consider that this is a material omission. The farmed salmon sector contributes to the Scottish economy every year providing direct employment for over 2,500 people in farming and a further 10,000 across Scotland. It is surprising therefore that there is no reference to the economic importance of fish farming in the socio-economic chapter of the Scoping Report given the presence of fish farms within Loch Awe.

The potential effects of the development on the continued operation of the fish farms requires to be scoped into the EIAR. We would expect the Water Environment and the Water Resources impact assessments outlined in the Scoping Report to be expanded to examine the specific risk to the fish farms and, if required identification of appropriate mitigation measures and actions. We would specifically highlight the following issues that require to be examined within the EIAR.

Construction Phase Impacts:
An assessment should be carried out to examine the risk of connectivity of any potential catchment scale water quality impacts from construction phase pollution with the Loch Awe fish farms. We would be especially Concerned with elevated suspended solids and liberation of metals from soil and rock excavations. Although the fish farm sites are located some distance from the main development site, potential construction run-of release points to the water environment and connectivity to Loch Awe should be identified for appropriate mitigation measures. – RESPONSE: Water quality effects are assessed in *Chapter 11: Water Environment*, along with appropriate mitigation to ensure impacts to water quality in Loch Awe are minimised during construction and operation.

Operational Phase Impacts:
A key concern for the continued viable operation of the fish farms is the potential impacts through changes to water levels within Loch Awe, both high water and low water levels. Mowi operates freshwater fish farms in a number of loch waterbodies which are also subject to storage hydro operations. Fluctuations in water levels outside of normal waterbody changes have the potential to significantly impact the operation of fish farms and we have direct experiences of this elsewhere.

The Scoping Report correctly identifies the range of existing hydro operations within the Loch Awe catchment and *the influences and behaviour these operations have on current water levels in Loch Awe. The proposed development will result in further changes to water levels within Loch Awe and a generic assessment on the likely variation in water levels in Loch Awe is proposed, based on the pumped and generating volumes and surface area of the loch with a commitment that if the outcomes are found to be significant, further modelling of the impact will be undertaken to identify mitigation measures to reduce the impact. It is essential that effects of changes in water levels in Loch Awe and the potential for impacts to the operation of the fish farms is scoped into the EIAR. This EIAR should examine the following:*

• Assessment of water level changes on the mooring systems and containment measures for stock at the Tervine and Braevallich fish farms.
• Assessment of water level changes to shoreside farm infrastructure such as slipways and vessel pontoons. High water or low water level changes may render facilities such as slipways and pontoons unusable for periods of time. Maintenance of year-round vessel access to the fish farms is required especially during key in-year periods involving sensitive operations such as fish transfers in and out of the fish farms.

RESPONSES:

Construction phase impacts – embedded mitigation will ensure water quality is not adversely affected during construction, and considering the distance of the fish farms from the proposed development (approx. 10 km SW of the inlet/outlet, and at the mouth of the River Awe opposite the falls of Cruachan, approx. 11 km to the NW), there are no expected impacts on the fish farms due to water quality (suspended solids or metals). Water quality monitoring will be in place during the construction phase. Potential effects to water quality and appropriate mitigation measures and monitoring requirements are detailed in *Chapter 11: Water Environment.*

Operational phase impacts – the commitment made as part of the EIAR to maintain water levels in Loch Awe through the operational regime of the scheme will ensure this does not adversely affect the fish farms. The comments refer to ‘Fluctuations in water levels outside of normal waterbody changes’; however, there is a commitment for the scheme to maintain water levels within normal fluctuations. Operational regime is proposed to limit the impact of the scheme during periods of high and low water levels. This is based on a hands-off arrangement when water levels fall below an agreed level together with a ‘no discharge / generation’ commitment when water level are above an agreed level. This will ensure that the scheme does not impact on extreme water level in Loch Awe. An assessment of the rate of variation in change of water level has been carried out based on the proposed generation and abstraction rate. The rate of change has been found to be in line with the current changes in Loch Awe based on review of historic water level. The larger rates of change however will occur on a more frequent basis as a result of the scheme operation. They will however be in line with the normal water level changes that are currently occurring in Loch Awe.

It is assumed that moorings and containment measures, and slipways and vessel pontoons, are designed to operate within the current normal loch level fluctuations, and these will therefore continue to operate unhindered by the proposed operation of the scheme.

7.4 Study Area

The site for the Development is situated west of Loch Lomond and The Trossachs National Park, in western Scotland. The proposed site is situated between freshwater and brackish Lochs (Loch Awe and Loch Fyne respectively) as shown on *Figure 1.1 Location Plan (Volume 3: Figures)*.

The Zone of Influence (ZoI) of the Development is the area over which aquatic ecological features may be subject to impacts as a result of its construction, operation, and/or decommissioning, and may extend beyond the boundary of the Development Site.

The ZoI will vary for different aquatic features depending on their sensitivity to an environmental change. It is therefore appropriate to identify different ZoI for different features. As recommended by the Chartered Institute of Ecology and Environmental Management in CIEEM (2022), professionally accredited or published studies and guidance, where available, were used to help determine the likely ZoI, as well as professional judgement. However, CIEEM also highlight that establishing the ZoI should be an iterative process and can be informed by further desk study and field survey. Where limited information was available, the Precautionary Principle (UNESCO, 2005) was adopted and a ZoI estimated on that basis.

The study areas used for desk study and field survey, and which are reported in *Appendix 7.1 Aquatic Ecology Baseline Report (Volume 5: Appendices)*, were designed to allow sufficient data to be collected to establish the baseline condition of aquatic ecological features.

Survey locations were selected based on their potential to be impacted by the Development. Any watercourses where a channel crossing may be required or had the potential to be impacted by runoff were surveyed to assess their conservation value and establish a baseline. The majority of survey locations assessed for this report are small headwater streams that arise in uplands between Loch Fyne (brackish) and Loch Awe (freshwater) and run through a variety of conifer plantations, broadleaved woodland, open field and moorland areas.

A small number of additional survey locations included potentially impacted freshwater bodies (lochs), and proposed developments (engineering works) on the shores of Loch Fyne and Loch Awe. For example, one of the proposed transportation routes would involve the construction of a temporary Marine Facility on the western shore of Loch Fyne, near Inveraray.

7.5 Methods

7.5.1 Guidance and Standards

The following guidance was used when designing the field surveys carried out to inform this assessment and to determine the scope and method of the assessment itself:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2022);
- Assessing the Cumulative Impact of Onshore Wind Energy Developments (SNH, 2012).
- Habitat Surveys Training Course Manual (SFCC, 2007).

7.5.2 Assessment Scope

The scope of survey and assessment described in this chapter was informed by the guidance contained in the published documents listed in *Appendix 7.1 Aquatic Ecology Baseline Report (Volume 5 Appendices)*, on the responses of consultees (as set out in *Table 7.2 Consultee Responses to Scoping Report, Section 7.3 Consultation*), and on the results of detailed study once underway.

The guidelines for EcIA published by CIEEM recommend that only those features that are 'important' and that could be significantly affected by the Development require detailed assessment, stating that "*it is not necessary to carry out detailed assessment of ecological features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable*".

Consequently, for the purposes of the desk study, field survey and assessment described in this chapter, 'important' aquatic ecological features were taken to include:

- The qualifying features of designated sites within the zone of influence (or further where connectivity exists) of the Development;
- Species listed on Annex II of the Habitats Directive;
- All species listed on Schedule 1 of the WCA;
- Species listed on the Scottish Biodiversity List (SBL);
- All species on the Argyll and Bute LBAP;
- Species or species assemblages shown to indicate Good habitat conditions, for example in relation to Good Ecological Status or better in relation to the Water Framework Directive (WFD);
- Species or habitats raised through consultation (see *Table 7.2 Consultee Responses to Scoping Report*, *Section 7.3 Consultation*) as being at risk, or of particular local significance or concern.

The assessment considers the effects during the four phases of the Development lifespan as identified in *Chapter 2: Project and Site Description*. The phases include pre-construction, construction, operation, and decommissioning.

The scope of the assessment described in this Chapter was defined by AECOM following the completion of ecological surveys and based on the comments provided by consultees in the Scoping Opinion response to the Scoping Report for the Development. A summary of the key comments provided by those organisations is provided in *Table 7.2 Consultee Responses to Scoping Report, Section 7.3 Consultation*.

Potential impacts to surveyed water bodies have been assessed in this chapter. These water bodies are also assessed in the WFD assessment, supported by WFD monitoring data which is contained within *Chapter 11: Water Environment* of the EIAR.

Based on the results of the PEA and the feedback provided on the Scoping Report, the scope of the aquatic ecology assessment for the Development included the following ecological features:

- Statutory and non-statutory designated nature conservation sites;
- Catchment-wide and cross-catchment desk study to establish records of protected / notable species and INNS in the study area;
- Freshwater pearl mussel (FWPM) habitats;
- Aquatic macrophytes;
- Aquatic macroinvertebrates;
- Fish and fish habitats;
- Aquatic INNS.

7.6 Ecological Impact Assessment

The assessment of ecological impacts described in this Chapter was conducted in accordance with the guidelines published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016). The principal steps involved in the CIEEM approach can be summarised as:

- Ecological features that are both present and might be affected by the Development are identified (both those likely to be present at the time works begin, and for the sake of comparison, those predicted to be present at a set time in the future) through a combination of targeted desk-based study and field survey work to determine the relevant baseline conditions;
- The importance of the identified ecological features is evaluated to place their relative biodiversity and conservation value into geographic context, and this is used to define the relevant ecological features that need to be considered further within the impact assessment process;
- The changes or perturbations predicted to result as a consequence of the Development (i.e., the potential impacts) that have the potential to affect relevant ecological features are identified and their nature described. Established best-practice, legislative requirements, or other incorporated design measures to minimise or avoid impacts are also described and are taken into account;
- The likely effects (beneficial or adverse) on relevant ecological features are then assessed, and where possible quantified;
- Measures to avoid or reduce any predicted significant effects, if possible, are then developed in conjunction with other elements of the design (including mitigation for other environmental disciplines). If necessary, measures to compensate for effects on features of nature conservation importance are also included;
- Any residual effects of the proposed development are reported; and
- Scope for ecological enhancement is considered.

CIEEM impacts have been translated in this assessment into more widely-used terms. Taking account of professional judgement and the full range of impact assessment parameters, 'impact magnitude' has been translated as **negligible, minor, moderate or major (adverse or beneficial)**, and significance of effect has been expressed as **Low for site- or locally-significant effects, Medium for county- or regionally-significant effects, and High or Very High for nationally-or internationally-significant effects**.

7.6.1 Assessment Methodology

The assessment of impacts and effects on aquatic ecological features followed CIEEM EcIA guidelines (CIEEM, 2022). The principal steps involved in the CIEEM approach can be summarised as:

- Determine baseline conditions through targeted desk study and field survey, to identify Important [aquatic] Ecological Features (IEF) that might be affected;

- Evaluate the importance of identified ecological features on a geographic scale, determining those that need to be considered further;
- Describe potential impacts on relevant ecological features, considering best practice, legislation, and embedded design measures;
- Assess and quantify (as far as possible) likely effects (adverse or beneficial) on relevant ecological features;
- Develop measures to avoid, reduce or if necessary, compensate for predicted significant effects, in conjunction with other elements of the design (including mitigation for other environmental disciplines);
- Report residual effects considering developed mitigation or compensation; and
- Identify opportunities for biodiversity enhancement.

When baseline conditions have been determined, it can become apparent that there is no possibility of effect on certain ecological features, and in this case such features are scoped out of further assessment.

In line with CIEEM EcIA guidelines (CIEEM, 2022), this chapter draws a distinction between 'impact' and 'effect':

- Impact – action resulting in change to an ecological feature (e.g. a deterioration in water quality leading to adverse effects on aquatic flora and fauna; culverting of a watercourse presenting a barrier to fish migration);
- Effect – the outcome of an impact on the conservation status or structure and/or function of an ecological feature (e.g. deterioration in water quality may have an adverse effect on aquatic communities and corresponding WFD status at a particular scale; barriers to fish passage have an adverse effect on migratory and spawning success of fish species).

Impacts are assessed in view of the conservation status of the aquatic ecological feature under consideration. Conservation status is defined as follows:

- Habitats – the sum of influences acting on it that may affect its extent, structure/functions, distribution, and typical species within a given geographical area (CIEEM, 2022);
- Species – the sum of influences acting on it that may affect its long-term distribution and abundance within a given geographical area (CIEEM, 2022). Similarly, conservation objectives for European sites indicate that to contribute to favourable conservation status the following must be maintained: the population as a viable component of its habitats, distribution, and sufficiency of supporting habitats, processes, and prey.

NatureScot recommends that the concept of the favourable conservation status for species should be applied at a National (Scottish) level to determine the level of significance of an effect (SNH, 2018). However, consideration of effects at all scales is important (CIEEM, 2022), and where an impact may not affect conservation status at the national level, the potential for effects on conservation status at regional and local scales has been considered.

For the purposes of this EIA and in the context of the EIA Regulations, residual effects predicted to be significant at the Regional or higher geographic scale are considered 'Significant' in broader EIA terms, whereas those predicted to be significant at Local or Negligible scales are considered 'Not Significant'. The latter does not, however, necessarily imply that mitigation is not required.

A detailed description of the CIEEM method for impact assessment is provided in *Appendix 6.1: Method for Assessment of Ecological Impacts (Volume 5: Appendices).*

7.7 Baseline Data Collection

7.7.1 Desk Study

A desk study was carried out to identify designated sites, protected and notable habitats and species, and INNS within the zone of influence of the Development and of relevance to aquatic ecology. A stratified approach was taken when defining the desk study area, based on the likely zone of influence of the Development on different ecological receptors and an understanding of the maximum distances typically considered by statutory consultees. Accordingly, the desk study identified any international designated sites within 10 km of the red line boundary and other national statutory and local non-statutory designated sites and notable habitats and species within 2.5 km of the red line boundary.

Results of the desk study pertaining to statutory and non-statutory designated sites and terrestrial habitats and species are presented in *Chapter 6: Terrestrial Ecology*.

A desk study specific to the aquatic ecology scope was carried out to identify protected / notable aquatic species, and INNS.

For the purposes of the aquatic ecological assessment and baseline report, protected and notable habitats and species included:

- All species listed on Schedules 2 and 4 of the Habitats Regulations;
- All species listed on Schedules 1, 5 and 8 of the WCA;
- Species and habitats of principal importance for nature conservation in Scotland which are named on the SBL;
- Priority species listed on the UK Biodiversity Action Plan or the Argyll and Bute LBAP;
- Other species that are Nationally Rare, Nationally Scarce, or listed in national or local Red Data Lists;
- INNS of UK concern such as those identified on Schedule 9 of the WCA (although this no longer legally applies in Scotland) and in particular the 29 high impact species identified by Invasive Species Scotland and those listed as species of EU concern on the EU Invasive Alien Species Regulations.

The search of the NBN Atlas Scotland was extended to include records from 1993 onwards due to the sparsity of records in recent years. Although, where possible, data from the past ten years were prioritised.

The desk study was carried out using the data sources detailed in *Table 7.3 Desk Study Data Sources*.

Table 7.3 Desk Study Data Sources

Data Source	Date Accessed	Data Obtained
Argyll and Bute Council Open Data website (https://data-argyll-bute.opendata.arcgis.com/datasets/d05f7337b41e48b4af933404dc0592a2/explore)	06 July 2023	Information on local non-statutory nature conservation designations.
NatureScot SiteLink and Open Data Hub (https://sitelink.nature.scot/home; https://opendata.nature.scot/)	02 August 2023	Extents of and information on international and national statutory designations.
NBN Atlas Scotland (https://scotland.nbnatlas.org/)	December 2023	Commercially available records of species of conservation concern within 2 km since 1993.
Argyll Fisheries Trust (AFT)	December 2023	Information on habitats and habitat connections (based on aerial photography) relevant to interpretation of planning policy and assessment of potential protected and notable species constraints. Details of local planning policy relevant to nature conservation.
SEPA Water Environment Hub	January 2024	WFD status of ecological parameters for watercourses. Barriers to fish migration (natural and artificial).
Ordnance Survey (OS) 1:25,000 maps OS 1:50,000 maps and Bing aerial (https://www.bing.com/maps/)	31 October 2023	Habitats and connectivity relevant to interpretation of planning policy and potential presence of important features that could be used by protected and notable species.

7.7.2 Field Survey

7.7.2.1 Survey Locations

Survey locations were identified according to the proximity of water bodies to areas of proposed works such as watercourse crossings for Access Tracks, inlet/outlet location, proposed culverts, Headpond location, or otherwise to assess potential impacts to water quality during construction. As such, 19 survey sites were selected, with each survey type completed at each survey location, as shown in *Table 7.4 Aquatic Ecology Survey Locations*, below, and within *Appendix 7.1 Aquatic Ecology Baseline Report, Figures A1-A4 (Volume 5: Appendices).*

Table 7.4 Aquatic Ecology Survey Locations

Site ID	Watercourse Name	Grid Reference	Surveys Undertaken
BL-01	Allt Criche (tributary of Erralich Water)	NN 08167 12302	Macrophyte, Macroinvertebrate and Fish
BL-02	Erralich Water	NN 07790 11867	Macrophyte, Macroinvertebrate and Fish
BL-03	Allt Blarghour	NN 02880 13037	Macrophyte and Macroinvertebrate
BL-04	Buinne Dhubh (Allt Beolich)	NN 03197 15552	Macrophyte, Macroinvertebrate and Fish
BL-05	Allt Beolich	NN 01347 15431	Macrophyte and Macroinvertebrate
BL-06	Unnamed (direct into Loch Awe)	NN 01175 15660	Macrophyte and Macroinvertebrate
BL-07	Allt a' Chrosaid	NN 01127 16082	Macrophyte, Macroinvertebrate and Fish
BL-14	Loch Fyne Wharf (Brackish site)	NN 08537 07116	Macrophyte and Macroinvertebrate
BL-16	Loch Fyne (Brackish site)	NN 11301 09358	Macrophyte and Macroinvertebrate
BL-17	Allt a' Gheataidh (outfall into Loch Awe)	NN 00960 16289	Macrophyte and Macroinvertebrate
BL-18	Loch Awe	NN 00683 15657	Macrophyte, Macroinvertebrate, and fish eDNA
BL-19	Loch Awe	NN 07693 26840	Macrophyte, Macroinvertebrate, and fish eDNA
BL-20	Lochan Airigh	NN 04278 16416	Macrophyte and Macroinvertebrate
BL-21	Lochan Breac-liath	NN 03430 16457	Macrophyte and Macroinvertebrate
BL-22	River Aray	NN 09062 18945	Macrophyte, Macroinvertebrate and Fish
BL-23	Unnamed tributary of River Aray	NN 09795 19225	Macrophyte, Macroinvertebrate and Fish
BL-24	Unnamed tributary of Achan River	NN 07687 19480	Macrophyte and Macroinvertebrate
BL-25	Unnamed tributary of Keppochan River	NN 06895 19355	Macrophyte, Macroinvertebrate and Fish
BL-26	Unnamed tributary of Allt na Cuile Riabhaiche	NN 05988 18950	Macrophyte, Macroinvertebrate and Fish

Macrophyte surveys were completed in 2019, with no further surveys considered necessary due to the consistency of morphological conditions since those surveys, and the general lack of macrophyte species recorded due to the nature of the upland water bodies. Similarly, fish habitat surveys were completed in 2019 and were used to inform locations for fish surveys in 2021, 2023, and scheduled further surveys for 2024. Macroinvertebrate and fish eDNA surveys were also undertaken in 2019, 2023, and further surveys scheduled for 2024.

INNS surveys were completed concurrently with macrophyte and macroinvertebrate surveys, and also during terrestrial ecology surveys as detailed in *Chapter 6: Terrestrial Ecology*.

Sites surveyed comprised two brackish sites on Loch Fyne, four freshwater loch sites (including Loch Awe), and 14 running water sites on various watercourses, as detailed in *Table 7.4 Aquatic Ecology Survey Locations*. Sites BL-14 and BL-16 were the only brackish sites to be surveyed in 2023 as the third brackish site, BL-15 (located at NN 08202 07116), was removed from survey scope due to a lack of access and proximity to BL-14. Data collected from surveys at BL-14 was deemed sufficient to represent the aquatic ecology of the immediate and surrounding area.

The following is a summary of methods used for the aquatic ecological assessments and field surveys completed to establish baseline conditions at the Site. All aquatic ecology surveys were undertaken by suitably qualified and experienced AECOM ecologists. For full details of survey methods and results, refer to *Appendix 7.1: Aquatic Ecology Baseline Report (Volume 5: Appendices).*

7.7.2.2 Freshwater Pearl Mussel Habitat Surveys

Freshwater Pearl Mussel (FWPM) habitat potential was assessed in 2019 to identify areas of optimal habitat (Hastie et al., 2000, 2003) within the boundary of the Development. At each site, FWPM habitat potential was assessed over a 100 m downstream reach at each watercourse. Key habitat requirements include riverbed substrate diversity and stability, high water quality, and the presence of host fish (salmon and trout). Pockets of clean sand, stabilised by boulders and cobbles in moderate- to fast-flowing waters create optimal microhabitats for FWPM (Hastie et al., 2000, 2003). As a result of the FWPM habitat appraisal and subsequent assessment, no further surveys were recommended for FWPM.

7.7.2.3 Macrophyte Surveys

Macrophyte surveys were completed in 2019. The survey methodology undertaken varied depending on the type of water body, as described below.

Macrophyte survey of flowing watercourses followed the method outlined in the UKTAG River Assessment Method (Macrophytes and Phytobenthos) for use with LEAFPACS2 (WFD-UKTAG, 2014), which conforms to BS EN 14184:2014 Water quality - Guidance for the surveying of aquatic macrophytes in running waters.

Macrophyte (and macroinvertebrate) surveys of Lochan Airigh and Lochan Breac-liath were based on the PSYM (Predictive System for Multimetrics) pond survey methodology (Freshwater Habitats Trust, formerly Pond Action, 2002). This method was developed to provide a method for assessing the biological quality of still waters in England and Wales. Due to the location in Scotland, the PSYM metrics could not be calculated, however the survey methodology remains valid for this type of standing water body.

Macrophyte surveys at the Loch sites were undertaken along transects, on the shore, at the identified survey sites. The strandline was inspected for macrophytes and plant fragments, with records collected of any taxa encountered and their relative abundance (taxon cover value).

All INNS within or adjacent to surveyed water bodies were also recorded as part of the macrophyte assessment, together with incidental records of INNS elsewhere on the Site where these were observed.

7.7.2.4 Macroinvertebrate Surveys

Macroinvertebrate surveys were completed during autumn 2019 and autumn 2023, with further surveys proposed for spring 2024.

Macroinvertebrate samples were taken to assess the biological quality of the surveyed water bodies. Using a standard Freshwater Biological Association (FBA) pattern pond net (mesh size: 1 mm), instream habitats were ‘kick sampled’ where practicable, or ‘sweep sampled’. Sampling methodology adhered to aquatic macroinvertebrate sampling procedures standardised by the Environment Agency (Environment Agency, 2017) and used by regulatory authorities across the UK. These sampling procedures also conform to BS EN ISO 10870:2012 Water Quality – Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters.

Subsequent laboratory analysis identified specimens to ‘mixed-taxon level’ using stereo-microscopes; and lists of the aquatic macroinvertebrate taxa present were produced in line with Environment Agency guidance (Environment Agency, 2014).

Using collated survey data, metrics were calculated to inform an assessment of relative conservation value, habitat condition, and general degradation of surveyed water bodies. Aquatic macroinvertebrate data were analysed to generate the Whalley, Hawkes, Paisley & Trigg (WHPT) score, Average Score Per Taxon (ASPT), and Number of scoring taxa (NTAXA) values, which provide an indication of ecological quality in the watercourse (WFD-UKTAG, 2021). Further calculations were undertaken to determine the Proportion of Sediment-sensitive Invertebrates (PSI) index (Extence et al., 2013), the Lotic-invertebrate Index for Flow Evaluation (LIFE) score (Extence et al., 1999), which links benthic macroinvertebrate data to flow regimes prevailing in UK waters, and finally the Community Conservation Index (CCI) (Chadd & Extence, 2004) was used to classify present aquatic macroinvertebrates according to their scarcity and conservation value in a geographic context.

The resultant WHPT-ASPT and NTAXA values and environmental data collected were processed through the River Invertebrate Classification Tool (RICT) version 3 web application, to produce outputs as Ecological Quality Ratio (EQR) values. The EQRs are then translated into a Water Framework Directive (WFD) equivalent classification.

7.7.2.5 Fish Habitat Survey

Fish habitat assessments were completed in 2019 at 15 sites to establish fish spawning habitat potential per site. Habitat potential was assessed through key aquatic features including channel dimensions, mesohabitat coverage, habitat features, substrate composition, accessibility for migratory species, and potential spawning areas for salmonid species (Atlantic salmon *Salmo salar*, and brown/sea trout *Salmo trutta*). Subsequent analysis followed SEPA’s Guidance for applicants on supporting information requirements for hydropower applications (SEPA, 2005). Consideration was also given to the degree of suitable fish passage, as any barriers may impact passage of salmonid and other fish species upstream on surveyed water bodies.

7.7.2.6 Fish Surveys

Fish surveys were undertaken following the EA Operational Instruction 993_08, Electric fishing operations (2019) and in accordance with the Scottish Fisheries Coordination Centre protocols (SFCC, 2021) through electric fishing methods.

Surveys consisted of semi-quantitative three-run surveys of depletive electric fishing, to give an indication of population densities, or time-delineated surveys, which provided an index of abundance as catch per unit of effort (time).

For three-run depletion surveys, through channel isolation using cross-channel stop nets where possible, watercourses were electric fished in an upstream direction within the 100 m survey area (where such an area was accessible for survey). For time-delineated surveys, operatives electric fished the watercourse in an upstream direction for 6 minutes. The number of fish caught during this time is regarded as an index of abundance as catch per unit effort (time).

Subsequent fish catches were individually measured and identified to species level to inform species presence and abundance within the watercourses.

7.7.2.7 Fish eDNA Surveys

Water samples were obtained and filtered at two sites; the first at the River Awe outflow from Loch Awe; and the second on the east bank of Loch Awe at the proposed inlet/outlet location. Approximately 1.5 – 2.0 L of water from each site was filtered and subsequently extracted by Nature Metrics using a commercial DNA extraction kit with a protocol modified to increase DNA yields. This provided a list of fish species present, and an indication of relative abundance based on the quantity of eDNA detected per species – this is not an absolute measure of fish abundance and is dependent on the amount of eDNA present at the particular sampling location, and also on the amount of eDNA shed by each particular species.

7.7.2.8 Invasive Non-Native Species

The aquatic macrophyte and macroinvertebrate surveys included an assessment for INNS at the survey locations, together with incidental records of INNS elsewhere on the Site, where these were observed. The extent of terrestrial INNS and potential impacts as a result of their presence has been described in *Chapter 6: Terrestrial Ecology* and appendices (*Volume 5: Appendices*).

7.7.3 Limitations And Assumptions

Refer to *Appendix 7.1: Aquatic Ecology Survey Report (Volume 5: Appendices)* for limitations and assumptions in relation to the aquatic ecology surveys. A summary is provided below.

Information obtained by desk study is dependent upon local recorders and organisations having submitted records for the area of interest. As such, a lack of records for a species does not necessarily mean that the habitats or species do not occur in the study area. Likewise, the record of a species does not automatically mean that these still occur within the area of interest or are relevant in the context of the Development. The utilisation of multiple sources of information for the desk study means that the ecological data obtained is as comprehensive as possible.

Although surveys were undertaken during optimal survey periods, the weather during some surveys was sub-optimal. All sites were subject to heavy rain and higher than normal flows at the time of surveys in 2023. Consequently, some habitats within the watercourse may not have been representatively surveyed. Heavy rainfall in 2023 prevented fish surveys being undertaken at two of the survey sites (BL-04 and BL-07) as flows in the watercourses were higher than normal. Semi-quantitative 3-run electric fishing surveys could only be completed at two of the sites: BL-22 and BL-23. Where this was not possible semi-quantitative timed delineated surveys were carried out for six minutes (BL-01, BL-02, BL-25, BL-26) as stop nets could not be deployed. With the combination of fish survey data from 2019 and 2023, it is considered that representative fish data were obtained.

During 2019 and 2023 electric fishing surveys, only downstream stop nets were primarily used as upstream survey points were either unsafe or unsuitable for using an additional stop net. Where two stop nets were not used, some individuals may have escaped upstream; however, this is considered insignificant in the context of the fish species captured.

Best practice guidelines for aquatic macroinvertebrate survey include repeat sampling in spring and autumn seasons. In this case sampling was undertaken in autumn in both 2019 and 2023with repeat surveys to assess macroinvertebrate communities present being carried out in the spring and summer seasons 2024 to further inform the baseline assessment in an addendum report. However, it is considered that the combination of 2019 and 2023 survey data provides an appropriate baseline to inform the assessment.

INNS surveys were limited to the macrophyte and macroinvertebrate survey locations for identifying their presence, in addition to incidental records elsewhere on the Site. INNS were also recorded during terrestrial ecology surveys as detailed in *Chapter 6 Terrestrial Ecology*, and therefore it is considered that comprehensive INNS data have been obtained to inform the assessment and mitigation requirements, especially as aquatic ecology surveys were completed at specific points of potential impacts of the Development.

While the baseline is not expected to change sufficiently to alter the impact assessment at the time of construction, the precise situation regarding protected species may nevertheless differ at that time. For example, watercourse conditions may change through impacts of pollution or other anthropogenic activities. INNS may be introduced or spread through the Development Site. Pre-construction surveys should therefore be undertaken as required, depending upon the timescale of consenting and construction, with aquatic ecological data typically remaining valid for a period of three years from the point of collection.

7.8 Baseline Environment

7.8.1 Designated Sites

7.8.1.1 Statutory Designations

Refer to *Chapter 6: Terrestrial Ecology* for full details of all designated sites within the study area. A summary of the statutory designated sites relevant to the aquatic ecology assessment and within 10 km of the Development Site is provided below.

The Development does not lie within any statutory site designated for nature conservation. However, there are a number of statutorily designated sites within the potential zone of influence of the Development. These are described in *Table 7.5 Statutory Designated Sites in Proximity to the Development*. The designations are listed in descending order, with those closest to the Development Site listed first.

Table 7-5 Statutory Designated Sites in Proximity to the Development Site

Designated Site	Reason(s) for Designation	Relationship to the Development
Glen Etive and Glen Fyne SPA	A large, predominantly upland site encompassing a range of habitats including heather moorland, rough grassland, blanket bog, native woodland, montane heaths and exposed rock and scree with **numerous freshwater lochs and river systems**.	The SPA is split between two sites. One is situated approximately 4.2 km east of the proposed Headpond area, extending as far west as the A819. The second is 10.05 km north, on the opposite bank of the River Awe, and partially overlapping the Loch Etive Woods SAC. There is no hydrological connectivity between the Development and this SAC, and therefore it is not considered further in the Aquatic Ecology assessment – refer to *Chapter 6: Terrestrial* Ecology and *Chapter 9 Ornithology* for the assessment of impacts in relation to this site.
Glen Shira SAC	The sole qualifying feature is: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles. General site character includes **inland water bodies (standing water, running water)**	A two-part site on opposite sides of a watercourse in Glen Shira. The closest point is approximately 5.5 km from the Development Site. There is intervening highly mountainous terrain of moorland and forestry, and the SAC is in a different water catchment. There is no hydrological connectivity between the Development and this SAC, and therefore it is not considered further in the Aquatic Ecology assessment – refer to *Chapter 6: Terrestrial Ecology* for the assessment of impacts in relation to this site.
Loch Etive Woods SAC	Designated for supporting the following habitats and species: • Otter *Lutra lutra* • Other habitats and species are not relevant to aquatic ecology but can be found within the PEA (AECOM, 2019)	A multi-part site of which two parts are within the study area. Both are located on the opposite bank of Loch Awe, with one 9.05 km north west of the Site and one 9.98 km north east of the Site, both separated by Loch Awe, farmland, moorland and conifer plantation. There is no hydrological connectivity between the Development and this SAC, and therefore it is not considered further in the Aquatic Ecology assessment – refer to *Chapter 6: Terrestrial Ecology* for the assessment of impacts in relation to this site.

7.8.1.2 Non-statutory Designations

There are no non-statutory designations for nature conservation within 2.5 km of the Development which have influence over aquatic ecology investigations within the area of influence of the Development.

7.8.2 Aquatic Ecology Desk Study

7.8.2.1 Invasive Non-Native Species

The terrestrial and riparian INNS Japanese knotweed *Reynoutria japonica*, New Zealand willowherb *Epilobium brunnescens* and American skunk cabbage *Lysichiton americanus* were all present.

Additional accounts of the aquatics INNS Canadian pondweed *Elodea canadensis*, Nuttall's waterweed *Elodea nuttallii,* and New Zealand pigmyweed *Crassula helmsii*, were also identified. These species were notably present within Loch Awe.

Historic records of the New Zealand Mud Snail *Potamopyrgus antipodarum*, although none from within the past 12 years, were recorded in the desk study.

No records of the amphipod *Crangonyx pseudogracilis* were recorded in the desk study within the Loch Awe or Loch Fyne catchment.

7.8.2.2 Macrophytes

No protected macrophyte species were identified in the desk study. Species previously listed under the IUCN Red List are now all listed as Least Concern.

7.8.2.3 Macroinvertebrates

No macroinvertebrate species of national or local designation were identified within the study area. Scottish records within the Development Site were for widespread and common species only.

7.8.2.4 Freshwater Pearl Mussel (FWPM)

No records of freshwater pearl mussel were identified in the catchment-wide data search. The potential for aquatic habitats to support this species depends upon the presence of suitable salmonid host fish species, upon the gills of which the mussel's larval stage, Glochidia, attach.

7.8.2.5 Fish

Recent fish data was based off the results of gill netting (2011) and eDNA (2016) surveys completed by SEPA within Loch Awe. Records of protected or SBL species included Atlantic salmon *Salmo salar*, brown/sea trout *Salmo trutta*, arctic char *Salvelinus alpinus*, lamprey *Lampetra* sp. and European eel *Anguilla anguilla*.

Additional records of common and widespread fish species were also present and included Minnow *Phoxinus phoxinus*, Perch *Perca fluviatilis*, Pike *Esox Lucius*, Roach *Rutilus rutilus*, three-spined Stickleback *Gasterosteus aculeatus,* and Stone loach *Barbatula barbatula*.

The non-native Rainbow trout *Oncorhynchus mykiss* was also identified, although it is assumed specimens are escaped stocked fish or farmed fish, as there are no self-sustaining populations within Scotland.

7.8.3 Aquatic Ecology Field Survey

7.8.3.1 Aquatic Habitats - Flowing Watercourses

Flowing watercourses throughout the Site represent the SBL priority habitat Rivers, as small fast-flowing headwaters. The main notable watercourses within the red line boundary are Erallich Water, River Aray, Allt Blarghour, and Allt Beochlich. The first two watercourses flow south into Loch Fyne, while the latter two watercourses flow west into the freshwater Loch Awe. Together with minor tributaries, land drains, ponds, lochans and upland flushes, these water bodies form an important network of aquatic habitats.

7.8.3.2 Water Framework Directive Water Bodies

Erallich Water is a river (ID: 10225) in the Loch Fyne Coastal catchment of the Scotland river basin district. The main stem of this river is approximately 8.4 kilometres in length. Survey site BL-02 was located toward the centre of this stem, with brown trout present at the site. Site BL-01 was also located on a tributary of this watercourse and multiple brown trout and one individual of salmon were caught during fish surveys. The river is monitored under the WFD, with a current WFD (2020) overall ecological status of 'Moderate' due to the biological element fish ecology, being classified as 'Moderate'.

The River Aray is a river (ID: 10224), in the Loch Fyne Coastal catchment of the Scotland river basin district. The main stem is approximately 13.4 kilometres in length, which flows south into Loch Fyne. The river is designated under the WFD, with a current WFD (2020) overall ecological status of 'Moderate' due to the biological element fish ecology, being classified as 'Moderate'. Survey site BL-22 is near the northern end of this watercourse before the watercourse crosses under the A819. Brown trout were also identified at BL-22.

Allt Blarghour is a river (ID: 10274), in the River Awe catchment of the Scotland river basin district. The main stem is approximately 8.5 kilometres in length. The river is designated under the WFD, with a current WFD (2020) status of 'Moderate' driven by hydromorphology, classified as 'Moderate'. Survey site BL-03 is located on a tributary of this river.

Allt Beochlich is a river (ID: 10275), in the River Awe catchment of the Scotland river basin district. The main stem is approximately 7.7 kilometres in length. The river has a current WFD (2020) status of 'Moderate' due to hydromorphology - hydrology (medium/high flows), classified as 'Bad'. Survey sites BL-04 and BL-05 are both situated on the watercourse, with the Lochan sites BL-20 and BL-21 on tributary watercourse to Allt Beochlich.

Other flowing watercourses on the Site are not designated under the WFD, although feed into WFD water body catchments, and these include:

- The watercourse Allt a' Chrosaid into the River Aray, on which BL-07 is located;
- The watercourse Allt a' Gheataidh, which flows into Loch Awe, on which BL-17 is located;
- The watercourse unnamed tributary of River Aray on which BL-23 is located;
- The watercourse unnamed tributary of Achan River on which BL-24 is located;
- The watercourse unnamed tributary of Keppochan River on which BL-25 is located; and,
- The watercourse unnamed tributary of Allt na Cuile Riabhaiche on which BL-26 is located.

No previous monitoring data is available for these watercourses. However, baseline surveys have provided detail of the biological water quality within the watercourses. This is assessed as Very good/unimpacted at nine sites and Good/slightly impacted at two sites. However, the Good/slightly impacted sites are likely to be subject to natural pressures such as peat runoff and siltation, rather than anthropogenic impacts of organic pollution. However, there was evidence of recent deforestation alongside watercourses, notably BL-22 to BL-26, which may have contributed to this impact. The watercourses were also assessed as of moderate conservation value (based on the macroinvertebrate community present) at eight sites, and fairly high / high conservation value at three sites.

The flowing watercourses within the Development Site provide sustainable areas of priority habitat that form an essential component of the network of aquatic habitats, including other priority habitats, in the area of the Development. In addition, these watercourses have been assessed as providing suitable habitat for SBL priority species including brown trout and salmon.

Due to the prevalence of watercourses of this type locally, the majority of watercourses within the Development Site are assessed as of Local value.

However, due to the potential for four watercourses to provide suitable spawning habitat for salmonids, with brown trout caught at BL-01, BL-02 and BL-22, and Atlantic salmon caught at BL-01, these watercourses are assessed as of Regional value:

- Allt Criche (tributary of Erralich Water): BL-01 – Atlantic salmon presence and spawning habitat;
- Erralich Water: BL02 – brown trout spawning habitat;
- River Aray: BL-22 – brown trout spawning habitat; and
- Unnamed tributary of River Aray: BL-23 – brown trout spawning habitat.

7.8.3.3 Aquatic Habitats - Lochs and Lochans

Two lochs are present within the red line boundary of the Development, Loch Awe and Loch Fyne.

Loch Awe is designated as a WFD lake water body (ID: 100585), in the River Awe catchment of the Scotland river basin district, totalling 38.0 km^2 in area. It is one of the four largest lochs in Scotland and is the longest lake in Great Britain at 41 km. This Loch has been designated as a heavily modified water body, based on physical alterations that cannot be addressed without a significant impact on water storage for current hydroelectricity generation (Cruachan Power Station). It has a current WFD (2022) overall ecological potential of 'Moderate'. Hydrology and hydromorphology elements are classified as 'Poor', while biological parameters are overall classified as 'Moderate' driven by aquatic plants (macrophytes).

The fish barrier element for Loch Awe is classified as High status, indicating that there are no barriers to fish migration in Loch Awe. Likewise, the downstream River Awe water body is also classified as High status for the fish barrier element, indicating that there are no barriers to fish passage between the River Awe and Loch Awe. Outflow from Loch Awe is controlled by the operation of the Loch Awe Barrage, operated by Scottish and Southern Energy (SSE). The barrage consists of three gates, a fish pass, and two turbines. The operation of these structures (opening or closing gates and abstracting water) determines the outflow from Loch Awe. Operation aims to keep water levels within specific ranges for the Summer (April-November) and Winter (December-March) periods.

Loch Awe is assessed as of National value as it represents SBL Priority Habitat Oligotrophic and dystrophic lakes and is an important resource of large lochs of this size nationally.

Loch Fyne (Upper Basin) is a coastal water body (ID: 200334), in the Scotland river basin district. It is 47.3 km^2 in area. It is designated under the WFD, with a current WFD (2020) overall status of 'Good' due to Good-High classification for hydromorphological and ecological parameters. Loch Fyne is described and assessed in detail in *Chapter 8 Marine Ecology*.

Lochan Airigh is a small loch of approximately 2.4 ha; therefore, it satisfies the criteria as priority habitat: oligotrophic and dystrophic lakes of surface area larger than 1 ha. It drains into Loch Awe through a tributary of the WFD designated river Allt Beochlich. Lochan Airigh does not constitute a designated site and there are no records of protected species therein.

Lochan Breac-Iiath is another small loch of approximately 0.016 km^2; therefore, it satisfies the criteria as priority habitat: oligotrophic and dystrophic lakes of surface area larger than 1 ha. It also drains into Loch Awe through a tributary of WFD designated river Allt Beochlich, via another water body, Lochan Romach.

It is considered that both Lochans represent a receptor of Regional value as small areas of priority habitat that are an important component of this habitat resource locally.

7.8.4 Freshwater Pearl Mussel

No optimal riverbed FWPM habitat (boulder-stabilised deposits of clean sand) was observed at any of the surveyed sites. However, potential sub-optimal habitats (small patches of coarse sands and gravels) that may support small numbers of adult mussels, were noted at sites BL-01, BL-02, BL-04, BL-07, BL-22.

No evidence of FWPM (mussels, shells) was found at any site, and no historical records were found in the Development Site during the desk study. Therefore, FWPM are considered absent from water bodies within the Development Site, and this species is not considered further in the assessment.

7.8.5 Macrophytes

7.8.5.1 Flowing Water Habitats (BL-01, 02, 04, 05, 06, 07, 17, 22, 23, 25 and 26)

No rare or notable species were recorded within any of the survey sites. The sites surveyed were on small oligotrophic headwater streams and supported typical macrophyte communities characterised by an abundance of bryophytes, with higher plants limited and generally confined to the margins and riparian zone. Margins were therefore typified by emergent rushes and sedges, and plants of transitional wetland habitat.

These macrophyte communities are considered typical of upland watercourses in this part of Scotland. The steep gradients, resulting high velocity flow conditions, and unstable substrates, do not allow the development of extensive or diverse stands of macrophytes, while bryophytes, which are able to cope with these conditions, dominate. Although there was a slight increase in the diversity of vascular plants within sites with less dynamic flow conditions (such as BL- 17 and BL-22), the sites were still relatively species-poor, as is expected under these habitat conditions.

Similar macrophyte communities are likely to be very common across the wider landscape and therefore the macrophyte communities encountered are considered of Negligible conservation value.

7.8.5.2 Loch Awe (BL18 and BL19)

No rare or notable species were recorded within either of the survey sites on Loch Awe. The current WFD status for aquatic macrophytes and phytobenthos (diatoms) in Loch Awe is 'Moderate' and 'High' (Cycle 2: 2016) respectively. The communities surveyed were species poor and the species present are typical of a large oligotrophic lake.

The macrophyte community was similar at both survey sites and does not indicate that the potential intake and outfall locations are a particularly sensitive area for aquatic macrophytes. The communities present are likely to occur in numerous other locations within Loch Awe and in other similar lochs within the local area. As such, macrophyte community is of Negligible conservation value.

Both sites are exposed and subject to dynamic conditions, which combined with seasonally fluctuating water levels, limit the available niches for plants to exploit.

7.8.5.3 Standing Water (Lochan Airigh BL-20 and Lochan Breac-liath BL-21)

No rare or notable species were recorded within either lochan. The communities surveyed were species-poor and typical of upland oligotrophic lakes of this type.

The macrophyte communities present were similar to the flowing sites and supported a number of species typical of transitional habitats located between upland acid grassland and adjacent areas of standing and flowing water. Rush, reed, and moss species were recorded that grow on drainage impeded ground and the margins of water bodies. The diversity of strictly aquatic species was limited to spearwort, water milfoil, and broad-leaved pondweed. These macrophyte communities were similar at both sites and the communities present are likely to occur in numerous other locations in similar lochs within the local area. As such, macrophyte community is of Negligible conservation value. However, macrophyte cover does provide a valuable local resource for fauna, in particular aquatic macroinvertebrate community.

7.8.6 Macroinvertebrates

The majority of surveyed sites were classified as having Moderate conservation value, while three sites (BL-02, Bl-05 and BL-23) scored Fairly high conservation value under the CCI index. The survey sites of Loch Awe received a Low conservation value at BL-18, at the site of the intake, and Very High conservation value at BL-19, near the outflow of the River Awe from Loch Awe.

There were no taxa recorded that were Red Data Book RDB1 (Endangered) or RDB2 (Vulnerable), but one species of RDB3 (Rare) was found at BL-19, the diving beetle *Oreodytes davisii*. Several Locally Notable (but not RDB status) species were also present within the Development Site. The diving beetle *Agabus arcticus* was found in Lochan Airigh at BL-20. Although it is not rare and is widespread through Scotland, its distribution is limited by specific habitat requirements within montane lakes. However, in the local context, these habitats are fairly common and as such it can be expected to occur wherever there are comparable habitats. Most caddisflies identified were of common or lower conservation status with the exception of the Locally Notable caddisfly *Limnephilus bipuncatus*, which was found within the community at BL-06. A singular species of alderfly was recorded from macroinvertebrate samples and was later identified as the Locally Notable *Sialis fuliginosa* at BL-22.

Stonefly presence was extensive among most sites with two Locally Notable species present, as classified by their conservation score. The stonefly *Protonemura meyeri* was widespread among the survey sites, being found at 10 sites, only not being found on the shores of Loch Awe and at two running water sites (BL-06 and BL-24). An additional two records of the Locally Notable *Protonemura praecox* was also found on the hillside of Loch Awe at BL-05 and BL-07. Although both species are Locally Notable, both seem to be locally abundant as they are found in small stony streams, typical of those found within the Development Site.

Survey sites were also assessed to determine if they were potentially impacted by organic pollution using the WHPT and ASPT metrics. Nine of the fourteen assessed survey sites had WHPT scores that were indicative of very good, unpolluted and unimpacted status. A further three survey sites (BL-06, BL-17, BL-18) attained a good, clean but slightly impacted status and two survey sites (BL-14 and BL-19) were classified as poor, polluted or impacted. Two survey sites were Lochans. Similarly, BL-14 on Loch Fyne and BL-18 and BL-19 on Loch Awe are on the shores of Lochs so scores should be treated with caution as proportionally a small area of the Lochs has been sampled and assessed.

While several survey sites were found to support an aquatic macroinvertebrate community indicative of very good, unpolluted and unimpacted status, all species recorded were widespread and common. Therefore, the aquatic macroinvertebrate community throughout the Development Site is assessed as of Local value, and similar macroinvertebrate communities are likely to be common across the wider landscape.

7.8.7 Fish Habitat and Fish Species

7.8.7.1 Fish eDNA

Previous eDNA results from Loch Awe, in 2021, indicated the presence of three protected fish species; European eel (IUCN Critically Endangered, UKBAP and Scottish Biodiversity List (SBL) Priority Species), brown/sea trout (UKBAP and SBL Priority Species), and Atlantic salmon (Annex II Habitats Directive, UKBAP, and SBL Priority Species).

Arctic charr (SBL Priority Species; UKBAP species), pike, Lamprey, and three-spined stickleback, were not detected by eDNA survey but are known to be present in Loch Awe (SEPA survey database). Sea lamprey and river lamprey are listed in Annex II of the Habitats Directive and are UKBAP and LBAP priority species (Argyll and Bute LBAP, JNCC. 2007).

The presence of carp at site BL-18 and rainbow trout at site BL-19 are due to their introduction as sport fish and/or proximity to a nearby fish farm.

7.8.7.2 Fish Species and Assessment of Value

Due to the high gradient, steep banks, and the number of impassable barriers for migration throughout the catchment, migratory species including salmon, sea trout, sea lamprey and river lamprey are considered unlikely to be present and utilising the flowing watercourses for spawning throughout the west of the Development Site (sites BL-01, 02, 03, 04, 05, 06, 07, 17, 20 and 21).

Salmon and sea trout are also unlikely to be utilising the margins of Loch Awe or Loch Fyne to spawn as it is widely understood that migratory salmonids prefer to spawn in rivers and streams (Jonsson and Jonsson, 2011). Migratory species however will be utilising Loch Fyne as a migratory pathway from the sea to rivers such as the River Aray and Erralich Water, in which salmon and brown/sea trout have been found. Migratory species are considered not to be utilising the watercourses on the Development Site entering Loch Awe due to their steep nature, and the presence of multiple natural and artificial barriers to fish migration along the loch margins.

From eDNA surveys in 2021, Atlantic salmon and brown trout were present in Loch Awe, most likely utilising it as a migratory route between the sea and their spawning grounds. Lamprey species (brook and river) are also European protected species (listed in Annex II of the Habitats Directive) and are likely still present in Loch Awe, as indicated by SEPA eDNA surveys in 2016. As European protected species and in the case of salmon an endangered species in the UK (IUCN, 2024[1]), these species are assessed as of **National value**.

Loch Awe supports a community of priority fish species including the species Arctic char, European eel, Atlantic salmon, and brown trout, together with a wider range of more common species. Together this fish community is assessed as of **National value** due to the presence of a community including SBL priority species.

Brown trout is listed as a SBL priority species, with isolated lochs and watercourses potentially containing genetically distinct populations. The desk study highlighted a population at BL-20, on Lochan Airigh, which is likely isolated by the dam downstream on Allt Beochlich, near the survey site BL-04. Fish surveys could not be completed at BL-04 in 2023, although presence is likely as this species is found upstream in the Lochans. If brown trout are present, these would be small populations restricted due to the size of the watercourses and abundance of foodstuffs from macroinvertebrates or allochthonous input.

Limited habitat to support resident and spawning fish species was found during the baseline surveys. Only four survey sites; BL-01, BL02, BL-22, and BL-23, were identified to provide suitable spawning habitat for salmonids. During subsequent fish surveys at these sites, brown trout were caught at BL-01, BL-02 and BL-22, in addition to one specimen of Atlantic salmon caught at BL-01. Small patches (<1 m^2) of suitable salmonid spawning habitat were also noted at four more survey sites: BL-04, BL-07, BL-25, BL-26. However, it should be noted that the steep gradients and numerous natural and artificial obstacles likely prevent or restrict fish migration within these watercourses.

As such, Atlantic salmon populations in Allt Criche (tributary of Erralich Water): BL-01 are assessed as of **National value**.

Due to the prevalence of habitat for brown trout locally, and the likelihood that these represent resident rather than migratory populations due to the presence of natural and artificial barriers to migration, this species is considered as of **Local value**.

[1] IUCN (2024). Atlantic Salmon *Salmo salar* (Great Britain subpopulation) https://www.iucnredlist.org/species/213546282/213546288#geographic-range

Some survey sites could potentially support small numbers of European eel, but natural and artificial obstacles severely restrict fish movements and have reduced the chance of colonisation. Similarly, the steep gradients of the watercourses, in addition to a lack of suitable riverbed substrates (stable fine sand deposits) are unlikely to support suitable nursery habitats for lamprey ammocoetes (larvae). Although both species were not observed during fish habitat or fish surveys, their presence is likely within the wider red line boundary of the Development, due to persistent identification during eDNA surveys in Loch Awe between 2016 and 2023.

There is limited potential for resident salmonids to disperse widely through the Development Site due to the presence of multiple barriers to migration. This is especially evident at survey sites to the west of the development but within the Development Site boundary, where large artificial and natural obstacles to fish migration and passage have been observed, together with the lack of fish caught during surveys. The River Aray and Erralich Water are the only watercourses found to support notable fish populations during surveys.

Other fish species present within the Development Site are widespread and common and are assessed as of **Local value**.

7.8.8 Invasive Non-Native Species

7.8.8.1 INNS Macrophytes and Plants

Macrophyte INNS were recorded at two sampling sites, BL-14 and BL-19.

Japanese knotweed and Himalayan balsam were both identified above the strandline at BL-14 in 2019 and 2023, in long extensive stands over 10 m in width. Both are Schedule 9 species in the WCA, and therefore it is an offence to release them or otherwise cause them to grow in the wild.

A fragment of waterweed (*Elodea* sp.) was present within the strandline at BL-19 in 2019. Although it was not possible to identify the species, this genus is listed as a Schedule 9 species in the WCA in the case of Canadian pondweed *Elodea canadensis*, and as a Species of Special Concern in Scotland in the case of Nuttall’s waterweed *Elodea nuttallii* (under EU Regulation (1143/2014) on the prevention and management of the introduction and spread of invasive alien species).

Nuttall’s waterweed, Canadian pondweed, and New Zealand pigmyweed have been previously recorded within Loch Awe. As sampling surveys were limited to shallower water, there is the potential for these species to occur in close proximity to the area of the Development. Their absence from the survey data in 2023 should not be interpreted as absence from Loch Awe.

7.8.8.2 Non-native Macroinvertebrates

Macroinvertebrate non-native species were present at three sampling sites. The invasive amphipod *Crangonyx pseudogracilis* was present at survey location BL-19 (Loch Awe). This is the only surveyed site in which this species was recorded, and only four individuals were found, indicating low species density. It was not present in the other Loch Awe sampling location (BL-18) or in the smaller water bodies (BL-05, BL-06, BL-07 and BL-17) surveyed nearby.

The New Zealand mud snail was present at BL-06 and BL-17, outfall tributaries to Loch Awe on the western side of the Development.

C. pseudogracilis and the New Zealand mud snail are not listed in Schedule 9 of WCA, and therefore there is no legislative restriction on their spread, or requirement for their control. However, SEPA and NatureScot monitor data on the distribution of these species to inform WFD classification, and therefore appropriate precautions should be implemented to prevent their spread.

The presence of INNS presents potential risks to native species and habitats, and therefore the assessment of impacts will be in relation to those species and habitats rather than to the INNS themselves.

7.8.9 Future Baseline

7.8.9.1 Baseline at Time of Construction

Construction of the Development is expected to start in 2027 and is expected to last up to 7 years, including the pre-construction works to complete. As stated below, no major land use changes are expected within the Development Site prior to commencement of construction. No meaningful changes to the environment within the Development Site are therefore likely before construction starts.

Changes in the distribution of freshwater aquatic species before the commencement of construction are considered unlikely due to the stability of aquatic habitats, and the existence of natural and artificial barriers to fish migration, which limit fish communities present under current circumstances. Any such changes are very likely to be within the range of normal inter-annual variation in the distribution and abundance of species populations.

It is therefore expected that the current baseline conditions will remain largely unchanged by the time of construction of the Development.

7.8.9.2 Baseline in the Absence of the Development

In the absence of the Development, the Development Site is likely to continue to be used for sheep grazing, and no major change in the baseline conditions with respect of freshwater aquatic ecology are expected. No major changes to baseline conditions are expected around the town of Inveraray, at the location of the Marine Facility, Construction Compounds, and Access Tracks.

7.8.10 Importance of Ecological Features

The assessed importance of those ecological features identified in the baseline conditions, and which have not been screened out above, is set out in *Table 7.6 Importance of Ecological Features*, below, together with rationale for the assessment. Ecological importance has been assessed considering geographic scale (as per CIEEM (2016) guidelines) and is used in this chapter as a surrogate for 'sensitivity' as defined in Chapter 4: Approach to Environmental Impact Assessment. The approach to valuing ecological features is described in detail in Appendix 6.1: Method for Assessment of Ecological Impacts.

Table 7-6 Importance of Ecological Features

Ecological Feature	Importance	Rationale
Habitats		
Loch Awe: SBL Oligotrophic and dystrophic lakes	High (National)	Loch Awe is assessed as of National value as it represents SBL Priority Habitat Oligotrophic and dystrophic lakes and is an important resource of large lochs of this size nationally.
Lochan Airigh and Lochan Breac-liath: SBL oligotrophic and dystrophic lakes of surface area larger than 1 ha	Medium (Regional)	Both Lochans represent a receptor of Regional value as small areas of SBL priority habitat: oligotrophic and dystrophic lakes of surface area larger than 1 ha, that are an important component of this habitat resource regionally.
Flowing watercourses: SBL Rivers: Allt Criche (tributary of Erralich Water): BL-01 Erralich Water: BL02 River Aray: BL-22 Unnamed tributary of River Aray: BL-23	Medium (Regional)	Sustainable areas of SBL priority habitat: Rivers that form an essential component of the network of aquatic habitats, including other priority habitats, in the Development Site. Provide suitable habitat, including spawning habitat, for the SBL species Atlantic salmon and brown trout.
Flowing watercourses: SBL Rivers: All other watercourses and water bodies within the Site	Low (Local)	Sustainable areas of SBL priority habitat: Rivers that form an essential component of the network of aquatic habitats, including other priority habitats, in the Development Site.
Species		
Aquatic macrophyte assemblage: All water bodies	Negligible	The communities present are likely to occur in numerous other locations and in other similar lochs and water bodies within the local area. However, macrophyte cover does provide a valuable local resource for fauna, in particular aquatic macroinvertebrate community.
Aquatic macroinvertebrates	Low (Local)	While several sites were found to support an aquatic macroinvertebrate community indicative of very good, unpolluted and unimpacted status, all species recorded were widespread and common. Similar macroinvertebrate communities are likely to be common across the wider landscape.
Atlantic salmon, brown/sea trout, arctic char, European eel, and lamprey species (Loch Awe)	High (National)	Loch Awe is a migratory route between the sea and spawning grounds, although these do not include watercourses within the Development red line boundary. Salmon and lamprey species are European protected species and are present in Loch Awe. Loch Awe supports a fish community of several notable species, including SBL species.

Ecological Feature	Importance	Rationale
Atlantic salmon in Allt Criche (tributary of Erralich Water): BL-01	High (National)	Salmon is a European protected species listed in Annex II of the Habitats Directive, and an endangered species in the UK (IUCN, 2024), as well as a SBL species. Salmon was caught at BL-01 and suitable salmonid spawning habitat was identified.
Brown/sea trout in four watercourses: Allt Criche (tributary of Erralich Water): BL-01 Erralich Water: BL02 River Aray: BL-22 Unnamed tributary of River Aray: BL-23	Low (Local)	Brown/sea trout is a SBL priority species. BL-01, BL02, BL-22, and BL-23, were identified to provide suitable spawning habitat for salmonids. During subsequent fish surveys at these sites, brown trout were caught at BL-01, BL-02 and BL-22. Similar habitat is abundant locally, and the habitat resource within the red line boundary is considered of Local significance given natural and artificial barriers to fish migration limit the dispersal of trout locally.
Other fish species (All water bodies)	Low (Local)	Water bodies support a broader community of common and widespread fish species.
INNS	N/A	INNS represent a threat to native species and habitats, and it is an offence to cause their spread during construction or operation of the Development. Therefore, mitigation will be required to ensure biosecurity and prevent the spread of INNS during construction and operation and is included within *Appendix 3.1 Outline CEMP (Volume 5 Appendices*). However, with the Development being a 'closed-loop' system, there is a low risk of the spread of INNS to adjacent catchments during operation.

7.9 Assessment of Effects

Relevant ecological features are those that are considered to be 'important' and have the potential to be affected by the Development (CIEEM, 2016). In view of the baseline data obtained through desk study and field survey, the following features have been excluded from further assessment because they have been found to be absent from the Development Site or it is clear that no effect from the Development is anticipated:

- **Glen Etive and Glen Fyne SPA** – There is no hydrological connectivity between the Development and this SAC, and therefore it is not considered further in the Aquatic Ecology assessment – refer to Chapter 6 Terrestrial Ecology and Chapter 9 Ornithology for the assessment of impacts in relation to this site.
- **Glen Shira SAC –** There is no hydrological connectivity between the Development and this SAC, and therefore it is not considered further in the Aquatic Ecology assessment – refer to Chapter 6 Terrestrial Ecology for the assessment of impacts in relation to this site.
- **Loch Etive Woods SAC –** There is no hydrological connectivity between the Development and this SAC, and therefore it is not considered further in the Aquatic Ecology assessment – refer to Chapter 6 Terrestrial Ecology for the assessment of impacts in relation to this site.
- Sites with non-statutory designation for nature conservation – there are no such sites within 2 km of the Development.
- **Freshwater Pearl Mussel –** No evidence of FWPM (mussels, shells) was found at any site, and no historical records were found in the Development area during the desk study. Therefore, FWPM are considered absent from water bodies within the Development Site, and this species is not considered further in the assessment.
  - This assessment should be read in conjunction with Chapter 11: Water Environment, which presents the assessment of impacts to surface water and groundwater receptors. Therefore, there is overlap with the assessment of impacts on freshwater ecology presented in this chapter.
  - The impact assessment for Loch Fyne and its shoreline is presented in *Chapter 8: Marine Ecology*, and impacts in this location are not considered further in this chapter.

7.9.1 Construction Effects

Considering the above, the potential effects during construction of the Development on aquatic ecological features that require impact assessment are considered to comprise the following:

- Loss of habitat which supports freshwater aquatic species as a result of the construction of infrastructure associated with the Development;

- Loss of Lochan Airigh and part of the upstream catchment of Allt Beochlich / Buinne Dhubh as a result of construction of the Headpond and Embankments (refer to *Chapter 11: Water Environment* for further details, and also operational effects below).

- Disturbance to and/or displacement of species during construction, operation and/or decommissioning;
- Impacts resulting from the construction of the cofferdam on the shoreline of Loch Awe at the inlet/outlet location, including piling, de-watering and substrate removal;
  - Cofferdam (during Construction) – a Cofferdam will be installed in Loch Awe, which is a water-tight, temporary structure that will encircle the area required for the Tailpond works. The area within the Cofferdam will be pumped dry to facilitate the construction of the Tailpond inlet / outlet Structure.
- Effects of construction of the temporary Marine Facility and delivery of abnormal indivisible loads (AILs) by barge;);
- Effects as a result of watercourse crossings for temporary Access Tracks and temporary site compounds, including culverting of watercourses;
- Effects as a result of construction of the Headpond and Headpond Embankments, including land take and transport of excavated material;
- Effects due to the transport of excavated tunnel material to Headpond via dump trucks, and spoil management of material from tunnelling works;
- Effects as a result of temporary site drainage, including SUDs, settlement ponds, temporary ditches and other drainage features;
- Effects of general plant movement throughout the Development Site;
- Potential effects resulting from the spread of INNS through the Development Site, notably from Loch Awe during de-watering and substrate excavation, and effects of transporting materials onto or away from the Development Site and the potential introduction of INNS.

Table 7.7 Locations of Proposed and Potential Impacts to Watercourses and Water Bodies, below provides a summary of all proposed impacts to watercourses, whether from proposed new crossing points (culverts or bridges), potential upgrades to existing Access Tracks, or sections of watercourses lost due to construction of the Headpond and Embankments.

Table 7.7 Locations of Proposed and Potential Impacts to Watercourses and Water Bodies

Impact to Water Body	Watercourse Name	Grid Reference
Three Bridges Access Track, to be constructed for Blarghour Wind Farm - construction impacts are excluded from the assessment, but operational impacts for all watercourse crossings are considered.	Allt Crìche (Trib of Erallich Water)	NN 07257 12590
	Unnamed Trib of Erallich Water	NN 07367 12353
	Unnamed Trib of Erallich Water	NN 07357 12147
	Unnamed Trib of Erallich Water	NN 07585 12018
	Allt Crìche (Trib of Erallich Water)	NN 08740 12424
	Unnamed Trib of Erallich Water	NN 05749 12006
	Unnamed Trib of Erallich Water	NN 06046 12067
	Unnamed Trib of Alltan Airigh Mhic Choinnich	NN 05096 12370
	Unnamed Trib of Alltan Airigh Mhic Choinnich	NN 04950 12494
	Unnamed Trib of Alltan Airigh Mhic Choinnich	NN 04744 12657
	Unnamed Trib of Allt Blarghour	NN 04042 13011
	Unnamed Trib of Allt Blarghour	NN 04001 13273
	Unnamed Trib of Allt Blarghour	NN 03945 13339
	Unnamed trib of Allt na h-Airigh	NN 03637 13580
	Unnamed trib of Allt na h-Airigh	NN 03595 13701
	Unnamed trib of Allt na h-Airigh	NN 03602 13825
	Unnamed trib of Allt na h-Airigh	NN 03634 14001
	Unnamed trib of Allt na h-Airigh	NN 03800 14243

Impact to Water Body	Watercourse Name	Grid Reference
	Pond/Lake	NN 03893 14434
	Bog area	NN 04128 14777
	Bog Area	NN 04154 14939
Existing Access Tracks to be upgraded	Unnamed Trib of Allt Beochlich	NN 02064 15280
	Unnamed Trib of Allt Beochlich	NN 01993 15371
	Unnamed Trib of Allt Beochlich	NN 01541 15543
	Unnamed water course into Loch Awe	NN 01186 15650
	Allt Beochlich	NN 00577 15361
	Unnamed water course into Loch Awe	NN 00945 15652
	Allt a' Chrosaid	NN 01135 16078
	Allt a' Gheataidh	NN 01148 16320
Upper Sonachan Access Track to be constructed / upgraded – main Access Track for the Development from the north-east	Unnamed Trib of Allt na Cùile Riabhaiche	NN 06190 18709
	Unnamed Trib of Archan River	NN 07611 19570
	Unnamed Trib of Allt na Cùile Riabhaiche	NN 05432 18078
	Unnamed Trib of Allt na Cùile Riabhaiche	NN 05507 18079
	Unnamed Trib of Allt na Cùile Riabhaiche	NN 05631 18096
	Unnamed Trib of Allt na Cùile Riabhaiche	NN 05691 18183
	Unnamed Trib of Keppochan River	NN 06750 19328
	Unnamed Trib of Keppochan River	NN 06878 19345
	Unnamed Trib of Archan River	NN 08107 20069
	Unnamed Trib of Archan River	NN 08176 19937
	Unnamed Trib of Archan River	NN 09024 20391
	Allt na Cùile Riabhaiche	NN 05037 17944
Proposed Culvert / Bridge (new infrastructure for the Development)	Unnamed trib of Allt Beochlich	NN 02614 15966
	Unnamed trib of Allt Beochlich	NN 02997 15896
	Buinne Dhubh	NN 03602 15972
	Unnamed trib of Buinne Dhubh	NN 03545 15974
	Unnamed trib of Buinne Dhubh	NN 03769 16842
	No symbol for culvert - floating transition	NN 04012 16707
	No symbol for culvert - floating transition	NN 04581 15248
	Allt Mòr	NN 05393 15920
	Buinne Dhubh	NN 05344 15842
	Unnamed trib of Buinne Dhubh	NN 05108 15574
	Unnamed trib of Buinne Dhubh	NN 05499 16379
	Unnamed trib of Buinne Dhubh	NN 05302 16578
	Unnamed trib of Buinne Dhubh	NN 05256 17064
	Unnamed trib of Buinne Dhubh	NN 05252 17181
	Buinne Dhubh	NN 03744 15903
	Allt Mòr	NN 04162 15130
	Allt Mòr	NN 04316 15143
	Allt na Fainge	NN 01143 16496
	Trib of Cròm Allt	NN 08374 07473

Impact to Water Body	Watercourse Name	Grid Reference
Water body and watercourses lost for Headpond and Embankments	Lochan Airigh and 12 further tributaries of the Allt Beochlich / Buinne Dhubh catchment	NN 04319 16454 (Lochan Airigh)

7.9.2 Operational Effects

The potential effects during operation of the Development on aquatic ecological features that require impact assessment are considered to comprise the following:

- Effects on water levels in Loch Awe due to regular generation cycles with water pumped up to the Headpond then returned to the loch. Corresponding effects on the Loch Awe Barrage, associated fish lift, and fish passage, due to fluctuating water levels.
- Lasting effects of the inlet / outlet structure on the Loch Awe shoreline, including effects in relation to loch priority habitat, fish (e.g., entrainment, impingement, and distraction from migratory routes), and INNS;
- Effects as a result of watercourse crossings for permanent Access Tracks, including permanent culverting of watercourses;
- Effects as a result of permanent Construction Compounds, including land take and permanent culverting of watercourses;
- Effects due to utilities and diversions, including public road diversion, core paths, and new watercourse crossing points;
- Permanent effects as a result of the Headpond and Embankments, including land take and drainage, and impacts to the hydrological regime of downstream watercourses;
  - The construction of the Headpond will result in the loss of a proportion of the Allt Beochlich / Buinne Dhubh hydrological catchment (refer to Chapter 11 Water Environment for further detail).
  - Loss of a large proportion of the catchment may result in significant changes to the hydrology and the flow regime of the Allt Beochlich / Buinne Dhubh, in the absence of mitigation such as compensation flow into the downstream catchment (refer to Chapter 11 Water Environment for further detail).
  - Reduced flows may correspond to a drying up of parts of the bed and reduced aquatic habitat along the river corridor.
- Effects resulting from permanent site drainage, including SUDs, settlement ponds, temporary ditches, and other drainage features;
- Effects due to the spread of INNS through the Development Site as a result of operation of the Development, for example from Loch Awe to the Headpond and connected catchment, especially if compensation flows are required to downstream watercourses.

7.9.3 Assessment of Construction Effects

7.9.3.1 Cofferdam Construction (Loch Awe)

There will be temporary disturbance to the shoreline and margins of Loch Awe, with the temporary cofferdam extending out into the loch. The Cofferdam, which is a water-tight, temporary structure that will encircle the area required for the Tailpond works. The area within the Cofferdam will be pumped dry to facilitate the construction of the Tailpond inlet / outlet Structure.

The effects on habitats within Loch Awe (High value) will be localised to the relatively small area of the cofferdam (< 0.05% of the total loch area). These effects will consist of disruption and removal of substrate, including dredging after removal of the cofferdam, and de-watering of this area. Due to the small area to be temporarily impacted, this is considered to represent a Low magnitude impact, resulting in a **temporary Moderate adverse effect**.

The migratory route of salmon and other migratory species through Loch Awe is not known, but it is likely that these species will be present in the vicinity of the cofferdam during their migration: late spring and early summer for salmon smolt migration; late autumn or early winter for adult migration.

Potential impacts on the assemblage of fish in Loch Awe including Atlantic salmon, brown/sea trout, arctic char, European eel, and lamprey species (High value receptor) through the cofferdam construction include:

- Direct mortality or physical injury through construction, piling and de-watering activities;
- Physical injury as a result of piling noise – although the effects of piling noise vary with size of piles and blow energy, under the most likely scenario (vibro-driven piles, so percussive noise will be kept to a minimum), auditory injury to salmon is calculated to occur out to approximately 20 m from the noise source, a strong avoidance reaction is calculated to occur out to 330 m and a significant avoidance behaviour reaction is calculated to occur out to 2.1 km (Mason and Collett, 2011);
- The impacts of piling noise on other fish species remains largely unstudied (Hawkins and Popper, 2012); however, the effects are likely to be similar to those for salmon described above.
- Avoidance reaction by salmon, potentially disrupting the migratory pathway.

In the absence of mitigation, the potential effects on this fish assemblage in Loch Awe through construction of the cofferdam are considered of Medium magnitude due to the disruption of migratory behaviour and potential mortality and physical injury to fish, including Atlantic salmon. This would result in a **temporary Moderate adverse effect**.

Effects on aquatic macrophytes (Negligible value), and macroinvertebrates and other fish species (Low value) through the cofferdam construction are considered Negligible, resulting in a **Negligible effect** that is effectively a 'no change' situation and not significant.

Effects due to the potential spread of INNS through cofferdam construction are considered in the relevant sections below.

7.9.3.2 Watercourse Crossings for Temporary Access Tracks and Temporary Site Compounds, Including Diversion and Culverting of Watercourses

Watercourse crossings will be required for temporary Access Tracks to provide access to Construction Compounds and the Headpond and Embankments, and for the compounds themselves (refer to *Table 7.7 Locations of Proposed and Potential Impacts to Watercourses and Water Bodies*). Where possible, existing crossing points will be utilised; however, these may need to be upgraded by the use of closed-pipe (culvert) crossings or bottomless arch watercourse crossings.

Watercourses throughout the Development Site are assessed as of Medium value (Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, Unnamed tributary of River Aray: BL-23) or otherwise Low value. Where diversions are required or culverts for temporary watercourse crossings it is not clear whether these will be removed upon completion of the temporary works, and therefore these will be assessed as permanent features. This is considered a Medium magnitude permanent **Moderate adverse effect** due to the loss or alteration of sections of watercourses.

Atlantic salmon are present in Allt Criche (tributary of Erralich Water): BL-01, and brown/sea trout are present in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, Unnamed tributary of River Aray: BL-23. Due to the potential spawning habitat present in these watercourses, culverting of these watercourses may have an impact on fish passage and spawning habitat for species of up to High importance (salmon). Therefore, this is assessed as a Medium magnitude permanent **Moderate adverse effect**.

The effects on other watercourses of Low value of permanent or temporary watercourse crossings is assessed as a Medium magnitude permanent **Minor adverse effect.**

Effects on aquatic macrophytes (Negligible), macroinvertebrates (Low), and other fish (Low value) through watercourse crossings are considered of Low magnitude, resulting in a **Negligible effect** that is effectively a 'no change' situation and not significant.

7.9.3.3 Construction of the Headpond and Headpond Embankments, Including Land Take and Transport of Excavated Material

Construction of the Headpond and Embankments will result in the loss of a proportion of the Allt Beochlich / Buinne Dhubh hydrological catchment (refer to *Chapter 11 Water Environment* for further detail). This impact is assessed in detail in the Water Environment chapter. The loss of these watercourses (refer to *Table 7.7 Locations of Proposed and Potential Impacts to Watercourses and Water Bodies*) of Low value will not result in the loss of habitat for notable aquatic species; fish are largely excluded from this catchment due to the presence of the existing hydro-power plant downstream, the presence of natural and artificial barriers to migration downstream, and their generally steep and inaccessible nature. Therefore, the impact on these watercourses and the aquatic species therein is assessed as a Low magnitude **Negligible effect**.

The primary potential indirect effects due to construction of the Headpond and Embankments are impacts to water quality in watercourses and water bodies that will receive temporary and permanent drainage from the Embankment areas. The effects of permanent drainage from the Embankments are assessed in the Operational Effects section that follows.

Lochan Airigh will be lost due to construction of the Headpond. This lochan is of Medium importance, and its loss is considered to represent a Medium magnitude impact due to the presence of multiple similar water bodies in the surrounding area. Therefore, in the absence of mitigation, this is assessed as a **Moderate adverse effect**.

There is the potential for Loch Awe (High value) and smaller water bodies within the construction area to receive runoff from the Headpond construction area and associated impacts on water quality. In the absence of mitigation, the assessment of impacts for these water bodies is as follows:

- Loch Awe (High value) – this water body is currently at Moderate WFD status. In terms of aquatic ecology, impacts to species are assessed below, and impacts to water quality and hydrology are assessed in *Chapter 11: Water Environment*. Therefore, the potential impacts to species within Loch Awe are assessed as Low magnitude and represent a **temporary Moderate adverse effect**, in the absence of mitigation.
- Lochan Breac-liath (Medium value) is likewise assessed in *Chapter 11: Water Environment*. The potential impacts to species within this Lochan are assessed as Low magnitude and represent a **temporary Minor adverse effect**, in the absence of mitigation.
- Smaller water bodies (Low value) within the Site are likely to receive only minimal quantities of runoff due to the surrounding topography. Therefore, the potential impacts to species within these water bodies is assessed as a Low magnitude and represent a **temporary Negligible effect**.

There is the potential for small watercourses (Low value) to receive runoff from the area of Headpond and Embankments construction and associated impacts on water quality. Impacts to these watercourses is assessed in *Chapter 11: Water Environment*. Effects to aquatic ecology in these watercourses due to water quality impacts are assessed as of Low magnitude and represent a **temporary negligible effect**.

Effects on fish species including brown trout, aquatic macrophytes, and macroinvertebrates through the Headpond and Embankments construction are considered to be Low, resulting in a **Negligible effect** that is effectively a ‘no change’ situation.

7.9.3.4 Transport of Excavated Tunnel Material to Headpond via Dump Truck, and Spoil Management of Material from Tunnelling Works

Material will be excavated from tunnels and from the cofferdam area in Loch Awe.

The primary potential impact of substrate excavation from Loch Awe is the translocation of INNS, which is assessed in a later section.

Materials excavated from the tunnels will be transported throughout the Development Site and stockpiled in pre-agreed locations. Therefore, the primary potential impacts on aquatic habitats associated with spoil transport and management are the spread and runoff of sediment and resulting reductions in water quality.

The effects of sediment input into watercourses and water bodies on each receptor is assessed in the points that follow:

- Loch Awe – the assessment of impacts to Loch Awe from runoff from spoil management areas is the same as described above for Headpond construction: Low magnitude **temporary Moderate adverse effect.**
- There is the potential for Loch Awe to be impacted due to substrate and sediment removal and mobilisation, together with runoff from stockpiled material on the loch shore. Due to the localised area of works on the loch shore and in the context of Loch Awe as a whole, this is considered to constitute a Low magnitude temporary **Moderate adverse effect**.
- Impacts to other watercourses and water bodies due to the transport of excavated tunnel material are the same as those described above for Headpond construction.

The fish community in Loch Awe (Atlantic salmon, brown/sea trout, arctic char, European eel, and lamprey species) (High value) is considered unlikely to be adversely affected by sediment runoff due to the localised nature of the works on the loch shoreline in the context of the loch as a whole. Therefore, this is assessed as Negligible magnitude and represents a **temporary Minor adverse effect**.

Other fish species in Loch Awe and other watercourses in this area of construction (Low value) will also be unlikely be adversely affected by sediment runoff due to the localised nature of the works on the loch shoreline in the context of the loch as a whole. Therefore, this is assessed as a **Negligible effect**.

Atlantic salmon are present in Allt Criche (tributary of Erralich Water): BL-01, and brown/sea trout are present in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23. Due to the potential spawning habitat present in these watercourses, impacts to water quality may have an impact on spawning success for species of up to High importance (salmon). Therefore, this is assessed as a Medium magnitude temporary **Moderate adverse effect**.

Macrophytes, macroinvertebrates, and fish species (other than salmon and brown trout) would be subject to similar reductions in water quality and reduced oxygen levels, and therefore impacts to these receptors is assessed as a Low magnitude **temporary Negligible effect**.

7.9.3.5 Temporary Site Drainage, Including SUDs, Settlement Ponds, Temporary Ditches and Other Drainage Features

It is anticipated that the choice of locations for these components will avoid direct impacts to aquatic receptors, and therefore **no effects** are envisaged.

Potential effects of runoff and siltation through these components are assessed in the preceding section for effects due to spoil transport and management, including in the event that temporary site drainage features fail or are ineffective, and thus result in the introduction of runoff or sediment into aquatic habitats.

7.9.3.6 General Plant Movement Throughout the Development Site

Plant movement through the Development Site has the potential to result in the spread of sediment through the Development Site, or introduce pollutants such as oil or diesel into aquatic habitats. Such effects are assessed in the section above on effects due to spoil transport and management.

Plant movement also has the potential to spread invasive species through the Development Site, and this has been assessed in the section on INNS below.

7.9.3.7 Potential Spread or Introduction of INNS

There is the potential for INNS to be spread through or introduced to the Development Site during construction by:

- Cofferdam construction, including de-watering of Loch Awe;
- Stockpiling of spoil materials;
- Transport of spoil materials throughout the Development Site;
- General plant and vehicle movement onto and through the Development Site;
- Transfer of INNS on Personal Protective Equipment (PPE), site clothing and other materials and equipment;
- Transport of materials by barge on Loch Fyne, where required.

The effects of the introduction of INNS on different receptors are summarised in the points below:

Loch Awe is currently inhabited by several INNS, as established in the baseline assessment. Equipment and materials will be transported to Loch Awe and to the Development Site by barge via Loch Fyne and road routes. Therefore, the potential for the spread of INNS from elsewhere on the Development Site or off-site to Loch Awe as a result of construction activity is considered low, and this is assessed as a **Negligible effect**.

Other watercourses and water bodies throughout the Development Site have been predominantly shown through the baseline assessments as having a likely absence of INNS (refer also to *Chapter 6: Terrestrial Ecology*). Therefore, the introduction of INNS, in the absence of mitigation, would cause a potential deterioration in the ecological quality of these water bodies, and is considered to constitute:

- For Medium value watercourses Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02 River Aray: BL-22, and Unnamed tributary of River Aray: BL-23, and water bodies of Medium value (Lochan Airigh and Lochan Breac-liath), a high magnitude **permanent Moderate adverse effect**.
- For all other watercourses (Low value), a high magnitude **permanent Moderate adverse effect**.

The fish assemblage in Loch Awe (High value) co-exist with the INNS that are already present in that waterbody. However, there are other INNS that have the potential to adversely affect the salmon population, namely the salmon fluke, which is currently absent from this country. There is a pathway for the introduction of this and other INNS into

Loch Awe, namely construction routes from Loch Fyne, therefore it is considered that the potential for the Development to increase the risk of introduction is low. This is assessed as a low magnitude **Moderate adverse effect**, in the absence of mitigation.

Atlantic salmon (High value) and Brown trout (Low value) in watercourses, namely Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23, would potentially be impacted by the introduction of INNS, for example by choking of the watercourse with invasive plant species. Therefore, the potential introduction of INNS is assessed as a high magnitude **Major adverse effect in the case of salmon, and a Moderate adverse effect on brown trout**.

Macrophytes, macroinvertebrates and fish species (other than brown trout) are also likely to be adversely affected by the potential introduction of INNS, through factors such as inter-species competition and displacement. Therefore, this is assessed as a high magnitude impact of up to a **Moderate adverse effect**.

7.9.4 Assessment of Operational Effects

7.9.4.1 Effects on Water Levels in Loch Awe

Due to regular generation cycles with water pumped up to the Headpond then returned to the loch, water levels in Loch Awe will fluctuate to a greater extent than in the baseline scenario, and with greater regularity. There will be resulting effects on the Loch Awe Barrage, associated fish lift, and fish passage, due to fluctuating water levels.

Outflow from Loch Awe is controlled by the operation of the Loch Awe Barrage, operated by Scottish and Southern Energy (SSE). The barrage consists of three gates, a fish pass, and two turbines. The operation of these structures (opening or closing gates and abstracting water) determines the outflow from Loch Awe into the River Awe. Operation aims to keep water levels within specific ranges for the Summer (April-November) and Winter (December-March) periods to regulate water levels in Loch Awe.

As described in the baseline, both Loch Awe and the River Awe are classified in the WFD assessment as ‘High Status’ for the ‘fish barrier’ element, indicating that there are currently no constraints to the migration of fish in and out of the loch. Although no information on the operation or effectiveness of the fish lift is available, it is assumed therefore that it operates successfully in allowing migratory fish to navigate the barrage, or otherwise fish are able to navigate the barrage at high flows. The Loch Awe Barrage operates with a compensation flow regime designed to ensure fish passage is maintained.

Publicly available data from the fish counter on the Loch Awe barrage fish lift show that prior to 1985 (the fish lift and counter were installed in 1964), fish numbers (assumed to constitute Atlantic salmon and brown/sea trout) were stable at approximately 3000 fish annually. Numbers declined to approximately 2000 per annum from 1990 onwards. This is likely due to general declines in salmon populations through that time, with the UK population of salmon now being classified as Endangered by IUCN (2024).

The predicted rate of change of loch level during operation is at the extremes of recorded level changes, as predicted by hydrological modelling for the Development. The winter target minimum operating level for the Loch Awe Barrage is 36.96 mAOD. This corresponds to the 95% percentile exceedance probability for the entire flow series. It is unknown at which levels the fish passes of the Loch Awe Barrage are no longer able to operate. A prolonged period of low loch levels in July 2021 took the level down to 35.52 mAOD. Other low periods in 2013, 2014 and 2019 had minimum levels of approximately 35.8 mAOD.

It is noted, however, that a generation cycle will not result in water levels in Loch Awe being reduced for a significant amount of time, as water will be returned to the loch during generation. It is also the case that a full generation cycle may not run, and a proportion of water may be retained in the Headpond as loch levels recharge naturally. Therefore, the levels detailed above are a worst-case scenario in the absence of mitigation measures to be detailed later.

Hydrological effects on Loch Awe are assessed in detail in *Chapter 11: Water Environment*. However, due to the existing natural fluctuation of the loch and the uniformity of aquatic habitats in the margins, this is assessed as a Low magnitude effect on Loch Awe habitats and in the absence of mitigation represents a **Moderate adverse effect**.

Fluctuating water levels in Loch Awe have the potential to impact upon fish passage at the Loch Awe barrage and associated fish lift, and therefore impact on the migratory success of fish species in the loch and River Awe, including Atlantic salmon, brown/sea trout, European eel, and lamprey species. Reduced water levels could also affect the migratory success of fish to upstream catchments from Loch Awe, although this is considered a reduced risk in autumn and winter when loch levels are likely to be higher. This is not considered likely to impact Arctic char, which are a deep-water species. In the absence of mitigation, the impact on this fish assemblage in Loch Awe is assessed as Medium magnitude and represents a **Moderate adverse effect**.

The effects on aquatic macrophytes, macroinvertebrates, and other fish species in Loch Awe, including Arctic char, of fluctuating water levels is considered a **Negligible effect**.

7.9.4.2 Inlet / Outlet Structure on Loch Awe Shoreline, Including Screen During Operation

The inlet / outlet structure will occupy a relatively small area of the Loch Awe shoreline and during operation it is anticipated that it will operate relatively maintenance-free, with the exception of regular maintenance checks and screen cleaning. It is also envisaged that the substrate on the bed of Loch Awe will be reinstated to pre-works condition. Therefore, the effects of this structure on Loch Awe during operation are considered Negligible and represent a **Minor adverse effect**.

Fish species of High value in Loch Awe (Atlantic salmon, brown/sea trout, arctic char, European eel, and lamprey species) will continue to utilise the loch, including as a migratory pathway, and may therefore pass the inlet / outlet structure. Screening requirements will be finalised through discussion with SEPA / Nature Scot for the CAR Licence to prevent the entrapment and/or impingement of fish. It is predicted that the maximum inlet velocity will be 0.15 m/s. More information on development operation (e.g., turbine design & associated pressure changes), and liaison with SEPA would be required should deviation from best-practice screening be required.

The maximum sustained swimming speed of salmon has been shown to be 0.91 m/s (0.45 m body length) and 0.54 m/s (0.15 m body length) (Tang and Wardle, 1992), with burst swimming speeds much higher than this.

The sustained / burst swimming speed of European eel has been shown to be 0.09 m/s / 1.01 m/s (0.10 m body length) and 0.58 m/s / 1.26 m/s (0.70 m body length) (Sheridan et al, 2011).

The swimming speed of lamprey ammocoetes (juvenile lamprey) is no more than 0.45 m/s, and more usually between 0.10 and 0.30 m/s (Maitland, 2003). These swimming speeds seem to apply when the lamprey are disturbed or are seeking out food resources, and most larval movement results from passive downstream migration.

Lamprey ammocoetes will be among the weaker swimming fish species in Loch Awe, and therefore the majority of fish in the loch will swim sufficiently fast to avoid impingement at the inlet screen. Sustained and burst swimming speeds of salmon and eel certainly indicate that they will be able to escape the inlet screen. It is not clear for how long the inlet will operate during a pumping cycle, but it is anticipated that one cycle will operate a maximum of once per day.

Given the sporadic operation of the inlet and the evidence that even the weaker swimming fish species swim sufficiently fast to escape the inlet velocity, together with the very small size of the inlet structure in the context of the size of Loch Awe, the potential impact of the inlet / outlet on the High value fish assemblage in the loch is assessed as of Negligible magnitude and represents a **Minor adverse effect**.

The inlet / outlet may present a rheotactic (the tendency of fish to face into an oncoming current) distraction by attracting migratory fish such as salmon from their migration path (O'Keeffe & Turnpenny, 2005). The main risk of such distraction is fish entering the inlet / outlet and becoming trapped. This will not be the case for this Development, as the inlet / outlet Screen will be completely impassable to such migratory fish. The inlet / outlet will not discharge constantly, and the sporadic nature of the discharge will ensure that fish are not constantly distracted and are able to continue on their migration. In addition, Loch Awe is approximately 1.2 km wide at the location of the inlet / outlet and therefore provides ample migratory pathway for fish to avoid the inlet / outlet structure. Therefore, the effect of distraction by the inlet / outlet on High value migratory fish species in Loch Awe is considered Negligible and constitutes a **Minor adverse effect** in the context of this EIA.

Other fish species in Loch Awe are, as above, considered able to escape the inlet velocity and therefore avoid entrapment and impingement effects. Therefore, the effect of the inlet / outlet on other fish species of Low value is assessed as **Negligible**.

Macrophytes and macroinvertebrates in Loch Awe will not be subject to any adverse effects through the operation of the inlet / outlet. A small number of macroinvertebrates may be drawn into the inlet, but in the context of their populations in Loch Awe as a whole, this is considered to constitute a **Negligible effect**.

INNS are known to be present within Loch Awe, including *Elodea* sp. (Nuttall's waterweed and/or Canadian pondweed) identified at the inlet / outlet location. While fragments of *Elodea* sp. may be drawn into the inlet, the closed-loop system has been designed to prevent cross-catchment contamination, although such INNS may become established in the Headpond, resulting in on-going maintenance requirements to prevent clogging of infrastructure.

The effects of the transfer of INNS through construction activities have been assessed above, and these would result in INNS becoming permanently established in the water bodies they were transferred to. However, the transfer of INNS into the Headpond would introduce a new pathway for the transfer of INNS, i.e. from the Headpond to nearby water bodies and watercourses. The effects of the transfer of INNS to those receptors from the Headpond would be comparable with the effects assessed above, and therefore the impact assessment will not be repeated here.

7.9.4.3 Watercourse Crossings for Permanent Access Tracks, Including Culverting of Watercourses

Several watercourses may be crossed by permanent Access Tracks, or existing Access Tracks upgraded to accommodate construction traffic. There are existing forestry Access Tracks and a proposed Access Track to the consented wind farm – no upgrades are proposed to the consented Access Track, however, some other watercourse crossings may need to be improved and/or widened, including the upgrade of culverts and/or bridge crossings. Culverting of watercourses, where required, will follow SEPA best practice guidance, but this may result in a permanent impact on watercourse conditions in those locations. This is considered a **Medium magnitude permanent effect, and is assessed as follows for the watercourses crossed:**

- For Medium value watercourses Allt Criche (tributary of Erralich Water): BL-01, Erallich Water: BL02 River Aray: BL-22, and Unnamed tributary of River Aray: BL-23, a **permanent Moderate adverse effect**.
- For all other watercourses (Low value), a **permanent Minor adverse effect**.

Atlantic salmon (High value) and Brown trout (Low value) in watercourses, namely Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23, would potentially be impacted by the upgrade of existing watercourse crossings, or the installation of new crossings, for example by presenting barriers to fish migration, or direct impacts to spawning habitat. This is assessed as a **Moderate adverse effect in the case of salmon, and a Minor adverse effect on brown trout**.

Effects on aquatic macrophytes (Negligible value), macroinvertebrates and other fish (Low value) through new or upgraded watercourse crossings are considered to be Low, resulting in a **Negligible effect**.

7.9.4.4 Waterway Pipes and Tunnels

Waterways transfer water between the Headpond and Tailpond within a closed loop system. Waterways including the high-pressure tunnel (connecting Headpond to pump turbines), low-pressure tunnel (connecting pump turbines to the inlet / outlet structure on Loch Awe, the Tailpond), spillway pipe used to drain any excess water from the Headpond, and scour pipe used for draining down the Headpond in an emergency situation, will be buried pipes and therefore will not require any watercourse crossings. Therefore, these are not assessed further.

7.9.4.5 Construction Compounds, Including Permanent Land-Take

Where Construction Compounds will be constructed to facilitate the Development, these have been designed to avoid watercourses and water bodies, and therefore there will be no adverse effects to these features. Potential effects to water quality due to Construction Compounds are assessed in the construction effects section, and also in *Chapter 11: Water Environment.*

7.9.4.6 Headpond and Embankments, including Land Take and Drainage

The loss of Lochan Airigh through construction of the Headpond and Embankments is assessed in the construction effects section, and also in *Chapter 11: Water Environment.*

7.9.4.7 Permanent Site Drainage, Including SUDs, Settlement Ponds, Temporary Ditches, and Other Drainage Features

During the operational phase, drainage from the Development Site will constitute clean surface water runoff, which will be comparable with current drainage conditions. *Chapter 11: Water Environment*, assesses the effects of site drainage and hydrology. It is anticipated that the design of site drainage will facilitate the maintenance of water supply to the existing water bodies and watercourses on the Development Site.

7.9.4.8 Spread of INNS through the Development Site as a Result of Operation of the Development

There is the potential for INNS to be spread or introduced during the operation of the Development, for example through movement of vehicles and personnel, delivery of materials from off-site by barge or vehicles, and through the regular pumping of water from Loch Awe to the Headpond. The latter could be exacerbated by the utilisation of the Headpond by wildlife and the transfer of INNS to nearby water bodies.

The effects of the introduction of INNS on different receptors during operation are consistent with construction effects assessed above; refer to *Potential spread or introduction of INNS* and are therefore not repeated here.

7.9.5 Decommissioning Effects

As detailed within Section 3.3 Scope of the EIA within the Scoping Report, the decommissioning phase has been scoped out of the assessment. Decommissioning has been scoped out of assessment as the decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of the facility. Potential decommissioning effects are therefore considered to be similar to, and associated with the components described in the operational project phase. Given the approximated operational lifetime of PSH is in the region of 100 years, a decision would made in the future whether to refurbish the PSH or to decommission the scheme. The refurbishment plan or if the latter, a detailed decommissioning plan, would be prepared as required as this may be subject to a separate planning application at the time. Decommissioning will not be referred to again throughout this chapter

7.10 Cumulative Effects

7.10.1 Inter-Cumulative Effects

The assessment of likely cumulative effects based on the cumulative schemes identified in *Chapter 4: Approach to EIA.* Cumulative schemes identified are those that are reasonably foreseeable – i.e., in the public domain at scoping stage, or has been consented but not yet under construction/constructed at the point of writing the assessment or at submission.

It is not considered at this stage that there are any other developments that could have a cumulative effect with this Development.

7.10.2 Intra-Cumulative Effects

7.10.2.1 Intra-Project Effects

Intra-project effects due to component parts of the project being undertaken concurrently have been assessed as part of the construction effects assessment above. This assessment has been made on a worst-case precautionary approach, and therefore cumulative intra-project effects will not increase the magnitude or significance of effects on individual receptors.

Construction is expected to last up to seven years including the pre-construction works. The construction work is anticipated to peak within years 2 and 3 of construction as the tunnelling construction and the Headpond construction are the two biggest operations, and they are likely to be sequenced in parallel. Tunnelling is anticipated to be a 24-hour operation, and therefore there may be potential effects of lighting on aquatic habitats, see below.

There will be a requirement for lighting during construction, and operational external lighting at tunnel portals and along Access Tracks and Construction Compounds. External lighting will also be required at the Headpond and Tailpond for access, although this will only be used occasionally. Lighting may also be fitted to the Marine Facility on Loch Awe. It is envisaged that embedded mitigation, including directional cowling and restrictions to the hours of operation, will ensure that the potential effects of this lighting will be **Negligible** on all receptors.

7.11 Mitigation and Monitoring

7.11.1 Embedded Mitigation

7.11.1.1 Construction Environmental Management Plan

A Construction Environmental Management Plan (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 *Chapter 11: Water Environment*), and due to the potential spread of INNS. An Outline CEMP can be found in *Appendix 3.1 Outline CEMP (Volume 5: Appendices)*. This would be expanded upon by the appointed contractor and considered a live document.

7.11.1.2 CAR Licence

Works in Loch Awe (and potentially other water bodies) will require a Controlled Activities Regulations (CAR) licence application to SEPA before the works can proceed.

Under the CAR licence the works in Loch Awe may be restricted as to the timing of their completion, to avoid the migratory season of salmon and other fish species, which may be migrating through Loch Awe.

7.11.1.3 Design Evolution

Steps have been taken during the design process to minimise impacts via design evolution, including design workshops to facilitate input from all disciplines. This facilitated the development of various design principles to minimise impacts, including those summarised below.

- The implementation of Sustainable Drainage (SuDs) features and attenuation features will control runoff into watercourses and Lochs and avoid contamination of these water bodies.
- The design is for a completely ‘closed-loop’ system, whereby water will be drawn from Loch Awe to the Headpond and returned to Loch Awe via the tunnels and spillway pipes. Therefore, the risk of water spilling into adjacent water bodies will be negligible.
- The risk of cross-catchment contamination during construction, for example by the spread of INNS between Loch Fyne, Loch Awe, and other catchments, will be minimised by measures set out in the CEMP, and the incorporation of temporary SuDs and attenuation features in the intervening land.
- Dust screens will be installed along Access Tracks to prevent contamination of the surroundings with dust and fine sediments during construction.
- Where culverts are installed at watercourse crossings, i.e., for the installation of new watercourse crossings or the upgrade of existing crossings, the culvert invert will be set below the existing watercourse bed to ensure continued longitudinal connectivity and fish passage through the culvert. Such culverts will be designed and installed according to SEPA best practice guidance[2].
- Watercourse crossings (new or upgraded) where appropriate will be designed as bottomless arch watercourse crossings, which will maintain natural bed material to ensure continued longitudinal connectivity and fish passage.
- Where possible, a 50 m buffer from watercourses will be maintained to avoid the need for mitigation such as temporary silt fencing.
- Pipeline and tunnel infrastructure will be installed by drill and blast avoid impacts to surface habitats, including watercourses.
- Screening requirements at the inlet / outlet on Loch Awe will be finalised through discussion with SEPA / NatureScot for the CAR Licence to prevent the entrapment and/or impingement of fish, and to minimise the transfer of INNS. More information on Development operation (e.g., turbine design & associated pressure changes), and liaison with SEPA would be required should deviation from best-practice screening be considered appropriate, for example in the presence of additional mitigation such as bubble curtains to deter fish from the inlet / outlet structure.
- The maximum inlet velocity from Loch Awe is predicted to be 0.15 m/s given the size of the inlet structure and screen.

7.11.1.4 Embedded Mitigation During Construction

Construction of the cofferdam on the shoreline of Loch Awe, including piling, de-watering, and substrate removal

As detailed in the standalone Design Statement submitted with the application, a silt curtain or equivalent will be installed prior to the cofferdam being installed. This is to reduce the potential for sediment mobilisation and dispersal in Loch Awe during construction.

Once the cofferdam has been removed there may be a requirement for some localised dredging to remove any material that has built about around the piles. This will require a dredger and a silt curtain (or equivalent) to prevent any pollution to Loch Awe. Dredging should be supervised by the Aquatic Ecological Clerk of Works (EcoW) due to the potential for INNS and fish to be encountered during the works.

Construction of temporary Marine Facility and delivery of materials by barge, including AILs

[2] SEPA (2015). WAT-PS-06-02: Culverting of Watercourses - Position Statement and Supporting Guidance. Available at: https://www.sepa.org.uk/media/150919/wat_ps_06_02.pdf

Mitigation in relation to the Marine Facility at Loch Fyne is detailed in *Chapter 8: Marine Ecology*.

Watercourse crossings for temporary Access Tracks, including culverting of watercourses
Where culverts are required for watercourse crossings, these will be installed as per SEPA guidelines based on the principles set out in the standalone Design Statement submitted with the application.

A CAR licence for all watercourse crossings will be obtained well in advance of the works, where required in consultation with SEPA / NatureScot.

The construction of watercourse crossings will avoid the migration and spawning seasons of resident brown trout and migratory Atlantic salmon, where those species are present (Atlantic salmon in Allt Criche (tributary of Erralich Water): BL-01; Brown/sea trout in four watercourses: Allt Criche (tributary of Erralich Water): BL-01; Erralich Water: BL02; River Aray: BL-22; Unnamed tributary of River Aray: BL-23), as follows:

- Brown trout spawning – January to March
- Atlantic salmon upstream migration and spawning – November to February

Construction of the Headpond and Headpond Embankments, including land take and transport of excavated material
Details of drainage and water management measures during the Headpond and Embankment works will be detailed in the standalone Design Statement submitted with the application and will be informed by the CEMP. *(Appendix 3.1 Outline CEMP (Volume 5: Appendices)*

Transport of excavated tunnel material to Headpond via dump trucks, and spoil management of material from tunnelling works, including general plant movement throughout the Development Site
Spoil management, including stockpiling and transport, will be carried out according to the standalone Design Statement submitted with the application and CEMP. Measures have been built into the design to ensure that spoil management is effective in minimising runoff and subsequent contamination of water bodies. It is anticipated that such measures in the CEMP will include dust screens and vehicle washing facilities to minimise dust and siltation.

Wherever feasible, a 50 m standoff buffer between works, especially those involving spoil management, and aquatic habitats will be maintained to reduce the risk of runoff contaminating water bodies. This buffer will be maintained as a vegetated strip to act as a sediment trap if runoff does occur.

Where considered necessary to prevent silt-laden runoff into aquatic habitats, silt fencing will be installed alongside spoil stockpiles. This will be supervised and monitored by the ECoW to ensure that silt control measures are effective.

Potential spread of INNS through the site
There are potential effects due to the spread of INNS through the Development Site, notably from Loch Awe during de-watering and substrate excavation, and effects of transporting materials onto the Development Site and the potential introduction of INNS from Loch Fyne and other catchments.

Mitigation has been built into the design, and will be outlines in the Outline CEMP, to prevent the transport of INNS into other areas and to prevent the upstream transport of INNS. *(Appendix 3.1 Outline CEMP (Volume 5: Appendices)*

7.11.2 Further Surveys and Pre-Commencement Checks

It is recommended that the following pre-commencement surveys are completed to inform the proposed works:

- Fish survey of Lochan Airigh to inform the requirement for fish rescue and translocation during the construction of the Headpond and Embankments, when this lochan will be lost. Fish surveys have been completed by eDNA sampling for baseline assessment, but further surveys should include a combination of electric fishing, seine netting, and/or fyke netting as considered appropriate to determine the fish population and density within the lochan.
- Electric fishing surveys of the Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23, to inform mitigation for permanent and temporary watercourse crossings. The presence of resident Atlantic salmon and brown trout populations has been demonstrated in these watercourses, and fish rescue and translocation may be required during construction, for example prior to and during the draw-down and/or over-pumping of watercourses for the installation of watercourse crossings.

- On-going seasonal (quarterly) fish eDNA survey in Loch Awe to include spring and summer 2024 (currently being undertaken).
- Survey of the extent of the proposed cofferdam in Loch Awe for the presence of INNS, notably Elodea sp. (Nuttall's waterweed and/or Canadian pondweed).
- Walkover survey of watercourse crossing locations for INNS, both aquatic and riparian species (to be combined with pre-commencement surveys for terrestrial INNS: refer to *Chapter 6: Terrestrial Ecology*).

7.11.3 Additional Mitigation

7.11.3.1 Additional Mitigation During Construction

Construction of the cofferdam on the shoreline of Loch Awe, including piling, de-watering, and substrate removal

To minimise the effects of noise from piling on fish, there should be a 'soft start' to piling works to deter fish from the immediate area where physical injury may occur. Mason and Collett (2011) suggest a soft start to piling using a blow energy of 150 kJ and show that using a soft start will have a lower impact on the salmon initially. Alternatively, vibro-driven piles will be used to minimise the effects of underwater noise and vibration on fish, including Atlantic salmon.

Works in Loch Awe should be carried out under the supervision of an Aquatic ECoW; this is likely to be a condition of the CAR licence.

A fish rescue will be required during de-watering of the cofferdam as it is highly likely that fish will congregate in these sheltered areas during construction and then become trapped as the cofferdam is sealed. This process will form part of the CAR licence, and detailed methodology will be provided for the licence application.

Watercourse crossings for temporary Access Tracks, including culverting of watercourses

In addition to the pre-commencement fish surveys described above, it is recommended that culverting of watercourses is supervised by the Aquatic ECoW, and this is likely to form a condition of the CAR licence. The ECoW will ensure the correct installation and functioning of silt and pollution control measures.

Culverting of watercourses will require sections to be isolated and fish rescues carried out, according to the conditions of the CAR licence. This process will be informed by the fish surveys of watercourse crossing locations.

Construction of the Headpond and Headpond Embankments, including land take and transport of excavated material

The pre-construction fish surveys described above will inform the mitigation requirements for the loss of Lochan Airigh. It is envisaged that this will involve the translocation of fish to a suitable nearby receptor site – there are numerous similar lochans locally. Due to the abundance of this type of habitat locally, it is considered that a replacement water body is not required.

Works in this area will be supervised by the Aquatic ECoW to ensure that water management measures, including drainage ditches, attenuation ponds, buffer strips, and silt fencing, will be effective in preventing the runoff of silt-laden water to adjacent watercourses and water bodies.

Effects due to temporary site drainage, including settlement ponds, temporary ditches, and other drainage features

As described above, the installation of temporary site drainage will be supervised and monitored by the ECoW to ensure that it is effective in preventing the contamination of watercourses and water bodies.

Potential effects due to the spread of INNS through the Site

Material excavated or dredged from Loch Awe must be retained in the immediate area, i.e., stockpiled on the loch shoreline, to prevent the spread of INNS, including *Elodea sp.*, which is known to be present in Loch Awe.

The Aquatic ECoW will supervise all excavation and dredging works in Loch Awe to check for the presence of INNS and ensure that appropriate biosecurity measures, as detailed in the CEMP, are implemented. (Appendix 3.1 Outline CEMP (*Volume 5: Appendices*)

Biosecurity measures should be implemented throughout the development, following 'Check, Clean, Dry' principles as set out in the CEMP. These measures will include, but are not limited to:

- Vigilance for the presence of INNS, including pre-commencement surveys, supervision, and monitoring by the ECoW;

- Vehicle washing facilities, including washing plant and vehicles before transferring between this and different construction sites;
- Washing and disinfection of Plant, PPE, and materials after works in aquatic habitats, especially in Loch Awe where INNS are known to be present;
- Ensuring where possible that materials are retained in the habitats where they originated, especially where INNS are known to be present, i.e. Loch Awe;
- Drying facilities should be provided for equipment and PPE – some INNS can live, or seeds and propagules remain viable, in moist conditions for long periods;
- Avoid the transfer of water between aquatic habitats on site.

7.11.3.2 Additional Mitigation During Operation

Effects on water levels in Loch Awe

Running a full generation cycle has the potential to push loch levels out of an acceptable range, in terms of ecology, flood risk, operation of Cruachan power station, and operation of the Loch Awe Barrage and associated fish lift. The impact of operation is dependent on initial water level and balancing inflows and outflows to the loch.

Additional mitigation is proposed through the hydrological assessment (*Chapter 12: Water Resources and Flood Risk),* whereby operational conditions will ensure that water levels in Loch Awe remain within the historic range. In this way, the continued operation of the Loch Awe barrage and fish lift will be maintained. This includes:

- Ensuring that the maximum recorded level is not exceeded, likely based on the annual maximum flood level. The highest levels recorded in the 2013-2021 period were 38.3 mAOD in 2014 and 2018. The 5% exceedance level is 36.97 mAOD. It is recommended that a commitment be made to restrict the draw-down of Loch Awe to the 95% exceedance level of 35.97 mAOD. This will be implemented as an operational restriction on the operation of the Scheme, to ensure that fish passage is maintained at the fish lift at the Loch Awe Barrage.
- Ensuring that loch levels do not fall below the minimum operating level: The winter target minimum operating level for the Loch Awe Barrage is 36.96 mAOD. This corresponds to the 95% percentile exceedance probability for the entire flow series. It is unknown at this stage at which levels the fish lift (fish pass) of the Loch Awe Barrage is no longer able to operate. A prolonged period of low loch levels in July 2021 took the level down to 35.52 mAOD. Other low periods in 2013, 2014 and 2019 had minimum levels of approximately 35.8 mAOD.

These operational conditions will be confirmed and set post-consent, to ensure the continued operation of the Loch Awe barrage and fish lift.

7.11.3.3 Future Monitoring

Monitoring of aquatic habitats upon completion of the Development is recommended for the following aspects:

- Annual monitoring surveys for the presence of aquatic INNS, to be combined with surveys for terrestrial INNS, in watercourses within the Site and assessed as receptors in relation to INNS above. Due to the potential for INNS to be transferred to the Headpond, it is recommended that the Headpond and these receptors are monitored for INNS for a period of five years.
- Regular monitoring and maintenance of the inlet / outlet on the shore of Loch Awe should be carried out to ensure the integrity of the screen and assess any potential impacts in relation to fish, in particular migratory salmon, and other species due to the potential for distraction and entrapment / impingement.
- Where permanent culverts are installed in watercourse crossings, it is recommended that these are monitored to ensure that there are no lasting effects on fish passage, especially in the event that Atlantic salmon or brown trout or other protected / notable species are shown to be present in pre-commencement fish surveys (i.e., in particular for Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23).

7.12 Residual Effects

Design and construction mitigation has been taken into account when evaluating the significance of potential effects, meaning that in some instances the significance of residual effects is not the same as that reported for potential effects.

Where residual effects are the same as those reported for potential effects, they have not been repeated in this section but are presented in the summary of effects *Table 7.9 Summary of Effects: Construction*.

7.12.1 Construction Residual Effects

7.12.1.1 Construction of the cofferdam on the shoreline of Loch Awe, including piling, de-watering, and substrate removal

Considering the proposed mitigation it is considered that the residual effect of cofferdam construction on each receptor will be as follows:

- Loch Awe habitat – Negligible magnitude **Minor adverse effect**.
- Fish assemblage in Loch Awe (High value) – Negligible magnitude **Minor adverse effect;**
- Macrophytes, macroinvertebrates, and other fish species in Loch Awe – **Negligible effect**;

7.12.1.2 Watercourse crossings for temporary Access Tracks, including culverting of watercourses

Considering the implementation of additional mitigation measures under the conditions of a CAR licence, the residual effects of watercourse crossings for temporary and permanent Access Tracks are as follows:

- Flowing watercourses of Medium value (Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, Unnamed tributary of River Aray: BL-23) or otherwise Low value – Low magnitude **Minor adverse effect**;
- Atlantic salmon present in Allt Criche (tributary of Erralich Water): BL-01, and brown/sea trout present in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, Unnamed tributary of River Aray: BL-23 – Negligible effect of **Minor significance**;
- Other watercourses, aquatic macrophytes, macroinvertebrates and other fish - **Negligible effect**.

7.12.1.3 Construction of the Headpond and Headpond Embankments, including land take and transport of excavated material

Works in this area will be supervised by the ECoW to ensure that water management measures, including drainage ditches and attenuation ponds, will be effective in preventing the runoff of silt-laden water to adjacent watercourses and water bodies.

Residual effects as a result of construction of the Headpond and Embankments for each receptor are as follows:

- Watercourses of Low value – **Negligible effect.**
- Loss of Lochan Airigh – Low magnitude **Minor adverse effect**;
- Loch Awe, Lochan Breac-liath, smaller water bodies, and aquatic species – **Negligible effect**.

7.12.1.4 Transport of excavated tunnel material to Headpond via dump trucks, and spoil management of material from tunnelling works, including general plant movement throughout the Development Site

With the implementation of mitigation in addition to that built into the design, the residual impacts of spoil excavation, transport, and management are as follows:

- Loch Awe – Negligible magnitude **Minor adverse effect.**
- Atlantic salmon present in Allt Criche (tributary of Erralich Water): BL-01, and brown/sea trout present in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23 – Negligible magnitude **Minor adverse effect**.
- Macrophytes, macroinvertebrates, and fish species (other than salmon and brown trout) – **Negligible effect.**

7.12.1.5 Temporary site drainage, including SUDs, settlement ponds, temporary ditches, and other drainage features

- The installation of temporary site drainage will be supervised and monitored by the ECoW to ensure that it is effective in preventing the contamination of watercourses and water bodies.
- The implementation of Sustainable Drainage (SuDs) features and attenuation features will control runoff into watercourses and Lochs and avoid contamination of these water bodies.

- Dust screens will be installed along Access Tracks to prevent contamination of the surroundings with dust and fine sediments during construction.
- Where possible, a 50 m buffer from watercourses and water bodies will be maintained to avoid the need for mitigation such as temporary silt fencing.
- Where considered necessary to prevent silt-laden runoff into aquatic habitats, silt fencing will be installed alongside spoil stockpiles. This will be supervised and monitored by the ECoW to ensure that silt control measures are effective.

Considering the implementation of the above mitigation measures, as detailed in *Chapter 11: Water Environment*, it is considered that there will be no adverse effects of temporary site drainage.

7.12.1.6 Potential spread or introduction of INNS

Specific additional mitigation measures have been recommended to minimise the risk of spreading INNS through or introducing them to the Site, including spoil management, ECoW supervision, and strict biosecurity measures. These measures are outlined in the Outline CEMP which includes an outline Biosecurity Management Plan *(Appendix 3.1 Outline CEMP, Volume 5: Appendices).*

Residual effects as a result of the potential spread or introduction of INNS are as follows:

- Loch Awe - Negligible effect.
- Medium value watercourses Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02 River Aray: BL-22, and Unnamed tributary of River Aray: BL-23, and water bodies of Medium value (Lochan Airigh and Lochan Breac-liath) – Low magnitude **Minor adverse effect**.
- Other watercourses (Low value) – **Negligible effect**.
- Fish assemblage in Loch Awe (High value) – Low magnitude **Minor adverse effect**.
- Atlantic salmon (High value) in watercourses, namely Allt Criche (tributary of Erralich Water): BL-01 – Negligible magnitude **Minor adverse effect**.
- Brown trout (Low value) in watercourses, namely Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23 – Negligible magnitude **Negligible effect.**
- Macrophytes, macroinvertebrates and fish species (other than brown trout) – Low magnitude **Negligible effect.**

7.12.2 Operation Residual Effects

7.12.2.1 Effects on Water Levels in Loch Awe

Due to regular generation cycles with water pumped up to the Headpond then returned to the loch, water levels in Loch Awe will fluctuate to a greater extent than in the baseline scenario, and with greater regularity. There will be resulting effects on the Loch Awe Barrage, associated fish lift, and fish passage, due to fluctuating water levels.

Additional mitigation is proposed through the hydrological assessment (*Chapter 12: Water Resources and Flood Risk),* whereby operational conditions will ensure that water levels in Loch Awe remain within the historic range. In this way, the continued operation of the Loch Awe barrage and fish lift will be maintained.

Residual effects due to fluctuating water levels in Loch Awe are as follows:

- Loch Awe habitats (High value) – Negligible magnitude, resulting in a **Minor adverse effect**.
- Migratory fish species in Loch Awe, including Atlantic salmon, brown/sea trout, European eel, and lamprey species (High value) – Considering the operational regime outlined above, the residual effect on migratory fish will be Low, resulting in a **Minor adverse effect**.
- Aquatic macrophytes, macroinvertebrates, and other fish species in Loch Awe, including Arctic char – **Negligible**

7.12.2.2 Inlet / Outlet structure on Loch Awe shoreline, including Screen during Operation

Screening requirements at the inlet / outlet on Loch Awe will be finalised through discussion with SEPA / NatureScot for the CAR Licence to prevent the entrapment and/or impingement of fish, and to minimise the transfer of INNS.

More information on Development operation (e.g., turbine design & associated pressure changes), and liaison with SEPA would be required should deviation from best-practice screening be considered appropriate, for example in the presence of additional mitigation such as bubble curtains to deter fish from the inlet / outlet structure.

The residual effects due to the operation of the inlet / outlet structure and associated screen on Loch Awe are as follows:

- Loch Awe – Negligible magnitude **Minor adverse effect**.
- Fish species of High value in Loch Awe (Atlantic salmon, brown/sea trout, arctic char, European eel, and lamprey species) – Negligible magnitude **Minor adverse effect**.
- Migratory fish species in Loch Awe (Atlantic salmon, brown/sea trout, European eel, lamprey species) - Negligible magnitude **Minor adverse effect.**
- Other fish species, macrophytes, and macroinvertebrates in Loch Awe - **Negligible effect.**

7.12.2.3 Watercourse Crossings for Permanent Access Tracks, Including Culverting of Watercourses

Where culverts are required for watercourse crossings, these will be installed as per SEPA guidelines. Alternatively, bottomless arch watercourse crossings may be utilised, where appropriate.

The residual effects on watercourses during operation are as follows:

- Medium value watercourses Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02 River Aray: BL-22, and Unnamed tributary of River Aray: BL-23 – Low magnitude **Minor adverse effect**.
- All other watercourses (Low value) - **Negligible effect**.
- Atlantic salmon (High value) in Allt Criche (tributary of Erralich Water): BL-01 – Negligible magnitude **Minor adverse effect**.
- Brown trout (Low value) in watercourses, namely Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23 – **Negligible effect**.
- Aquatic macrophytes, macroinvertebrates, and other fish – **Negligible effect**.

7.12.2.4 Headpond and Embankments, including Land Take and Drainage

The loss of Lochan Airigh through construction of the Headpond and Embankments is assessed in the construction effects section, and in *Chapter 11: Water Environment*.

7.12.2.5 Spread of INNS through the Development Site as a Result of Operation of the Development

The effects of the introduction of INNS on different receptors during operation are consistent with construction effects assessed above; refer to *Potential spread or introduction of INNS* and are therefore not repeated here.

7.12.3 Summary of Residual Effects

Table 7.8 Summary of Effects: Construction, below, presents a summary of residual effects during construction, with *Table 7.10 Summary of Effects: Operation*, presenting a summary of residual effects during operation.

Table 7.8 Summary of Effects: Construction

Description of Effect	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
Construction of the cofferdam on the shoreline of Loch Awe, including piling, de-watering, and substrate removal	Loch Awe (Habitat)	Moderate	Works in Loch Awe should be carried out under the supervision of an Aquatic Ecological Clerk of Works (ECoW).	Minor	Not significant
	High value fish assemblage in Loch Awe	Moderate	To minimise the effects of noise from piling on fish, there should be a 'soft start' to piling works to deter fish from the immediate area where physical injury may occur. Mason and Collett (2011) suggest a soft start to piling using a blow energy of 150 kJ and show that using a soft start will have a lower impact on the salmon initially. Alternatively, vibro-driven piles will be used to minimise the effects of underwater noise and vibration on fish, including Atlantic salmon. Works in Loch Awe should be carried out under the supervision of an Aquatic ECoW; this is likely to be a condition of the CAR licence. A fish rescue will be required during de-watering of the cofferdam as it is highly likely that fish will congregate in these sheltered areas during construction and then become trapped as the cofferdam is sealed. This process will form part of the CAR licence, and detailed methodology will be provided for the licence application.	Minor	Not significant
	Aquatic macrophytes (Negligible value), and macroinvertebrates and other fish species (Low value)	Negligible	N/A	N/A	Not significant
Watercourse crossings for temporary Access Tracks and temporary site compounds, including diversion and culverting of watercourses	Watercourses throughout the Site are assessed as of Medium value (Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, Unnamed tributary of River Aray: BL-23) or otherwise Low value	Moderate	Culverting of watercourses supervised by the Aquatic ECoW to ensure the correct installation and functioning of SuDS and silt control measures. In addition to the pre-commencement fish surveys described above, it is recommended that culverting of watercourses is supervised by the Aquatic ECoW, and this is likely to form a condition of the CAR licence. The ECoW will ensure the correct installation and functioning of silt and pollution control measures.	Minor	Not significant

Description of Effect	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
	Atlantic salmon present in Allt Criche (tributary of Erralich Water): BL-01, and brown/sea trout present in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, Unnamed tributary of River Aray: BL-23	Moderate	Culverting of watercourses will require sections to be isolated and fish rescues carried out, according to the conditions of the CAR licence. This process will be informed by the fish surveys of watercourse crossing locations.	Minor	Not significant
	Other watercourses of Low value	Minor		Negligible	Not significant
	Aquatic macrophytes (Negligible), macroinvertebrates (Low), and other fish (Low value)	Negligible	N/A	N/A	Not significant
Construction of the Headpond and Headpond Embankments, including land take and transport of excavated material	Watercourses of Low value (Allt Beochlich / Buinne Dhubh)	Negligible	Works in this area will be supervised by the ECoW to ensure that water management measures, including SuDS, drainage ditches and attenuation ponds, will be effective in preventing the runoff of silt-laden water to adjacent watercourses and water bodies. In addition to the pre-commencement fish surveys for Lochan Airigh described above: The pre-construction fish surveys will inform the mitigation requirements for the loss of Lochan Airigh. It is envisaged that this will involve the translocation of fish to a suitable nearby receptor site – there are numerous similar lochans locally. Due to the abundance of this type of habitat locally, it is considered that a replacement water body is not required. Works in this area will be supervised by the ECoW to ensure that water management measures, including drainage ditches, attenuation ponds, buffer strips, and silt fencing, will be effective in preventing the runoff of silt-laden water to adjacent watercourses and water bodies.	Negligible	Not significant
	Lochan Airigh	Moderate		Minor	Not significant
	Loch Awe (Habitats)	Moderate		Negligible	Not significant
	Lochan Breac-liath (Medium value)	Minor		Negligible	Not significant
	Other watercourses and water bodies (Low value); macrophytes, macroinvertebrates, and fish	Negligible	N/A	N/A	Not significant
Transport of excavated tunnel material to Headpond via dump trucks, and spoil management of material from tunnelling works	Loch Awe (Habitats)	Moderate	As described above, the installation of temporary site drainage will be supervised and monitored by the ECoW to ensure that it is effective in preventing the contamination of watercourses and water bodies. The implementation of Sustainable Drainage (SuDs) features and attenuation features will control runoff into watercourses and Lochs and avoid contamination of these water bodies.	Minor	Not significant
	Fish community in Loch Awe (Atlantic salmon, brown/sea trout, arctic char, European eel, and lamprey species) (High value)	Minor		Negligible	Not significant

Description of Effect	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
	Other fish species in Loch Awe and other watercourses in this area of construction (Low value)	Negligible	Dust screens will be installed along Access Tracks to prevent contamination of the surroundings with dust and fine sediments during construction. Where possible, a 50 m buffer from watercourses and water bodies will be maintained to avoid the need for mitigation such as temporary silt fencing. Where considered necessary to prevent silt-laden runoff into aquatic habitats, silt fencing will be installed alongside spoil stockpiles. This will be supervised and monitored by the ECoW to ensure that silt control measures are effective.	Negligible	Not significant
	Atlantic salmon present in Allt Criche (tributary of Erralich Water): BL-01, and brown/sea trout present in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23	Moderate		Minor	Not significant
	Macrophytes, macroinvertebrates, and other fish species	Negligible	N/A	N/A	Not significant
Temporary site drainage, including SUDs, settlement ponds, temporary ditches, and other drainage features	All	No Effects	Assessed in *Chapter 11: Water Environment* As described above, the installation of temporary site drainage will be supervised and monitored by the ECoW to ensure that it is effective in preventing the contamination of watercourses and water bodies. The implementation of Sustainable Drainage (SuDs) features and attenuation features will control runoff into watercourses and Lochs and avoid contamination of these water bodies. Dust screens will be installed along Access Tracks to prevent contamination of the surroundings with dust and fine sediments during construction. Where possible, a 50 m buffer from watercourses and water bodies will be maintained to avoid the need for mitigation such as temporary silt fencing. Where considered necessary to prevent silt-laden runoff into aquatic habitats, silt fencing will be installed alongside spoil stockpiles. This will be supervised and monitored by the ECoW to ensure that silt control measures are effective.	-	-
Potential spread or introduction of INNS	Loch Awe (Habitats)	Negligible	Mitigation has been built into the design, and will be detailed in the CEMP, to prevent the transport of INNS into other areas and to prevent the upstream transport of INNS. Survey of the extent of the proposed cofferdam and temporary jetty works in Loch Awe for the presence of INNS, notably Elodea sp. (Nuttall's waterweed and/or Canadian pondweed). Walkover survey of watercourse crossing locations for INNS, both aquatic and riparian species (to be combined with pre-commencement surveys for terrestrial INNS: refer to *Chapter 6: Terrestrial Ecology*).	Negligible	Not significant
	Medium value watercourses Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02 River Aray: BL-22, and Unnamed tributary of River Aray: BL-23, and water bodies of Medium value (Lochan Airigh and Lochan Breac-liath)	Moderate		Minor	Not significant

Description of Effect	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
	Other watercourses (Low value)	Moderate	Material excavated or dredged from Loch Awe must be retained in the immediate area, i.e., stockpiled on the loch shoreline, to prevent the spread of INNS, including Elodea sp., which is known to be present in Loch Awe. The Aquatic ECoW will supervise all excavation and dredging works in Loch Awe to check for the presence of INNS and ensure that appropriate biosecurity measures, as detailed in the CEMP, are implemented. Biosecurity measures should be implemented throughout the development, following 'Check, Clean, Dry' principles as set out in the CEMP. These measures will include, but are not limited to: • Vigilance for the presence of INNS, including pre-commencement surveys, supervision, and monitoring by the ECoW; • Vehicle washing facilities, including washing plant and vehicles before transferring between this and different construction sites; • Washing and disinfection of Plant, PPE, and materials after works in aquatic habitats, especially in Loch Awe where INNS are known to be present; • Ensuring where possible that materials are retained in the habitats where they originated, especially where INNS are known to be present, i.e. Loch Awe; • Drying facilities should be provided for equipment and PPE – some INNS can live, or seeds and propagules remain viable, in moist conditions for long periods; • Avoid the transfer of water between aquatic habitats on site.	Negligible	Not significant
	Fish assemblage in Loch Awe (High value)	Moderate		Minor	Not significant
	Atlantic salmon (High value) in Allt Criche (tributary of Erralich Water): BL-01	Major		Minor	Not significant
	Brown trout (Low value) in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23	Moderate		Negligible	Not significant
	Macrophytes, macroinvertebrates and fish species	Moderate		Negligible	Not significant

Table 7.9 Summary of Effects: Operation

Description of Effect	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
Effects on water levels in Loch Awe	Loch Awe (Habitats)	Moderate	Running a full generation cycle has the potential to push loch levels out of an acceptable range, in terms of ecology, flood risk, operation of Cruachan power station, and operation of the Loch Awe Barrage and associated fish lift. The impact of operation is dependent on initial water level and balancing inflows and outflows to the loch. Additional mitigation is proposed through the hydrological assessment (*Chapter 12: Water Resources and Flood Risk*), whereby operational conditions will ensure that water levels in Loch Awe remain within the historic range. In this way, the continued operation of the Loch Awe barrage and fish lift will be maintained. This includes: • Ensuring that the maximum recorded level is not exceeded, likely based on the annual maximum flood level. The highest levels recorded in the 2013-2021 period were 38.3 mAOD in 2014 and 2018. The 5% exceedance level is 36.97 mAOD. • Ensuring that loch levels do not fall below the minimum operating level: The winter target minimum operating level for the Loch Awe Barrage is 36.96 mAOD. This corresponds to the 95% percentile exceedance probability for the entire flow series. It is unknown at this stage at which levels the fish lift (fish pass) of the Loch Awe Barrage is no longer able to operate. A prolonged period of low loch levels in July 2021 took the level down to 35.52 mAOD. Other low periods in 2013, 2014 and 2019 had minimum levels of approximately 35.8 mAOD. These operational conditions will be confirmed and set as the design evolution progresses, to ensure the continued operation of the Loch Awe barrage and fish lift.	Minor	Not significant
	Migratory fish species in Loch Awe and River Awe, including Atlantic salmon, brown/sea trout, European eel, and lamprey species	Moderate		Moderate	**Significant**
	Aquatic macrophytes, macroinvertebrates, and other fish species in Loch Awe, including Arctic char	Negligible		Negligible	Not significant
Inlet / Outlet structure on Loch Awe shoreline, including Screen during operation	Loch Awe (Habitats)	Minor	Works in Loch Awe should be carried out under the supervision of an Aquatic Ecological Clerk of Works (ECoW). Screening requirements at the inlet / outlet on Loch Awe will be finalised through discussion with SEPA / Nature Scot for the CAR Licence to prevent the entrapment and/or impingement of fish, and to minimise the transfer of INNS. More information on development operation (e.g., turbine design & associated pressure changes), and liaison with SEPA would be required should deviation from best-practice screening be considered appropriate, for example in the presence of additional mitigation such as bubble curtains to deter fish from the inlet / outlet structure.	Minor	Not significant
	Fish species of High value in Loch Awe (Atlantic salmon, brown/sea trout, arctic char, European eel, and lamprey species), including migratory species	Minor		Minor	Not significant
	Other fish species in Loch Awe	Negligible		Negligible	Not significant
	Macrophytes and macroinvertebrates in Loch Awe	Negligible		Negligible	Not significant

Description of Effect	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
Watercourse crossings for permanent Access Tracks, including culverting of watercourses	Medium value watercourses Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02 River Aray: BL-22, and Unnamed tributary of River Aray: BL-23	Moderate	The implementation of Sustainable Drainage (SuDs) features and attenuation features will control runoff into watercourses and Lochs and avoid contamination of these water bodies. Electric fishing surveys of the Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23, to inform mitigation for permanent and temporary watercourse crossings. The presence of resident Atlantic salmon and brown trout populations has been demonstrated in these watercourses, and fish rescue and translocation may be required during construction, for example prior to and during the draw-down and/or over-pumping of watercourses for the installation of watercourse crossings. Where culverts are installed at watercourse crossings, i.e., for the installation of new watercourse crossings or the upgrade of existing crossings, the culvert invert will be set below the existing watercourse bed to ensure continued longitudinal connectivity and fish passage through the culvert. Such culverts will be designed and installed according to SEPA best practice guidance. Watercourse crossings (new or upgraded) where appropriate will be designed as bottomless arch watercourse crossings, which will maintain natural bed material to ensure continued longitudinal connectivity and fish passage.	Minor	Not significant
	Other watercourses (Low value)	Minor		Negligible	Not significant
	Atlantic salmon (High value) in Allt Criche (tributary of Erralich Water): BL-01	Moderate		Minor	Not significant
	Brown trout (Low value) in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23	Minor		Negligible	Not significant
	Aquatic macrophytes (Negligible value), macroinvertebrates and other fish (Low value)	Negligible		Negligible	Not significant
Headpond and Embankments, including Land Take and Drainage	All	No Effects	Assessed in *Chapter 11: Water Environment* The implementation of Sustainable Drainage (SuDs) features and attenuation features will control runoff into watercourses and Lochs and avoid contamination of these water bodies.	-	-
Spread of INNS through the Development Site through operation of the Development	Refer to Construction Effects section above	-	The design is for a completely ‘closed-loop’ system, whereby water will be drawn from Loch Awe to the Headpond and returned to Loch Awe via the tunnels and spillway pipes. Therefore, the risk of water spilling into adjacent water bodies will be negligible.	-	-

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 1: Introduction

ILI (Borders PSH) Ltd

July 2024

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Quality information

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1	July 2024	Submission	DL	David Lee	Technical Director

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8. Marine Ecology

8.1 Introduction

This chapter of the EIAR has been produced by AECOM Ltd and identifies the potential impacts and effects to marine ecology and nature conservation that are considered as part of the EIA of the Development. A detailed description of the Development can be found within *Chapter 2: Project and Site Description.*

The Development is located at central national grid reference NN 03615 17578, approximately 4.4 km to the south of the village of Portsonachan and 9 km northwest of Inveraray in Argyll and Bute, Scotland. The Marine Facility is located south of Inveraray and is comprised of a jetty constructed into Loch Fyne, a sea loch extending from the Firth of Clyde (*Figure 2.3 Above Ground Infrastructure (Sheet 2)* (*Volume 3: Figures)* and *Figure 2.18 Indicative Temporary Marine Facility*, (*Volume 3: Figures)*). This jetty will facilitate the delivery of large, abnormal loads, reducing pressures to the local road network during the construction of the main PSH Development. The construction and operation of the jetty has the potential to affect marine ecological receptors in the vicinity of this Marine Facility.

This chapter sets out a review of the existing marine ecological baseline conditions and assesses the potential permanent and temporary impacts from the Development. The marine ecological receptors that are considered in this chapter are:

- Benthic ecology (including invasive non-native species; INNS);
- Fish and shellfish;
- Marine mammals; and,
- Relevant designated sites.

For planning and consenting purposes the marine environment is defined as any area seaward of the mean high-water springs (MHWS) mark of any tidally influenced water body. Thus, it includes intertidal zones, which are periodically exposed by the tide and subtidal zones which are always submerged. Terrestrial designations, habitats, and species, i.e. those above MHWS, are considered in *Chapter 8: Terrestrial Ecology*, whilst freshwater ecology is considered in *Chapter 7: Aquatic Ecology*. Impact pathways to any coastal seabirds and relevant designated sites are considered in *Chapter 9: Ornithology*.

This chapter should be read in conjunction with:

- *Chapter 2: Project and Site Description;*
- *Chapter 3: Approach to EIA;*
- *Chapter 18: Marine Physical Environment and Coastal Processes;*

Figures (Volume 3 Figures):

- *Figure 8.1: Benthic Ecology and Fish and Shellfish Study Area;*
- *Figure 8.2: Intertidal Benthic Habitats Observed during Phase I Walkover Surveys;*
- *Figure 8.3: Benthic Habitat Classification from Drop-Down Camera Transects Near the Proposed Jetty Location;*
- *Figure 8.4: PMF Occurrence During Drop-Down Camera Transects Near the Proposed Jetty Location;*
- *Figure 8.5: Migratory Fish Catchments Near the Development;* and
- *Figure 8.6: Shellfish Activity within Loch Fyne.*

Appendices (Volume 5 Appendices):

- *Appendix 8.1: Intertidal Survey Report (produced by Ocean Ecology)*
- *Appendix 8.2: Subtidal Benthic Survey Report;* and
- *Appendix 8.3: Marine Protected Area Assessment.*

8.2 Legislation and Policy

This section outlines legislation, policy, and guidance relevant to the appraisal of the potential effects on marine ecological receptors associated with the construction, operation, and decommissioning phases of the Development. For further information regarding the legislative context, refer to the standalone Planning Statement submitted with the Section 36 Application.

8.2.1 Legislation

This assessment has been undertaken within the context of relevant legislation, of projects, such as the Development, in UK waters. The following legislation is relevant to the appraisal of the policies, and guidance which concern the preservation of marine ecological receptors during the planning and execution potential effects on marine ecology associated with the Development:

- Marine and Coastal Access Act (MCAA) 2009 (HM Government, 2009);
- Marine (Scotland) Act 2010 (Scottish Government, 2010);
- Wildlife and Countryside Act 1981;
- Water Environment and Water Services (Scotland) Act 2003 (HMSO, 2003);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Scottish Statutory Instrument 2011 No. 209 (HMSO, 2009), as amended;
- Wildlife and Natural Environment (Scotland) Act 2011;
- The Conservation of Habitats and Species Regulations 2017 (amended 2019);
- The Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019; and
- The Environment (EU Exit) (Miscellaneous Amendments) (Scotland) Regulations 2019.

8.2.2 National Planning Policy

The National Planning Framework 4 (NPF4) was formally adopted by Scottish Ministers on 13 February 2023. NPF4 includes the following statements of policy intent: "*To protect, restore and enhance natural assets making best use of nature-based solutions*" and "*To protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks*". Wherever possible and proportionate to the scale and nature of the project, the Development has therefore sought to deliver benefits for biodiversity, in addition to protecting existing biodiversity. NPF4 also states that major developments will only be supported where nature networks "*are in a demonstrably better state than without intervention*" using best practice and including future monitoring and management where appropriate.

Prior to the UK's exit from the European Union (EU), Scotland's SACs and SPAs were part of a wider European network of such sites known as the 'Natura 2000 network'. They were consequently referred to as 'European sites.' Now that the UK has left the EU, Scotland's SACs and SPAs are no longer part of the Natura 2000 network but form part of a UK-wide network of designated sites referred to as the 'UK site network'. However, it is current Scottish Government policy to retain the term 'European site' to refer collectively to SACs and SPAs (Scottish Government, 2020).

The following additional national and devolved policies include requirements concerning the preservation of biodiversity during the planning and execution of projects in UK waters:

- UK Marine Policy Statement (HM Government, 2011a);
- UK Post 2010 Biodiversity Framework (HM Government, 2012); and
- Scottish National Marine Plan (2015) (Scottish Government, 2015).

8.2.3 Local Planning Policy

The Argyll and Bute Local Development Plan 2 (LDP2) was adopted in February 2024. Planning policy relevant to nature conservation and the Development contained within LDP2 is summarised below in *Table 8.1 Summary of Potentially Relevant Policies of the Argyll and Bute LDP2*. Further details are presented in the standalone Planning

Statement submitted with the application for the Development, and are available from the Argyll and Bute Council website (https://www.argyll-bute.gov.uk/planning-and-building/planning-policy/local-development-plan-2).

Additional consideration has been given, where relevant, to the Clyde Regional Marine Plan, which creates a framework for integrated, sustainable, and coordinated planning and management of the Clyde Marine Region's (including Loch Fyne) environmental, economic, and community resources (Clyde Marine Planning Partnership, 2018).

Table 8.1Summary of Potentially Relevant Policies of the Argyll and Bute LDP2

Planning Policy	Summary of Purpose
Policy 28 – Supporting Sustainable Aquatic and Coastal Development	Proposals for marine and freshwater aquaculture, marine and coastal developments will be supported where it can be demonstrated that there will be no significant adverse effects, directly, indirectly or cumulatively on: The landscape/coastal character, seascape or visual amenity (including Isolated Coast, Wild Land and National Scenic Areas); and The natural, built and/or historic or archaeological sites and their settings; and Designated sites, habitats and species for nature conservation, (including Priority Marine Features, wild migratory salmonids, and European Protected Species); and Ecological status of coastal and transitional water bodies and biological carrying capacity (water quality & seabed impacts); and Commercial and recreational activity (including other coastal/marine users (MOD)), and navigational interests (including anchorages); and Amenity, arising from operational effects (waste, noise, light and odour), and Public access (access to and along the coast will be maintained and enhanced wherever possible).
Policy 30 – The Sustainable Growth of Renewables	The Council will support renewable energy developments where consistent with the principles of sustainable development and it can be demonstrated that there would be no unacceptable environmental effects, including on ecological features.
Policy 73 – Development Impact on Habitats, Species and Biodiversity	The Council will consider nature conservation legislation, the Argyll and Bute Biodiversity Strategy and Action Plan and the Scottish Biodiversity Strategy when assessing developments. Where a development is likely to have effects on important habitats or species, the Council will require the developer to undertake appropriate surveys and, if necessary, to prepare a mitigation plan. Development proposals likely to have an adverse effect on protected species and habitats will only be permitted where it can be justified in accordance with the relevant protected species legislation.
Policy 74 – Development Impact on Sites of International Importance	This policy sets out the strict requirements for developments potentially affecting European sites, including compliance with the Habitats Regulations.
Policy 75 – Development Impact on Sites of Special Scientific Interest and National Nature Reserves	This policy sets out requirements for developments affecting Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR). Where adverse effects on these are possible, developments must demonstrate that integrity of the sites/interests would not be compromised, or that social, economic or environmental benefits of national important clearly outweigh adverse effects on the sites/interests, and that there no suitable alternative locations.

8.3 Consultation

The summary of consultation comments provided in *Table 8.2 Summary of Consultation* has been prepared from responses provided from consultees on the Marine Ecology section of the Scoping Report (AECOM, 2022).

Table 8.2 Summary of Consultation

Consultee	Key Issue	Summary of Response	Action Taken
Peel Port Group	Invasive Non-Native Species	Risk assessment required as part of further environmental assessments.	Included in EIAR (see *Section 8.6 Baseline Environment* and *Section 8.7 Assessment of Effects*)
NatureScot	Potential impacts on the Upper Loch Fyne and Loch Goil Nature Conservation Marine Protected Area (MPA).	Video survey of seabed required to confirm extent of protected features. Mitigation required to minimise impact from siltation, debris from construction, loading, transport, and from any ballast water. Vessel movement information required.	Video surveys were conducted in 2021. Results summarised in *Appendix.2: Subtidal Benthic Survey Report (Volume 5: Appendices*). Mitigation measures provided in EIAR Section 8.9 Mitigation and Monitoring. Vessel movements are provided in EIAR Chapter 19: Shipping and

Consultee	Key Issue	Summary of Response	Action Taken
			Navigation, and are considered here for relevant receptors in Section 8.7 Assessment of Effects.
	Marine Mammals	'The Protection of Marine European Protected Species from Injury and Disturbance: Guidance for Scottish Inshore Waters' should be considered in relevant mitigation measures. There is a risk of disturbance to harbour porpoise (*Phocoena Phocoena*), bottlenose dolphin (*Tursiops truncatus*), harbour seal (*Phoca vitulina*), and grey seal (*Halichoerus grypus*). EPS license may be required.	Relevant mitigation, including JNCC mitigation protocols, are included in *Section 8.9 Mitigation and Monitoring*. Impacts to these species considered in *Section 8.7 Assessment of Effects*.
Argyll and Bute Council	Benthic Ecology	Applicant is requested to submit their Intertidal Phase 1 Survey and Subtidal Benthic Survey.	Survey results provided in *Appendices 8.1: Intertidal Survey Report and 8.2: Subtidal Benthic Survey Report.*
	Benthic Ecology	Applicant to undertake an Intertidal Phase 1 Survey and a Subtidal Benthic Survey to inform likely significant effects to priority marine features of Loch Fyne Nature Conservation Marine Protected Area (NCMPA).	Surveys conducted in 2021. Results provided in *Appendices 8.1: Intertidal Survey Report and 8.2: Subtidal Benthic Survey Report.*
	Marine Ecology	Possible Likely Significant Effects to cetaceans, seals, basking sharks.	Assessment of potentially significant effects to these receptors discussed in *Section 8.7 Assessment of Effects*.
	Marine Ecology	Applicant is to submit a Biosecurity Management Plan.	A Biosecurity Management Plan based on the measures included in the Loch Fyne Marine Biosecurity Plan will be included in the CEMP to be produced by the project contractor.
	Fish and Shellfish Ecology	Loch Shira is an important nursery area for salmon and sea trout populations and is part of the Loch Fyne Marine Consultation Area.	Assessment of likely significant effects to migratory fish populations, such as salmon and sea trout, are discussed in *Section 8.7 Assessment of Effects*.
	Marine Mammals and Fish and Shellfish Ecology	As a measure of good practice, it is advised that the applicant apply for a European Protected Species License for the possible disturbance of cetaceans and under Part I, Section 16(3)(i) of the Wildlife and Countryside Act 1981 a license to disturb basking shark.	Applications for an EPS license and license to disturb basking shark will be included in the CEMP to be produced by the project contractor.
	Marine Mammals	The Applicant will adopt JNCC mitigation protocols to minimise disturbance to marine mammals from piling.	Mitigation measures, including the use of JNCC mitigation for piling, are outlined in *Section 8.9 Mitigation and Monitoring*. Where feasible, vibro-piling will be used during construction of the Marine Facility.
	Water Quality	The applicant must adopt pollution prevention strategies for potential of diesel, hydraulic or battery spillages into the environment.	Mitigation measures, including best practice measures and appropriate pollution prevention guidance, are outlined in *Section 8.9 Mitigation and Monitoring*
	Noise and Vibration	Mitigation measures to abate noise and vibration should be deployed during construction and predicted noise and vibration levels should be detailed within the EIAR.	Mitigation measures, including the use of JNCC mitigation for piling, are outlined in *Section 8.9 Mitigation and Monitoring*. Predicted noise levels are detailed in *Section 8.7 Assessment of Effects*.
Marine Scotland Science	Marine Mammals	Detail on the abundance of marine mammal species within the area is lacking.	Marine mammal abundance and distribution is detailed in *Section 8.6 Baseline Environment*.

8.4 Study Area

The Study Area used for this assessment has been defined as including the likely Zone of Influence (ZoI) where potential significant effects may arise from the Development to marine receptors. The ZoI, and therefore also the Study Area, is specific to each receptor, recognising both the mobility of each receptor and the likely impact pathways to that receptor. A summary of the Study Area for each receptor is defined below, with further details provided in relevant sections for each receptor:

- **Benthic Ecology** - The extent of the Study Area is based on the greatest likely impact to benthic ecological receptors, which is considered to be increased levels of suspended sediment and sediment deposition. This area covers a 700 m buffer around the Marine Facility, which reflects the maximum tidal excursion distance on a flood and ebb tide, over which particles in suspension may travel. Sites designated for the protection of benthic receptors will also be considered within this area. The Study Area is shown *on Figure 8.1 Benthic Ecology and Fish & Shellfish Study Area* within *Volume 3: Figures*.
- **Fish and Shellfish** - The extent of the Study Area is based on the greatest likely impact to fish and shellfish receptors, which is considered to be underwater sound (UWS) associated with piling. Migratory fish may also be associated with the Development area, which can travel to and from natal rivers outside the maximum ZoI. As such, a regional approach has also been adopted which includes designated sites associated with migratory routes for fish species associated with the Development area. The Study Area is shown on *Figure 8.1 Benthic Ecology and Fish & Shellfish Study Area* within *Volume 3: Figures*
- **Marine Mammals** - Marine mammals are highly mobile and transient species, and as such, there are potential implications to wider populations resulting from localised impacts. Therefore, the Study Area has been determined at a scale that reflects the range of relevant marine mammal populations. For cetaceans, the Inter Agency Marine Mammal Working Group (IAMMWG) has established species-specific management units (MUs) for common species according to population structure, movement and habitat use, and relevant management boundaries (IAMMWG, 2023). ICES has also divided European waters into ecoregions, which set boundaries for monitoring ecosystems based on biogeographic and oceanographic features, as well as existing political, social, economic, and management divisions, that also refer to cetacean populations (ICES, 2022).
- **For pinnipeds,** the Special Committee on Seals (SCOS) has outlined Seal Management Units (SMUs) based on expert knowledge and opinion of seal ecology in the UK, using a pragmatic approach to management without inferring discrete populations (SCOS, 2021). The Development occurs within the Southwest Scotland SMU, with consideration given to the adjacent West Scotland – South SMU to consider any potential connectivity. With regard to designated sites, species' ecology and habitat connectivity are considered to determine likely effects to associated populations. The Study Area is shown *on Figure 8.1 Benthic ecology and Fish & Shellfish Study Area* within *Volume 3: Figures*).

8.5 Methods

This EIAR applies the appraisal methodology detailed in *Chapter 4: Approach to EIA*. The identification and appraisal of effects and mitigation are based on a combination of CIEEM guidelines for ecological assessments in the UK (CIEEM, 2018), professional judgment, and the application of relevant guidelines.

8.5.1 Guidance and Standards

Key guidance documents used to inform the assessment of Development impacts on marine ecological receptors include:

- Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018);
- Centre for Environment, Fisheries and Aquaculture Science (Cefas) Guidance Note for Environmental Impact Assessment in respect of Food and Environment Protection Act (FEPA) and Coast Protection Act (CPA) requirement (Cefas, 2004);
- Cefas Chemical Action Levels (MMO, 2014) for sediment quality thresholds and Canadian Sediment Quality Guidelines (CCME, 2001);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Judd, 2012).

- Joint Nature Conservation Committee (JNCC) guidelines for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010);
- The Protection of Marine EPS From Injury and Disturbance: Draft Guidance for Scottish Inshore Waters (Marine Directorate, 2020);
- JNCC guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise Special Areas of Conservation (SACs) (JNCC, 2020);
- Scotland's Marine Assessment (Marine Scotland 2020); and
- The ASCOBANS Agreement 1992 makes provision for the protection of cetaceans through monitoring, research, public awareness, pollution control and data sharing. This agreement has been signed by eight European countries bordering the Baltic and North Seas (including the English Channel) and includes the United Kingdom (UK). A number of guidance documents are available on the ASCOBANS website (UNEP, 1992).

8.5.2 Assessment Scope

The assessment considers effects during the three phases of the Development lifespan, construction, operation, and decommissioning as described in *Chapter 2: Project and Site Description*. The assessment scope described in this chapter was informed by the guidance listed in *Section 8.5.1 Guidance and Standards*, desk study results and published guidance for specific ecological features (as referenced where appropriate below), the responses of consultees, and professional expertise. For the purposes of this assessment, important marine ecological features were taken to include:

- Qualifying features of Marine Protected Areas (MPA);
- Marine features of Special Areas of Conservation (SAC);
- Marine species listed on Schedules 2 and 4 of the Habitats Regulations,
- Marine species listed on Schedules 5 and 8 of the WCA,
- Priority Marine Features, as adopted by Scottish ministers (Tyler-Walters et al., 2016); and,
- Species or habitats indicated to be priorities in the Argyll and Bute Local Biodiversity Action Plan.

8.5.3 Baseline Data Collection

Marine ecological baseline conditions were established by undertaking a combination of desktop review of published information, project-specific survey data, and consultation with relevant organisations. This aims to provide a robust and up-to-date characterisation of the marine environment within the Study Area.

A desktop review included published and publicly available information and consultation with relevant organisations, including NatureScot and Marine Directorate (formerly Marine Scotland). Where relevant, this information has been used to inform marine ecological baseline characterisation for the Development. The range of data sources that have been used to inform the baseline description and appraisal include:

- European Marine Observation Data Network (EMODnet) Seabed Habitats Project data for broad-scale habitat maps of the Study Area (EU Sea Map, 2021);
- European Union Nature Information System (EUNIS) for classifying benthic habitats (European Environment Agency, 2012);
- JNCC Marine Protected Area (MPA) Habitat Mapper for detailed information on MPAs in the region (JNCC, 2023);
- Marine Life Information Network for habitat and species sensitivity assessments, where available;
- Marine Directorate (formerly Marine Scotland) Information Map Layers (NMPi)[1];
- International Council for the Exploration of the Sea (ICES) data;
- Updated Cefas Fisheries Sensitivity Maps in British Waters (Coull *et al*., 1998);
- Spawning and nursery grounds of selected fish species in UK waters (Ellis *et al*., 2012);

[1] https://marine.gov.scot/maps/nmpi

- Spatial Interactions between Marine Aggregate Application Areas and Atlantic Herring Potential Spawning Areas (Reach *et al*., 2013);
- Sandeel sediment habitat preferences in the marine environment (Holland *et al*., 2005);
- SCANS (Small Cetacean Abundance in the European Atlantic and North Sea) data (Gilles et al., 2023)[2];
- Inter-Agency Marine Mammal Working Group (IAMMWG, 2023);
- Sea Mammal Research Unit (SMRU);
- Habitat-based predictions of at-sea distributions for grey and harbour seals in the British Isles (Carter, et al., 2022);
- Distribution models for 12 species of cetacean covering the North-east Atlantic (Waggitt J. J., et al., 2020);
- Hebridean Whale and Dolphin Trust marine mammal sightings distribution maps;
- Designated site condition assessments as available;
- Academic papers and online reports as available for the Study Area; and
- Relevant environmental statements from other projects as available.

In addition to the desktop review, project-specific surveys were undertaken in December 2021 to characterise intertidal and subtidal benthic habitats within the Benthic Ecology Study Area. Results are summarised below with full details provided in *Appendix 8.2: Subtidal Benthic Survey Report (Volume 5: Appendices)*

8.5.4 Assessment Methodology

This chapter applies the environmental appraisal methodology detailed *Chapter 4: Approach to EIA.* The identification and appraisal of effects and mitigation for marine ecology are based on a combination of Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for ecological impact assessments in the UK (CIEEM, 2018), professional judgment, and the application of relevant guidelines as outlined above. Potential effects are assessed according to the potential magnitude of impacts and sensitivity of relevant environmental features, using terminology as outlined in *Chapter 4: Approach to EIA*.

Additionally, NatureScot recommends that the concept of the favourable conservation status for species should be applied at a national (Scottish) level to determine the level of significance of an effect (SNH, 2018). However, consideration of effects at all scales is important (CIEEM, 2022), and where an impact may not affect conservation status at the national level, the potential for effects on conservation status at regional and local scales has also been considered.

A detailed description of the CIEEM method for impact assessment is provided in *Appendix 6.1: Method for EcIA (Volume 5: Appendices);* however; it is important to note that the matrix approach is not sufficient for marine ecological assessments, and professional judgement has also been exercised and applied where appropriate.

8.5.5 Limitations And Assumptions

The availability of data for marine mammals, fish and shellfish is considered sufficient to characterise the baseline and as such provides a good understanding of the existing environment. However, due to the mobile nature of these taxa, there is the potential for variability in the actual usage of an area by different species. As a result, each survey contributing to the available library of research, realistically, only provides a snapshot in time.

For example, the SCANS data for marine mammals occur in summer (predominantly July), therefore only providing summer distributions. It is understood that the densities of cetaceans around the British Isles is likely greatest during this time period and as such, the abundances presented in Section 8.6 Baseline Environment are considered to represent the worst-case scenario and indicate the greatest abundances likely to be encountered within the Study Area.

[2] The SCANS project is a large-scale ship and aerial based survey effort to quantify cetacean abundance and distribution in UK and European Atlantic Waters. It first began in 1994 (SCANS I) with boat-based line and aerial line transect surveys following methods of Hiby and Lovell (1998), initially in the North and Celtic seas. It has since evolved and has been repeated in 2005 (SCANS II), 2016 (SCANS III), and 2022 (SCANS IV). Abundance estimates are divided into blocks. The relevant block containing the cable corridor are Block CS-F, although consideration is also given to the adjacent block CS-D.

Furthermore, available data for fish and shellfish is typically broad, providing only an indication of where species are present or absent, often relating to ICES boundaries. Therefore, a precautionary approach is adopted when considering the presence of sensitive receptors in the Study Area.

With regard to the subtidal benthic surveys, although the sampling design and collection process for the survey data analysed provided robust data on the benthic communities, interpreting these data to determine biotopes has three main limitations:

- It can be difficult to interpolate data collected from discrete sample locations to cover the whole Study Area and to define the precise extent of each biotope, even with site-specific data;
- Benthic communities generally show a transition from one biotope to another and therefore, boundaries of where one biotope ends and the next begins cannot be defined with absolute precision; and
- The classification of the community data into biotopes is not always straightforward, as some communities do not readily fit the available descriptions in the biotope classification system and the classification for subtidal benthic communities is generally regarded as incomplete.

8.6 Baseline Environment

The marine ecological baseline relevant to the Development is summarised below. Further findings of the desk and field-based studies, including evaluation of the relevant conservation value of identified ecological features is provided within the technical appendices that accompany this chapter *Appendices 8.1: Intertidal Survey Report, 8.2 Benthic Survey Report* and *Appendix 8.3 Marine Protected Area Assessment (Volume 5: Appendices)*.

8.6.1 Benthic Ecology

Benthic ecology refers to the diversity, abundance, and function of organisms living on (epifauna) or in (infauna) the seabed. Benthic communities are found in all marine habitats, from the deepest parts of the ocean to the intertidal zone. Physical factors such as water depth, seabed and/or sediment type, water movement and supply of organic matter determine habitat types and species present, and therefore the composition of benthic communities.

The Study Area has been defined based on the greatest potential impact pathway to benthic receptors, which has been identified as sediment dispersion. It encompasses an area of 700 m around the Marine Facility (*Figure 8.1 Benthic Ecology and Fish & Shellfish Study Area (Volume 3: Figures)*) and has been determined using spring tidal excursion data, as the estimated maximum travel distance for a particle carried in suspension can be related to the length of the major axis of the tidal excursion ellipse (see *Chapter 18. Marine Physical Environment and Coastal Processes*).

The Study Area includes a range of benthic habitats including rocky intertidal habitats and areas of mud and sandy mud and macroalgal communities in the subtidal. The following subsections provide an overview of published information that has been used to characterise baseline conditions for benthic ecology within the Study Area, as well as a summary of data collected during project-specific benthic surveys (as reported in *Appendices 8.1: Intertidal Survey Report and 8.2: Benthic Survey Report (Volume 5: Appendices)*).

The sensitivity value of benthic ecological receptors present within the Study Area varies by taxonomic group, as some species are of high conservation value and thus may be considered to have high sensitivity.

8.6.1.1 Intertidal Ecology

There is a paucity of recent records for Loch Fyne's intertidal area, however, two reviews have collated historical information available for the region (Connor and Little, 1998; Wilding et al., 2005). These studies indicate that the intertidal area of Loch Fyne exhibits low habitat diversity and is mostly comprised of bedrock and boulders. These habitats support communities typical of rocky shores at temperate latitudes and are dominated by fucoid algae and barnacles before transitioning to communities dominated by *Laminaria saccharina* and red foliose algae in the infralittoral zone[3]. To supplement this information, project-specific surveys of the Development's intertidal area have been conducted.

The Scottish Association for Marine Science also conducted a Strategic Environment Assessment for the Clyde Sea (Wilding, et al., 2005), which also identified the coastline of Upper Loch Fyne as consisting of mainly boulders and bedrock, with some areas of sediment shores. The upper shore was characterised by bands of brown algae

[3] Infralittoral refers to shallow subtidal areas nearest the shore, excluding the intertidal zone.

Pelvetia canaliculata and *Fucus spiralis*, and the upper shore barnacle *Chthamalus montagui*. In the midshore, substrate cover varied by wave exposure, with exposed substrate dominated by barnacles and sheltered areas exhibiting thick fucoid (e.g. *Ascophylum nodosum, Fucus vesiculosus,* and *F. serratus*) growth. Sediment shores were all confined to the head of the loch, with sediments ranging from cobbles to fine sand. Embayments exhibited sparse to thick fucoid cover, with blue mussel (*Mytilus edulis*) beds beneath the algal stands in the lower midshore. The lower shore primarily consisted of sand overlying gravel, with little to no algal cover. In this zone, the lugworm *Arenicola marina* was present at high densities. Where the lower shore consisted of coarser sediments, *F. serratus* and *M. edulis* were the dominant organisms.

Project-specific Phase I walkover and unmanned aerial vehicle (UAV) surveys indicated that the intertidal area within the Development it exhibited a range of broadscale littoral rock and sediment habitats with various algal communities typical of intertidal areas. The habitats observed were assigned to EUNIS biotopes (*Table 8.3 Habitat Types Observed in the Intertidal Survey Area*). No Priority Marine Features (PMFs) were observed in the intertidal survey area (*Appendix 8.1: Intertidal Survey Report*) (*Volume 5 Appendices*).

Table 8.3 Habitat Types Observed in the Intertidal Survey Area

EUNIS BSH	EUNIS Code	EUNIS Description
A1.3	**A1.311**	*Pelvetia canaliculata* on sheltered littoral fringe rock
	A1.312	*Fucus spiralis* on sheltered upper eulittoral rock
	A1.3142	*Ascophyllum nodosum* on full salinity mid eulittoral mixed substrata
	A1.3151	*Fucus serratus* on full salinity sheltered lower eulittoral rock
	A1.322	*Fucus spiralis* on sheltered variable salinity upper eulittoral rock
	A1.324	*Ascophyllum nodosum* and *Fucus vesiculosus* on variable salinity mid eulittoral rock
A1.4	**A1.421**	Green seaweeds (*Enteromorpha spp.* and *Cladophora spp.)* in shallow upper shore rockpools
	A1.451	*Enteromorpha spp.* on freshwater-influenced and/or unstable upper eulittoral rock
A2.1	**A2.111**	Barren littoral shingle
A2.2	**-**	Littoral sand and muddy sand
B3.1	**-**	Supralittoral rock (lichen or splash zone)

8.6.1.2 Subtidal Ecology

Several survey efforts have been conducted within Loch Fyne to establish the distribution of PMFs in the Firth of Clyde area (Allen et al., 2013). Drop down video and grab sampling surveys were conducted between August and October in 2010 to identify biotopes at 44 sites. A total of 14 different biotopes were recorded, with several PMF habitats and species observed throughout the loch, including burrowed mud, fireworks anemone (*Pachycerianthus multiplicatus*), flame shell (*Limaria hians*) beds, horse mussel (*Modiolus modiolus*) beds and ocean quahog (*Arctica islandica*).

Grab sampling conducted in July 2015 by NatureScot, also characterised benthic infauna at 17 sites within the loch (Allen, 2017). A total of 279 taxa were identified, with the primary taxa (>50% of total abundance) including polychaetes, nematodes, brittle stars, and molluscs. Of these, the only PMFs observed included the flame shell and horse mussel.

Project-specific drop-down camera benthic surveys were also conducted in September 2021, which revealed that the benthic habitat near the proposed jetty location was largely composed of two broad-scale habitats: 'sublittoral macrophyte dominated sediment' (EUNIS A5.5) and 'mud and sandy mud' (EUNIS A5.3). Other broadscale habitat types observed patchily throughout the survey area include 'Atlantic and Mediterranean low energy infralittoral rock' (EUNIS A3.3), 'Atlantic and Mediterranean low energy circalittoral rock' (EUNIS A4.3), 'sand and muddy sand' (EUNIS A5.2) and 'mixed sediment' (EUNIS A5.4). The distribution of benthic habitats observed during drop-down camera surveys is provided in *Figure 8.3: Benthic Habitat Classification from Drop-Down Camera Transects Near the Proposed Jetty Location (Volume 3: Figures)*.

Areas of mud and sandy mud were further classified into 'infralittoral sandy mud' (EUNIS A5.33) and 'Seapens and burrowing megafauna in circalittoral fine mud' (EUNIS A5.361), with areas of A5.361 classifying as the PMF 'burrowed mud' for which the Upper Loch Fyne and Loch Goil MPA is designated. Areas of sublittoral macrophyte-dominated sediment were further classified 'Kelp and seaweed communities on sublittoral sediment' (EUNIS A5.52), which also qualifies as a PMF. Additionally, occasional occurrences of the PMF species fireworks anemone were observed throughout the transects. The distribution of PMF observations is provided in *Figure 8.4: PMF Occurrence During Drop-Down Camera Transects Near the Proposed Jetty Location (Volume 3: Figures).*

Project-specific grab sampling supported these results, with most grab sample sediments classified as infralittoral and circalittoral sandy mud (EUNIS A5.33 & A5.34). Additional habitats were observed sporadically across the sites and included 'infralittoral coarse sediment' (EUNIS A5.13), 'infralittoral muddy sand' (EUNIS A5.24), 'infralittoral mixed sediment (EUNIS A5.43), and 'circalittoral mixed sediment' (EUNIS A5.44). Particle size analysis further indicated that most sites exhibited similar compositions of sand and mud with varying amounts of gravel. Macrofaunal sampling indicated that the infaunal assemblage at each site was dominated by polychaetes and bivalves, with no PMFs observed in grab samples. Detailed grab sampling results can be found in *Appendix 8.1: Benthic Survey Report (Volume 5: Appendices)*.

A number of marine habitats are referred to in the Argyll and Bute Council's Local Biodiversity Action Plan: 'mud habitats in deep water', 'sheltered muddy gravels', and/or 'sublittoral sands and gravels' (Argyll and Bute Council, 2009). However, based on water depth of the proposed jetty and PSA analysis habitats within the Development area are unlikely to qualify as mud habitats in deep water or sheltered muddy gravels. Sublittoral sands and gravels may occur, but benthic habitat observed was primarily comprised of muddy habitats.

8.6.1.3 Invasive Non-Native Species

Marine Invasive Non-Native Species (INNS) pose significant threats to native ecosystems. They often compete for the same resources as local species but lack natural predators and, when not properly managed, can outcompete native species.

In 2015, Loch Fyne was surveyed by NatureScot as part of an effort to identify early warning signs of INNS, and several Non-Native Species (NNS) were identified (Cook, Beveridge, Twigg, & Macleod, 2015). In these surveys, natural and artificial structures and settlement panels were used to assess community composition for the presence of INNS at sites in the upper, middle, and lower reaches of the loch. Structures were visually surveyed while settlement panels were preserved in ethanol and surveyed under a microscope.

Whilst five invertebrate INNS were identified within Loch Fyne, only one, the modest barnacle (*Austrominius modestus*), was observed on the settlement panels in the upper loch. This species is widely distributed across the UK. Additional INNS observed in other areas of the loch included the orange-tipped sea squirt *Corella eumyota*, erect bryozoans *Bugula simplex*, and *Tricellaria inopinata*, Japanese skeleton shrimp *Caprella mutica,* and the alga *Codium fragile.* This study also highlighted several INNS that had previously been reported south of Loch Fyne in the Clyde area, including the colonial ascidian *Botrylloides violaceus*, carpet sea squirt *Didemnum vexillum*, leathery sea squirt *Styela clava*, and the macroalga wireweed, *Sargassum muticum*.

Of these, *D. vexillum* is the only INNS to have been reported as establishing itself within Loch Fyne (Marine Scotland, 2020). The carpet sea squirt can spread rapidly, forming dense colonies on the seabed and other substrates, which can lead to the exclusion of other benthic species, degradation of functional habitats, and habitat homogenisation. The carpet sea squirt proliferates particularly on man-made submerged structures including docks, moorings, vessel hulls and aquaculture equipment (Brown, 2020). Within Loch Fyne, its presence has been confirmed in Portavadie, near the mouth of the loch (approximately 45 km from the Development; Marine Scotland, 2020). However, the Clyde Marine Plan has reported that *D. vexillum* has colonised the upper, middle and lower extents of the loch (Clyde Marine Planning Partnership, 2018) though it has been primarily observed in the intertidal zone (Marine Scotland, 2020). A biosecurity plan for Loch Fyne[4] indicates that industrial activities within the loch pose a high risk of spreading *D. vexillum* through vessel movement and disturbance of substrates (Brown, 2020).

No INNS were observed during project-specific surveys. Additionally, whilst the remaining non-native species are not considered established within the loch, the proximity of the Study Area to these populations indicates the potential for future colonisation within Loch Fyne and the Study Area.

8.6.2 Fish and Shellfish Ecology

This section discusses the fish and shellfish species occurring within the Study Area. The Study Area has been informed based on the maximum theoretical potential ZoI for impacts likely to occur as a result of the Development, which would be UWS from piling activities. In the absence of specific guidance for fish and shellfish ecology with regard to the impacts from UWS, advice from JNCC has been adhered to which states an effective deterrent range

[4] A voluntary plan funded by Marine Scotland and developed by the users and community of Loch Fyne, Argyll, Scotland with the support of C2W Consulting. (Gov Scot, 2020).

for UWS associated with monopile installation is 26 km for harbour porpoise. As such, the Study Area for fish and shellfish will reflect this range.

The Development is also likely to interact with migratory fish which can travel to and from natal rivers, outside the maximum ZoI. Guidance produced by ABPmer (2014) recommends that a regional approach should be adopted for migratory fish to ensure any fish which may pass through the Study Area and therefore any other sites which may have interaction with the Development, but are beyond the initial screening distance, are also considered. For the purpose of this section, additional disturbance is considered to occur where the Study Area falls in front of a migratory route into a river. As such, any designated sites which protect rivers that flow into the loch within the Study Area have also been considered, to ensure any potential interactions between the Development and potential migration routes are included.

The sensitivity value of fish and shellfish present within the Study Area varies by taxonomic group. Pelagic species are likely to be of low to medium sensitivity, whereas demersal and / or migratory species may be of medium to high sensitivity.

8.6.2.1 Diadromous Fish

Diadromous fish are those which seasonally migrate between fresh and marine water bodies. Several species are protected under international and national conservation legislation and are known to be present in the Study Area (*Table 8.4 Diadromous Fish Species Known to Occur in Loch Fyne and their Conservation Designations*).

Loch Fyne is a sea loch, extending inland from the Firth of Clyde, with upper Loch Fyne (past Newton Bay) known to have varying salinity due to freshwater inputs (Argyll and Bute Council, 2009). Twenty-two rivers run into Loch Fyne, many of which have been identified as important locations for diadromous species. Of these catchments, 14 have been surveyed to identify present fish populations (Argyll Fish Trust 2012), having observed Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*), European eel (*Anguilla anguilla*), European flounder (*Platichthys flesus*), lamprey (*Lampetra* spp), and three-spined stickleback (*Gasterosteus aculeatus*). Eel were observed in nine catchments, and flounder, lamprey, and stickleback in fewer than five catchments each (Argyll Fisheries Trust, 2012).

Six of these catchments were surveyed again in the summer months of 2020 for juvenile Atlantic salmon and sea trout, five of which occur in the upper Loch Fyne area: Array, Shira, Kinglas, Fyne, and Leacann (*Figure 8.5: Migratory Fish Catchments Near the Development (Volume 3: Figures))*; Argyll Fisheries Trust, 2020). Surveys were conducted at 42 sites within these catchments using electrofishing during low-medium flow conditions. A total of 52 juvenile salmon were found across four of the five catchments, with no observations in the Kinglas catchment since 2017 (Argyll Fisheries Trust, 2020). For trout, a total of 66 juveniles were observed, with individuals reported from every catchment (Argyll Fisheries Trust, 2020). Density ranges of fish present at sites within each catchment is provided in *Table 8.5 Juvenile Atlantic Salmon and Sea Trout Densities in Catchments Which Flow into Upper Loch Fyne*.

Both Atlantic salmon and sea trout are anadromous migratory species, migrating from the sea into freshwater for spawning. Spawning typically occurs in the upper reaches of rivers in gravelly substrate (Heessen *et al*., 2015; NASCO, 2012). The migration of juveniles down-river to the ocean usually occurs from late spring, with most fish having migrated by June (Thorstad *et al*., 2012; NatureScot, 2023a). Once salmon have spent another one to five years at sea, the adults then return to their spawning rivers, which in Scotland usually occurs in the period November to December, but may extend from October to February (NatureScot, 2023a). Atlantic salmon are protected in the UK as an Annex II species, however, there are no sites designated for their protection within the Study Area.

Trout exhibit a similar life cycle to Atlantic salmon, though the adult marine stage of sea trout is shortened both spatially and temporally. Some individuals migrate back to freshwater environments after only a very short period of time feeding at sea, whilst ‘maidens’ only return to freshwater after a minimum of a year at sea (Gargan *et al*., 2006). Adult sea trout returning to freshwater to spawn are more likely to stray from natal rivers compared to salmon. Both sea trout and Atlantic salmon are included in the Argyll and Bute Council’s local biodiversity action plan (Argyll and Bute Council, 2009).

Lamprey are also an anadromous migratory species, with the river (*Lampetra fluvialitis*) and sea lamprey (*Petromyzon marinus*) species known to migrate from marine habitats to freshwater to spawn. The river lamprey migrates upstream in autumn and spring, but spawning only occurs in spring (April – May) as autumnal migrants are undeveloped (NatureScot, 2023b). Sea lampreys migrate upstream to spawn in spring and early summer, primarily between May and June (NatureScot, 2023b).

Lamprey are usually found in coastal waters, estuaries, and accessible rivers, with juveniles often found in large congregations (Maitland, 2003a). They generally spend one to two years in estuaries, before moving upstream (Zancolli *et al.,* 2018). Only the river lamprey (*L. fluvialitis*) is protected in the UK as an Annex II species, although there are no sites within the Study Area designated for their protection.

The European eel is a catadromous migratory species, migrating from freshwater to the sea for spawning. They are considered critically endangered on the IUCN Red List (2023) and are a PMF in Scotland. Eels migrate upstream into freshwater predominately during spring but may continue to do so until early Autumn. Once within freshwater habitats, eel remain for five to 15 years, before they begin their downstream migration through rivers and estuaries back towards marine spawning grounds, predominately between August and December (Behrmann-Godel and Eckmann, 2003; Chadwick *et al.,* 2007). Some eels do not migrate into freshwater but instead inhabit estuaries before returning to spawning grounds.

Table 8.4 Diadromous Fish Species Known to Occur in Loch Fyne and their Conservation Designations

Common name	Latin Name	Conservation Designations
Atlantic salmon	*Salmo salar*	• UK Biodiversity Action Plan (BAP) Priority Species • Scottish Biodiversity List • Priority Marine Feature – Scotland • Argyll and Bute LBAP • OSPAR list of Threatened and/or Declining species and habitats
Brown / sea trout	*Salmon trutta*	• UK BAP Priority Species • Scottish Biodiversity List • Priority Marine Feature – Scotland
European eel	*Anguilla anguilla*	• Priority Marine Feature – Scotland • 'Critically Endangered' IUCN Red List
Lamprey	*Lampetra* spp.	• UK BAP Priority Species (river lamprey (*Lampetra fluviatilis*) only) • Scottish Biodiversity List • Priority Marine Feature – Scotland (river lamprey only) • Annex II of the Habitats Directive • Annex V of the Habitats Directive (river lamprey only) • Environmental Liability Directive (brook lamprey (*Lampetra planeri*) only)

Sources:
UK BAP Priority Species (JNCC, 2007)
Scottish Biodiversity List (Marine Scotland, 2013)
Priority Marine Features – Scotland (SNH, 2014)
Argyll and Bute (LBAP) (Argyll and Bute Council, 2009)

Table 8.5 Juvenile Atlantic Salmon and Sea Trout Densities in Catchments Which Flow into Upper Loch Fyne

Catchment	Salmon (individuals 100 m^{-2})		Sea Trout (individuals 100 m^{-2})	
	Fry	Parr	Fry	Parr
River Array	0.8-54.8	0-4.6	0-20.0	0-6.4
River Shira	0-22.4	0-3.6	0-87.4	0-9.4
River Fyne	0-36.1	0-6.7	0-5.0	0-11.2
River Kinglas	0	0	0.7-12.1	0.6-2.8
Leacann Water	3.3-10.6	0-1.3	0.8-6.7	0.6-10.7

8.6.2.2 Pelagic Fish

There is a paucity of records regarding the distribution of pelagic fish species present within Loch Fyne. Whilst a few fishing harbours are registered within the loch, it is not considered a regular commercial fishing ground for any pelagic species (JNCC, 2015). Management plans for the region are primarily concerned with salmon and trout

(Argyll Fisheries Trust, 2009), but local recreational angling has reported that mackerel (*Scomber scombrus*) may be numerous in summer months and herring are occasionally present (Argyll and Bute Council, 2009).

The adjacent Firth of Clyde has historically supported important fisheries, namely for demersal species and herring, however, these fisheries are considered to have since collapsed (Lawrence and Fernandes, 2021). Despite this, the area has still been recorded as an important nursery ground for herring (*Clupea harengus)* and mackerel, as well as an important spawning ground for sprat (*Sprattus sprattus*; Coull et al., 1998; Ellis et al., 2012).

Herring is an important commercial species and represents a significant prey species for many predators, including large gadoids (such as cod), dogfish, sharks, marine mammals and birds (ICES, 2006). It was once abundant in the Firth of Clyde, with Loch Fyne contributing to a major spawning herring fishery in the mid-1800s (Thurstan and Roberts 2010). Herring is found mostly in continental shelf areas up to depths of 200 m (Whitehead, 1986), with juveniles generally distributed in shallower waters of 15-40 m before migrating into deeper waters to join the adult stock after two years, and spawning occurring along the seabed (Heessen *et al*., 2015). Little information is available regarding herring distribution within Loch Fyne, with the stock historically associated with the Firth of Clyde considered to have not yet recovered since its collapse, with low biomass in the region (Lawrence and Fernandes, 2021). Whilst there are no recent records of herring within upper Loch Fyne, the area is mapped as a high-intensity nursery area for this species (Ellis et al., 2012), although the Study Area does not include sediments suitable for spawning.

Sprat is a short-lived, small-bodied pelagic schooling species that is relatively abundant in shallow waters. Sprat is an important food resource for a number of commercially important predatory fish, as well as seabirds and marine mammals. Sprat has recently been reported with great numbers in the Firth of Clyde, representing an increase in local stock biomass since 2010 (Lawrence and Fernandes, 2021). There are no recent records of sprat from Loch Fyne, but the loch has been identified as an important spawning ground for sprat (Coull et al., 1998).However,sprat are batch spawners with pelagic eggs and larvae and are considered to have no interaction with the benthos.

Atlantic mackerel once comprised an important fishery in the Firth of Clyde but have long-since declined in the region (Thurstane and Roberts 2010). Nonetheless, the Study Area has been identified as a low-intensity nursery area for mackerel (Ellis et al., 2012). Mackerel are an entirely pelagic species and form an important part of the diet of sharks, tuna and dolphin (Tappin *et al*., 2011). They are batch spawners with pelagic eggs and larvae (Murua and Saborido-Rey, 2003) and are considered to have no interaction with the benthos.

8.6.2.3 Demersal Fish

Observations of other fish species in upper Loch Fyne have primarily consisted of demersal fish species, which are species known to live or feed near the seabed. Demersal species have also historically been part of important fisheries in the Clyde region, with cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), hake (*Merluccius merluccius*), saithe (*Pollachius virens*), and whiting (*Merlangius merlangu*s) previously reported as comprising over 80% of demersal fish landings in the area (Hislop 1986; Connor and Little 1998). Today, reports indicate that biomass of demersal fish remains high, but many individuals are subject to bycatch in local shellfish fisheries (Lawrence and Fernandes, 2021).

Cod have historically been abundant in the Clyde, with increased landings observed into the 1960s before experiencing a 99% decline in abundance and biomass after 1984 and reaching a historical low in spawning biomass (Thurstan and Roberts 2010). The most recent assessment of the region has also reported no recovery in terms of abundance or biomass 10 years following the closure of the area to fishing, with young cod believed to be susceptible to bycatch in *Nephrops* fishery areas (Clarke et al., 2015). A survey of semi-pelagic white fish within Loch Fyne reported cod in both lower and upper Loch Fyne. Only 8 individuals were landed from trawls in the upper loch, but greater abundances were recorded in the lower Loch (Turrell et al., 2016).

Haddock are common throughout British waters, occurring around rock, sand, gravel, and shells from 40-300 m depth (Barnes 2008a). In the Firth of Clyde, haddock also used to comprise an abundant fishery in the region, prior to a collapse in the 1980s (Thurstan and Roberts 2010; McIntyre et al., 2012). The remaining demersal fishery in the Clyde is mixed, with haddock comprising one of the predominant species caught, although overall biomass is still comparatively low (McIntyre et al., 2012). Fishing tows within Loch Fyne reported a limited number of individuals (n<20) in the upper loch, with much greater abundances reported in the lower loch near the entrance to the firth (n>1500; Turnell et al., 2016).

Hake are common throughout the western British Isles, from the western English Channel and Irish Sea to western Scotland (Barnes 2008b). Like other demersal species, hake was also an important species in the Firth of Clyde in the late 1900s, with 57% of total Scottish landings for this species coming from the Clyde (Thrustan and Roberts 2010). Since the 1990s, the landings of hake from this area have declined to virtually zero, although they are still recorded as bycatch in other fisheries (McIntyre et al., 2012). Fishing tows in Loch Fyne have reported relatively few individuals in both the upper and lower reaches of the loch (n≤21; Turnell et al., 2016). The Study Area has also been identified as a low intensity nursery ground for this species (Ellis et al., 2012).

Saithe are particularly common off the north-west coasts of Scotland and Ireland (Barnes 2008c). Juveniles spend 1-2 years in shallow inshore surface waters before moving offshore to demersal habitats (Smith and Hardy 2001). Saithe have similarly become rare in the Firth of Clyde since the 1980s, following overexploitation (Thurston and Roberts 2010; Hunter et al., 2016). Today they comprise a portion of the mixed demersal fishery that operates in the region (McIntyre et al., 2012).

Five sandeel species occur in Scottish seas, with the two most common species known as Raitt's sandeel (*Ammodytes marinus*) and lesser sandeel (*A. tobianus*) (NatureScot, 2023c). Their distribution across Scotland is patchy but generally concentrated around sandbanks and other areas of suitable sediment (NatureScot 2023c). Sandeel are an important element of the food chain in the north Atlantic as prey for other fish species, sea birds and marine mammals (Dipper, 2001). They are a burrowing species, spending large proportions of the year under the sediment surface (Van der Kooij *et al.*, 2008). They are known to have strong habitat preferences with regard to sediment type, with reduced selection and even avoidance observed in habitats with higher proportions of fine gravel, fine sand, coarse silt (Holland et al., 2005). In western Scotland, inshore fisheries of *A. marinus* were abundant prior to 2000 (Marine Scotland, 2020). Sandeel have not since been recorded in any efforts concentrated within the Firth of Clyde or Loch Fyne. Nonetheless, the Study Area has been identified low intensity nursery area for sandeel, with the adjacent waters of the Firth of Clyde identified as important spawning grounds (Coull et al., 1998; Ellis et al., 2012).

Whiting is a bentho-pelagic species which can be found in association with a variety of different seabed types including sediment and rocky areas (Barnes, 2008). Following declines in several fisheries, whiting now comprise one of the main fish communities within the Firth of Clyde (McIntyre et al., 2012; Hunter et al., 2016). Tows within Loch Fyne have reported mostly low numbers of individuals within both the upper and lower reaches of the loch, with the greatest abundance reported at the entrance to the firth (Turrell et al., 2016). The Study Area overlaps with a high intensity nursery ground for whiting (Coull et al., 1998; Ellis et al., 2012), however, juvenile whiting are considered pelagic and have no interaction with the benthos.

8.6.2.4 Elasmobranchs

Elasmobranchs include sharks, skates, and rays. Scotland's waters are home to over 30 different species, 25 of which occur in coastal waters (Scottish Government, 2011). Of these species, eight are listed as PMFs: basking shark (*Cetorhinus maximus*), blue shark (*Prionace glauca*), common skate complex (*Dipturus batis* and *D. intermedius*), leafscale gulper shark (*Centrophorus squamosus*), porbeagle shark (*Lamna nasus*), Portuguese dogfish (*Centroscymnus coelolepis*), sandy ray (*Leucoraja circularis*), and spiny dogfish (*Squalus acanthias*). Blue shark, porbeagle shark, sandy ray, and Portuguese dogfish are all primarily pelagic/oceanic or deepwater species and are unlikely to occur near the Development.

Basking shark are a particularly important species on the west coast of Scotland where they are known to commonly occur (Marine Scotland, 2020). They are found in their greatest concentrations locally in summer months, with seasonal migrations to offshore waters or southern areas common in winter months (Doherty et al., 2017; Marine Scotland, 2020). However, recent telemetry studies have indicated that basking sharks exhibit some degree of site fidelity (Doherty et al., 2017; Marine Scotland, 2020). The Sea of Hebrides has been recognised as a particular hotspot for this species and has recently been designated as an MPA (Marine Scotland, 2020). Some sightings have historically been reported in the Firth of Clyde and Loch Fyne (Marine Scotland, 2020) though distribution and habitat suitability modelling has indicated that the loch itself is unlikely to host suitable habitat or persistent populations, and individuals are likely to remain restricted to the Firth of Clyde (Paxton et al., 2014; Austin et al., 2019; Marine Scotland, 2020). As such, whilst occasional basking sharks may occur within the loch, it is unlikely they will occur in persistently high numbers near the Development.

The common skate complex is a demersal elasmobranch with a historically high abundance in Scotland and the North Sea. Overexploitation has led to the decline of this species and it is now listed as critically endangered on the IUCN red list. In Scotland, a particular hotspot for this species has been identified and designated as an MPA – Loch Sunart to the Sound of Jura MPA (approximately 207 km from the Development). Once thought to primarily inhabit deeper habitats, a recent tracking study within the MPA has indicated that this species makes extensive use of shallow-water habitats, including habitats <10 m (Thorburn et al., 2021). Additionally, modelling has indicated that the lower reaches of Loch Fyne may also serve as core habitat in winter months, with seasonal migration patterns indicating that individuals move to shallow waters over winter (Thorburn et al., 2021). However, previous surveys in Loch Fyne (1988-1990) only reported a single skate, with more recent video surveys of the loch not reporting any (Moore, 2019). Furthermore, they are considered to have a below average abundance compared to other regions in western Scotland (Mills, Sheridan, & Brown, 2017; Clyde Marine Planning Partnership, 2018). As such, whilst occasional common skates may occur within the Study Area, it is unlikely that they will be present in high numbers near the Development.

The spiny dogfish is primarily a benthopelagic species but can be found in inshore waters. In Scotland, they occur on the west coast, with recent tagging studies indicating their presence in Loch Etive and the Firth of Lorn, with Loch Etive serving as a mating and nursery ground (Thorburn et al., 2018). Once thought to be abundant in the Firth of Clyde, as evident by fishing records, there is a paucity of records regarding their catch or distribution in the region today (McIntyre et al., 2012). Loch Fyne has been reported as serving as a high intensity spawning area for spiny dogfish (Ellis et al., 2012), however, surveys within the loch have not reported this species in recent years (Scottish Natural Heritage, 2019). As such, it is unlikely that they will occur in high number near the Development.

8.6.2.5 Shellfish

Shellfish is a broad term used to describe a large group of marine invertebrates that possess an exoskeleton (e.g., crustaceans, and molluscs) that are used as food. Shellfish are usually benthic, demersal, subtidal and/or intertidal during their adult stages. Shellfish are predominantly crustaceans and molluscs but other groups such as squid and octopus may also be commercially important in some areas.

Loch Fyne is primarily a recognised shellfish water for its production of Pacific oyster (*Crassostrea gigas*) in both the upper and lower reaches of the loch (SEPA, 2022). The northern basin has also been observed to support blue mussel (*Mytilus edulis*) production, while the middle and lower basins of the loch have also supported otter shell (*Lutraria lutraria*), razor clam (*Ensis arcuatus*), and scallops (*Chlamys opercularis;* SEPA, 2011). It is also thought that the loch provides commercially important density of the Norwegian lobster *Nephrops norvegicus*, with the upper loch identified as having a moderate monetary value in regards to *Nephrops* trawling (Kafas et al., 2014).

Pacific oyster were initially introduced into the UK for mariculture, with ‘escapees’ now having established populations in various regions (Hughes, 2008). They typically occur in sheltered waters on hard surfaces from the lower intertidal zone to the shallow subtidal (NIMPIS, 2022). In Loch Fyne, one oyster farm exists in the upper loch, near Ardkinglas (SEPA, 2022), which has previously reported an annual turnover around £10 million per year (Argyll and Bute Council 2009).

Blue mussel are common throughout the coasts of the British Isles, with large commercial beds located in the estuaries of western Scotland (Tyler-Walters 2008). They typically occur from the high intertidal to the shallow subtidal, attached to rocky surfaces and along piers in sheltered harbours, often forming dense aggregations (Tyler-Walters 2008). They are known to naturally occur throughout Loch Fyne and have previously been farmed in the northern loch, however the most recent assessment of the Loch Fyne shellfish water indicates that these sites have since been declassified (SEPA 2022).

The langoustine, *Nephrops norvegicus*, is considered one of the main target commercial species within Loch Fyne (Argyll and Bute, 2009). Trawlers operate throughout the majority of the loch, including the Study Area, except the shallow sill area around Otter Spit (***Error! Reference source not found.*** *(Volume 3: Figures)*). Nephrops typically occur on sublittoral soft sediments and are commonly associated with fine cohesive mud which is stable enough to support their burrows (Hill and Sabatini 2008). Considerable populations are known from the Clyde region, with Scotland’s sea lochs known to serve as important habitats (Marine Scotland, 2020). Furthermore, Nephrops is commonly associated with the PMF habitat ‘burrowed mud’ (Marine Scotland, 2020), which is a designated feature of the Loch Fyne and Loch Goil MPA, within which the Development is situated.

8.6.2.6 Spawning and Nursery Grounds

The occurrence, distribution and abundance of many fish and shellfish within the Study Area is determined by their propensity to aggregate within specific areas to spawn. ‘Spawning grounds’ are defined either by the species behaviour and may, therefore, cover a wide area, or by specific habitat preferences (e.g., gravel), which may restrict spatial extent. Fish exhibit several modes of reproduction, the most common being broadcast spawning, where eggs and sperm are released into the water column (Ellis *et al*., 2012). Other species deposit egg-cases or egg mats onto the seafloor making them more vulnerable to seabed disturbance.

Fisheries sensitivity maps presented by Coull *et al*. (1998) and Ellis *et al*. (2012) provide important information on the locations of spawning (where eggs are laid) and nursery (common locations for juveniles) grounds for selected species of fish and shellfish in the Study Area. The data indicate that the Study Area and therefore the Development fall within important spawning grounds for sprat (Coull et al., 1998) and important nursery grounds for cod, common skate, hake, herring, mackerel, sandeel, and spiny dogfish (Ellis et al., 2012).

However, several of the aforementioned species present in the Study Area are broadcast spawners or release eggs in the water column (e.g., whiting, sprat, mackerel, and cod). Therefore, once eggs have spawned, they become pelagic and are carried away by ocean currents, dispersing throughout the water column. As such, eggs of these species are expected to be transported away from the Development, making them unlikely to be at risk of impact. The only species carried forward for detailed appraisal and assessment of potential impacts resulting from the Development are herring and sandeel.

In Scotland, the Firth of Clyde has historically been home to a spawning population of herring, which remained one of the last known spawning populations following overexploitation in the region (Frost and Diele, 2022). However, pollution and further degradation has occurred in the area and herring are no longer considered to spawn in great numbers (ICES 2019). Herring are known to spawn in high energy environments, selecting structurally complex habitats and coarse substrates (e.g. gravel, shells, small rocks, shingle, coarse sand; Frost and Diele, 2022). Within the Firth of Clyde, present-day spawning is largely restricted to the ridges of Ballantrae Bank and the coast of Arran (Frost and Diele, 2022). Furthermore, project-specific benthic surveys reported that the Study Area was largely comprised of muddy sediments. As such, when considering the remaining distribution of spawning herring in the Clyde region and the unsuitability of the habitat within the Study Area, it is unlikely any herring spawning will occur near the Development.

Sandeel spawning is associated with specific habitat types, which typically consist of coarse sand with small contributions of mud and sometimes gravel. Particle size analysis (PSA) for sites within the Development area yielded sediment samples with mud composition ranging from 18-62% (*Appendix 8.2 Subtidal Benthic Survey Report*). This exceeds the percent of mud considered suitable for sandeel spawning. Analysis of PSA conducted by NatureScot in upper Loch Fyne also reported sediment types not suitable for sandeel spawning, comprised primarily of mud with varying amounts of sand, classified as 'slightly gravelly sandy mud' (Allen, 2017). As such, it is unlikely that any suitable sandeel spawning habitat is present near the Development.

8.6.3 Marine Mammal Ecology

There are two groups of marine mammals found in UK waters: cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals). Most are wide ranging and those recorded within the study area are likely to be individuals from larger biological populations present along the UK coast. All marine mammal species are of high conservation value and sensitivity to impacts from Development activities range from low to high depending on the activity and species.

8.6.3.1 Cetaceans

The Development is located within ICES Celtic Seas Ecoregion (ICES 2022). Within this ecoregion, thirteen marine mammals species are considered to commonly occur or be regular visitors: Atlantic white-sided dolphin (*Lagenorhynchus acutus*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), cuvier's beaked whale (*Ziphius cavirostris*), fin whale (*Balaenoptera physalus*), harbour porpoise (*Phocoena phocoena*), orca (*Orcinus orca*), long-finned pilot whale (*Globicephala melas*), Minke whale (*B. acutorostrata*), northern bottlenose whale (*Hyperoodon ampullatus*), Risso's dolphin (*Grampus griseus*), Sowerby's beaked whale (*Mesoplodon bidens*), sperm whale (*Physeter macrocephalus*), and white-beaked dolphin (*L. albirostris*).

Most of the above species are considered pelagic, occurring primarily offshore in deep waters and unlikely to occur near the Development. However, Atlantic white-sided dolphin, bottlenose dolphin, harbour porpoise, orca, minke whale, and white-beaked dolphin are known to regularly inhabit or visit shallow coastal habitats and as such may occur near the Development. These, and all cetacean species are protected in UK waters and are of international conservation importance (*Table 8.6 Protection Status for the Most Common Cetaceans Present within the study area*).

Table 8.6 Protection Status for the Most Common Cetaceans Present within the study area

Common Name	Latin Name	Wildlife and Countryside Act, 1981	EC Habitats Directive (Annex)	Bonn Convention (Appendix)	Bern Convention (Appendix)	ASCOBANS	Scottish Priority Marine Feature
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	✓	IV	II	II	✓	Offshore waters
Bottlenose dolphin	*Tursiops truncatus*	✓	II, IV	II	II	✓	Offshore & territorial waters

Harbour porpoise	*Phocoena phocoena*	✓	II, IV	II	II	✓	Offshore & territorial waters
Orca	*Orcinus orca*	✓	IV	II	II	✓	Offshore & territorial waters
Minke whale	*Balaenoptera acutorostrata*	✓	IV	-	II, III	-	Offshore & territorial waters
White-beaked dolphin	*L. albirostris*	✓	IV	II	II	✓	Offshore & territorial waters

The IAMMWG has further defined management units for the most common species in the UK, based on population structure, movement and habitat use, and relevant management boundaries (IAMMWG, 2023). As such, the study Area for cetaceans reflects the relevant MUs of each species.

For Atlantic white-sided dolphin, minke whale, and white-beaked dolphin, the Development falls within the Celtic and Greater North Sea IAMMWG MU. For bottlenose dolphin and harbour porpoise, it occurs within the Coastal West Scotland & Hebrides IAMMWG MU for bottlenose dolphin and West Scotland IAMMWG MU respectively. No MU has been defined for orca.

The most recent effort to understand the abundance of cetaceans in UK waters has been the SCANS IV surveys, which estimated the abundance of small cetaceans across the northeastern Atlantic and North Sea. The programme commenced in 1994 with boat-based line transect and aerial surveys, and has since been repeated in 2005, 2016, and 2022. Abundance estimates are divided into blocks, with block CS-F containing the Development. Considering the wide-ranging nature of marine mammals, consideration has also been given to the adjacent block CS-D (*Image 8. 1 SCANS IV Survey Blocks*, below). It is important to note that SCANS surveys were conducted in the summer (predominantly July) and therefore data is only representative of summer distributions (Hammond, et al., 2021). However, it is understood that the densities of cetaceans around the British Isles are likely to be highest during this season (Waggitt et al., 2019).

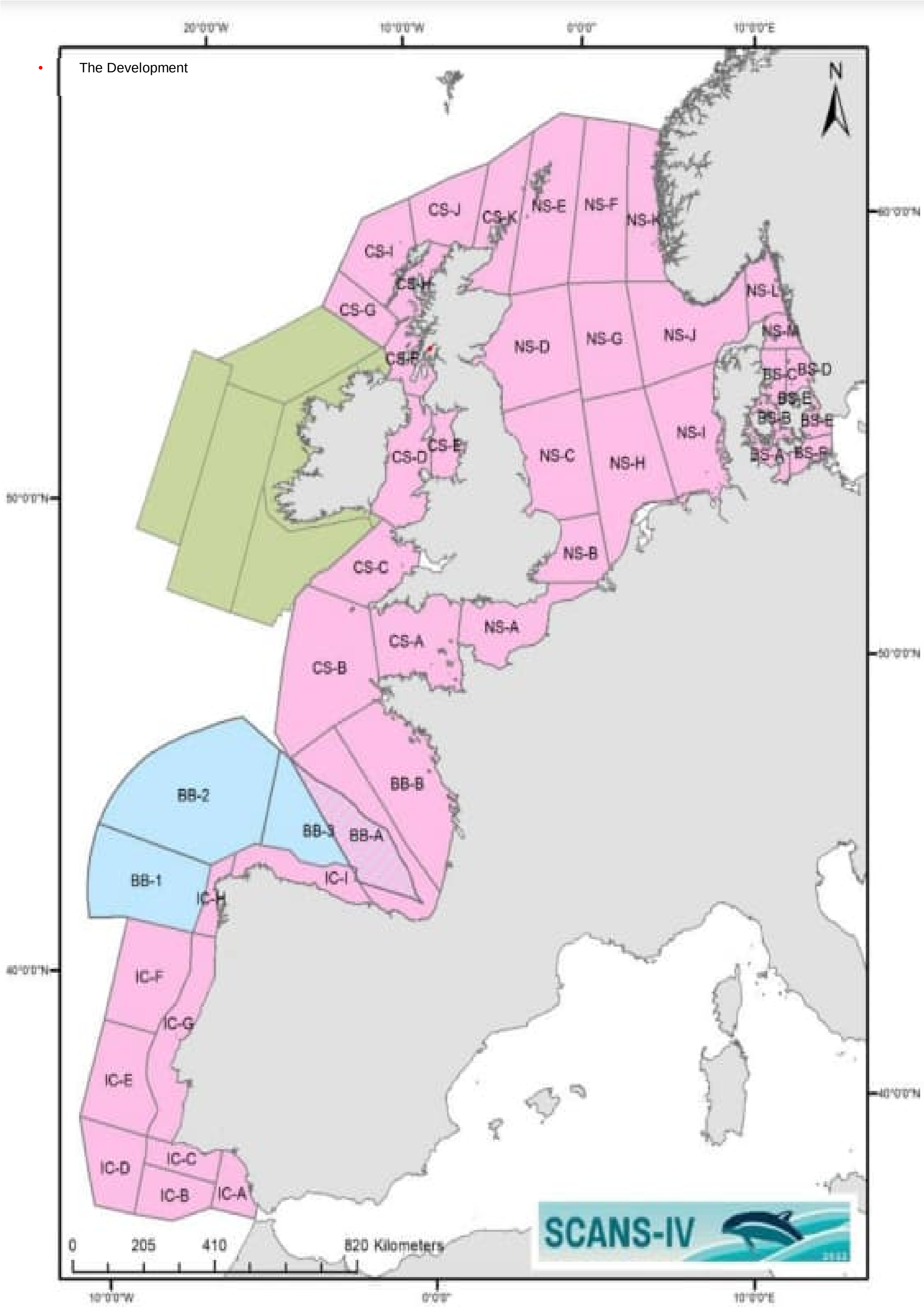

Image 8. 1 SCANS IV Survey Blocks

The most recent abundance estimates for the IMMWG MUs and relevant SCANS IV block data are provided in *Table 8.7 Abundance and Density Estimates for Cetaceans in the Study Area.*

Table 8.7 Abundance and Density Estimates for Cetaceans in the Study Area

Species	IAMMWG MU	MU Abundance	MU UK EEZ Abundance	SCANS IV Block CS-F Density (ind. Km^{-2})	SCANS IV Block CS-D Density (ind. Km^{-2})

Harbour porpoise	West Scotland	28,936	24,305	0.20	0.28
Bottlenose dolphin	Coastal West Scotland & Hebrides	N/A	45	0.78	0.35
Minke whale	Celtic and Greater North Sea	20,118	10,288	0.01	0.01
Atlantic white-sided dolphin	Celtic and Greater North Sea	18,128	12,293	0	0
White-beaked dolphin	Celtic and Greater North Sea	43,951	34,025	0	0
Orca	N/A	N/A	N/A	N/A	N/A

Harbour porpoise are widespread and abundant throughout UK waters. They most commonly occur in continental shelf waters less than 100 m deep and are frequently observed in coastal bays and estuaries. Harbour porpoise are widespread around the seas of Scotland, with the inner Hebrides designated for the protection of this species. Lower Loch Fyne is also considered to host groups of harbour porpoise (Argyll and Bute Council, 2009). Within the ?Firth of Clyde, harbour porpoise have been detected with passive acoustic monitoring (PAM) surveys, with sightings also reported in both the lower and upper reaches of Loch Fyne (Brown 2018; Hebridean Whale and Dolphin Trust 2023). Additionally, modelling of harbour porpoise distribution in the North Sea indicates that sea surface temperature, distance to coast, depth, and distance to sandeel grounds are important predictor variables in describing their distribution (Gilles, et al., 2016) as harbour porpoise forage mainly for sandeel (Maeda, et al., 2021). However, within Loch Fyne, no preferred sandeel grounds were identified (*Section 8.6.2 Fish and Shellfish Ecology*). Nevertheless, occasional sightings within the loch and proximity to the firth suggest individuals may occur near the Development.

Bottlenose dolphin have a near global distribution and are common throughout UK waters. In Scotland, resident populations exist in the Moray and Cromarty Firths along the east coast, but only occur in small groups along the west coast, particularly around the Hebrides (Sea Watch Foundation, 2012a). There are two recognised ecotypes of bottlenose dolphins – a coastal ecotype which primarily occurs within 30 km of the coastline and exhibits habitat fidelity, and a wide-ranging offshore ecotype (Hague, Sinclair, & Sparling, 2020). The most recent assessment of bottlenose dolphin sightings and distribution in western Scotland reported sightings from around the Firth of Clyde and into the lower reaches of Loch Fyne, but also estimated that abundance is approximately five times greater on the east coast than the west coast (Thompson et al., 2011). Predicted density and distribution of the offshore ecotype reported low densities in the northern Irish Sea and Firth of Clyde, with a lack of any seasonal variation (Waggitt et al., 2020). Furthermore, the lower loch is considered to host groups of bottlenose dolphin (Argyll and Bute Council, 2009), but very limited sightings have been reported within the upper loch (Hebridean Whale Trust 2023). As such, whilst occasional individuals may be present within the vicinity of the Development, it is unlikely bottlenose dolphin will occur in large numbers.

The minke whale is relatively common in UK waters with much of its distribution concentrated in coastal waters around Scotland. They are most commonly seen in areas of strong currents around headlands and islands, but have also been observed entering estuaries, bays, and inlets (NatureScot 2023d). The waters around the Hebrides are known to host a seasonal abundance of minke whale between July and September (NatureScot 2023d), with occasional observations of individuals reported within Loch Fyne (Hebridean Whale and Dolphin Trust, 2023). Atlantic white-sided dolphin occur primarily in temperate and subarctic waters of the northern Atlantic, most commonly along the continental shelf slope in western Ireland and north-west Britain (Sea Watch Foundation, 2012b). In the waters off western Scotland, they occur in social groups of 2-30 individuals (Hebridean Whale and Dolphin Trust 2023). In summer months they migrate to more coastal waters but are still rarely seen within the continental shelf in the Hebrides (Hebridean Whale and Dolphin Trust 2023). When considering this in conjunction with the lack of assessment during the SCANS IV surveys, they are unlikely to occur within the study area.

The white-beaked dolphin is endemic to the northern Atlantic and North Sea (Sea Watch Foundation, 2012c). It occurs primarily in continental shelf waters less than 200 m deep and is common in the waters of western Ireland and Scotland (Sea Watch Foundation, 2012). On the west coast of Scotland, they occur primarily around the northern Minch and Western Isles (Calderan et al., 2013). When considering this in conjunction with their absence in the SCANS IV surveys, it is unlikely that this species will occur near the Development.

In UK waters, orcas are common in northern and western Scotland. A resident group is known to range widely around the west coast of the UK and Ireland. A separate population are seasonal visitors to Northern Scotland, particularly the Shetland and Orkney Islands. In the Hebrides there is a small group of killer whales called the West Coast Community, which include just eight individuals that have been seen in the Clyde and around Arran. However, no sightings have been reported within the upper loch (Hebridean Whale Trust 2023), nor have they been reported in the SCANS IV surveys and as such are unlikely to occur within the study area.

8.6.3.2 Pinnipeds

Two seal species are known to occur in the northeast Atlantic, the harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*), with the UK known to support important populations of both species. Scotland in particular supports high concentrations, accounting for 80% and 85% of the UK population respectively for harbour and grey and seals (SCOS, 2023. The Development falls within the Southwest Scotland MU for both species, where the most recent count data are 1,709 individuals for harbour seal and 517 individuals for grey seal (SCOS, 2023).

Both species are known to forage over large distances, coming onshore at haul-out sites to rest, breed, and moult. Harbour seals forage up to 273 km from their haul out site, but typically remain within 50 km of the coastline (Russell & McConnell, 2014; Russel, Jones, & Morris, 2017; Carter et al., 2022), whilst grey seals are known to forage up to 448 km from their haul-out sites (Carter et al., 2022).

Recent modelling of at-sea seal distribution in the UK has indicated that Loch Fyne is not likely to support any grey seals but may support very low numbers (>0.05% of the at-sea population) of harbour seal (Carter et al., 2022). Furthermore, no breeding colonies for grey seal are known to occur within Loch Fyne or the Firth of Clyde region, but small haul out sites for harbour seal (supporting <100 individuals) may occur within the loch (SCOS, 2021).

Recent aerial surveys of the area have been conducted by the Sea Mammal Research Unit at the University of St Andrews, which tracked the abundance and distribution of seals in Scotland during the summer moult period from 2016-2019 (Morris et al., 2021). The most recent data for Loch Fyne (2018) indicated that harbour seals were abundant (*Image 8.2 Harbour Seal Distribution by 10 km Squares from Aerial Surveys Conducted During Moult in August 2016-2019 source: Morris et al., 2021,* below) within the loch, exhibiting an increasing population trend between 1989 (n=136) and 2018. Harbour seal haul-out locations near Lochgilphead (Argyll & Bute, 2009) but these are over 100 km south of the development. Grey seals were also reported, but at much lower numbers (n<10; *Image 8.3: Grey Seal Distribution by 10 km Squares from Aerial Surveys Conducted During Moult in August 2016-2019 source: Morris et al., 2021*, below), indicating that they are not likely resident in the area (Morris et al., 2021).

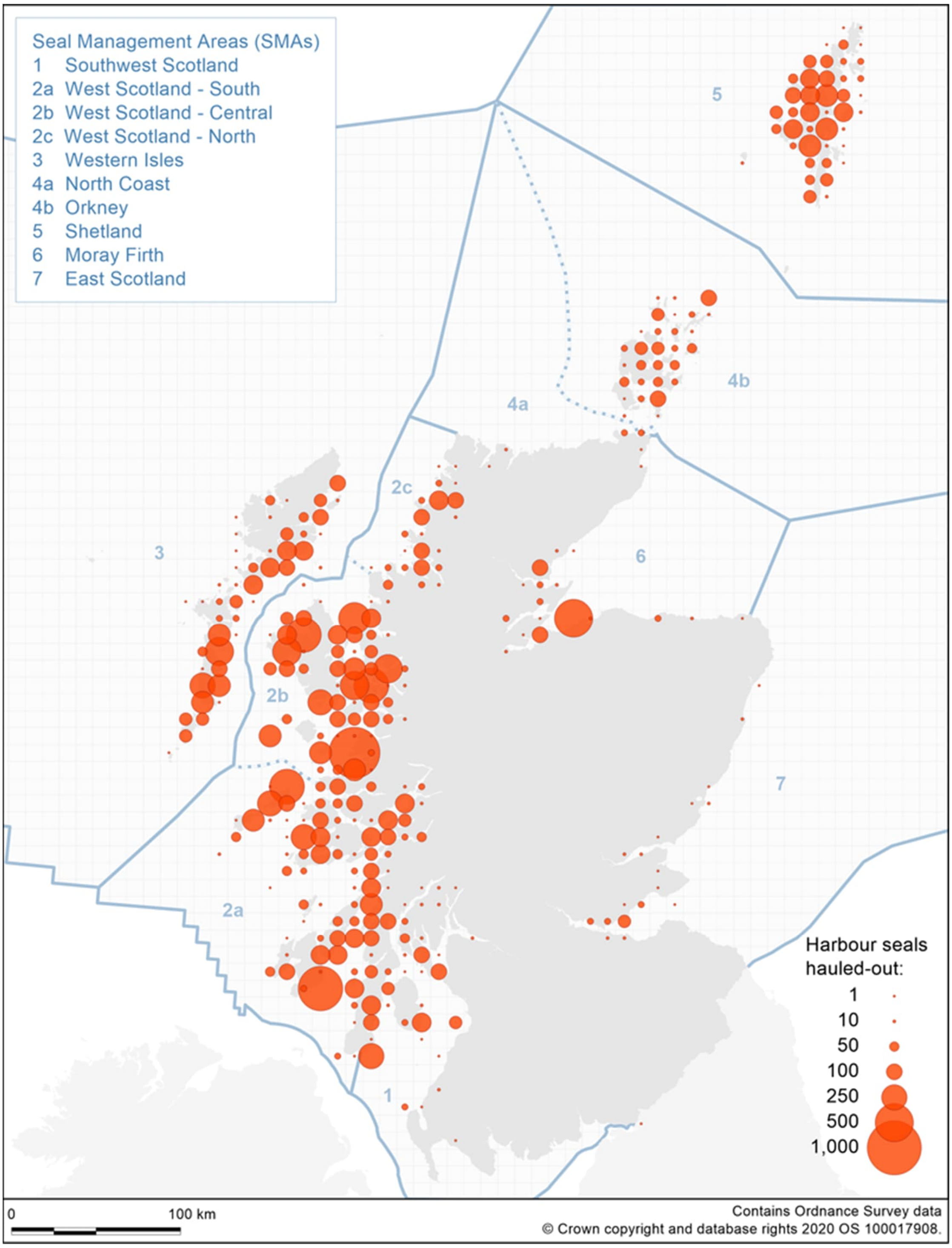

Image 8.2 Harbour Seal Distribution by 10 km Squares from Aerial Surveys Conducted During Moult in August 2016-2019 *source: Morris et al., 2021*

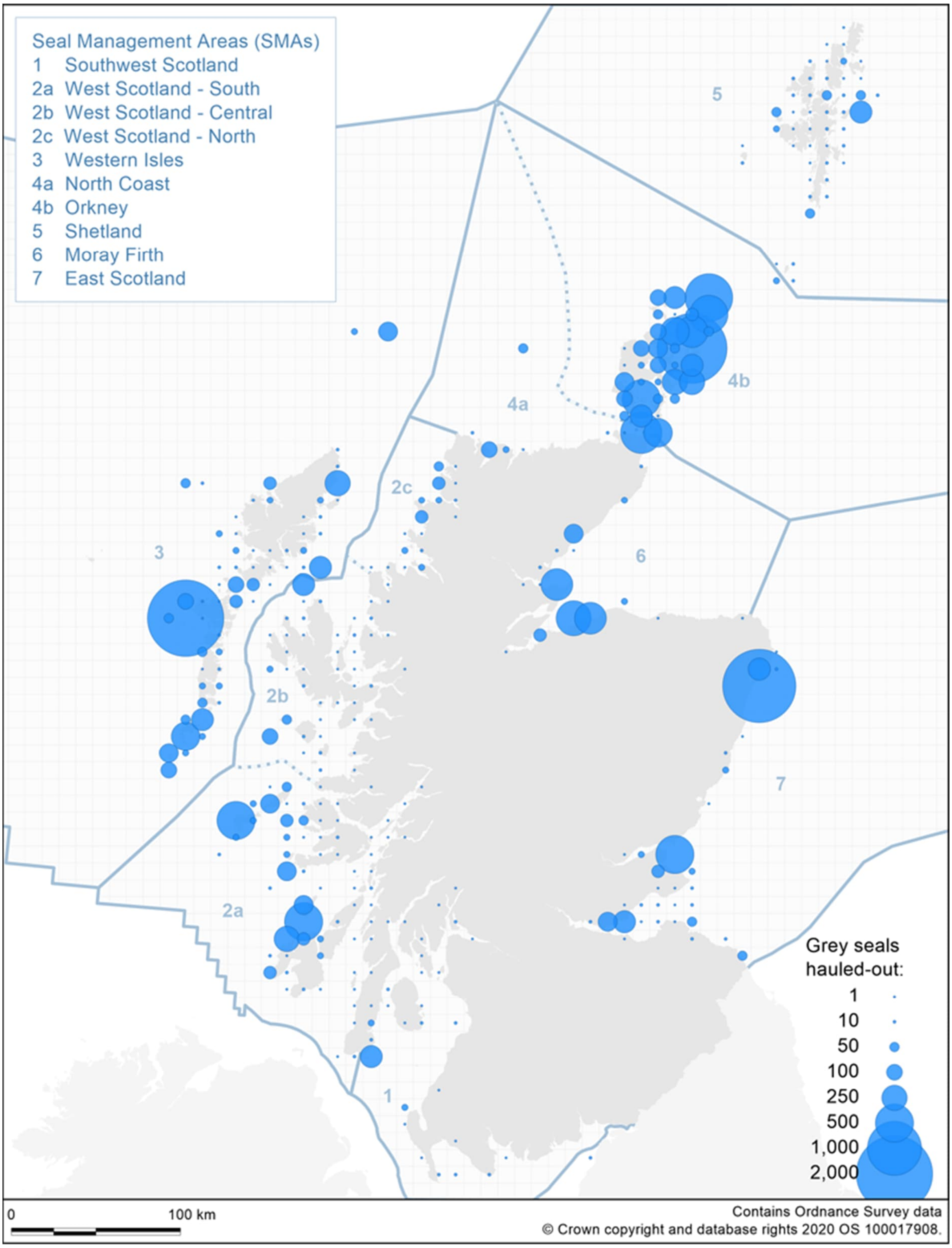

Image 8.3: Grey Seal Distribution by 10 km Squares from Aerial Surveys Conducted During Moult in August 2016-2019 ***source: Morris et al., 2021***

8.6.4 Designated Sites

Several sites designated for the protection of marine ecological features occur within the study areas of relevant receptors. These include:

- Upper Loch Fyne and Loch Goil MPA (0 km) – overlaps with the Development, designated for the protection of burrowed mud, flame shell beds (*Limaria hians*), horse mussel beds (*Modiolus modiolus*), and ocean quahog aggregations (*Arctica islandica*);

- The Maidens SAC (~156 km) – designated for the protection of grey seal;
- North Channel SAC (~166 km) – designated for the protection of harbour porpoise;
- Skerries and Causeway SAC (~178 km) – designated for the protection of harbour porpoise;
- South-east and Islay Skerries SAC (~179 km) – designated for the protection of harbour seal
- Inner Hebrides and the Minches SAC (~187 km) – designated for the protection of harbour porpoise; and,
- Sea of Hebrides MPA (~255 km) – designated for the protection of minke whale.

The Development directly overlaps with the Upper Loch Fyne and Loch Goil MPA (*Figure 8.1: Benthic Ecology and Fish and Shellfish Study Area (Volume 3: Figures)*) and as such, direct impacts to the designated features of this site are likely to occur. These have been considered in *Appendix 8.3 MPA Assessment.*

The remaining designated sites are each located >150 km from the Development area. Although the marine mammal species for which these sites are designated are known to range over great distances, no connection has been reported between the populations of these sites and Loch Fyne. Occasional visitors are known to occur within the upper reaches of the loch, but no resident populations or regular visitors occur (Sea of Hebrides Trust, 2023). As such, these sites have been screened out of any further assessment and only the Upper Loch Fyne and Loch Goil MPA is considered

8.6.5 Summary

A variety of important marine habitats and organisms occur within the study area which may be subject to impacts from project activities. The Development occurs within the Upper Loch Fyne and Loch Goil MPA, which is designated for the protection of burrowed mud habitats, flame shell beds, horse mussel beds, ocean quahog aggregations, and sublittoral mud and mixed sediment communities. Project-specific benthic surveys observed the PMFs 'burrowed mud' and 'kelp and seaweed communities on sublittoral sediment', which comprise the majority of the study area.

Loch Fyne is a sea loch, with numerous rivers which have been identified as important locations for diadromous fish species that run into the loch. As such, Atlantic salmon, brown trout, European eel, and lamprey may all be present within the study area with Atlantic salmon and sea trout included in the Argyll and Bute Council's local biodiversity action plan. Additionally, tows within the upper loch have reported the presence of demersal fish including cod, haddock, and hake, which may be present near the Development.

Marine mammals may also be occasional visitors to the area, although no resident populations have been recorded within the loch. The outer and inner Hebrides are known to support resident populations of several marine mammal species, and as such, occasional individuals of harbour porpoise, bottlenose dolphin, and minke whale may occur. Similarly, occasional grey seals may occur near the development but they are not considered resident. The most abundant marine mammal within the loch is likely to be harbour seal, which have been reportedly observed in high numbers.

A summary of receptors sensitivity is provided in *Table 8.8 Summary of Receptor Sensitivity*.

Table 8.8 Summary of Receptor Sensitivity

Receptor	Relevant Species or Habitats	Sensitivity	Justification
Benthic Ecology	Kelp and seaweed communities on sublittoral sediment Burrowed mud Fireworks anemone	High	These habitats and species were observed in project-specific benthic surveys and are designated as PMFs in Scotland. Burrowed mud is also a designated feature of the Loch Fyne and Loch Goil MPA.
Fish and Shellfish	Migratory fish (e.g. Atlantic salmon, sea trout, European eel, lamprey)	High	Atlantic salmon, European eel, and lamprey are protected in the UK as Annex II species under the Conservation of Habitats and Species Regulations 2017. All species are PMFs in Scotland. Both Atlantic salmon and sea trout are associated with rivers in the upper loch and as such, may migrate through the Development area.
Marine Mammals	Harbour seal Harbour porpoise	High	Protected in the UK as Annex II species under the Conservation of Habitats and Species Regulations 2017 and listed as PMFs in

Receptor	Relevant Species or Habitats	Sensitivity	Justification
	Bottlenose dolphin		Scotland. Harbour seal are resident in the lower loch, with harbour porpoise and bottlenose dolphins likely occasional visitors.
Designated Sites	Upper Loch Fyne and Loch Goil MPA	High	Directly overlaps with Development. Designated for the protection of burrowed mud, sublittoral mixed sediment, flame shell beds, horse mussel beds; and ocean quahog aggregations. Of these features, only burrowed mud was observed in project-specific benthic surveys within the study area.

8.6.6 Future Baseline

The Firth of Clyde is a highly anthropogenically influenced region, subject to heavy shipping traffic, pollution, and overexploitation of marine species, which has resulted in marked changes in its marine faunal communities (Thurstan and Roberts 2010). It has since become the subject of numerous local environmental regulations and policies, particularly in relation to fishing and as such, it is possible that local community compositions and populations of marine fauna may change over time.

In particular, data indicate that the harbour seal population is increasing within the study area, individuals having more than doubled in number locally between 1989 and 2018 (Morris et al., 2021). Thus, it is likely that the local population of harbour seals may continue to increase.

Furthermore, it is noted that as environmental variables, such as sea surface temperature, are altered with predicted climate change, there may be shifts and / or expansions of the distribution of marine faunal populations. However, only the piles are expected to be left *in situ* permanently, which are unlikely to pose long-term impacts to the local environment. When considering population trends, it takes several years before changes in population structure are apparent. Therefore, considering the short-term nature of impacts from the construction of the Marine Facility, it is unlikely that significant changes to baseline conditions will occur within the life cycle of the project

8.7 Assessment of Effects

This section describes the potential impacts of the Project on the benthic ecology receptors during the pre-construction, construction, operational, and decommissioning phases (*Chapter 2: Project and Site Description*). The appraisal has been undertaken in accordance with the methodology presented in *Chapter 3: Approach to EIA Methodology*, with consideration given to the CIEEM guidance for Ecological Impact Assessment (*Section 8.5.1: Guidance and Standards*). The following pathways detailed in *Table 8.9 Summary of Potential Impacts* have been assessed in the appraisal.

Table 8.9 Summary of Potential Impacts

Potential Impact	Receptor	Zone of Influence (ZoI)	Development Phase
Effects from underwater sound (UWS)	Fish & Shellfish Ecology Marine Mammal Ecology	Disturbance to some cetaceans may occur up to 26 km (Dahne, 2013; Tougaard et al., 2013; JNCC 2020)	Construction, operation, and decommissioning
Permanent Loss of Benthic Habitat	Benthic Ecology	Installation of 72 piles of 0.6 m diameter giving a total footprint of 20.4 m2	Construction
Benthic habitat modification from the introduction of artificial structures on the substrate	Benthic Ecology	Installation of 72 piles of 0.6 m diameter giving a total footprint of 20.4 m2	Construction
Temporary physical disturbance to subtidal benthic habitats and species	Benthic Ecology	Footprint of jack up barge spud legs on the seabed estimated to be ~12 m2 (4 legs of 2 m diameter each).	Construction
Temporary increase in SSC and sediment deposition leading to turbidity, smothering effects and contaminant mobilisation	Benthic Ecology Fish & Shellfish Ecology	Fine particulates may disperse up to 700 m away from the Marine Facility	Construction

Disturbance to habitats and species due to scour from hydrodynamic change	Benthic Ecology Fish & Shellfish	Small region (<1 m) in the immediate vicinity of each pile	Operation
Airborne sound and visual disturbance	Marine Mammal Ecology	500 – 1,500 m	Construction, operation, and decommissioning
Vessel collision risk	Marine Mammal Ecology	Localised	Construction, operation, and decommissioning
Reduction in water quality (discharges, unplanned releases, and accidental leaks and spills from vessels)	Benthic Ecology Fish & Shellfish Ecology Marine Mammal Ecology	700 m	Construction, operation, and decommissioning
Introduction and spread of INNS	Benthic Ecology	700 m	Construction, operation, and decommissioning

8.7.1 Construction Phase

8.7.1.1 Underwater Sound

For underwater sound impact appraisals, the applied metrics are sound pressure level (SPL) and sound exposure levels (SEL). The SPL is a measure of the amplitude or intensity of a sound and is typically measured as a peak value. In contrast, the SEL is a time-integrated measurement of the sound energy, which takes account of the level of sound as well as the duration over which the sound is present in the marine environment.

Construction works required for the Development require the installation of steel piles to construct the marine jetty. The installation method is expected to be dominated by in-water vibratory piling but there may be a requirement to use drop hammer impact piling to toe the piles into bedrock to install the Marine Facility, which may produce high Sound Pressure Levels (SPL) that can be detected by many groups of marine fauna, including fish and marine mammals. The impact of anthropogenic sound on marine fauna depends on a range of factors including the frequency and intensity of the sound source, the duration of the sound, normal background levels, as well as the sensitivity and behaviour of the receiving animal, and possible habituation to background sound sources.

The sound characteristics of Development activities have been determined on the basis of equipment specifications and literature values as provided in *Table 8.10 Characteristics of Underwater Sound Sources Generated by the Development's Construction Phase*. The sound level for these activities were only available for a distance of 10 m from the sound source.

Table 8.10 Characteristics of Underwater Sound Sources Generated by the Development's Construction Phase

Development Activity	Nature of the sound source	Operating Frequency	SPL_{peak} dB re 1µPa @ 10 m
Impact piling (600 mm)	Impulsive	<500 Hz (Reyff, 2012)	183-205 (California Dept. of Transport, 2007; Jimenez-Arranz, 2020)
Vibratory piling (600 mm diameter steel pile)	Continuous	20-40 Hz (Jimenez-Arranz, 2020)	173-178 SPLrms (Jiminez-Arranz, 2020)
Use of project vessels	Continuous	Low to high frequency	160-184

Marine Mammals

Marine mammals rely on sound for a range of important ecological functions. Underwater sound from anthropogenic activities can negatively impact marine mammals, as it can affect their ability to echolocate and communicate and can even cause physical harm (Southall et al., 2007). Cetaceans in particular, produce and receive sound over a wide range of frequencies for communication, orientation, predator avoidance and foraging (Tyack, 2008).

Severe responses, such as indirect death from strandings in particular, have only been recorded in beaked whales specifically relation to military sonar (e.g. see Southall et al., 2013). The most likely responses to underwater sound from construction in the marine environment are damage or injury to auditory apparatus and disturbance.

Depending on the intensity and frequency of the sound source, exposure can result in several impacts to marine mammals, which are categorized as follows:

- Auditory injury - a consequence of damage to the inner ear of marine mammals, the organ system most directly sensitive to sound exposure. Hearing loss or a shift in hearing thresholds can be permanent or temporary:
  - Permanent Threshold Shift (PTS) - is a permanent elevation in hearing threshold. PTS can occur from a variety of causes, but it is most often the result of intense and / or repeated noise exposures; and
  - Temporary Threshold Shift (TTS) - is a recoverable elevation in hearing threshold most commonly resulting from long-term noise exposure not high enough to cause PTS.
- Behavioural responses – are highly variable and context-specific, ranging from increased alertness, altering vocal behaviour, interruption to feeding or social interaction, alteration of movement or diving behaviour, temporary or permanent habitat abandonment. Minor or temporary behavioural responses are often simply evidence that an animal has heard a sound; and
- Masking – anthropogenic underwater sound may partially or entirely reduce the audibility of signals of interest such as those used for communication and prey detection.

The scale of impact of UWS on marine mammals is largely determined by physiology and is dependent upon a species' auditory range. Thus, for the determination of the impact of UWS, marine mammals have been categorized into functional hearing groups based on their peak hearing range. These groups are detailed in *Table 8.11 Marine Mammal Hearing Groups, Auditory Bandwidth and Potential Species within the Study Area*, along with representative species from each category that may be present within the study area.

Table 8.11 Marine Mammal Hearing Groups, Auditory Bandwidth and Potential Species within the Study Area

Functional Hearing Group	Auditory Band Width[5]	Species	Species potentially present in the study area
Low frequency cetaceans	7 Hz – 35 kHz	Baleen whales	Minke whale
High frequency cetaceans	150 Hz – 160 kHz	Dolphins, toothed and beaked whales	Bottlenose dolphin
Very high frequency cetaceans	275 Hz – 160 kHz	True porpoise and some small whales	Harbour porpoise
Pinnipeds in water	75 Hz – 100 kHz	Seals	Harbour seal

The most up-to-date sound exposure criteria for auditory injury in marine mammals have been published by the United States National Marine Fisheries Service (NMFS), often referred to as the NOAA (National Oceanic and Atmospheric Administration) thresholds (NMFS, 2018). For impulsive sounds, NMFS suggest thresholds of 196 dB re 1µPa^{2}s for TTS in very high frequency cetaceans (such as harbour porpoise) and 212 dB re 1µPa^{2}s in pinnipeds (NMFS, 2018). For continuous sounds, there are no SPL thresholds. Thus, the NMFS thresholds are based on M-weighted[6] SELs for PTS and TTS only.

There are no quantitative thresholds for behavioural disturbance in the latest guidance (NMFS, 2018; Southall, et al., 2019). Published guidance on disturbance ranges, called the effective deterrent range (EDR), associated with monopile installation by impact piling suggests 26 km (JNCC, 2020) for harbour porpoise, the most noise sensitive of the cetacean species. The details of thresholds for both marine mammals and fish are provided in *Table 8.12 PTS and TTS Thresholds for Marine Mammals Exposed to UWS Sources.*

The Development will use vibratory piling predominantly, with impact piling potentially required for the final stages of the installation. For impact piling, the sound source will be impulsive, which could be associated with injury. For vibratory piling, the primary sound source will be continuous, which is predominantly associated with behavioural changes in marine fauna.

[5] Estimated lower to upper frequency hearing cut-off (Southall et al., 2007)
[6] M-weighting gives deemphasized frequencies outside of marine mammal hearing ranges, giving greater value to frequencies within their hearing ranges.

Table 8.12 PTS and TTS Thresholds for Marine Mammals Exposed to UWS Sources (Southall et al., 2019)

Hearing Group	Continuous		Impulsive			
	PTS SEL_{cum}	TTS SEL_{cum}	PTS SEL_{cum}	PTS SPL_{peak}	TTS SEL_{cum}	TTS SPL_{peak}
Low frequency cetaceans	199	179	183	219	168	213
High frequency cetaceans	198	178	185	230	170	224
Very high frequency cetaceans	173	153	155	202	140	196
Pinnipeds in water	201	181	185	218	170	212

The estimated programme of construction works for the jetty is a period of 12 months (*Chapter 2: Project and Site Description*). The period in which piling will take place is currently unknown but considering a likely worst-case scenario of one pile installation per day, this would equate to 72 days when some kind of piling could occur.

Vibratory piling, which is expected to be the main pile installation method, produces underwater sound at a significantly lower sound intensity than impact piling (*Table 8.10 Characteristics of Underwater Sound Sources Generated by the Development's Construction Phase*). Most of the sound produced during vibratory piling is radiated within the frequency range of the vibration frequency of the pile driver, which is generally between 20 and 40 Hz (Matuschek and Betke 2009). This is generally a range at which marine mammals, other than low frequency cetaceans, are not as sensitive (Southall et al., 2007).

Whilst no resident marine mammal populations exist near the Development, occasional visitors, primarily harbour seals and harbour porpoise, may occur which would thus be subject to impact from Development activities. For vibratory piling, the operating frequency is not within the peak auditory band width for these species and the sound from vibratory hammers rises relatively slowly (California DoT, 2009). As such, is very unlikely to result in injury. There is expected to be some disturbance but considering the low intensity and continuous nature of the sound source from vibratory piling, and the hearing range of the most likely species to be present, it is considered to be minor and not significant.

Should impact piling occur, it is considered to pose a risk of auditory injury to marine mammals. Impact piling can operate at frequencies up to 500 Hz, with SEL values that vary depending on pile composition and dimensions. For ~600 mm steel piles, the SEL values are approximately 170-180 dB re 1 $\mu Pa^2 s$ (NOAA, 2017), with much greater peak SPL values. Peak SPL values associated with impact piling can exceed thresholds for PTS and TTS for low and very high frequency cetaceans, and pinnipeds. Additionally, behavioural responses have been observed in high frequency cetaceans such as harbour porpoises up to 20 km from a piling site. Following pile-driving activities, a short-term reduction in porpoise detections was recorded, indicating that impact piling is likely to result in significant displacement of individuals (Graham et al., 2017).

Embedded mitigation measures are in place per guidance from JNCC on minimising the risk of injury to marine mammals during impact piling activities (JNCC, 2010). The mitigation includes the use of marine mammal observers (MMO) and soft-start procedures (see *Section 8.9 Mitigation and Monitoring*). The purpose of the soft-start period is to allow sound to build gradually, allowing any marine mammals present to easily move away from the immediate area, and as no impact piling will start if animals are within the 500 m observation zone, injury is unlikely to occur.

Some disturbance is expected but considering the embedded mitigation this is considered to result in minor behavioural changes only. Furthermore, impact piling is intermittent, with gaps in between piles and pauses during piling operations. These intervals allow for avoidance behaviour and for recovery if any impacts such as TTS were to occur. Despite the high sensitivity of the receptor, the number of individuals likely to be affected is low, as marine mammal species are considered only occasional visitors. Therefore, as impacts are considered to be predominantly behavioural with appropriate mitigation in place, the magnitude of the impact is considered to be low, and the significance of effects from impact piling on marine mammals is considered **minor adverse** and thus **not significant**.

Fish and Shellfish

Fish use sound for communication, prey location and predator avoidance (Fay and Popper, 2000). They perceive sound through their ears and lateral line (termed the 'acoustico-lateralis system') which are sensitive to vibrations created by sound sources. Some have a gas-filled sack known as a swim bladder which can also be used for sound detection (Hawkins, 1993) but can be vulnerable to rapid changes in pressure.

Responses to sound depend on whether the sound source is present at a level and within the range of frequencies to which an individual is sensitive. Most fish cannot hear sound above 1 kHz, however, some sub-members of the Clupeidae family (herring and Alosidae or shads) are capable of detecting significantly higher frequencies, up to several thousand kHz for Atlantic herring for example and some species in this group in the ultrasonic range (Mann et al., 2001).

Depending on the intensity and frequency of the sound source, UWS exposure can result in several impacts on fish, including:

- Physical or physiological effects – generally only occur when exposed to very high amplitude, impulsive sounds such as explosions;
- Auditory injury or damage, including damage to the inner ear, sensory hair cells and otoliths (Parvin et al., 2006) and temporary threshold shift (TTS), a recoverable elevation in hearing threshold;
- Masking of auditory cues; and
- Behavioural changes, including changes in movement and swimming direction, alterations to migratory routes, changes in feeding patterns and breeding, and displacement / avoidance behaviour.

The scale of impact of UWS on fish is also largely determined by physiology, particularly whether the fish has a swim bladder or not, and whether the swim bladder aids in hearing sensitivity and hearing range (Popper et al., 2014). As such, fish have been categorised based on morphological features and the resulting sensitivity to UWS, which can be used when assessing impacts (*Table 8.13 Fish Sensitivity to UWS*).

Table 8.13 Fish Sensitivity to UWS

Sensitivity	Description	Examples of species in the study area
High hearing sensitivity fish	Hearing involves a swim bladder or other gas volume. Species such as these are susceptible to barotrauma and can detect both sound pressure and particle motion.	Atlantic cod Herring Other species of the Clupeidae family
Medium hearing sensitivity fish	Species possess a swim bladder but it is not required for hearing. These species can only detect particle motion, not sound pressure, but they are still susceptible to barotrauma.	Atlantic salmon Sea trout European eel
Low hearing sensitivity fish	These species do not have a swim bladder or any other gas-filled chamber. Such species only detect particle motion rather than sound pressure and are less susceptible to barotrauma.	Lamprey Flatfish Elasmobranchs

The most up-to-date thresholds for impacts to fish come from the 2014 ANSI standards (Popper & et al., 2014). The thresholds for impulsive sounds are quantitative for all hearing groups but for continuous sounds are quantitative only for the highest hearing sensitivity fish (the herring family) in relation to recoverable injury and TTS. The thresholds for low or medium sensitivity fish, are relative, providing likely risk levels (high, moderate or low) for injury, threshold shift or behavioural disturbance in medium or low hearing sensitivity fish at three relative distances from the source defined in relative terms as near (N), intermediate (I), and far (F) (Popper et al, 2014). While it would not be appropriate to ascribe particular distances to effects because of the many variables in making such decisions, "near" might be considered to be in the tens of meters from the source, "intermediate" in the hundreds of meters, and "far" in the thousands of meters. These thresholds are provided in

Table 8.14 Injury and Disturbance Thresholds for Fish from Sound Sources.

Table 8.14 Injury and Disturbance Thresholds for Fish from Sound Sources[7]

	Continuous				Impulsive			
Receptor Group	Mortality	Recoverable injury	TTS	Low level disturbance	Mortality/mortal injury	Recoverable injury	TTS	Low level disturbance

[7] All criteria are presented as sound pressure even for fish without swim bladders since no data for particle motion exist.

Low sensitivity fish	(N/I/F) Low	(N/I/F) Low	(N) Moderate; (I/F) Low	(N/I) Moderate (F) Low	>219 dB SELcum >213 dB peak	>216 dB SELcum >213 dB peak	>>186 dB SELcum	(N) High (I) Moderate (F) Low
Medium sensitivity fish	(N/I/F) Low	(N/I/F) Low	(N) Moderate; (I/F) Low	(N/I) Moderate (F) Low	>210 dB SELcum >207 dB peak	>203 dB SELcum >207 dB peak	>186 dB SELcum	(N) High (I) Moderate (F) Low
High sensitivity fish	(N/I/F) Low	170 dBrms re 1 µPa for 48 h 48 hours	150 dBrms re 1 µPa for 12 h 12 hours	(N) High (I) Moderate (F) Low	>207 dB SELcum >207 dB peak	>203 dB SELcum >207 dB peak	>186 dB SELcum	(N/I) High (F) Moderate

Species from all three hearing groups have the potential to be present near the Development. For high sensitivity hearing fish (e.g. cod and herring), both vibratory and impact piling have the potential to reach peak SPL values which may exceed the auditory threshold for recoverable injury. However, species of primary concern within the Development area are migratory species, such as Atlantic salmon and sea trout, which are considered to be of medium sensitivity and unlikely to be adversely affected by vibratory piling. Impact piling, however, has the potential to exceed peak SPL values for injury and even mortality of all fish hearing groups.

For impact piling operations, embedded mitigation measures are in place per guidance from JNCC on minimising the risk of injury to marine mammals during piling activities (JNCC, 2010), which include the use of soft-start procedures (see *Section 8.9 Mitigation and Monitoring).* It is anticipated that the soft-start period will allow for any fish present to easily move away from the immediate area, thus likely resulting in only minor behavioural changes. Furthermore, impact piling is intermittent, with gaps in between piles and pauses during piling operations. These intervals allow for avoidance behaviour and for recovery if any impacts such as TTS were to occur. Despite the high sensitivity of the receptors, the number of individuals likely to be affected is low, as fish species are likely to be only occasional visitors during migration patterns. Furthermore, piling works will occur over a small area comparatively to the area of loch available for migration and the nearest catchment associated with migratory fish is located approximately 2.3 km from the Marine Facility (River Array). Therefore, as impacts are considered to be predominantly behavioural with appropriate embedded mitigation in place, the magnitude of the impact is considered to be low, and the significance of effects from impact piling on fish is considered **minor adverse** and thus **not significant**.

For vibratory piling, the latest quantitative underwater sound thresholds for fish (Popper et al., 2014) indicate that the risk of mortality or mortal injury from vibratory piling for all hearing categories and functional groups is low. Furthermore, the sound from vibratory hammers rises relatively slowly (California DoT, 2009). As such, the magnitude is considered low and the significance of effects from vibratory piling on marine fauna (including fish and marine mammals) is considered **minor adverse** and thus **not significant**.

8.7.1.2 Permanent Loss of Benthic Habitat Due to the Installation of Steel Piles

The construction of the Marine Facility in Loch Fyne will be associated with the placement of approximately 72 piles into the benthic substrate, which will be left *in situ* long-term following the completion of the construction phase, resulting in permanent habitat loss of benthic habitat.

Each pile will be 600 mm in diameter (see *Chapter 2: Project and Site Description*), resulting in the permanent loss of benthic habitat of 20.4 m^2. Within the study area, there were two habitats observed, the PMFs ‘kelp and seaweed communities on sublittoral sediment’ and ‘burrowed mud’, during benthic surveys. Of these, the construction of the Marine Facility is considered to largely overlap with the ‘kelp and seaweed communities on sublittoral sediment’ as the burrowed mud was also observed in deeper water further offshore (see *Appendix 8.1: Benthic Ecology Survey Report (Volume 5: Appendices)*), outside the direct footprint of the Marine Facility.

Considering that ‘kelp and seaweed communities on sublittoral sediment’ are of conservation importance in Scotland (as noted by PMF designation), the sensitivity of this receptor is high. However, this biotope has been observed throughout both lower and upper Loch Fyne, as reported in both historical records and recent surveys (Allen, 2013), suggesting it is common and widely distributed throughout the loch. Furthermore, as the Development is situated within Loch Fyne and Loch Goil MPA, which does not have this habitat as a designated feature, it is unlikely that it occurs in important concentrations within the Development area.

When considering this in conjunction with the relatively small area of impact and the fact that the overall footprint will be divided into smaller segments by each pile, it is likely that the integrity of the overall habitat will remain intact. As such, the magnitude of impact has been assessed as low, and the overall significance of permanent habitat loss on benthic ecological receptors has been assessed as **minor adverse** and therefore **not significant.**

8.7.1.3 Benthic Habitat Modification from the Introduction of Artificial Structure on the Seabed

The construction of the Marine Facility in Loch Fyne will be associated with the installation of approximately 72 piles into the seabed, which will be left *in situ* long-term following the completion of the construction phase, resulting in the permanent introduction of artificial structures. Each pile will result in the replacement of 20.4 m^2 of benthic habitat by artificial structures.

Within the study area, two benthic habitats were observed, the PMFs 'kelp and seaweed communities on sublittoral sediment' and 'burrowed mud'. Of these, the Marine Facility is considered to only overlap with the 'kelp and seaweed communities on sublittoral sediment', which has been observed throughout both lower and upper Loch Fyne, as reported in both historical records and recent surveys (Allen, 2013), suggesting it is common and widely distributed. Furthermore, the Upper Loch Fyne and Loch Goil MPA does not include this habitat as a designated feature, suggesting it is unlikely to occur in important concentrations within the Development area.

The construction of the Marine Facility also has the potential to provide new surface area for colonisation by a range of epifaunal species, including INNS (see below for assessment of '*Introduction and Spread of INNS*'), altering the local community composition. Studies looking at the colonisation of offshore wind infrastructure shows marked zonation of epifaunal communities with the upper reaches dominated by mussels, macroalgae, and barnacles, which are replaced by filter-feeding arthropods and then anemones at greater depths (Galparsoro et al., 2022). Similar colonisation may occur in on the steel piles of the Marine Facility. However, many of these epifaunal species are likely to be naturally present on the surrounding reef habitat and whilst diversity may be lower, and abundance of some species may be higher on the plies, the overall impact to local diversity is expected to be minor.

When considering this in conjunction with the relatively small area of impact and the fact that the overall footprint will be divided into smaller segments by each pile, it is likely that the integrity of the overall habitat will remain intact. As such, the magnitude of impact has been assessed as low, and the overall significance of benthic habitat modification from the introduction of artificial structures has been assessed as **minor adverse** and therefore **not significant.**

8.7.1.4 Temporary Disturbance of Benthic Habitats

As piling works will require the use of a jack up barge (JUB), the placement of spud legs on the seabed will likely result in the temporary disturbance on benthic habitats. The Marine Facility is expected to require the placement of 72 piles, in which a worst-case scenario has been assumed that the barge will be repositioned for every pile, thus impacting new areas of the seabed with each placement.

As vessel specifications are not available at this stage, the exact footprint associated with the barge placement is unknown, as barge legs can vary in size and number, but has been estimated to be a total of 12 m^2. The project-specific surveys have indicated that the proposed location of the Marine Facility overlaps primarily with the benthic habitat 'kelp and seaweed communities on sublittoral sediment', which is a PMF. Despite the high sensitivity of this receptor, it is considered to be widespread in coastal shallow waters throughout the loch, as it has been noted both in recent surveys and historical data (Allen, 2013). This habitat is considered to have medium sensitivity and high resilience to physical disturbance, with growth rates allowing rapid recovery from loss and damage (Stamp & Mardle, 2022). The JUB spud legs are likely to be placed on the seabed, at each location, for a very short time period and so whilst there is likely to be some damage and potential mortality this will be small in scale and seaweed plants are expected to recover. Furthermore, the Development occurs within an MPA which has not noted this habitat as a designated feature, suggesting it does not occur in important concentrations locally.

When considering the likely widespread nature of this habitat, the small spatial scale of the effect, the temporary nature of the disturbance and likely rapid recovery, the magnitude of impact has been assessed as low. Therefore, the significance of temporary disturbance to benthic habitats from the use of a JUB during piling activities is considered **minor adverse** and thus **not significant.**

8.7.1.5 Temporary Increase in SSC and Sediment Deposition Leading to Turbidity, Smothering Effects and Contaminant Mobilisation

Whilst no dredging is required for the Development, the installation of piles is likely to result in a temporary increase in SSC concentrations. This has the potential to mobilise sediments into the water column that could increase local SSC and turbidity, creating a plume at some distance from the cable corridor before settling onto the seabed. There are several potential effects to marine ecological receptors associated with increased SSC and sediment deposition, including:

- Reduced photosynthesis resulting in reduced primary production in marine seaweed and algae;
- Smothering of benthic invertebrate species;
- Decreased visibility in visual predators which results in decreased feeding success;
- Clogging of feeding and respiratory apparatus;
- Potential barriers to movement and migration for mobile species;
- Egg and larvae mortality; and
- Indirect effects of released sediment contaminants, such as heavy metals and hydrocarbons.

The largest sediment plumes and highest levels of SSC are associated with the disturbance of sediments that exhibit a high proportion of fine particulate material, such as muds and clays, which remain in suspension longest and settle to the seabed more slowly. Coarse material, such as sand and gravel settle to the seabed quickly, typically within a few hours of disturbance, with sediment likely transported a distance of meters to tens of meters from the source. As sediment disperses, prevailing tides and currents contribute to dilution over a broad area and a reduction in SSC levels, returning water column turbidity to baseline conditions within hundreds to a few thousand metres from the point of release, depending on particle size.

Sediment dispersion distances were estimated using tidal excursion ellipse data (see *Chapter 18: Marine Physical Environment and Coastal Processes*). The estimated travel distance for a particle carried in suspension can be related to the length of the major axis of the tidal excursion ellipse, where maximum tidal excursion on an ebb and flow tide reaches approximately 300 m around the Marine Facility in the nearshore and 700 m around the Marine Facility near the center of the loch (ABPmer, 2017). Mean particle size distribution at study sites sampled within the Development area ranged from 38.1-73.6% for sand, 17.8-61.6% for mud, and 0.3-14.0% for gravel (*Appendix 8.2: Subtidal Benthic Ecology Survey Report*). This indicates that some sediment particles are likely to gradually settle out of suspension, with coarse particles settling quickly whilst finer particles have the potential to extend to the maximum reaches of the spring tidal excursion.

Increased SSC can affect filter feeding organisms, such as fish and shellfish, clogging and damaging feeding and breathing equipment. Impairment in the growth of filter-feeding bivalves has also been observed at suspended particulate matter concentrations greater than 250 mg/L (Widdows, Feith, and Worral, 1979). Similarly, functioning fish gills may be impaired due to clogging, although sensitivity varies by species. For example, demersal fish may be more susceptible to smothering effects as they live closest to the seabed. Furthermore, the increased deposition associated with SSC increase may smother important benthic habitats.

With regard to sediment-bound contaminants, a recent assessment of contaminants present in sediment and marine biota concluded that contaminant concentrations were highest in the Irish Sea, including the Clyde Marine Region (Marine Scotland, 2020). Contaminants of concern in this region noted in sediments which may lead to adverse effects included mercury, lead, and polychlorinated byphenyls (PCBs). Additionally, heavy metal input into the Clyde Marine Region has historically been high, with elevated water concentrations of chromium noted in the inner estuary. However, concentrations within sediments and inputs into the Clyde were considered stable or declining for all substances measured. Within Loch Fyne, sediment cores have previously reported increased concentrations of trace metals, such as lead, copper, and zinc (Krom et al., 2009).

Contaminants will be associated with finer material such as silts and clays, which comprise low-moderate proportions of the sediment within the study area. Where finer sediments do occur, dilution of suspended particulate matter is anticipated to occur rapidly with distance from the Marine Facility. In addition, natural disturbance to the sediment such as during storm events and periods of strong wave action will mobilise contaminants and subject benthic habitats and species to temporary and localised changes in water quality. As a result, these habitats and species will have a tolerance to moderate changes in the surrounding water quality.

As a fjordic loch[8], Loch Fyne is a sheltered environment where the sills contribute to stable conditions within each of the loch's basins (Brown, 2020). As a result, tidal currents within the loch are weak (Brown, 2020), which is reflected by the relatively low maximum tidal excursion distances. Despite the high percentage of fine particulates in some sediment samples, much of the sediment will remain localised to the Marine Facility. Whilst this lessens the overall footprint of impact, it may result in increased levels of sediment deposition within that area.

[8] Fjordic lochs are carved by glacial movements

Within the study area, several benthic PMFs were observed: the habitats ‘burrowed mud’, ‘kelp and seaweed communities on sublittoral sediment’, and the fireworks anemone. As burrowed mud is already composed of fine particulate sediments, increased sediment deposition over this feature is unlikely to affect its conservation objectives. A recent study of suspended fine particulates in aquatic vegetation patches observed an increased retention of fine particulates over vegetation canopies, which is considered to trigger positive feedback as the sediment is rich in organic material (Solar et al., 2021).

As much of the immediate study area around the Marine Facility is composed of ‘kelp and seaweed communities on sublittoral sediment’, this may contribute to an increased retention of SSC in the immediate vicinity. Finally, the fireworks anemone is also a known inhabitant of muddy habitats, which can extend up to 30 cm from the substrate. As such, it is considered to have a low intolerance to smothering from sediment deposition and increased SSC (Wilding and Wilson, 2008).

With regard to fish and shellfish, Atlantic salmon, trout, and Nephrops are most likely to be present within the study area. Salmonids can have an increased sensitivity to SSC due to reduced feeding success resulting from reduced vision (Abbotsford, 2021). Increased SSC can also create a migration barrier between freshwater and marine habitats. However, the nearest river which supports diadromous fish species is approximately 2.14 km north (River Array). When considering this in conjunction with the small ZoI associated with increased SSC, it is unlikely that migratory fish will be affected as these areas can be easily avoided during any movement through the loch. In addition, Nephrops are known to inhabit burrowed mud habitats and are considered tolerant to both increased SSC and smothering from excess sediment deposition, as they are scavengers which burrow into muddy substrates (Hill and Sabatini, 2008).

As such, the sensitivity of marine features within the study area is considered to be low. When considering the small footprint of the piles associated with the Marine Facility and that the benthic community is composed of features known to occur in muddy habitats with low intolerance to effects from sediment deposition, the magnitude has also been assessed as low. Therefore, the significance of increased SSC on marine ecological receptors has been assessed as **negligible** and therefore **not significant.**

8.7.1.6 Airborne Sound and Visual Disturbance

Operations during the construction phase, such as piling and use of supporting vessels could result in changes in visual stimuli and an increase in airborne sound, which could impact marine mammals. Cetaceans are not considered to be particularly sensitive to changes in visual stimuli or airborne sound as their primary sense relates to underwater sound. However, pinnipeds spend time hauled out on land and at the sea-surface, making them more susceptible to these airborne sound and visual stimuli. These can lead to avoidance behaviour disturbance effects which could cause individuals to stop resting, feeding, travelling and / or socialising, with possible long-term effects of repeated disturbance resulting in permanent displacement and / or a decline in fitness and productivity. In general, shipping traffic more than 1,500 m away from a haul-out site is not thought to evoke any reaction. However, studies of harbour seals have shown a flight response to boats occurs at a distance of around 500 m (Anderson, Teilmann, Dietz, Schmidt, & Miller, 2012).

Harbour seals, considered resident in the loch, are known to occasionally haul out between Loch Gilp and Otter Narrows, which is approximately 30 km from the Development. There are no known haul out sites in the vicinity of the Marine Facility. Thus, changes in visual stimuli from construction activities, including any lighting from the vessels, are not anticipated to cause disturbance to hauled-out harbour seals. Loch Fyne is also not thought to provide important foraging habitat for this species, with a very low density of animals present (Carter et al., 2022). However, as harbour seals are known to forage at some distance from haul out sites (Carter et al., 2022), there is potential for the presence of some individuals to be present during project activities. There is therefore the potential for any surfaced harbour seals to be affected while foraging.

Telemetry data has indicated avoidance behaviour in seals during piling activities for offshore windfarm construction (Russell et al., 2016). Sounds associated with vibro-piling are much less than that associated with impact piling, which are considered below the thresholds for behavioural responses in pinnipeds. As such, with most piling activity to be vibratory, and a soft-start in place for an impact piling, it is unlikely that the air-borne produced sound will elicit a significant disturbance response in present seals. Additionally, any disturbance effects are likely to be limited to minor avoidance behaviour as highly mobile animals that forage over extensive ranges, such movements are not considered likely to have any meaningful effect on the availability of prey or the energetic expenditure required for foraging.

Whilst all marine mammal species are of high conservation value and thus of high sensitivity, they are considered to have high tolerance to, and recoverability from short-term and temporary disturbance and thus considered to have a low sensitivity to airborne sound and visual disturbance, resulting in a low magnitude. As such, any effects to marine mammals from airborne sound and / or visual disturbance due to Development activities is considered to be **minor adverse** and thus **not significant**.

8.7.1.7 Vessel Presence and Marine Mammal Collision Risk

The installation of the Marine Facility will primarily involve the deployment of a jack up barge (JUB). As construction of the Marine Facility is expected to take place over a 12-month period, the JUB will largely only transit over a small area as the jetty is constructed. As such, it likely only poses a collision risk with marine mammals during its transit to and from the site.

Vessel strikes with marine mammals can result in physical impairment, which may reduce foraging abilities and fitness at an individual level, or even mortality (Southall, et al., 2019; Moore, et al., 2013). Marine mammals, particularly cetaceans, are considered to be fast swimming, agile species, with rapid reflexes and good sensory capabilities (Hoelzel, 2002). Moreover, marine mammals possess a thick subdermal layer of blubber or fat deposits which provides a level of protection to their vital organs, meaning they are reasonably resilient to minor strikes and collisions (Wilson, Batty, Daunt, & Carter, 2007). The most lethal and serious injuries to marine mammals are believed to be caused by large ships, typically 80 m and longer with large drafts, as well as vessels travelling faster than 14 knots (Laist, Knowlton, Mead, Collet, & Podesta, 2001). Higher vessel speeds produce a greater impact force and larger drafts have been associated with increased mortality (Southall, et al., 2019; Dahne, et al., 2013; Rockwood, Calambokidis, & Jahncke, 2017).

Avoidance behaviour exhibited by cetaceans is often associated with fast, unpredictable vessels such as speedboats and jet-skis (Bristow & Reeves, 2001; Gregory & Rowden, 2001), while neutral or positive reactions, particularly in dolphins have been observed with larger, slower moving vessels such as cargo ships (Ng & Leung, 2003; Sini, Canning, Stockin, & Pierce, 2005). Although there have been reports of vessel strikes with marine mammals, evidence of risk is limited. Mortality and injury of cetaceans resulting from vessel strikes have been mostly reported in large baleen whales which are slow swimming (IAMMWG, 2015). There are few reports of vessel strikes with harbour porpoise and other small cetaceans, likely due to the avoidance behaviour of these species (particularly porpoises (Wisniewska, et al., 2018; Roberts, Collier, Law, & Gaion, 2019).

The risk to pinnipeds is considered to be generally lower than that for cetaceans (Jones, et al., 2017). Although there have been reports of vessel strikes to pinnipeds, including several cases of ‘corkscrew’ type injuries ascribed to vessel propellers and thrusters, evidence of risk is limited (Bexton, Thompson, Brownlow, Milne, & Bidewell, 2012). Later research has shown that very similar form injuries were the result of predation from grey seals and may be responsible for a high proportion of the assume propellor duct injuries (Brownlow et al., 2016). For slow-moving dredging operations (Todd, et al., 2015) individual seals have been seen to easily avoid vessel movements.

Whilst large marine mammals, such as whales, are considered primarily at risk of collision with vessels, many different species, including small cetaceans and seals, have also been reported as involved in vessel strikes in the wider Atlantic (Winkler, Panigada, Murphy, & Ritter, 2020). However, when considering the low abundance of marine mammals within the study area, the likelihood of the Project vessels colliding with marine mammals is low. Furthermore, a self-propelled jack up barge may travel at consistent speeds of around 5 knots. At this speed, small cetaceans and seals can easily avoid the vessel, greatly reducing the risk of collision.

Although the occurrence of any collisions could cause injury or death, which would be considered a moderate or high sensitivity for a receptor of high conservation value, the likelihood of vessel collision with marine mammals is appraised as unlikely when considering the agility of marine mammals and the slow vessel operation speeds. Therefore, the magnitude of impact is considered negligible, and the impact significance is considered **minor adverse** and thus **not significant**.

8.7.1.8 Reduction in Water Quality due to Discharges, Unplanned Releases, and Accidental Leaks and Spills from Vessels

The accidental release of pollutants (e.g., oil, fuels, lubricants, chemicals) and planned release of wastewater could occur from any of the vessels associated with the Development. Such releases, as well as mobilisation of any sediment-bound contaminants, have the potential to reduce water quality, leading to consequences to marine fauna, including benthic invertebrates, fish and shellfish, and marine mammals.

To ensure the risk of accidental spills is as low as reasonably practicable (ALARP), the Development will adhere to relevant guidance (e.g., Pollution Prevention Guidance) and comply with all relevant health, safety, and environmental legislation. This includes compliance with regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73 / 78) with the aim of preventing and minimising pollution from ships. Preparedness and swift responses are essential for effective spill management and as such, response plans will be in place should an incident occur. Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. Any planned effluent dischargers will also be compliant with MARPOL Annex IV ‘Prevention of Pollution from Ships’ standards.

Moreover, an Emergency Spill Response Plan and Waste Management Plan will be implemented during the Construction phase of the Project to minimise releases (*Chapter 2: Project and Site Description*). Appropriate Health, Safety, and Environment (HS&E) procedures will also be implemented, with strict weather and personnel limits to reduce any risk of accidental spillage. With consideration of this good practice mitigation, the likelihood of an accidental spillage occurring from any of the vessels is considered to be very low. Should a spill occur, the impact would be of very small magnitude, short-term and localised to the Development. Any releases will be rapidly dispersed and diluted by wave and tidal movements.

When considering the low likelihood of accidental releases from vessels and rapid dilution of any mobilised sediment-bound contaminants, the magnitude of impact is assessed as negligible. Irrespective of the value and sensitivity of marine fauna, it can therefore be concluded that the effect on marine ecological receptors from adverse water quality is **negligible** and therefore **not significant**.

8.7.1.9 Introduction and Spread of INNS

The are multiple pathways associated with Construction phase activities which have the potential to result in the accidental introduction of INNS. International vessels may release ballast water into the water column and / or the addition of hard substrata to the seabed (e.g., piles) may act as potential stepping-stones for new species. Whilst most non-native species are unlikely to become invasive, those that do can out-compete native species and introduce diseases which could result in significant changes to community composition and mortality.

The installation of the Marine Facility will involve the placement of 72 piles on the seabed. Artificial structures in the marine environment are readily colonised by INNS, with some species known to be almost exclusively associated with artificial structures (Hurst 2016). These structures are known to favour colonisation by range-shifting species and act as either a stepping stone or as a direct vector for their dispersal (Mineur et al., 2012), indicating the potential for detrimental changes to native benthic habitats and species.

INNS considered to be of concern to Loch Fyne include wireweed (*Sargassum muticum*), Japanese skeleton shrimp, and the parasite *Gyrodactylus salaris* which poses a threat to Atlantic salmon populations (Argyll and Bute Council, 2009).

No INNS were observed during project-specific surveys, but previous surveys of the loch have observed the modest barnacle, carpet sea squirt, erect bryozoans *B. simplex* and *T. inopinata*, the orange-tipped sea squirt, Japanese skeleton shrimp*,* leathery sea squirt*,* and the alga *C. fragile* (Marine Scotland, 2020). Of these, only the modest barnacle and carpet sea squirt have been observed within the upper loch. The modest barnacle *A. modestus* is well established around the UK and out-competes some native barnacle species on the shore. In comparison, the carpet sea squirt is capable of covering extensive areas of the substratum. It is known to colonise artificial structures, rocks, boulders and even tide pools and is usually found in low energy environments where water motion is limited (Gibson-Hall & Bilewitch, 2018). A marine biosecurity plan for Loch Fyne has indicated that industrial activities within the loch pose a high risk of spreading carpet sea squirt through the use of vessels (Brown, 2020).

For this reason, all project vessels will adhere to the International Convention for the Control and Management of Ships’ Ballast Water and Sediments with the aim of preventing the spread of INNS (IMO, 2022). In addition, vessels will be required to adhere to the IMO guidelines for the control and management of ships’ biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (resolution MEPC.207(62). These measures lower the probability of INNS transmission from vessels to the benthic habitat.

The GB Invasive Non-Native Species Strategy also provides guidance for the prevention, detection, eradication and management of INNS, including marine species (NBN, 2021). Best practice measures will be adopted in compliance with the relevant IMO guidance regarding ballast water, should it be present, and biofouling. These measures will reduce the overall risk of introduction of INNS, resulting in a low magnitude of change.

When considering these embedded mitigation measures, the spread of any existing non-native species is considered unlikely. Although the sensitivity of benthic receptors to INNS introduction may be low to high, the introduction of INNS is unlikely and thus appraised to be of **negligible** magnitude and therefore **not significant.**

8.7.2 Operation Phase

The presence of the Marine Facility will involve the installation of 72 piles, which may alter the local hydrodynamics of the marine environment and result in disturbance to habitats and species from scour and hydrodynamic changes.

Both benthic ecological receptors and fish and shellfish rely on local currents for certain life history stages. For example, benthic invertebrates, fish, and/or shellfish may have pelagic egg or larval stages which rely on local currents for distribution. In Loch Fyne, flow rate was found to influence the distribution of flame shell beds (Millar et al., 2019).

However, hydrodynamic modelling conducted for the Marine Facility (*Chapter 18: Marine Physical Environment and Coastal Processes*) concluded that local hydrodynamics or sediment pathways would not be altered under normal conditions. Even with wind events that contribute to current speed magnification, the Marine Facility is considered to have minimal influence on both the flow regime and bed shear stress. Should any localised changes occur from the Marine Facility's presence, they are expected to rapidly dissipate and thus are unlikely to affect marine ecological receptors beyond the immediate vicinity around each of the piles. As such, the magnitude of impact is appraised as **negligible** and therefore **not significant.**

At the end of the operational phase of the Development the deck of the Marine Facility is expected to be removed but the piles will remain *in situ*. This is to enable the Marine Facility deck to be reinstated to allow for maintenance and repairs to the PSH scheme, should they be needed. The additional potential impact pathways to marine ecological receptors are expected to be the same as those identified for vessel use for the construction phase of the Development (see *Section 8.7.1 Construction Phase**Error! Reference source not found.***). As such, additional effects are predicted to be **negligible / minor adverse** and therefore **not significant.**

8.7.3 Decommissioning Phase

The approximated operational lifetime of PSH is in the region of 100 years. As such, decommissioning has been scoped out of assessment as the decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of the facility, and a decision would be made at a future time whether to refurbish the PSH or to decommission the scheme. At this time, potential decommissioning effects are therefore considered to be similar to and associated with the components described in the operational project phase. Should future works occur, a refurbishment plan or detailed decommissioning plan would be prepared as required as this may be subject to a separate planning application at the time.

8.8 Cumulative Effects

8.8.1 Inter-Cumulative Effects

At this stage, no other schemes or developments have been identified as reasonably foreseeable which have the potential to pose cumulative effects to marine ecological receptors. Therefore, the effects to marine ecological receptors are predicted to be **negligible** and **not significant**.

8.8.2 Intra-Cumulative Effects

No inter-cumulative effects have been identified between marine ecological receptors and other environmental impacts of the Development. All other activities associated with the Scheme are land-based and unlikely to affect the marine environment. Therefore, the effects are predicted to be **negligible** and thus **not significant**.

8.9 Mitigation and Monitoring

8.9.1 Embedded Mitigation

The following embedded mitigation measures have been incorporated into the Development design which aim to avoid and/or minimise impacts to marine ecological receptors:

- 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;
- Where impact piling is used the project will follow the JNCC guidance to minimise the risk of injury to marine mammals (JNCC, 2010) and such measures will be incorporated into the project CEMP;
- Measures in the Loch Fyne Marine Biosecurity Plan (Gov Scot, 2020) relevant to the construction methods used in the marine environment will be adopted and incorporated into the project CEMP;
- All vessels will follow the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) and International Convention for the Safety of Life at Sea 1974 (SOLAS);

- All vessels will be in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations and will therefore be equipped with waste disposal facilities onboard. The discharging of contaminants is not permitted within 12 NM from the coast to preserve bathing waters;
- Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels;
- Ballast water discharges from all vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (Ballast Water Management Convention); and,
- All vessels will adhere to the International Maritime Organisation guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (resolution MEPC.207(62).

8.9.2 Additional Mitigation, Compensation and Enhancement

Aside from the embedded mitigation measures described in *Section 8.9 Mitigation and Monitoring,* no additional mitigation measures or monitoring have been identified as required following the appraisal.

8.10 Residual Effects

No additional mitigation was required as no significant effects on marine ecological receptors were identified. As such, the residual effects of the Development remain as reported in *Section 8.7 Assessment of Effects,* the following tables therefore present a summary of the marine ecology impact assessment (*Table 8.15: Summary of Construction Effects* and *Table 8.16: Summary of Operation Effects*) and demonstrate that there are no expected significant effects during construction and operation on marine ecology/biodiversity.

Table 8.15: Summary of Construction Effects

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Benthic Ecology	Permanent loss of benthic habitat due to installation of piles	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
	Habitat modification from introduction of artificial surfaces on the seabed	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
	Temporary disturbance of benthic habitats	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
	Temporary increase in SSC and sediment deposition	Negligible	N/A (All mitigation is embedded)	Negligible	Not significant
	Reduction in water quality	Negligible	N/A (All mitigation is embedded)	Negligible	Not significant
	Introduction and spread of INNS	Negligible	N/A (All mitigation is embedded)	Negligible	Not significant
Fish and Shellfish Ecology	Effects from UWS	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
	Temporary increase in SSC and sediment deposition	Negligible	N/A (All mitigation is embedded)	Negligible	Not significant
	Reduction in water quality	Negligible	N/A (All mitigation is embedded)	Negligible	Not significant
Marine Mammal Ecology	Effects from UWS	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
	Airborne sound and visual disturbance	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
	Vessel presence and collision risk	Minor adverse	N/A (All mitigation is embedded)	Minor adverse	Not significant
	Reduction in water quality	Negligible	N/A (All mitigation is embedded)	Negligible	Not significant

Table 8.16: Summary of Operation Effects

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Benthic Ecology	Disturbance to habitats and species due to scour from hydrodynamic change	Negligible	N/A (All mitigation is embedded)	Negligible	Not significant
Fish and Shellfish	Disturbance to habitats and species due to scour from hydrodynamic change	Negligible	N/A (All mitigation is embedded)	Negligible	Not significant

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 9: Ornithology

ILI (Borders PSH) Ltd

July 2024

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

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9. Ornithology

9.1 Introduction

This chapter addresses the potential impacts and effects (see *Section 9.5.4 Assessment Methodology* for a definition of these terms) of the construction and operation (including maintenance) of the Development on bird species. Where appropriate, it provides details of committed mitigation and/or enhancement measures identified to minimise or compensate for adverse effects on ornithological features.

This chapter relates to ornithological features (i.e., bird species and the sites and habitats that support them) only. The following chapters are relevant to other ecological features:

- *Chapter 06: Terrestrial Ecology;*
- *Chapter 07: Aquatic Ecology (which considers freshwater ecology);*
- *Chapter 08: Marine Ecology.*

This chapter is supported the following figures (*Volume 3 Figures*)

- *Figure 9.1: Natural Heritage Zone 14*
- *Figure 9.2: Vantage Point Locations*
- *Figure 9.3: Ornithology Survey Areas*
- *Figure 9.4: Moorland Breeding Bird Surveys*
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- *Figure 9.10: Non breeding Coastal Waterbird Surveys*

This chapter is also supported by the following Appendices (*Volume 5 Appendices*):

- *Appendix 5.4 Outline Landscape and Ecology Management Plan*
- *Appendix 6.1: Method for Ecological Impact Assessment;*
- *Appendix 6.2 Non-Confidential Statement to Inform HRA*
- *Appendix 9.1: Ornithology;*
- *Appendix 9.2: Golden Eagle Topographical Modelling.*

Certain raptor and other rare species are regarded by NatureScot as being vulnerable to persecution, for which reason the precise location of breeding sites of these species are confined to *Confidential Appendix 9.1: Schedule 1 Birds (Volume 6 Confidential Appendices).*

Also relevant to this chapter is the Statement to Inform Habitats Regulations Appraisal (*Confidential Appendix 6.2 (Volume 6 Confidential Appendices))* submitted as part of the Section 36 application in support of the Development. This describes the assessment conducted to test for adverse effects from the Development on the qualifying features of European sites, which comprise Special Areas of Conservation (SAC) and Special Protection Areas (SPA), the latter of which are designated for the conservation of bird species. Where appropriate, reference is made in this chapter to analysis presented in the Statement to Inform Habitats Regulations Appraisal. A non-confidential version can be found within *Appendix 6.2 Non-Confidential Statement to Inform HRA (Volume 5 Appendices)*

Throughout this chapter, species are given their common and scientific names when first referred to and their common names only thereafter. All distances are cited as the shortest distance ‘as the crow flies’, unless otherwise specified.

9.2 Legislation and Policy

9.2.1 Legislation

The following nature conservation legislation is potentially relevant to the Development and has been considered during the preparation of this chapter:

- Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive');
- Convention on Wetlands of International Importance ('Ramsar Convention');
- Conservation (Natural Habitats, &c.) Regulations (as amended) (the 'Habitats Regulations');
- Wildlife and Countryside Act 1981 (as amended) (the 'WCA');
- Nature Conservation (Scotland) Act 2004 (as amended);
- Wildlife and Natural Environment (Scotland) Act 2011 (as amended) ('WANE Act').

9.2.2 Planning Policy

Detailed information on relevant planning policy can be found in the Planning Statement which has been submitted as part of the Section 36 application for the Development. However, a brief summary of national and local planning policy relevant to the conservation of bird species is given under the following sub-headings.

9.2.2.1 National Planning Policy

National Planning Framework 4 (NPF4) was formally adopted by Scottish Ministers on 13 February 2023. NPF4 includes the following statements of policy intent: "*To protect, restore and enhance natural assets making best use of nature-based solutions*" and "*To protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks*". Wherever possible, and proportionate to the scale and nature of the project, the Development has therefore sought to deliver benefits for biodiversity, in addition to protecting existing biodiversity. NPF4 also states that major development will only be supported where nature networks "*are in a demonstrably better state than without intervention*" using best practice and including future monitoring and management where appropriate.

Prior to the UK's exit from the European Union (EU), Scotland's SACs and SPAs were part of a wider European network of such sites known as the 'Natura 2000 network'. They were consequently referred to as 'European sites'. Now that the UK has left the EU, Scotland's SACs and SPAs are no longer part of the Natura 2000 network but form part of a UK-wide network of designated sites referred to as the 'UK site network'. However, it is current Scottish Government policy to retain the term 'European site' to refer collectively to SACs and SPAs (Scottish Government, 2020).

9.2.2.2 Local Planning Policy

The Argyll and Bute Local Development Plan 2 (LDP) was adopted in February 2024.. Planning policy relevant to nature conservation and the Development contained within LDP2 is summarised in *Table 9.1*. Further details are presented in the Planning Statement for the Development, and are available from the Argyll and Bute Council website (https://www.argyll-bute.gov.uk/planning-and-building/planning-policy/local-development-plan-2).

Table 0.1 Summary of Potentially Relevant Policies within the Argyll and Bute LDP2

Planning Policy	Summary of Purpose
Policy 30 – The Sustainable Growth of Renewables	The Council will support renewable energy developments where consistent with the principles of sustainable development and it can be demonstrated that there would be no unacceptable environmental effects, including on ecological features.
Policy 73 – Development Impact on Habitats, Species and Biodiversity	The Council will consider nature conservation legislation, the Argyll and Bute Biodiversity Strategy and Action Plan and the Scottish Biodiversity Strategy when assessing developments. Where a development is likely to have effects on important habitats or species, the Council will require the developer to undertake appropriate surveys and, if necessary, to prepare a mitigation plan. Development proposals which are likely to have an adverse effect on protected species and habitats will only be permitted where it can be justified in accordance with the relevant protected species legislation.
Policy 74 – Development Impact on Sites of International Importance	This policy sets out the strict requirements for developments potentially affecting European sites, including compliance with the Habitats Regulations.

Planning Policy	Summary of Purpose
Policy 75 – Development Impact on Sites of Special Scientific Interest (SSSIs)	This policy sets out requirements for developments affecting Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR). Where adverse effects on these are possible, developments must demonstrate that integrity of the sites/interests would not be compromised, or that social, economic or environmental benefits of national important clearly outweigh adverse effects on the sites/interests, and that there no suitable alternative locations.
Policy 76 – Development Impact on Local Nature Conservation Sites (LNCS)	Development having a significant effect on Local Nature Conservation Sites (LNCS) will not be supported unless demonstrated that clear social, economic or environmental benefits outweigh the adverse effects and sufficient mitigation is provided to conserve and enhance the site interests.
Policy 77 – Forestry, Woodland and Trees	There is a strong presumption in favour of protecting these resources, particularly ancient semi-natural woodland, native or long-established woods, hedgerows and trees with high nature conservation value. Developments affecting these must demonstrate clear public benefits and provide adequate compensation.
Policy 78 – Woodland Removal	Woodland removal and compensation will be assessed using Scottish Government's Control of Woodland Removal Policy and Argyll and Bute Woodland and Forestry Strategy. Compensatory planting is preferred on-site, secondarily off-site in Argyll and Bute and least preferably elsewhere in Scotland.

9.3 Consultation

The assessment of impacts on birds has been informed and influenced by consultation held with several statutory and non-statutory stakeholders. A summary of the consultation held, the information / recommendations provided by consultees, and details of how this EIA has responded to consultee feedback is provided in *Table 9.2 Summary of Consultation*.

Table 0.2 Summary of Consultation

Consultee	Key Issue	Summary of Response	Action Taken
NatureScot	Consultation was held with NatureScot on the following key topics: • The scope of ornithological field survey; • The validity of data collected by ornithological field survey.	NatureScot confirmed broad agreement with the scope of ornithological field survey carried out to inform this EIA. NatureScot advised that if field survey data were more than five years old by the time of submission of this EIA, then further fieldwork may be required. They advised that additional data sources be used to supplement information collected by the field survey, including: • Argyll Raptor Study Group; • Natural Research, for commercially-available golden eagle *Aquila chrysaetos* satellite tag data. In addition, NatureScot also advised that Golden Eagle Topographical (GET) modelling be carried out to assist in the assessment of habitat loss impacts on this species. NatureScot also highlighted that consideration of impacts on golden eagles belonging to the Glen Etive and Glen Fyne SPA would be required. NatureScot advised that with the continued expansion of the white-tailed eagle *Haliaeetus albicilla* population in the area, it would be necessary to consider the potential for new pairs to establish ranges within the zone of influence of the Development post-submission of this EIA.	This EIA has responded to the advice provided by NatureScot as follows: • Data on the locations of breeding raptors were obtained from the Argyll Raptor Study Group in October 2023. This included information collected during the 2023 breeding season; • Golden eagle satellite tag data relevant to the Development site were obtained in February 2024; • GET modelling was carried out and is reported in this chapter and in *Appendix 9.2;* • A Statement to Inform Habitats Regulations Appraisal has been prepared and assesses the potential impacts of the Development on golden eagles associated with Glen Etive and Glen Fyne SPA; • Impacts on white-tailed eagle have been assessed in this chapter, including consideration of potential expansion of the population in the area of the Development; • A range of habitat enhancement measures will be delivered by the Development which will

Consultee	Key Issue	Summary of Response	Action Taken
		NatureScot advised that the Development should seek to deliver positive effects for biodiversity and to demonstrate that enhancement will be provided. It was suggested that opportunities to collaborate with other developments in the area should be explored.	benefit biodiversity. Details of these measures are set out in the Outline Landscape and Ecological Management Plan (oLEMP) (*Appendix 5.4)(Volume 5 Appendices*). The oLEMP includes measures to restore and enhance blanket bog and other upland habitats, something also being committed to by the neighbouring Blarghour Wind Farm project. Areas identified for enhancement by the Development and Blarghour lie immediately adjacent one another at the south of the Development Site. Both projects will be delivering woodland creation / enhancement which will benefit black grouse *Tetrao tetrix* (and other species).
Argyll and Bute Council	N/A	No specific issues relating to ornithology were raised by Argyll and Bute Council in their response to the EIA Scoping Request submitted for the Development.	N/A
Royal Society for the Protection of Birds (RSPB)	RSPB stated in their response to the EIA Scoping Request that the Development has the potential to impact on bird species of conservation concern including: • Golden eagle; • White-tailed eagle; • Hen harrier *Circus cyaneus*; • Red-throated diver *Gavia stellata*; • Black grouse; • Upland breeding wader assemblage.	RSPB advised that ornithology surveys should follow NatureScot guidance for wind farms (SNH, 2017) and recommended that surveys cover two years. They advised that monitoring of key species should continue "*up to and throughout the application process*". RSPB recommended obtaining data from the Argyll Raptor Study Group to inform the EIA. RSPB recommended that, where possible, data collected by neighbouring developments be obtained. RSPB also suggested that there may be opportunities for enhancement of habitat to benefit upland breeding waders and black grouse, and identified possible measures which could be implemented. RSPB recommended that the potential cumulative impacts of the Development and other projects in the area be assessed.	This EIA has responded to the advice provided by RSPB as follows: • Impacts on the key species identified by RSPB have been assessed in this chapter; • Survey methods followed relevant best practice guidance, including that published in SNH (2017); • Available data from neighbouring developments have been reviewed and considered as part of the assessment of cumulative effects described in this chapter; • Habitat enhancement will be delivered by the Development, as described in the oLEMP. In addition to targeted field surveys, data were obtained from the Argyll Raptor Study Group which provided information on the breeding locations of species during the 2023 season. Furthermore, data obtained from satellite tagged golden eagles also covered 2023 and the early part of 2024. These datasets therefore provide recent information on which the assessment described in this chapter has been based. Update surveys for protected and important bird species will

Consultee	Key Issue	Summary of Response	Action Taken
			be completed prior to the commencement of construction activities.

9.4 Study Area

The Zone of Influence (ZoI) of the Development is the area over which an ecological effect might extend as a result of construction and operation. This will vary for different ornithological features and effects, depending on their sensitivity to environmental change. It is therefore appropriate to identify different ZoI for different features and effects. As recommended by the Chartered Institute of Ecology and Environmental Management in CIEEM (2022), professionally accredited or published studies and guidance, where available, were used to help determine the likely ZoI, as well as professional judgement. However, CIEEM also highlight that establishing the ZoI should be an iterative process informed by both desk study and field survey. Where limited information was available, the Precautionary Principle (UNESCO, 2005) was adopted and a ZoI estimated on that basis.

The desk study and field survey areas were designed to allow sufficient data to be collected to establish the baseline condition of ornithological features and determine the impacts of the Development. The ZoI can extend beyond a development and beyond the survey area. However, at a distance from a development its impacts might not result in significant effects (these being the focus of Ecological Impact Assessment (EcIA) according to CIEEM guidance), and even where a significant effect might occur over a large distance this does not necessarily require the field survey to extend to such distances[1]. The field survey areas adopted for this assessment were sufficiently precautionary to allow assessment of potentially significant effects from the Development on ornithological features, including within the wider ZoI beyond the field survey areas.

9.5 Methods

9.5.1 Guidance and Standards

The following guidance was used when designing the field survey carried out to inform this assessment and to determine the scope and method of the assessment itself:

- *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2022);
- *Recommended bird survey methods to inform impact assessment of onshore wind farms* (SNH, 2017);
- *Assessing Significance of Impacts from Onshore Windfarms on Birds out with Designated Areas* (SNH, 2018);
- *Assessing Connectivity with Special Protection Areas (SPAs)* (SNH, 2016);
- *Assessing the Cumulative Impact of Onshore Wind Energy Developments* (SNH, 2018).

9.5.2 Assessment Scope

The scope of survey and assessment described in this chapter was informed by the guidance contained in the published documents listed in *Section 9.5.1*, on the responses of consultees (as set out in *Table 0.2 Summary of Consultation*), and on the results of detailed study once underway.

NatureScot has devised 21 'Natural Heritage Zones' (NHZ) covering the whole of Scotland, which reflect biogeographical differences across the country. Assessment of the impacts on birds in this EIA has been carried out in the context of the Argyll West and Islands Natural Heritage Zone (NHZ 14), within which the Development is located (see *Figure 9.1 Natural Heritage Zone 14*). This includes the assessment of cumulative effects which has

[1] By way of a theoretical example to illustrate this concept: many important bird species hold large home ranges and use the habitat within these for foraging. Construction activities within the home range of a given pair of birds could be said to have a ZoI which extends to the full home range, which may extend to several kilometres from a nest site, and cover thousands of hectares. However, these works may only have a significant effect on the impacted birds in their immediate vicinity, for example by preventing them from foraging within a few hundred metres of the activities. The field survey area in this case would focus on the area over which significant effects could occur, rather than the potential ZoI, which could encompass the entire home range.

considered the potential for in-combination effects to arise due to other energy developments and land use changes within NHZ 14.

The guidelines for EcIA published by CIEEM recommend that only those features that are 'important' and that could be significantly affected by the Development require detailed assessment, stating that "*it is not necessary to carry out detailed assessment of ecological features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable*".

Consequently, for the purposes of the desk study, field survey and assessment described in this chapter, 'important' ornithological features were taken to include:

- The qualifying features of SPAs within 10km (or further where connectivity exists) of the Development;
- All species listed on Annex I of the Birds Directive;
- All species listed on Schedule 1 of the WCA;
- Species listed on the Scottish Biodiversity List (SBL);
- All species on the Argyll and Bute Local Biodiversity Action Plan (LBAP);
- All species on the Red List of Birds of Conservation Concern (BoCC) 5 (Stanbury *et al*, 2021).

Decommissioning has been scoped out of assessment as the decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of such facilities. Potential decommissioning effects are therefore considered to be similar to and associated with the components described in the construction project phase, and are not separately assessed, however a decommissioning survey and plan would be produced when required.

The Development will not construct an Access Track from Three Bridges, off the A819 to the south-east (such an Access Track will only be used if already consented and constructed by Blarghour Wind Farm and the necessary land rights have been secured). Therefore, assessment of possible impacts associated with the construction of the Three Bridges Access Track has been excluded. Potential operational phase impacts from use of this access route have been assessed.

9.5.3 Baseline Data Collection

9.5.3.1 Desk Study

A desk study was carried out to identify nature conservation designations and records of important bird species (as defined in *Section 9.5.2 Assessment Scope*) potentially relevant to the Development. A stratified approach was taken when defining the desk study area, based on the likely ZoI of the Development on different ornithological features. Accordingly, the desk study sought to identify:

- International nature conservation designations within 10 km of the Development Site (or further afield where there is clear connectivity, for example through hydrological linkage or where the qualifying species are known to range over a wider distance);
- National statutory nature conservation designations within 2 km of the Development Site;
- Local non-statutory nature conservation designations within 1 km of the Development Site;
- Records of important bird species within 1 km of the Development Site, this being extended to 6 km for raptor species listed on Schedule 1 of the WCA.

The desk study was carried out using the data sources detailed in *Table 9.3 Desk Study Data Sources*.

Table 0.3 Desk Study Data Sources

Data Source	Date Last Accessed	Data Obtained
NatureScot SiteLink website (https://sitelink.nature.scot/home)	24 January 2024	• Information on international and national statutory designations within the ZoI of the Development.
Ordnance Survey (OS) 1:25,000 maps	24 January 2024	• Habitats and connectivity relevant to interpretation of planning policy and potential presence of important ornithological features.
Bing Maps aerial imagery (https://www.bing.com/maps/)	24 January 2024	

Data Source	Date Last Accessed	Data Obtained
Argyll and Bute Council website (https://www.argyll-bute.gov.uk/)	24 January 2024	• Local Development Plan policies relevant to nature conservation. • Argyll and Bute LBAP information.
Argyll and Bute Council Open Data website (https://data-argyll-bute.opendata.arcgis.com/datasets/d05f7337b41e48b4af933404dc0592a2/explore)	06 July 2023	• Local non-statutory nature conservation designations within 1 km of the Development Site.
NatureScot	19 December 2018	• Confidential reports on golden eagle ranges within the potential ZoI of the Development.
Argyll Raptor Study Group	28 October 2023	• Information on the breeding locations of raptors within approximately 2 km of the Development Site, extended to approximately 6 km for golden eagle.
Natural Research	08 February 2024	• Data from two satellite tagged golden eagles referred to as 582 and 816, which have home ranges overlapping the Development Site, were obtained.

The proposed jetty location on Loch Fyne lies within a vacant British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) core count area referred to as 'Loch Fyne SE Otter Ferry to Inveraray'. According to the BTO website (https://app.bto.org/webs-reporting/numbers.jsp?locid=LOC650733), no data for this site have been submitted since 1987, making any data very old and unreliable for the purposes of this EIA. No WeBS data were therefore obtained as part of the desk study.

9.5.3.2 Field Survey

Ornithology field surveys were carried out in the vicinity of the Headpond, Access Tracks and other infrastructure associated with the Development between November 2018 and July 2021. All surveys followed the *Recommended bird survey methods to inform impact assessment of onshore wind farms* (SNH, 2017), as well as the following relevant guidance documents:

- The Brown and Shepherd (1993) methodology for censusing upland waders;
- Species-specific approaches for surveying raptors described in Hardey *et al* (2013);
- Other species-specific methodologies described in Gilbert *et al* (1998), including for breeding divers and lekking black grouse.

In addition, surveys for non-breeding coastal waterbirds[2] in the vicinity of the proposed jetty on Loch Fyne were carried out between September 2020 and February 2021, inclusive. The survey followed the method adopted by the BTO for the national WeBS scheme (https://www.bto.org/our-science/projects/wetland-bird-survey/taking-part/core-counts-methods), which itself is based on the 'look-see' method described in Bibby *et al* (2000).

A summary of the ornithological field surveys completed between 2018 and 2021 is provided in *Table 9.4 Summary of Ornithology Surveys Carried out for the Development*. A detailed description of the methods adopted for each survey type is provided in *Appendix 9.1 Ornithology (Volume 5 Appendices)*. The survey areas used varied according to survey type. The adopted field survey areas for each survey type are shown on *Figures 9.2* and *9.3 (Volume 3 Figures)*.

Table 0.4 Summary of Ornithology Surveys Carried out for the Development

Ornithology Survey	Date of Survey	Scope of Survey
Vantage point (VP) survey	November 2018 – October 2019	Four VP locations were used to provide visual coverage of the Development Site and surrounding area (see *Figure 9.2*). As far as possible, six hours of survey were completed per VP per month, although access restrictions and weather conditions meant this was not always possible. However, survey hours in each of the breeding and non-breeding seasons equalled or exceeded 36 hours per VP.
Moorland breeding bird survey	April – July 2019	Survey of breeding birds in areas of suitable open habitat within approximately 500m of proposed infrastructure following the Brown and Shepherd (1993) method for censusing upland waders. In line with recommendations made by Calladine *et al* (2009), four survey visits were carried out, although the visit in July 2019 was subject to access restrictions.

[2] The BTO define 'waterbirds' as wildfowl (ducks, geese and swans), waders, rails, divers, grebes, cormorants, herons, gulls and terns. This BTO definition has been adopted in this chapter.

Ornithology Survey	Date of Survey	Scope of Survey
Breeding raptor and eagle survey	February – August 2019	Survey for breeding raptor species listed on Schedule 1 of the WCA and/or Annex I of the Birds Directive carried out in all areas of suitable habitat within 2km of above-ground infrastructure, extended to 6km for eagles. A total of four survey visits were made.
Breeding diver survey	May – July 2019	Targeted searches were conducted for breeding red-throated diver and black-throated diver *Gavia arctica* at all potentially suitable waterbodies within 1.5km of above-ground infrastructure. Two survey visits were made, one in late-May and one in July.
Black grouse lek survey	April – May 2019	Survey for lekking black grouse in areas of suitable habitat within approximately 1.5km of above-ground infrastructure.
Common Bird Census (CBC)	May – July 2021	Survey of breeding bird assemblage within the footprint of infrastructure around Inveraray, plus a 50m buffer. Three survey visits were made, following an adapted version of the CBC method described in Gilbert *et al* (1998).
Non-breeding coastal waterbird survey	September 2020 – February 2021	Survey for waterbirds within approximately 1km of the proposed jetty location on Loch Fyne. A single visit per month carried out during the survey period, with surveys being stratified according to tide times, focussing on high and low tides.

In summary, survey effort between 2018 and 2021 resulted in in the completion of:

- A minimum of 36 hours of VP survey from each of four VP locations during the course of one breeding season and one non-breeding season (the latter split over two years);
- Survey for moorland breeding birds, breeding raptors (including eagles), breeding divers, lekking black grouse, and general breeding birds around Inveraray in one breeding season);
- Survey for coastal waterbirds in one complete non-breeding season.

9.5.3.3 Territory Analysis

The results of the moorland breeding bird surveys and CBC surveys were used to determine breeding activity and to estimate territorial locations of important bird species (as defined in *Section 9.5.2 Assessment Scope*). Species not considered to be important (e.g., those on the Amber or Green Lists of BoCC) and not meeting any of the other criteria in *Section 9.5.2* were not included in the territory analysis. The detailed method used for territory analysis is described in *Appendix 9.1 Ornithology (Volume 5 Appendices)*.

9.5.3.4 GET Modelling

Fielding *et al* (2019), developed a model, known as the Golden Eagle Topographical (GET) model, to predict habitat use by golden eagles. The model was developed using data from 92 satellite tagged golden eagles which were tagged as nestlings between 2007 and 2016 and subsequently dispersed from nest sites. The model found that young golden eagles preferred, or used according to availability, space above slopes greater than 10º, at an altitude of 300m or greater, and within 300 m of a ridge. The GET model uses predicted use-class values of between 1-10 for habitats. Habitat valued at 1-5 is considered to be unfavourable for golden eagles, while habitat scored as 6 or above is considered to be suitable.

The GET model is recommended by NatureScot as a tool for estimating loss of this preferred habitat to range holding golden eagles (https://www.nature.scot/doc/naturescot-statement-modelling-support-assessment-forestry-and-wind-farm-impacts-golden-eagles). As set out in *Table 9.2 Summary of Consultation*, NatureScot also recommended that GET modelling be carried out for the Development.

Full details of the GET model methodology are provided in *Appendix 9.2 Golden Eagle Topographical Modelling (Volume 5 Appendices)*. However, in summary, all habitat within the footprint of proposed above-ground infrastructure plus a 300 m buffer was assigned a use value of 1-10, based on topographical characteristics. Any habitat with a score of 6 or greater, and which is not currently afforested, was assumed to be suitable habitat for golden eagles and will be lost to any birds occupying a territory which overlaps this area.

9.5.4 Assessment Methodology

The assessment of impacts and effects on ornithological features described in this chapter was conducted in accordance with the guidelines published by CIEEM (2022). The principal steps involved in the CIEEM approach can be summarised as:

- Determine baseline conditions through targeted desk study and field survey, to identify important features that might be affected;
- Evaluate the importance of identified ornithological features on a geographic scale, determining those that need to be considered further;
- Describe potential impacts on relevant ornithological features, considering best practice, legislation and embedded design measures;
- Assess and quantify (as far as possible) likely effects (adverse or beneficial) on relevant ornithological features;
- Develop measures to avoid, reduce or if necessary compensate for predicted significant effects, in conjunction with other elements of the design (including mitigation for other environmental disciplines);
- Report residual effects taking into account developed mitigation or compensation;
- Identify opportunities for biodiversity enhancement.

In line with CIEEM guidelines, the terminology used within this chapter draws a clear distinction between the terms 'impact' and 'effect'. Within this chapter, these terms are defined as follows:

- Impact – actions resulting in changes to an ornithological feature (for example, the removal of nesting habitat);
- Effect – the outcome resulting from an impact acting upon the conservation status or structure and/or function of an ornithological feature (for example, the loss of nesting habitat may reduce the population of an important bird species and result in an adverse effect on the conservation status of the population concerned).

Impacts are assessed in view of the conservation status of the bird species under consideration. NatureScot defines the conservation status of a species as "*the sum of the influences acting on it which may affect its long-term distribution and abundance, within the geographical area of interest*" (SNH, 2018). A species' conservation status is considered to be 'favourable' when:

- Population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitats;
- The natural range of the species is not being reduced, nor is it likely to be reduced for the foreseeable future;
- There is (and probably will continue to be) a sufficiently large habitat to maintain its population on a long-term basis.

NatureScot recommends that the concept of the favourable conservation status of a species should be applied at a national (Scottish) level in order to determine the level of significance of an effect arising from the impact(s) of development (SNH, 2018). However, as highlighted in *Section 9.5.2 Assessment Scope*, this assessment has also been conducted in the context of NHZ 14, within which the Development is located. Therefore, even where an impact may not affect the conservation status of a species at the national level, the potential for effects on the conservation status of that species within the NHZ has also been considered.

For the purposes of this EIA, effects predicted to be significant on an ornithological feature at the Regional or greater geographic level are considered to be 'Significant' in broader EIA terms, whereas those predicted to be significant only at the Local or Negligible levels, are considered to be 'Not Significant'.

A detailed description of the CIEEM method for impact assessment is provided in *Appendix 6.1: Method for Assessment of Ecological Impacts (Volume 5 Appendices).*

9.5.5 Limitations And Assumptions

The aim of the desk study was to help characterise the baseline context of the Development and provide valuable background information that may not be captured by field survey alone. Information obtained during the desk study is dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for particular species does not necessarily mean they do not occur in the study area. Likewise, the presence of records for a particular species does not automatically mean that these still occur within the area of interest or are relevant to the Development.

It was not always possible to carry out a full six hours at each VP per calendar month due to adverse weather conditions or access restrictions. Sometimes poor visibility necessitated repeat surveys. However, VP survey effort per breeding and non-breeding season was equal to or exceeded the required 36 hours recommended by SNH (2017).

Land access restrictions resulted in only part of the survey area being covered in July 2019. Areas unable to be accessed included land in the south-west and north-east of the Development Site, therefore the only areas surveyed in July were the south-east of the Development Site and the majority of the southern Access Track. However, the survey in this month did cover the area around Lochan Airigh, which lies within the proposed Headpond area and will therefore be subject to the greatest impacts from the Development.

No nocturnal surveys were carried out during the 2019 breeding season and this could potentially lead to an underestimation of the activity of some species, including short-eared owls *Asio flammeus*, grasshopper warbler *Locustella naevia* and certain waders such as snipe *Gallinago gallinago*. Incidental observations were however made of snipe and grasshopper warbler during bat surveys. Short-eared owl was not recorded at any time during the breeding survey programme, and since this species can be active during daylight hours, particularly during the breeding season when they may be provisioning young, it is considered to be likely absent as a breeding species. Suitable habitat for grasshopper warbler is highly localised at the Development Site, and this species was identified nearer Loch Awe.

For the non-breeding coastal waterbird survey, it was not possible for reasons of logistics and tide times to alternate low and high tides each survey visit. However, an equal number of high tide and low tide survey visits were completed, and this limitation is not considered significant.

There were no other significant limitations to the desk study, field survey or subsequent analysis which could affect the reliability of this impact assessment.

9.6 Baseline Environment

9.6.1 Designated Sites

9.6.1.1 Statutory Designated Sites

A single international nature conservation designation exists within the desk study area: Glen Etive and Glen Fyne SPA. This is a large and predominantly upland site which rises from sea level to over 1,100 m and encompasses a diverse range of habitats including moorland, rough grassland, blanket bog, native woodland, montane heaths and exposed rock and scree. The sole qualifying feature of the SPA is breeding golden eagle. According to the citation for the SPA (available from https://sitelink.nature.scot/site/10113), the site supported nineteen pairs in 2003, this representing more than 4.2% of the British population. At closest, the Glen Etive and Glen Fyne SPA is approximately 230 m to the east of the Development Site boundary, on the east side of the A819 road between Inveraray and Dalmally.

There are no other SPAs or Wetlands of International Importance (Ramsar sites) within 10 km of the Development, or which could otherwise by impacted by it.

There are no SSSIs within 2 km of the Development.

9.6.1.2 Non-statutory Designated Sites

There are no Local Nature Conservation Sites within 1 km of the Development Site.

9.6.2 Moorland Breeding Birds

A total of 54 species were recorded during moorland breeding bird survey. The full list of species recorded is provided in *Table B1* in *Annex B* of *Appendix 9.1 Ornithology (Volume 5 Appendices)*. Of the 54 species recorded, 25 are considered to be important in the context of this EIA. The locations of the important species recorded during moorland breeding bird survey are shown on *Figure 9.4 Moorland Breeding Bird Surveys*. Territory analysis was carried out on these species (with exception of those which do not hold territories and breed gregariously) and a total of thirteen are believed to have held territories within the survey area in 2019 (the locations of estimated territory centres are shown on *Figure 9.5 Territory Analysis - Important moorland breeding birds (Volume 3 Figures)*):

- Common sandpiper *Actitis hypoleucos*;

- Cuckoo *Cuculus canorus*;
- Curlew *Numenius arquata*;
- Goldeneye *Bucephala clangula*;
- Golden plover *Pluvialis apricaria*;
- Mistle thrush *Turdus viscivorus*;
- Oystercatcher *Haematopus ostralegus*;
- Skylark *Alauda arvensis*;
- Spotted flycatcher *Musciapa striata*;
- Snipe;
- Song thrush *Turdus philomelos*;
- Tree pipit *Anthus trivialis*;
- Whinchat *Saxicola rubetra*.

A further three which nest in groups are also believed to have bred (common crossbill *Loxia curvirostra*, lesser redpoll *Carduelis cabaret*, and siskin *Carduelis spinus*).

Two additional territories of grasshopper warbler (BoCC Red List species and priority species under the SBL) were recorded during other surveys. One was heard repeatedly on the low slopes in the south-west corner of the Development Site on walking to vantage points, and another was heard once during a bat survey just south of the Development Site but within the 500 m buffer. Grasshopper warblers are crepuscular birds and hence liable to be under-recorded during daytime surveys. However, suitable habitat for this species is highly localised within the Development Site, and largely confined to areas close to Loch Awe.

9.6.2.1 Waders

A flock of seven golden plover was recorded in flight to the north of Lochan Breac-liath from VP2 in June 2019. No other waders were recorded during the course of VP surveys.

As stated above, common sandpiper, curlew, golden plover, oystercatcher and snipe are all believed to have bred within the moorland breeding bird survey area in 2019. The locations of estimated territory centres are shown *on Figure 9.5 Territory Analysis - Important moorland breeding birds (Volume 3 Figures)*. Further details are provided in *Appendix 9.1 Ornithology (Volume 5 Appendices)*.

9.6.2.2 Schedule 1 Passerines

A small number of sightings of common crossbill (hereafter simply 'crossbill')[3] were recorded during moorland breeding bird survey, although they are highly likely to be common in suitable conifer plantation woodland in the vicinity of the Development. Identifying crossbill territories is difficult because they nest semi-colonially, forage over significant areas, and it is often difficult to see the birds, particularly their nests. However, it is very likely that this species breeds in suitable habitat in the vicinity of the Development.

9.6.2.3 Red Listed Passerines

Spotted flycatcher, tree pipit, whinchat, cuckoo, lesser redpoll mistle thrush, song thrush and skylark are all believed to have bred within the moorland breeding bird survey area in 2019. Further information on the breeding locations of these species is provided in *Appendix 9.1*.

9.6.3 Raptors

The following target (i.e., important) raptor species were recorded at or near to the Development Site by field surveys:

- Golden eagle;
- White-tailed eagle;
- Hen harrier;

[3] It has been assumed that the species observed was common crossbill, which is common across Scotland, rather than Scottish crossbill *Loxia scotica*, which Is confined to the Scottish Highlands, or the rarer parrot crossbill *Loxia pytyopsittacus*, confined as a breeding species to certain parts of the Scottish Highlands.

- Peregrine *Falco peregrinus*;
- Osprey *Pandion haliaetus*.

Other raptors which are not considered to be important by this EIA, and which are therefore not considered further but which were recorded by field survey were buzzard *Buteo buteo* and sparrowhawk *Accipiter nisus*. Neither species is suspected to have bred within 2 km of above-ground infrastructure in 2019.

The Argyll Raptor Study Group provided records of breeding locations of barn owl *Tyto alba* and short-eared owl *Asio flammeus*. In addition, two historical merlin *Falco columbarius* breeding locations were identified by the Raptor Study Group, but these are not recent.

9.6.3.1 Golden Eagle

Full details of the baseline conditions with respect of golden eagle are provided in *Appendix 9.1* Ornithology (*Volume 5 Appendices*) and *Confidential Appendix 9.1 Schedule 1 Birds (Volume 6 Confidential Appendices)*.

9.6.3.2 White-tailed Eagle

White-tailed eagles were regularly seen on the Development Site, most often near and south of Beochlich Reservoir. Two mature birds were seen together on a number of occasions, from VP3 and during breeding raptor survey. A survey investigating an Access Track route which no longer forms part of the Development found immature birds, probably in their second year, sat next to a small lochan at NN 0312. This would make a minimum count of six individual white-tailed eagles seen within a 6 km buffer of the Development Site.

White-tailed eagles are more likely to nest in trees than golden eagles (Evans *et al*, 2010). Although they could therefore potentially nest in forestry within 6 km of the Development Site, no evidence of this was found and frequent photographing of individual birds failed to reveal any recently fledged birds at the end of the summer. Some flights of white-tailed eagles from within the Development Site, including towards the eastern edge, passed south-westwards towards and ultimately beyond the eastern shore of Loch Awe. No provisioning flights were observed.

9.6.3.3 Hen Harrier

A male hen harrier was observed twice during a breeding raptor survey on 02 April 2019 in the west of the Development Site. A short flight of a female hen harrier was recorded from VP1 on 04 April 2019, about 500 m north of the proposed Headpond. A male hen harrier was seen to fly over the Headpond area on 25 September 2019.

Suitable nesting habitat for hen harriers, typically with knee length scrub, is very scarce on the Development Site, and given also that these birds are not inconspicuous and there were so few sightings, it is considered extremely unlikely that this species bred within the survey area. The fenced area around Lochan Romach (north-west of Beochlich Reservoir), which was regularly passed during all types of field survey, has thick vegetation through absence of grazing, offering the best potential hen harrier nesting habitat locally. However, the lack of observations of hen harrier in this area also suggest breeding is highly unlikely to have occurred here in 2019.

9.6.3.4 Peregrine

A peregrine was seen from VP4 on 22 February 2019. Another sighting was of a bird recorded during moorland breeding bird survey at Sron Bhreach-Liath on 10 April 2019. Peregrines tend to nest conspicuously on cliff faces and, as a result of a paucity of records and suitable cliffs, it is concluded that peregrines are highly unlikely to have nested within 2 km of the Development in 2019.

9.6.3.5 Osprey

A single osprey was observed within 2 km of the Development Site in the bay near Inverinan on 02 April 2019. An osprey was also seen to overfly Allt Bheochlich parallel to the shore of Loch Awe and about 500 m inland on 23 May 2019. Given the paucity of records, it is concluded that it is highly unlikely that osprey bred within 2 km of the Development in 2019.

9.6.3.6 Other Schedule 1 Raptors

The Argyll Raptor Study Group provided records of barn owl, short-eared owl and merlin breeding sites.

A single barn owl breeding site was highlighted by the RSG on the west side of Loch Awe, approximately 3 km from the Development. A single short-eared owl site was also identified, also on the opposite side of Loch Awe, approximately 6 km from the Development.

Two historic merlin territories were also identified by the RSG but there has been no recent evidence of either being occupied. One is approximately 1 km south-east of the Development Site, and further than this from the nearest proposed infrastructure. The other is almost 2 km from the Blarghour Wind Farm Access.

9.6.4 Divers

A total of eleven waterbodies were identified within the breeding diver survey area. A description of the suitability of these waterbodies for nesting by divers is provided in *Appendix 9.1 Ornithology (Volume 5 Appendices).*

No breeding by red-throated divers or black-throated divers within the survey area was identified or suspected during the 2019 breeding season.

The only sighting of red-throated divers on any waterbody within 1.5 km of above-ground infrastructure was of a pair on an un-named waterbody, to the west of the Blarghour Wind Farm access, noted during a moorland breeding bird survey on 19 June 2019 (see *Figure 9.6 Red throated Diver Observations (Volume 3 Figures)*). No other observations of red-throated divers were made at this location.

Black-throated divers were never observed during the course of ornithological field survey for the Development.

9.6.5 Black Grouse

Black grouse leks were not confirmed with certainty within the survey area, and none were found during the targeted field surveys. The only confirmed occurrence of lekking black grouse was an auditory record (the lek was not seen) outside the survey area (and therefore beyond 1.5 km from above-ground infrastructure) near to Portsonachan on 11 April 2019 (see *Figure 9.7 Black Grouse Survey Results (Volume 3 Figures)*). This was noted incidentally whilst the surveyor was walking onto the Development Site for fieldwork.

Three black grouse, at least two of which were males, were flushed during a raptor walkover on 02 April 2019. The flushed birds flew from a flat-topped hillock approximately 600m south of the proposed Balliemeanoch (western) Access Track and approximately 500 m inland (east) of Loch Awe. The flushed birds were initially out of sight on higher ground than the surveyor. This may have been a lek, although no calling was heard, and no black grouse were located during the black grouse surveys in this area. However, several black grouse droppings, both recent and old, were found on the hillock the birds flew from, which is topped by short grass with scattered rushes *Juncus* sp. constituting ideal lekking habitat, and these factors suggest a possible lek site. A single black grouse dropping was also found incidentally during moorland breeding bird survey nearby to the south-east, close to the south-west corner of Bheachlich conifer plantation. The locations of this potential black grouse lek and the separate dropping are shown on *Figure 9.7 Black Grouse Survey Results (Volume 3 Figures)*).

Black grouse (not lekking) were also incidentally recorded on six occasions outside the survey area, again near Portsonachan. Two birds were first seen near the public road on 21 December 2018 and on 15 May 2019 a female which was incubating a clutch of seven eggs was flushed in a dense rushy area.

9.6.6 Breeding Bird Assemblage at Inveraray

A total of 44 species were recorded during CBC around Inveraray. The full list of species recorded is provided in *Table C1* in *Annex C* of *Appendix 9.1 Ornithology*. Of the 44 species recorded, sixteen are considered to be important in the context of this EIA. The locations of all of the important species recorded during the CBC survey are shown on *Figure 9.8 Common Bird Census (Volume 3 Figures)*. Territory analysis was carried out on these species and a total of twelve are believed to have held territories (or bred gregariously) within the survey area in 2021 (see *Figure 9.9 Territory Analysis - Important moorland breeding birds near Inveraray (Volume 3 Figures)*):

- Bullfinch *Pyrrhula pyrrhula*;
- Common sandpiper;
- Crossbill;
- Greenfinch *Chloris chloris*;
- Lesser redpoll
- Mistle thrush;
- Oystercatcher;
- Siskin;

- Spotted flycatcher;
- Song thrush;
- Tree pipit;
- Wood warbler *Phylloscopus sibilatrix*.

9.6.7 Non-breeding Coastal Waterbirds

Low numbers of birds were encountered at high and low tide surveys and it does not appear that the area holds significant numbers of waterbirds either feeding or roosting. No specially-notable species or aggregations of coastal birds were seen. The largest aggregation of shorebirds recorded during these surveys was of four turnstone *Arenaria interpres* and five redshank *Tringa totanus* on 13 October 2020 in the bay 200 m south of Inveraray jail, over 500m from the proposed jetty. Herring gull *Larus argentatus*, oystercatcher and shag *Gulosus aristotelis* were the most frequently occurring species. There were no large aggregations of waterbirds close to the proposed jetty location but the sea and shoreline within 200 m did hold, on some visits, small numbers (three or less), of oystercatcher, redshank, red-breasted merganser *Mergus serrator*, shag, herring gull and mallard *Anas platyrhynchos*.

Four curlew, 28 oystercatcher and six greylag geese *Anser anser* were all recorded in a field at Dalchenna Farm approximately 1 km south of the Development Site.

A summary of the results of the non-breeding coastal bird surveys, including the peak count of each species recorded, is provided in *Table 16* in *Appendix 9.1 Ornithology (Volume 5 Appendices)*. The locations of all birds recorded during the surveys are illustrated on *Figure 9.10 Non breeding Coastal Waterbird Surveys (Volume 3 Figures)*.

9.6.8 Future Baseline

9.6.8.1 Baseline at Time of Construction

Construction of the Development is expected to start in 2027 and take 7 years to complete including the pre-construction works.

At the time construction would start, Blarghour Wind Farm may have been constructed or be under construction. The majority of Blarghour Wind Farm is outside the Development Site, however the Access Track from Three Bridges is within it, although it would not be constructed by the Development and would only be used if already consented and constructed by Blarghour Wind Farm and the necessary land rights have been secured. It is possible that the Access Track from Three Bridges may have been constructed when construction of the Development commences (in which case it would be used). Offshoot Access Tracks and turbine pads may also have been constructed within the Blarghour Wind Farm development boundary, part of which overlaps the part of the Development Site covering the Three Bridges Access Track. Therefore there may, at the time of construction of the Development, be very slightly reduced extents of blanket bog, and to a lesser extent other associated habitats, within the habitat survey area (which included a wide strip along Three Bridges Access Track).

No other major land use changes are expected within the Development Site prior to commencement of construction.

The white-tailed eagle population in this part of Argyll, and Scotland more widely, is understood to be increasing. It is possible that a nest could be established in suitable habitat (e.g., forestry or crag) in the period between this EIA and commencement of construction. On a precautionary basis, the assessment of potential impacts/effects on this species has therefore considered this possibility.

Minor changes in the distribution of some species (e.g., nesting birds) may occur due to small-scale changes in habitat structure as a result of ecological succession or other natural processes. Given the relatively short period of time before construction would be expected to start, and that significant changes in land management practices (such as grazing regimes) are unlikely in the intervening period, any such changes are likely to be within the range of normal short-term variation in the distribution and abundance of species populations.

It is therefore expected that, with the exception of possible construction of Blarghour Wind Farm (the majority of which is outside the Development Site, the only part within it being the Three Bridges Access Track) the current baseline conditions will remain largely unchanged at the time of construction of the Development.

9.6.8.2 Baseline in the Absence of the Development

In the absence of the Development, and for this purpose taking a point 30 years in the future, there are unlikely to be significant changes from the current baseline. This is because current land management practices would be likely to continue as at present, and significant changes of land use are unlikely, especially in the more upland Headpond part of the Development Site. Small changes might occur in the more lowland parts of the Development Site, such as possible implementation of biodiversity measures (e.g., planting of new woodland), but would likely be of small impact relative to the size of the Development Site. Some impact from climate change could occur, however it is difficult to predict the direction of change on habitats, since the effects of possible drier and hotter periods but also increased rainfall (e.g., on blanket bog) could counteract. In summary, the future baseline in the absence of the Development is likely to be similar to current baseline.

9.7 Assessment of Effects

9.7.1 Embedded Mitigation

Embedded mitigation measures are incorporated into the design of a development and aim to avoid or reduce adverse effects, including those on ornithological features. Embedded mitigation can be considered at the impact assessment stage, whereas specific mitigation measures which are not part of the design and are developed after the initial impact assessment, are assessed at a later stage when considering the residual effects.

9.7.1.1 Infrastructure Design

The Development has sought to avoid impacts on ornithological features as far as possible by a number of infrastructure refinements embedded into the design, as set out below:

- The northern Access Track from the A819 has been located largely along existing forestry tracks, minimising the requirement for construction of new track infrastructure and avoiding impacts on non-forestry habitats;
- The Access Track from Balliemeanoch (west of the Headpond) has been adjusted to avoid impacting ancient semi-natural woodland along the Allt a’ Chrosaid, and to largely follow the existing Access Track with minimal other habitat impacts;
- Access tracks in the Inveraray area have been positioned almost entirely along existing forestry tracks, avoiding or very much minimising felling requirements, and also largely avoiding impacts on wetland habitat that was crossed in previous design iterations;
- No Access Track will be constructed as part of the Development from Three Bridges (off the A819 south-east of the Development) – access will only be taken from Three Bridges if an Access Track has already been constructed by Blarghour Wind Farm and the necessary land rights have been secured, otherwise access will be taken only from the north and west (Balliemeanoch);
- New Access Tracks throughout have been adjusted as far as possible to run though the shallowest peat, thereby also avoiding deeper, wetter and more intact blanket bog habitat;
- The Tailpond works extent has been adjusted to reduce the extent of woodland loss beside Loch Awe to a minimum;
- Temporary Construction Compound TC02 has been reduced to be confined only to agriculturally improved pasture, with no further impact on woodland beside Loch Awe;
- Temporary Construction Compound TC04 has been relocated to avoid impact on a substantial rushy wetland that constitutes a potential Groundwater Dependent Terrestrial Ecosystem (GWDTE) with greater floristic diversity than the heavily-grazed species-poor grassland that TC04 now occupies;
- Temporary Construction Compound TC07 has been re-shaped so that it no longer impinges on an existing grazing exclusion area by Lochan Romach with ungrazed blanket bog and native tree patches, and is now confined to habitats degraded by over-grazing, mainly wet heath and acid grassland;
- Temporary Construction Compound TC21 has been adjusted to impact only an existing quarry, rather than adjacent long-established plantation.

9.7.1.2 Other Measures

In the breeding season prior to commencement of construction and throughout the construction phase, a programme of breeding bird surveys will be carried out within the potential ZoI of the Development. The survey methods will follow those adopted during the surveys which have informed this EIA. The surveys will be carried out by a suitably experienced ornithologist(s) and will follow best practice methods, similar to those described in this chapter and *Appendix 9.1 Ornithology*. The results of on-going surveys will be communicated to relevant construction personnel to ensure that appropriate mitigation is implemented to protect identified breeding birds. The detailed programme of breeding bird surveys will be set out in a Species Protection Plan (SPP), which will be approved by Argyll and Bute Council, in consultation with NatureScot, prior to the commencement of construction works.

In addition, 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. These are well-developed and have been successfully implemented on infrastructure projects across the country and there is a high degree of confidence in their success. They can therefore be treated as embedded mitigation. These will include:

- All personnel involved in the construction and operation of the Development will be made aware of the ornithological features within the ZoI and the mitigation measures and working procedures that must be adopted. This will be achieved as part of the induction process and through the delivery of Toolbox Talks, where required;
- An Ecological / Environmental Clerk of Works (ECoW) will be employed for the duration of the construction of the Development. The remit of the ECoW will include, but may not be limited to:
  - Carrying out pre-works checks for important bird species and nesting birds;
  - Advising on exact infrastructure placement within micro-siting tolerances;
  - Monitoring of, and advising on, storage of overburden to minimise habitat damage;
  - Monitoring of any peat/vegetated turves that may be stored for later reinstatement;
  - Advising on habitat reinstatement;
  - Monitoring of pollution control measures and advising on placement of ditches, settlement ponds, etc. to minimise habitat damage;
- 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 August, 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 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;
- Sightings of protected and/or important bird species within the Development Site during the construction period will be recorded. If any evidence or sightings of specially protected bird species listed on Schedule 1 of the WCA suggest that a nest site may be present within 1km of active or planned near term works, then works in that area will stop immediately and the ECoW will be contacted for further advice.
- A Construction Environmental Management Plan (CEMP) will be prepared and submitted for approval by Argyll and Bute Council, in consultation with SEPA and NatureScot, where necessary, prior to commencement of construction. The CEMP will set out all environmental management measures and the roles and responsibilities of construction personnel;
- During all phases of the Development, pollution prevention measures will be adopted, following SEPA Pollution Prevention Guidelines (PPG) and Guidance on Pollution Prevention (GPP), including the following:
  - Controls and contingency measures will be provided to manage run-off from construction areas and to manage sediment;
  - All oils, lubricants or other chemicals will be stored in an appropriate secure container in a suitable storage area, with spill kits provided at the storage location and at places across the Development Site;
  - In order to avoid pollution impacts to soils, vegetation and watercourses / waterbodies during construction, all refuelling and servicing of vehicles and plant will be carried out in a designated area which is bunded and has an impermeable base. This will be situated at least 50m away from any watercourse;
- Works near or at any retained native trees or semi-natural woodland will follow guidance in British Standard 5837:2012 *Trees in relation to design, demolition and construction – Recommendations* (British Standards Institution, 2012);

- Any artificial lighting required for construction works will be directional to avoid or minimise light spill beyond immediate works areas.

9.7.2 Features Scoped Out of Further Assessment

As stated in *Section 9.5.2 Assessment Scope*, relevant ornithological features are those that are 'important' and have the potential to be significantly affected by the Development (CIEEM, 2022). In view of the baseline data obtained through desk study and field survey, the features in *Table 9.5 Ornithological Features Scoped Out of Further Assessment* have been excluded from further assessment because: a) available data indicates that they are likely to be absent from the ZoI of the Development; b) it is clear that no impact from the Development is possible; and/or c) they are features that, although identified as being 'important' by the criteria given in this chapter, are common and widespread and their conservation status is clearly not threatened by the Development.

Table 0.5 Ornithological Features Scoped Out of Further Assessment

Ornithological Feature	Rationale for Exclusion from Further Assessment in this Chapter
National statutory designated sites	There are no national statutory designated sites for nature conservation within 2km of the Development. Beyond this distance, there is not considered to be any possibility of impacts upon the notified ornithological features of any such sites from its construction and operation.
Local non-statutory designated sites	There are no local non-statutory designated sites for nature conservation within 1km of the Development. Beyond this distance, there is not considered to be any possibility of impacts upon the ornithological interests of any such sites from its construction and operation.
General moorland breeding birds	General moorland breeding bird species not considered to be important based on the definition used in this chapter have been scoped out of assessment on this basis; they are those species which are common and widespread in similar habitats both locally and across Scotland and are not of sufficient conservation concern to require detailed consideration.
Common crossbill	Although listed on Schedule 1 of the WCA, crossbill is a common species, reflected by its Green-Listed status. The Scottish breeding population is estimated to be between 5,000 and 50,000 pairs in most years, with a wintering population between 10,000 and 100,000 birds (Forrester *et al*, 2007). The species is widespread in suitable plantation forestry, similar to that surrounding the Development Site. For example, the Argyll Bird Report 2021 (the latest edition of the annual report produced by the Argyll Bird Club) states that "large numbers breed in good cone years" (Dickson, 2022).
Other Red-Listed and/or SBL passerines of woodland habitat: cuckoo, lesser redpoll, mistle thrush, spotted flycatcher, siskin, song thrush and tree pipit	Despite being Red-Listed or on the SBL, these species are all common and widespread, both locally and across Scotland.
Hen harrier	These species were recorded very rarely within or near to the Development Site. Habitat within the Development Site is generally sub-optimal or unsuitable for nesting by all three species.
Peregrine	
Osprey	
Barn owl	Records of breeding sites of these species were provided by the Argyll Raptor Study Group. However, all were located at substantial distance from the Development, (in the case of barn owl and short-eared owl) on the opposite side of Loch Awe, and (in the case of merlin) historically, with no evidence of recent occupancy. None of these species were recorded during targeted field survey for the Development. They are all considered likely absent from the ZoI.
Short-eared owl	
Merlin	
Red-throated diver	There was only a single sighting of red-throated divers on any waterbody within 1.5km of the Development. The majority of waterbodies within 1.5km of the Development are sub-optimal or unsuitable for breeding by red-throated divers. There is consequently not predicted to be any loss of red-throated diver breeding habitat or significant possibility of disturbance to breeding red-throated divers.
Black-throated diver	Black-throated diver was not observed at any point during the course of ornithological field survey carried out for the Development. This species is therefore likely absent from the ZoI.
General assemblage of breeding birds around Inveraray	As described above for general moorland breeding birds, except for those species which are considered to be important, the general assemblage of breeding birds in habitats around Inveraray comprises species which are common and widespread, and their conservation status is not vulnerable to the minor impacts of the Development in this area.

9.7.3 Importance of Ornithological Features

The assessed importance of those ornithological features identified in the baseline conditions, and which have not been scoped out above, is set out in *Table 9.6 Importance of Ornithological Features*, together with a rationale. Importance has been assessed considering geographic scale, in accordance with CIEEM (2022) guidelines.

When considering geographic scale, for the purposes of this assessment, the geographical level of 'Regional' is defined as the area encompassed by NHZ 14, and 'Local' as the area within 10 km of the Development.

Table 0.6 Importance of Ornithological Features

Ornithological Feature	Importance	Rationale
Glen Etive and Glen Fyne SPA	International	This site was selected, and is legally protected, for its international importance for breeding golden eagle.
Curlew	Regional	On a precautionary basis, it is estimated that in 2019 there were five possible curlew territories and one probable territory within the moorland breeding bird survey area. According to Wilson *et al* (2015), the breeding population of curlew within NHZ 14 is estimated at 207 pairs. Up to six pairs would therefore represent approximately 2.9% of the Argyll West and Islands NHZ, and Regional importance is therefore assigned.
Golden plover	Local	Golden plover is listed on Annex I of the Birds Directive. The golden plover breeding population in NHZ 14 is estimated by Wilson *et al* (2015) to be 1,429 pairs. Baseline surveys identified two possible and one probable golden plover territories, plus a single flight of seven golden plover during the breeding season. Three pairs would represent less than 1% of the NHZ population, and consequently local importance is considered to be appropriate.
Other waders: common sandpiper, oystercatcher and snipe	Local	Common sandpiper, oystercatcher and snipe are all on the Amber List of BoCC. However, as stated in the Argyll Bird Report (Dickson, 2022), they are all widespread and common in this region, and are found in habitats typical of those within and surrounding the Development Site. Local importance is therefore assigned.
Grasshopper warbler	Local	Two grasshopper territories were identified incidentally during the course of other ecological field survey carried out for the Development (i.e., not by moorland breeding bird survey). The Scottish breeding population of this species is estimated to be between 900 and 3,700 pairs. Considering the size of the national population, and in the absence of an estimate for NHZ 14, it is therefore considered that Local importance is appropriate.
Skylark	Local	Although Red-Listed, skylark remains a common and widespread breeding species in Argyll (Dickson, 2022). An estimated 127 possible and 17 probable skylark territories identified by moorland breeding bird survey illustrate this to be the case at the Development Site.
Whinchat	Local	Dickson (2022) describes whinchat in Argyll as being *"sparse but widespread"*. However. Forrester *et al* (2007) estimate the Scottish breeding population to be between 15,000 and 20,000 pairs, and identify Argyll (along with Scottish Borders, Dumfries and Galloway and larger Inner Hebridean islands) as supporting the highest breeding densities in the country. It is therefore unlikely that the two territories (one possible and one probable) identified by moorland breeding bird survey are Regionally important. Local importance is consequently assigned.
Wood warbler	Local	As for whinchat, above, Dickson (2022) describes wood warbler as *"scarce but widely distributed"* in Argyll. Forrester *et al* (2007) give a breeding population estimate for Scotland of between 2,900 and 3,300 pairs. Up to eight territories were identified in the CBC survey area around Inveraray. Considering the size of the national population, and in the absence of an estimate for NHZ 14, it is therefore considered that Local importance is appropriate.
Golden eagle	Regional	See *Confidential Appendix 9.1*.
White-tailed eagle	Local	No breeding by white-tailed eagle was identified within 6km of the Development in 2019. Furthermore, use of the habitats with the Development Site was sporadic, with no clear pattern indicating a particular area of importance to this species. As white-tailed eagles are wide-ranging, even when breeding, and make use of a variety of habitats around Loch Awe and across Argyll, white-tailed eagles and the habitats within the Development Site which may support them, are considered to be of Local importance only.
Black grouse	Local	Black grouse, and evidence of black grouse, were recorded within and beyond the Development Site. However, the only confirmed occurrence of lekking was beyond 1.5km from any proposed infrastructure. A further

Ornithological Feature	Importance	Rationale
		possible lek site and a confirmed black grouse nest were also outside of the Development Site. At least two males, and possibly three, were observed on one occasion, and a female incubating a clutch of eggs was also found. The NHZ 14 population of displaying male black grouse is estimated at 67 birds (Wilson *et al*, 2015). Thus, the number of birds recorded by baseline surveys is likely to be more than 1% of the Regional population. However, as the majority of sightings were outside of the Development Site, and distant from any proposed infrastructure, Local importance has been assigned to black grouse.
Non-breeding coastal waterbird assemblage	Local	Coastal waterbirds were recorded in low numbers and no specially-notable or larger aggregations of birds were seen. At most, the waterbird assemblage in the vicinity of the proposed jetty is of Local importance.

9.7.4 The Potential Impacts of the Development

The following broad categories of impact could arise during the construction and operation of the Development and are considered, where potentially relevant, in relation to each of the ornithological features scoped in to detailed assessment in *Table 9.6 Importance of Ornithological Features*:

- Loss of habitat which supports important bird species as a result of the construction of infrastructure associated with the Development;
- Disturbance to and/or displacement of species during construction and operation;
- Accidental destruction of active bird nests;
- Displacement of marine prey for waterbirds foraging in Loch Fyne;
- Cumulative impacts arising in combination with other energy developments or due to other land use changes within NHZ 14.

There are no likely pathways for pollution of surface water, groundwater, soils or vegetation given that industry-standard good practice mitigation measures will be implemented at all stages of the Development to meet legal and regulatory requirements, as described in *Section 9.7.1.2 Other Measures*. These measures are considered as embedded and this impact is therefore not considered for any ornithological feature.

9.7.5 Impacts on Glen Etive and Glen Fyne SPA

9.7.5.1 Construction Phase

A detailed assessment of the potential impacts and effects of the Development on Glen Etive and Glen Fyne SPA is provided in the Statement to Inform Habitats Regulations Appraisal.

It was concluded in that document that there will be no adverse effect on the integrity of Glen Etive and Glen Fyne SPA (or any other European site) as a result of the construction of the Development. A conclusion of no adverse effects on European site integrity can be drawn even where minor negative impacts are predicted, so long as these do not prevent the relevant Conservation Objectives of the given site from being met. Therefore, adopting EcIA terminology, while there may be slight negative impacts on Glen Etive and Glen Fyne SPA from the construction of the Development, these will be **Negligible** and **Not Significant**.

9.7.5.2 Operational Phase

Full assessment of the potential impacts and effects of the Development, at all stages, on Glen Etive and Glen Fyne SPA is presented in the Statement to Inform Habitats Regulations Appraisal.

It was concluded that there would be no adverse effect on the integrity of Glen Etive and Glen Fyne SPA as a result of the operation of the Development. For the purposes of this chapter, therefore, there is concluded to be **Negligible effect** on this European site during operation, which is **Not Significant**.

9.7.6 Impacts on Curlew

9.7.6.1 Construction Phase

<u>Loss of Habitat</u>

Six curlew territories (five possible and one probable) were identified by the moorland breeding bird surveys. Of these, one was outside of the boundary of the Development Site, south of the Allt Beochlich, and two were along the southern Access Track (which will be constructed by Blarghour Wind Farm, and not by the Development). These territories are considered to be sufficiently distant from the Development and/or separated by other habitat features that significant loss of habitat from within them is not likely.

The remaining three territories were located less than 100m from proposed infrastructure, with one being estimated to have a centre within the Headpond area.

Curlew have been found to breed at densities of less than one pair per km^2, although this was in a lowland landscape different to that at the Development Site, and subject to higher levels of human disturbance (Ewing *et al*, 2022). However, given the proximity of the three curlew territories to proposed infrastructure, in particular the Headpond, there could be a substantial loss of habitat which supports these breeding pairs.

Curlew breed in unenclosed moorland habitat and adjacent semi-improved grassland, pastures and meadows (Defra, 2023) and this is reflected in the identified distribution of curlew which were found in areas containing a mix of grassland and heath. These habitats are reasonably extensive along the lower parts of the Development Site, towards Loch Awe. Other than the Headpond, the total area of habitat which will be permanently lost to the Development will be relatively limited, with Access Tracks remaining but Construction Compounds being removed and habitat reinstated. Tree planting which will be carried out as part of the oLEMP has been designed to enhance existing woodland and to expand riparian woodland along watercourses. This will not result in a loss of suitable curlew breeding habitat. It is therefore considered unlikely that there would be sufficient habitat loss to result in the loss of three curlew territories from the Development Site. However, the territory within the Headpond will almost certainly be lost and, due to other losses of habitat, it may be that one further pair is lost.

The loss of two curlew territories would represent approximately 1% of the NHZ population and is therefore concluded to be a **Permanent Adverse effect of Regional Significance**. This is **Significant**.

Disturbance of Breeding Birds

Goodship and Furness (2022), in a NatureScot-commissioned report, suggest that curlew have 'high' sensitivity to disturbance, and recommend a breeding season buffer zone of between 200-300m around a nest. The three territories described above under 'habitat loss' would all be within this distance of works, while the other three found by surveys are beyond this distance and are unlikely to be subject to disturbance.

Assuming that the Headpond territory is completely lost, but that the remaining two territories are not, disturbance could therefore impact two breeding pairs of curlew. This impact would last for the duration of construction. As a species which is considered to be highly sensitive to disturbance, and given that there are significant works in the areas around both (several Construction Compounds and Access Tracks), it is possible that breeding by these birds may be prevented for the duration of the construction period. This is consistent with the findings of Pearce-Higgins *et al* (2012) who showed that density of curlew on wind farm sites during the construction period was significantly reduced compared to the pre-construction baseline.

The potential loss of two curlew territories (representing approximately 1% of the NHZ population) during the construction phase would represent a **Temporary Adverse effect of Regional Significance** and this is considered **Significant**.

Accidental Destruction of Active Nests

As stated in *Section 9.7.1.2* on embedded mitigation, ornithology surveys will be carried out prior to and during the construction phase, as well as pre-works checks for the presence of nest sites. It is therefore very likely that any breeding curlew within the Development Site will be identified and the location of potential nest sites (which are on the ground) will be known.

A total of five possible and one probable curlew territories were identified by moorland breeding bird surveys. Three were located at distance from proposed infrastructure and are very unlikely to be at risk of the accidental damage of nests. The probability of all three of the remaining territories having a nest within the footprint of construction is extremely low (although one in the proposed Headpond area very likely would). Therefore, even accounting for the possibility of a curlew territory/nest not being detected by pre-works surveys, the potential for accidental destruction of nests is likely to extend to only one or two curlew pairs. This impact would only arise during one breeding season and is extremely unlikely to affect the same pair in subsequent years.

Accounting for the very low risk of it occurring, and the small number of pairs which could, even in a very worst-case scenario, be impacted (relative to an NHZ 14 population of 207 pairs), the accidental destruction of active curlew nests is predicted to have a **Negligible effect** on the local population status of the species and this is **Not Significant**.

9.7.6.2 Operational Phase

Displacement

Pearce-Higgins *et al* (2009) studied the distribution of breeding waders around operational wind farms and found that curlew breeding densities within 500m of turbines reduced by 42%, and that there was a displacement distance of 800m from operational turbines. It is not known whether the same level of displacement would occur from the permanent above-ground infrastructure associated with the Development.

However, on the basis of the conclusion above, that there may be a permanent loss of two out of six existing curlew territories as a result of the construction of the Development, it is possible that there will only be one (or otherwise a small number) of curlew pairs which could be impacted. There will remain extensive areas of habitat on the lower parts of the Development Site suitable for remaining curlews post-construction, and any displacement is therefore expected to have a minor impact.

It is therefore concluded that there will be **Negligible effect** from displacement of curlew during the operational phase, and this is **Not Significant**.

Disturbance of Breeding Birds

As described above, disturbance of breeding curlew could occur at distances of between 200-300m from a nest. During the operational phase, the presence of personnel will be infrequent, especially in parts of the Development Site which could be used by curlew for breeding. Moreover, personnel (and vehicles and machinery) would be restricted to constructed Access Tracks, and it is quite likely that curlew would become habituated to the use of Access Tracks during the operational phase.

Consequently, given the low frequency of potential disturbance and the fact that personnel, plant and machinery will be restricted to obvious Access Tracks, it is considered that there will be **Negligible effect** from disturbance of breeding curlew during the operational phase, and this is **Not Significant**.

9.7.7 Impacts on Golden Plover

9.7.7.1 Construction Phase

Loss of Habitat

Three golden plover territories – two determined to be possible and one probable – were identified by moorland breeding bird survey. One possible territory was estimated to be centred approximately 270 m to the east of the Blarghour Wind Farm Access Track. This track will not be constructed by the Development but by the neighbouring Blarghour Wind Farm. There will consequently be no direct loss of habitat associated with this golden plover territory associated with the Development (however, the construction of both projects will have cumulative impacts of habitat loss for this species, as discussed in *Section 9.8.1 Scope of Cumulative Assessment*).

The second possible golden plover territory is estimated to be centred approximately 330 m from the Construction Compound proposed to the north of the Headpond, at the edge of existing plantation forestry. 'Moderate' densities of golden plover breeding pairs are reported by Natural England (2020) to be between 2-4 pairs per km^2, suggesting that a territory would extend to around 500 m or more from nest location. The construction of the compound, Access Tracks and potentially the Embankment 2 of the Headpond could all therefore lead to loss of habitat within the territory of this pair. Furthermore, an area of proposed native woodland planting in this area could also result in the loss of suitable golden plover habitat.

The probable golden plover territory is estimated to have been centred within 150 m of the Headpond and other infrastructure. At this distance, it is considered likely that there would substantial loss of habitat from within the territory of any golden plover pair nesting at this location.

Although there is similar habitat in the surrounding landscape, it is assumed on a precautionary basis that the Development could therefore lead to the loss of sufficient habitat to result in the loss of two golden plover breeding territories. As set out in *Table 9.6 Importance of Ornithological Features*, this species is considered to be of Local importance, and this impact is therefore assessed as having a **Permanent Adverse effect of Local Significance**, which is **Not significant**.

Disturbance of Breeding Birds

Goodship and Furness (2022), in a NatureScot-commissioned report, suggest that golden plover have 'medium' sensitivity to disturbance, and that disturbance could be caused by human activities taking place within 200-500 m of a nest. The estimated territory centres of all three golden plover territories identified by moorland breeding bird surveys are within this distance of proposed infrastructure (or in the case of the southern Access Track, infrastructure which will be used by the Development during the construction phase). Assuming that territories are not vacated due to habitat loss (as described above), it is therefore possible that all three locations could be subject to disturbance which, in a worst case, could lead to failure to breed. This impact could last for the duration of the construction phase.

Taking a precautionary approach, and assuming that the three pairs impacted fail to breed (rather than nest in a location sufficiently far from works to avoid disturbance), this would represent a **Temporary Adverse effect of Local Significance**, which is **Not Significant**.

Accidental Destruction of Active Nests

As stated in *Section 9.7.1.2 Other Measures* on embedded mitigation, ornithology surveys will be carried out prior to and during the construction phase, as well as pre-works checks for the presence of nest sites. It is therefore very likely that any breeding golden plover within the Development Site will be identified and the location of potential nest sites (which are on the ground) will be known.

A total of two possible and one probable golden plover territories were identified by moorland breeding bird surveys. The probability of all three being directly under the footprint of construction is extremely low. Therefore, even accounting for the possibility of a golden plover territory/nest not being detected by pre-works surveys, the potential for accidental destruction of nests is likely to extend to only one or two golden plover pairs. This impact would only arise during one breeding season and is extremely unlikely to affect the same pair in subsequent years.

Accounting for the very low risk of it occurring, and the small number of pairs which could, even in a very worst-case scenario, be impacted (relative to an NHZ 14 population of 1,429 pairs), the accidental destruction of active golden plover nests is predicted to have a **Negligible effect** on the species and this is **Not Significant**.

9.7.7.2 Operational Phase

Displacement

Pearce-Higgins *et al* (2009) studied the distribution of breeding waders around operational wind farms and found that golden plover breeding densities within 500 m of turbines reduced by 39%. However, other studies have found that golden plover may be more tolerant of wind farm infrastructure, including Douglas *et al* (2011) who found that the distribution of breeding golden plovers appeared to be unaffected by proximity to wind turbines or Access Tracks.

However, on the basis of the conclusion above, that there may be a permanent loss of two out of three existing golden plover territories as a result of the construction of the Development, it is possible that there will only be one (or otherwise a small number) of golden plover pairs which could be impacted. There will remain extensive areas of habitat within the Development Site and wider area (especially following habitat enhancement as part of the LEMP) suitable for remaining golden plover post-construction, and any displacement is therefore expected to have a minor impact.

It is therefore concluded that there will be **Negligible effect** from displacement of golden plover during the operational phase, and this is **Not Significant**.

Disturbance of Breeding Birds

As described above, disturbance of breeding golden plover could occur at distances of between 200-500 m from a nest. During the operational phase, the presence of personnel will be infrequent, especially in parts of the Development Site which could be used by golden plover for breeding. Moreover, personnel (and vehicles and machinery) would be restricted to constructed Access Tracks and it is quite likely that golden plover would become habituated to the use of Access Tracks during the operational phase.

Consequently, given the low frequency of potential disturbance and the fact that personnel, plant and machinery will be restricted to obvious Access Tracks, it is considered that there will be **Negligible effect** from disturbance of breeding golden plover during the operational phase, and this is **Not Significant**.

9.7.8 Impacts on Other Waders

9.7.8.1 Construction Phase

Loss of Habitat

Common sandpiper breed along rivers and around lochs and reservoirs. None of the identified common sandpiper territories were within the footprint of proposed infrastructure. Habitat which supports common sandpiper along Loch Awe (where two territories were found) and the Allt Beochlich will be retained by the Development and there will be no permanent loss of suitable habitat for this species.

The single possible oystercatcher territory was located on the shore of Loch Awe and not within the footprint of any infrastructure. Oystercatcher breed in a wide variety of habitats, including in close proximity to human activities (including on roofs, adjacent to roads, and on construction sites). It is therefore very unlikely that there would be a major impact on breeding oystercatcher as a result of habitat loss.

Snipe forage and nest on the ground in wet areas, including rough pasture, acid grassland, marshy grassland and flushes (Hoodless *et al*, 2007). Hoodless *et al* (2007) found that mean snipe breeding density was between 1.14-1.34 pairs/km^2. The majority of snipe recorded by surveys were along the southern Access Track (which will be constructed by Blarghour Wind Farm and not by the Development). Possible territories within the Development Site were all outside of the footprint of proposed infrastructure, although one near Balliemeanoch and one to the north of the Headpond are in close proximity to Construction Compounds / Access Tracks. In addition to direct loss, construction could also have indirect impacts on habitat used by snipe. This species relies on wet habitats for foraging, as the ground must be soft enough to probe with its long beak. Construction could result in hydrological changes, for example by reducing surface or groundwater flows, which could lead to the drying out of currently wet habitats, reducing the area available for snipe to forage. It is therefore possible that there may be some loss of habitat for these two territories and, in a worst-case scenario, it could result in the complete loss of two breeding pairs. However, this species is common and widespread both locally and across NHZ 14, and the loss of two pairs would have, at worst a **Permanent Adverse effect of Local Significance** only. This is **Not Significant**.

Disturbance of Breeding Birds

Goodship and Furness (2022) do not provide information on disturbance of common sandpiper. However, it is not considered to be highly sensitive to disturbance from construction activities. There will be significant areas of suitable habitat for this species along Loch Awe and the Allt Beochlich beyond any distance at which disturbance is likely to occur, and the effects of disturbance of birds closer to works are therefore expected to be negligible. It is possible that the Headpond may be attractive to nesting common sandpiper, however because water levels will fluctuate, this is not certain.

Oystercatcher are believed to be relatively tolerant to human activity, and Goodship and Furness (2022) recommend a breeding season buffer zone of between 50-100 m around a nest as a consequence. The single possible territory of this species was approximately 50m from a proposed Access Track, but less than this distance from the existing public road along the east side of Loch Awe. It is therefore very unlikely that construction works would have a significant disturbance effect on oystercatchers breeding in this location.

There is little published information on the sensitivity of breeding snipe to disturbance from construction works or other anthropogenic activities, and the species is not dealt with in Goodship and Furness (2022). As a cryptic species which relies on remaining on the ground, hidden in vegetation to avoid danger, identifying 'static' disturbance (i.e., disturbance which causes birds to become 'alert' but not to flush) is difficult. A study by Scarton (2018) of non-breeding snipe at a waterbody in Italy found that the average distance at which snipe were flushed (i.e., showed 'active' disturbance) by boats and pedestrians was approximately 30 m. Given such a short distance, and with other retained suitable habitat, such as rushy flushes and marshy grassland, being available within a short distance beyond 30m from works areas, there is likely to be minimal impact from construction disturbance of breeding snipe.

It is therefore concluded that there will be **Negligible effect** on breeding common sandpiper, oystercatcher and snipe from construction disturbance and this is **Not Significant**.

Accidental Destruction of Active Nests

As stated in *Section 9.7.1.2 Other Measures* on embedded mitigation, ornithology surveys will be carried out prior to and during the construction phase, as well as pre-works checks for the presence of nest sites. It is therefore very likely that breeding waders within the Development Site will be identified and the location of potential nest sites (which are on the ground) will be known.

No common sandpiper or oystercatcher territories are believed to have been centred within the footprint of proposed infrastructure during the course of baseline surveys. Only two snipe territories were identified in close proximity to the locations of proposed infrastructure. Therefore, even accounting for the possibility of a snipe or other wader territory/nest not being detected by pre-works surveys, the potential for accidental destruction of nests is likely to extend to only one or two pairs.

Accounting for the very low risk of it occurring, and the small number of pairs which could, even in a very worst-case scenario, be impacted, the accidental destruction of active wader nests is predicted to have a **Negligible effect** on common sandpiper, oystercatcher or snipe (or other species), and this is **Not Significant**.

9.7.8.2 Operational Phase

Displacement

Common sandpiper and oystercatcher, for the reasons described above, namely their habitat preferences and tolerance of human activity, are very unlikely to be displaced by the presence of infrastructure or personnel during the operational phase.

Like golden plover and curlew, evidence suggests that snipe are displaced from the area around active wind farms, with a roughly 48% reduction in density, and displacement of up to 400 m from turbines (Pearce-Higgins, 2009). However, only two pairs were found to be located in close proximity to proposed infrastructure and there will remain abundant habitat for this species within the Development Site, especially following habitat enhancement delivered as part of the LEMP.

It is therefore concluded that there will be **Negligible effect** from displacement of common sandpiper, oystercatcher and common snipe during the operation of the Development and this is **Not Significant**.

Disturbance of Breeding Birds

Given the relatively low levels of activity during the operational phase, the potential for disturbance of common sandpiper (which is restricted to habitats adjacent watercourses / waterbodies), tolerance to human activity (oystercatcher) and cryptic nature of snipe which means that disturbance is unlikely to occur over a large distance, there is expected to be **Negligible effect** from operational phase disturbance and this is **Not Significant**.

9.7.9 Impacts on Grasshopper Warbler

9.7.9.1 Construction Phase

Loss of Habitat

Grasshopper warbler nests on the ground amongst dense vegetation in a variety of habitats, including woodland, scrub, marsh and extensively managed farmland. Foraging for insect prey is largely carried out within 50m of the nest, although adults may forage up to around 220m distant (Glue, 1990).

Two grasshopper warbler territories were identified incidentally during the course of ecological field survey. The first was outside of the Development Site, south of the Allt Beochlich and approximately 250m from the nearest proposed infrastructure, making it unlikely that there will be any loss of habitat from within the territory of the birds at this location.

The second territory was located in scrub and woodland near to Loch Awe. The estimated centre of this territory is approximately 65m from a proposed compound location. Although this lies within the distance at which adults may forage, it covers an area of relatively open grassland habitat which is sub-optimal for grasshopper warbler which generally remains in dense cover. The woodland, scrub and other dense vegetation to the west of the public road around the estimated territory centre will be retained, and the most suitable habitat within this territory will not be impacted.

It is therefore concluded that there will be **Negligible effect** on grasshopper warbler as a result of habitat loss, and this is **Not Significant**.

Disturbance of Breeding Birds

Small passerine species such as grasshopper warbler are not considered to be particularly sensitive to disturbance. The nearest construction works to the two estimated territory centres would be approximately 65 m distant. This is beyond the distance at which works would be likely to have a disturbance effect on birds at the nest. As described in relation to habitat loss, above, there will also remain extensive areas of suitable habitat for grasshopper warbler, beyond any distance at which disturbance would be expected.

It is therefore predicted that there will be **Negligible effect** from disturbance of breeding grasshopper warblers during construction, and this is **Not Significant**.

Accidental Destruction of Active Nests

The 2019 nest sites of the two identified grasshopper warbler territories are both believed to be outside of the footprint of proposed construction areas. Furthermore, the most suitable habitat for this species (i.e., dense vegetation in woodland and scrub) will be largely avoided by the Development.

Where possible, vegetation clearance will take place outside of the breeding season. Where this cannot be achieved, a pre-clearance nest check will be carried out by the ECoW. However, with cognisance of the difficulty in finding nests of this species, the results of update breeding bird surveys, to be carried out in the breeding season prior to construction and during the course of construction, will also be used to identify potential grasshopper warbler breeding sites.

On the basis that works will take place away from identified grasshopper warbler territories and optimum habitat for this species, and with mitigation in the form of update breeding bird surveys / timing of vegetation clearance / pre-clearance nest checks, it is considered that the possibility of the accidental destruction of a grasshopper warbler nest is minimal.

There will consequently be **Negligible effect** on grasshopper warbler from destruction of active nests and this is **Not Significant**.

9.7.9.2 Operational Phase

Displacement

As set out above in relation to disturbance, grasshopper warbler are not considered likely to be particularly sensitive to disturbance. The presence of infrastructure and the routine activities associated with the operation of the Development are therefore unlikely to cause displacement of this species over anything more than a small distance. With abundant retained habitat, this is expected to have **Negligible effect** which is **Not Significant**.

Disturbance of Breeding Birds

Operational activities will be much reduced when compared to the construction phase. For the reasons set out above, therefore, **Negligible effect** is expected as a result of disturbance of breeding grasshopper warbler, and this is **Not Significant**.

9.7.10 Impacts on Skylark

9.7.10.1 Construction Phase

Loss of Habitat

Skylark was abundant across the Development Site and wider moorland breeding bird survey area, and a total of seventeen probable and 127 possible territories were identified.

However, this species requires a relatively small area during the breeding season, as demonstrated by the density at which it was recorded by the moorland breeding survey. It is therefore likely that sufficient habitat will remain in the area and that there will not be a complete loss of all of those territories estimated to be directly beneath the footprint of infrastructure.

However, even if this were to occur, considering the population of skylark within the Development Site and in NHZ 14 more widely, the significance of the effect would not be great enough to be material at anything more than the Local level. Therefore, while Negligible effect is very likely, on a precautionary basis it is concluded that there could be a **Permanent Adverse effect of Local Significance** on breeding skylark as a result of habitat loss, and this is **Not Significant**.

Disturbance of Breeding Birds

Small passerine species such as skylark are not considered to be particularly sensitive to disturbance. Pearce-Higgins *et al* (2012) found that densities of skylark increased on site during the construction phase of studied wind farms. It is suggested that this could be the result of vegetation disturbance during construction creating greater openness in the sward structure, which can be beneficial for this species.

It is therefore predicted that there will be **Negligible effect** from disturbance of breeding skylark during construction, and this is **Not Significant**.

Accidental Destruction of Active Nests

Where possible, vegetation clearance will take place outside of the breeding season. Where this cannot be achieved, a pre-clearance nest check will be carried out by the ECoW.

Skylarks lay up to four clutches per year (https://www.bto.org/understanding-birds/birdfacts/skylark), with two to three successful breeding attempts per year likely being required to sustain a population (Wilson *et al*, 1997). Therefore, even if an active nest was accidentally destroyed, the impacted birds would likely have either had a previous brood in the year or could lay another clutch. The accidental loss of active skylark nests, which would be minimised as far as possible by the mitigation described, is therefore unlikely to result in major impacts to the overall breeding success of the population within the Development Site.

There will consequently be **Negligible effect** on skylark from destruction of active nests and this is **Not Significant**.

9.7.10.2 Operational Phase

Displacement

As set out above in relation to disturbance, skylark are not considered likely to be particularly sensitive to disturbance and there was no evidence of reduced density of skylark during- or post-construction of wind farms in one study (Pearce-Higgins *et al*, 2012). The presence of infrastructure and the routine activities associated with the operation of the Development are therefore unlikely to cause displacement of this species over anything more than a small distance. With abundant retained habitat, this is expected to have **Negligible effect** which is **Not Significant**.

Disturbance of Breeding Birds

Operational activities will be much reduced when compared to the construction phase. For the reasons set out above, therefore, **Negligible effect** is expected as a result of disturbance of breeding skylark, and this is **Not Significant**.

9.7.11 Impacts on Whinchat

9.7.11.1 Construction Phase

Loss of Habitat

Whinchat breed in grassland, bracken *Pteridium aquilinum*, mixed low vegetation, gorse *Ulex europaeus*, heather *Calluna vulgaris* and young conifer plantations. Suitable perches for singing and hunting are an essential component of its home range (Forrester *et al*, 2007). A study by Andersson (1981) found that the mean distance at which male whinchat foraged from a nest was 43.8 m, with limited foraging up to around 150 m from the nest.

Two whinchat territories were identified by field surveys, both to the south of the Balliemeanoch (western) Access Track. One of these was estimated to centred on a location approximately 200 m from the Access Track. With a maximum foraging distance of around 150 m from the nest location (Andersson, 1981), there is likely to be no loss of habitat for this pair. The second territory was estimated to be centred in habitat adjacent to the Allt Beochlich, approximately 30 m south of the Balliemeanoch (western) Access Track. The Access Track would therefore be within the area in which the majority of foraging by this whinchat pair is likely to occur. However, the total area of habitat which will be lost to the Access Track (which will be minimal given that construction here involves upgrading / widening an existing track) will be very small. There will remain habitat suitable for foraging along the Allt Beochlich and beyond the Access Track.

There will consequently be **Negligible effect** on whinchat from habitat loss and this is **Not Significant**.

Disturbance of Breeding Birds

Small passerine species such as whinchat are not considered to be particularly sensitive to disturbance. One of the two identified territories is located approximately 200 m from nearest works areas and is well beyond the distance at which works would be likely to have a disturbance effect on birds at the nest. The other territory was estimated to be centred approximately 30 m from the Access Track from Balliemeanoch to the west. Birds nesting here may be subject to slight disturbance from construction works. This is only likely to impact these birds while particularly intrusive construction works are taking place (for example track construction) and it is probable that the birds would become habituated to the regular passage of plant and vehicles. Consequently, disturbance would only be expected to occur over a short period of time while construction of the track took place within around 30-50 m of the whinchat territory.

Considering the temporary nature of the disturbance, and that the estimated centre of the territory is towards the upper limit of distance at which disturbance would be expected, a very minor effect is predicted on whinchat breeding in this location. It is unlikely that the breeding success of a pair here would be compromised and thus **Negligible effect** from disturbance is concluded, and this is **Not Significant**.

Accidental Destruction of Active Nests

The 2019 nest sites of the two identified whinchat territories are both believed to be outside of the footprint of proposed construction areas.

Where possible, vegetation clearance will take place outside of the breeding season. Where this cannot be achieved, a pre-clearance nest check will be carried out by the ECoW. However, with cognisance of the difficulty in finding nests of this species, the results of update breeding bird surveys, to be carried out in the breeding season prior to construction and during the course of construction, will also be used to identify potential whinchat breeding sites.

On the basis that works will take place away from identified whinchat territories and with mitigation in the form of update breeding bird surveys / timing of vegetation clearance / pre-clearance nest checks, it is considered that the possibility of the accidental destruction of a whinchat nest is remote.

There will consequently be **Negligible effect** on whinchat from destruction of active nests and this is **Not Significant**.

9.7.11.2 Operational Phase

Displacement

As set out above in relation to disturbance, whinchat are not considered to be particularly sensitive to disturbance. The presence of infrastructure and the routine activities associated with the operation of the Development are therefore unlikely to cause displacement of this species over anything more than a small distance. With abundant retained habitat, this is expected to have **Negligible effect** which is **Not Significant**.

Disturbance of Breeding Birds

Operational activities will be much reduced when compared to the construction phase. For the reasons set out above, therefore, **Negligible effect** is expected as a result of disturbance of breeding whinchat, and this is **Not Significant**.

9.7.12 Impacts on Wood Warbler

9.7.12.1 Construction Phase

Loss of Habitat

In Scotland, wood warbler predominantly breed in closed canopy oak Quercus sp. woods, but also in birch Betula sp., beech Fagus sylvatica and ash Fraxinus excelsior woods. The nest is constructed close to or on the ground in scrub or other vegetation, and a relatively sparse understorey, often maintained by grazing deer or livestock, is essential (Forrester et al, 2007). Habitat loss as a result of the upgrading of the Access Track around Inveraray, and construction of the track to the jetty on Loch Fyne, will be minimal and is very unlikely to have a major impact on the nesting or foraging of wood warbler in this area.

It is therefore concluded that there will be **Negligible effect** from habitat loss on wood warbler and this is **Not Significant.**

Disturbance of Breeding Birds

Small passerine species such as wood warbler are not considered to be particularly sensitive to disturbance. Although the territories of wood warbler are assumed to be present along much of the Access Track around Inveraray, construction activities are not expected to cause disturbance of breeding birds over any substantial distance. There is a relatively extensive area of suitable mature woodland habitat in this area such that nesting and foraging by wood warbler could occur beyond any distance at which disturbance may occur.

It is therefore expected that there will be **Negligible effect** on wood warbler from construction-related disturbance. This is **Not Significant**.

Accidental Destruction of Active Nests

It is unlikely, though not impossible that wood warbler will nest immediately adjacent to the existing track, such that a nest site could be located in the footprint of track upgrade / widening. Where possible, vegetation clearance will take place outside of the breeding season. Where this cannot be achieved, a pre-clearance nest check will be carried out by the ECoW. However, with cognisance of the difficulty in finding nests of this species, the results of update breeding bird surveys, to be carried out in the breeding season prior to construction and during the course of construction, will also be used to identify potential wood warbler breeding sites.

On the basis that it is unlikely that a wood warbler nest would be built within the works area (i.e., immediately adjacent the existing track) and with mitigation in the form of update breeding bird surveys / timing of vegetation clearance / pre-clearance nest checks, it is considered that the possibility of the accidental destruction of a wood warbler nest is remote.

There will consequently be **Negligible effect** on wood warbler from destruction of active nests and this is **Not Significant**.

9.7.12.2 Operational Phase

Displacement

As set out above in relation to disturbance, wood warbler are not considered likely to be particularly sensitive to disturbance. The presence of infrastructure and the routine activities associated with the operation of the Development are therefore unlikely to cause displacement of this species over anything more than a small distance. With abundant retained habitat, this is expected to have **Negligible effect** which is **Not Significant**.

Disturbance of Breeding Birds

Operational activities will be much reduced when compared to the construction phase. For the reasons set out above, therefore, **Negligible effect** is expected as a result of disturbance of breeding wood warbler, and this is **Not Significant**.

9.7.13 Impacts on Golden Eagle

9.7.13.1 Construction Phase

A full assessment of the effects of the Development on golden eagle is provided in *Confidential Appendix 9.1: Schedule 1 Birds (Volume 6 Confidential Appendices).*. To avoid providing sensitive details on the location(s) of golden eagle, the assessed effects only are given in this chapter, with no supporting evidence, for which see the confidential appendix.

Loss of Habitat

Construction of the Development is predicted to have a **Permanent Adverse effect of Regional Significance** on golden eagles due to habitat loss. This is **Significant**.

Disturbance of Breeding Birds

Disturbance of breeding golden eagles from construction of the Proposed Development is expected to have, in the absence of mitigation, a **Temporary Adverse effect of Regional Significance**, which is **Significant**.

Displacement

Displacement during the construction phase is predicted to have a **Temporary Adverse effect of Regional Significance** on golden eagle. This is **Significant**.

9.7.13.2 Operational Phase

Displacement

It is concluded on the basis of evidence from other renewable energy developments in Scotland and Argyll, that there would be, at worst, a **Permanent Adverse effect of Local Significance** on golden eagle from displacement during the operational phase. This is **Not Significant**.

Disturbance of Breeding Birds

Operational activities will be much reduced when compared to the construction phase. There is thus expected to be **Negligible effect** from disturbance of breeding golden eagles during the operational phase, and this is **Not Significant**.

9.7.14 Impacts on White-tailed Eagle

9.7.14.1 Construction Phase

Loss of Habitat

White-tailed eagles occupy ranges associated with both inland and coastal waters (Forrester *et al*, 2007; Hardey *et al*, 2013; Evans *et al*, 2010). Nests are preferentially in trees, but birds will also nest on crags, with nest sites generally being in locations at altitudes of between 150-300m (Hardey *et al*, 2013).

Although no white-tailed eagle breeding was identified within 6 km of the Development, either through field survey or desk study, the population of this species is increasing in NHZ 14. It is therefore possible that pairs may establish nest sites within this area in future.

There will be limited felling required for the Development, with some clearance of conifer plantation to upgrade existing / construct new tracks for the northern access. Much of this woodland lies above 300 m altitude and is already subject to normal forestry operations. As stated above, white-tailed eagles tend to nest at lower altitudes than golden eagle, and closer to water (Evans *et al*, 2010). Potentially more favourable woodland at lower altitude and in closer proximity to Loch Awe will not be lost to the Development.

White-tailed eagle will forage over a wider range of habitats than golden eagle, including open water. Losses of upland moorland habitat, which can be used for foraging by white-tailed eagle, is therefore less likely to have significant effects than in the case of golden eagle.

Considering that the Development Site does not currently lie within the home range of any white-tailed eagles, the wider range of habitats which can be used for foraging by this species, and the fact that suitable nesting locations in proximity to Loch Awe will be retained, there is expected to be **Negligible effect** on white-tailed eagle from habitat loss, and this is **Not Significant**.

Disturbance of Breeding Birds

No white-tailed eagle breeding within 6km of the Development was identified by field survey or desk study.

This species tends to be more tolerant of humans than golden eagle (Forrester *et al*, 2007) and Goodship and Furness (2022) recommend a 250-500 m buffer around active nest sites. Surveys for breeding birds, including white-tailed eagle, will be carried out in the breeding season prior to commencement of construction and during the construction phase. Should any white-tailed eagle nest sites be established, a works exclusion zone of at least 250 m will be implemented, in consultation with NatureScot, to avoid disturbance of birds breeding at any such location.

Given their tolerance of human activities, white-tailed eagles are more likely to be active in the vicinity of works areas, and the author of this chapter observed white-tailed eagle hunting in very close proximity to construction works taking place for Carraig Gheal Wind Farm, on the opposite side of Loch Awe.

It is therefore concluded that there will be **Negligible effect** on breeding white-tailed eagle and this is **Not Significant**.

Displacement

As described above, white-tailed eagle are not considered to be particularly sensitive to human activities, and on-going construction activities would not be expected to displace birds over great distance. Furthermore, this species uses a wide range of habitats for foraging, including more low-lying areas and open water, meaning that any minor displacement from the upland parts of the Development Site would be very unlikely to affect the overall foraging success of the local white-tailed eagle population.

It is therefore concluded that there will be **Negligible Effect** from any minor impacts of displacement on white-tailed eagle, and this is **Not Significant**.

9.7.14.2 Operational Phase

Displacement

Operational phase activities will be much reduced from the construction phase, and the presence of personnel is considered very unlikely to have a major displacement impact on white-tailed eagles. There is also evidence that this species is not displaced by operational wind farms (and that this may be a contributing factor to collision mortality at certain sites) (Lie Dahl *et al*, 2013).

It is concluded that there will be **Negligible Effect** on white-tailed eagle from operational phase displacement, and this is **Not Significant**.

Disturbance of Breeding Birds

Operational activities will be much reduced when compared to the construction phase. For the reasons set out above, therefore, Negligible effect is expected as a result of disturbance of breeding white-tailed eagle, and this is Not Significant. Notwithstanding this, it will be necessary to monitor any known white-tailed eagle breeding sites within at least 250-500 m of the Development during the operational phase to ensure that disturbance is not caused, and to comply with legislation protecting this species.

9.7.15 Impacts on Black Grouse

9.7.15.1 Construction Phase

Loss of Habitat

Black grouse inhabit areas of open woodland and woodland edge adjacent to moorland and upland rough grassland. The diet of black grouse varies seasonally, with heather and bilberry *Vaccinium myrtillus* being particularly important. However, birch catkins and buds, the needles, buds and flowers of pines *Pinus* sp. and larch *Larix* sp. and various flowers, fruits of sedges and rushes and berries are all eaten. Chicks require a diet chiefly composed of invertebrates during the first two to three weeks of their life (Forrester *et al*, 2007).

No lek sites were found within or near to proposed Development infrastructure. A single confirmed black grouse nest site was also located outside of the Development Site. There will consequently be no loss of known or possible lek sites.

During the breeding season, both male and female black grouse are sedentary, with males being particularly restricted to small core areas no larger than 150 ha (1.5 km^2). Chick rearing areas may be as small as 5 ha, within 1.5 km of a lek, provided there is ample shelter and insects (http://www.blackgrouse.info/about/ecology/Habitat.htm).

The only identified lek site was beyond 1.5 km from the nearest proposed infrastructure, and it is consequently unlikely that habitat within the footprint of Development would be significantly important to birds associated with it. The possible lek to the south of the Balliemeanoch (western) Access Track, was also around 600 m from any proposed works area. While the track could therefore be located within the range of breeding black grouse associated with this lek, it is more likely that habitat closer to the lek would be of greater importance. In particular, the riparian woodland and adjacent habitat along the All Beochlich is highly suitable for black grouse and lies between the possible lek site and the Access Track. It will remain entirely unimpacted by the Development.

Consequently, it is not predicted that there will be any loss of black grouse lek sites to the Development, and any losses of habitat more widely will be minor. It is predicted that, at worst, there will be a **Permanent Adverse effect of Local Significance** on black grouse, and this is **Not Significant**.

Disturbance of Breeding Birds

Lekking Birds

Male black grouse gather at prominent locations and engage in communal displaying (lekking) to attract females. Although lekking can occur year-round, females only attend leks in the spring (late-March to mid-May) at which time lekking activity by males is at its peak (Gilbert *et al*, 1998). The location of leks is generally traditional and used year-on-year. They are usually less than 0.5 ha in size and comprise an area of relatively flat, open ground with short vegetation. This can be on pasture, moorland edge or in open areas within woodland. In addition, vehicle tracks are also used (Gilbert *et al*, 1998).

The only confirmed black grouse lek site was located near Portsonachan, more than 1.5 km from the nearest proposed infrastructure (this being the northern Access Track).

Goodship and Furness (2022) suggests that black grouse have medium sensitivity to disturbance and that a buffer zone of between 500-750 m for lekking males is suggested to protect birds from pedestrian disturbance, this being extended up to 1 km for forestry activities. The lek site near Portsonachan is therefore well beyond the distance at which disturbance of lekking birds is expected to be possible.

The possible lek site south of the Development Site (see *Figure 9.7 Black Grouse Survey Results (Volume 3 Figures)*), is located approximately 500-600 m from the Balliemeanoch (western) Access Track. It is separated from the Access Track by riparian woodland along the Allt Beochlich, which will provide at least some visual/auditory screening. Considering this and the distance between the Access Track, disturbance of black grouse lekking in this area is unlikely.

Update breeding bird surveys will be carried out in the breeding season prior to and during construction. This will include surveys for lekking black grouse. Should any new black grouse leks be found by these surveys, then suitable buffer zone(s) will be established to prevent activities taking place which could disturb birds attending the lek. Such a buffer zone would only be required in the early morning during the spring period when lekking takes place.

Given that no lek sites were identified within at least 500 m of works areas, that lek sites are largely traditional, and with pre-works surveys to take place to search for new lek sites, it is concluded that there will be **Negligible effect** on lekking black grouse from disturbance and this is **Not Significant**.

Nesting Birds

Black grouse nest on the ground, in tall, reasonably dense vegetation, usually mature heather or rushes. A single black grouse nest was found near to Portsonachan in a dense rushy area. A buffer zone of 100-150 m is recommended by Goodship and Furness (2022) to avoid disturbance of nesting female black grouse. The single identified nest site is thus significantly beyond the distance at which disturbance from works could occur.

Although it is possible that black grouse could nest elsewhere, the species prefers moorland-edge habitats, with a mosaic of habitats including broadleaved and young plantation woodland and extensive farmland (e.g., Forrester *et al*, 2007). Furthermore, female black grouse tend to nest within 1.5 km of lek sites which they attend (Bibby, 2018). For these reasons, it is most likely that nesting by black grouse will occur on the lower parts of the Development Site and not in the higher altitude areas where the majority of works will take place.

Considering that the impact would extend only a short distance from construction works (up to around 150 m) and that the likelihood of nesting by black grouse in proximity to the majority of works areas is low, there is limited potential for disturbance of nesting black grouse to arise. However, if it were to occur, it could result in the failure to raise any young in that breeding season as this species typically only has one brood per year (https://www.bto.org/understanding-birds/birdfacts/black-grouse). Reiterating again that this is unlikely, in a worst-case scenario, this could result in a **Temporary Adverse effect of Local Significance**.This is **Not Significant**.

Accidental Destruction of Active Nests

As described in relation to disturbance, the probability of a black grouse nest across the majority of proposed works areas is low. The potential for a nest to be destroyed is therefore correspondingly low. Where possible, vegetation clearance will take place outside of the breeding season. Where this cannot be achieved, a pre-clearance nest check will be carried out by the ECoW. If black grouse were nesting within the footprint of works, this species would be relatively easy to find as a flushed bird would be very obvious.

On the basis that it is unlikely that a black grouse nest would be present within the works area and with mitigation in the form of update breeding bird surveys / timing of vegetation clearance / pre-clearance nest checks, it is considered that the possibility of the accidental destruction of a black grouse nest is remote.

There will consequently be **Negligible effect** on black grouse from destruction of active nests and this is **Not Significant**.

9.7.15.2 Operational Phase

Displacement

Black grouse are considered to have medium sensitivity to disturbance according to Goodship and Furness (2022), with published studies suggesting that birds flushed at distances of between 30-100 m from pedestrians and skiers (birds are typically more sensitive to people outside of vehicles than to the passage of people in vehicles). The author of this chapter has also observed black grouse feeding on the sides of Access Tracks constructed for Carraig Gheal Wind Farm (on the opposite side of Loch Awe), with no evidence of disturbance by the passage of vehicles. As stated above, black grouse are also known to make use of vehicle tracks for lekking (Forrester *et al*, 2007).

It is therefore expected that there will be very little, if any, impact of displacement during the operational phase. **Negligible effect**, which is **Not Significant**, is therefore predicted.

Disturbance of Breeding Birds

Operational activities will be much reduced when compared to the construction phase. No lek sites were identified or suspected within 500 m of infrastructure associated with Development. For the reasons set out in the assessment of construction phase disturbance, therefore, no impact on lekking or breeding black grouse is expected. Nesting birds are also considered very unlikely to be significantly disturbed, as the species is generally only considered to be susceptible to disturbance over relatively short distances (Goodship and Furness, 2022) and because of the infrequent and minor nature of operational activities (which will predominantly involve infrequent passage of a small number of vehicles on Access Tracks).

Negligible effect on black grouse is expected as a result of operational-phase disturbance. This is **Not Significant**.

9.7.16 Impacts on Coastal Waterbird Assemblage

9.7.16.1 Construction Phase

Loss of Habitat

No large aggregations of waterbirds were identified by waterbird surveys, including in the footprint of the proposed jetty. The actual construction of the jetty will also involve minimal habitat loss and it is therefore concluded that there will be **Negligible effect** on non-breeding waterbirds as a result of habitat loss (there may be a slight positive effect, although still negligible, from its construction as it may provide resting habitat for several wader, cormorant and gull species). This is **Not Significant**.

Disturbance

Non-breeding waterbirds are generally considered to be susceptible to disturbance from construction works up to a distance of around 300 m, although this can be greater for certain species (e.g., curlew, which were only recorded on one survey, 1 km from the jetty location) (Cutts *et al*, 2013). The largest aggregation of non-breeding shorebirds was recorded more than 500m from the proposed jetty (and comprised four turnstone and five redshank). Within 200 m of the proposed jetty there were only ever small numbers (three or less) of a small number of species. Any impacts of disturbance can therefore be expected to be minimal given the clearly low importance of the site of the proposed jetty.

It is therefore concluded that there will be **Negligible effect** from disturbance of non-breeding waterbirds associated with the construction and construction phase use of the jetty on Loch Fyne, and this is **Not Significant**.

Displacement, Including Shift of Prey Resource

As set out above, disturbance impacts, which could lead to displacement, are expected to be negligible due to the small numbers of waterbirds recorded within 300m of the proposed jetty location. For this reason, works activities are considered unlikely to have a substantial displacement effect, and would impact a small number of birds only, over a small distance.

Construction of the jetty could lead to temporary shifts in prey for waterbirds, including fish, due to construction-related noise (particularly from piling) or sediment generation. Such impacts would be temporary, and baseline conditions would be expected to be re-established quickly on completion of construction works.

It is therefore expected that there will be **Negligible effect** on non-breeding waterbirds from displacement, including as a result of changes to prey resource, and this is **Not Significant**.

9.7.16.2 Operational Phase

Disturbance and Displacement

If the jetty is retained during the operational phase, it will be used very rarely. Any impacts of disturbance or displacement from its occasional use will be very minor and it is highly likely that there will be **Negligible effect** on non-breeding waterbirds, and this will be **Not Significant**.

9.8 Cumulative Effects

9.8.1 Scope of Cumulative Assessment

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location (CIEEM, 2022). The assessment of cumulative effects has been carried out in the context of the Argyll West and Islands NHZ (NHZ 14). However, to assess every development in the whole of NHZ 14 would be impossible due to the number of developments this would include and the lack of available data for many. This constraint is recognised by NatureScot in SNH (2018).

A list of schemes for which cumulative assessment may be necessary is therefore identified in *Chapter 4: Approach to EIA*. The full list of schemes is not reproduced here, but those most important to ornithological features are considered to be those schemes which are located within 6 km of the Development Site, this being the home range of golden eagle (which holds the largest home range of any species subject to assessment in *Section 9.7 Assessment of Effects* of this chapter). In addition, the existing Cruachan pumped storage hydro scheme and proposed expansion to Cruachan, located approximately 10 km from the Development, are also potentially particularly relevant given the impacts of both schemes could be similar to those of the Development. The key schemes for cumulative assessment for ornithology are therefore those set out in *Table 9.7 List of Schemes Most Important to Cumulative Assessment*.

Table 0.7 List of Schemes Most Important to Cumulative Assessment

Scheme	Description	Status	Approximate Distance from the Development Site	Potential for Cumulative Effects
Dalmally OHL	New overhead 33kv line. The new 33kv line will consist of fifteen new poles and two spans of single phase, which will house plant equipment and transformer. The new overhead line will be installed using poles of a wooden variety and these will be approximately 9.5 metres in height. The total length of the 33kv overhead line will be 1,150 m.	Consented	30 m	**Yes**. Habitat loss will be minimal for this project and so unlikely to be sufficient to have cumulative effects with this impact arising from the Development. However, if this scheme were under construction at the same time as the Development, disturbance caused by both could act cumulatively to significantly affect important ornithological features.
Blarghour Wind Farm and Blarghour Wind Farm Variation	Wind farm comprising seventeen turbines has been consented. However, Section 36 application submitted to increase height of turbines but reduce number to fourteen.	Consented / Application submitted	150 m	**Yes**. Given proximity to the Development there is potential for combined impacts of habitat loss, disturbance and displacement to act on ornithological features. A more detailed species-by-species assessment is given below this table.
Beochlich Hydro Scheme	Small-scale 1MW hydropower scheme. Operational since 1998.	Operational	1.3 km	No. Scheme operational and lies within ornithological survey area for Proposed Development. Baseline conditions reflect any impacts from this small-scale scheme.
Blarghour Wind Farm OHL Connection	Construct and operate a 132kV overhead line and underground cable to connect Blarghour Wind Farm to the proposed Creag Dhubh Substation.	Screening	2.0 km	No. Habitat loss from this scheme is likely to be minimal and at approximately 2 km distant, disturbance caused by its construction is unlikely to have significant cumulative effects with disturbance caused by construction of the Development.
An Carr Dubh Wind Farm	Wind farm development comprising thirteen turbines.	Application submitted	2.3 km	**Yes.** At approximately 2 km distance between this proposed wind farm and the Development, it is possible that habitat loss and/or displacement associated with both could act

Scheme	Description	Status	Approximate Distance from the Development Site	Potential for Cumulative Effects
				cumulatively to affect important bird species, including waders and golden eagles.
Creag Dubh to Inveraray OHL	Upgrade from existing 132kv to 275kv OHL.	Consented	2.4 km	No. Habitat loss from this scheme is likely to be minimal and at more than 2km distant, disturbance caused by its construction is unlikely to have significant cumulative effects with disturbance caused by construction of the Development.
Inveraray to Taynuilt (ITE/ITW) Tie-In to Creag Dhubh Substation	Construction and operation of a Tie-In connection to the proposed Creag Dhubh Substation from the existing 132 kV Taynuilt to Inveraray OHL, as well as the temporary diversion of the existing 132kV Taynuilt to Inveraray OHL to facilitate its connection to the substation and associated ancillary works.	Consented	3.7 km	No. Habitat loss from this scheme is likely to be minimal and at almost 4km distant, disturbance caused by its construction is unlikely to have significant cumulative effects with disturbance caused by construction of the Development.
Ladyfield Wind Farm	Wind farm development comprising 22 turbines.	Scoping	4.1 km	**Yes**. This project is sited almost entirely in commercial conifer plantation which has low or no value to golden eagle. However, a relatively small proportion does include potentially suitable golden eagle habitat. At approximately 4km distant from the Development, there is very little possibility of combined impacts of construction-phase disturbance.
Creag Dubh to Dalmally OHL	275kv OHL. Public Local Inquiry (PLI) held.	Consented	4.2 km	No. Habitat loss from this scheme is likely to be minimal and at more than 4km distant, disturbance caused by its construction is unlikely to have significant cumulative effects with disturbance caused by construction of the Development.
Carraig Gheal Wind Farm	Wind farm development comprising twenty turbines.	Operational	4.5 km	No. Scheme operational and lies on opposite side of Loch Awe. Baseline conditions at the Development Site reflect any existing impacts from the wind farm.
Creag Dubh Substation	Substation Proposals – All major Planning Applications and all approved by Planning Authority. – construction likely to commence 2024	Consented	4.0 km	No. This project is sited almost entirely in commercial conifer plantation which has low value to important ornithological features. At approximately 4km distant from the Development, there is very little possibility of combined impacts of construction-phase disturbance.
Cruachan Hydro Scheme	440MW pumped storage hydro scheme that uses Loch Awe as a Tailpond. Operational since 1965.	Operational	10.6 km	No. This scheme is operational and baseline conditions reflect any impacts arising from it. It is located approximately 10.6km distant, and it is unlikely that the home range of any birds would lie across both the Development Site and the Cruachan site.
Cruachan Expansion	Increasing the capacity of the existing pumped storage hydro scheme by up to 600MW.	Consented	10.6 km	No. For the same reasons as set out in row above. Birds are unlikely to make use of habitats in both the Development Site and the site of the Cruachan Expansion. Moreover, Cruachan Expansion does not involve any increase in the size of the Headpond, so permanent habitat loss

Scheme	Description	Status	Approximate Distance from the Development Site	Potential for Cumulative Effects
				to that scheme is understood to be minimal.
Balliemeanoch Grid Connection	Grid connection.		0 km	No. The grid connection route is anticipated to be to Creag Dhubh substation, which is located to the north-east of the Development Site. Within the Development Site, the High Voltage (HV) cable will be routed from the underground transformer gallery, through the power tunnel to PC15, from here the cable will be undergrounded using cut and cover to the Switching Station. The exact route of the grid connection from the Development Site to Creag Dhubh is currently unconfirmed, the connection may be via an underground cable however for the purposes of the assessment it has been assessed on a “worst case” scenario that it will be via an OHL. The grid connection location at Creag Dhubh is at NGR NN08739 19509, approximately 4.0 km north-east of the Development Site. A grid connection agreement has been entered into for Development between the Applicant and SSEN. The grid connection will be subject to its own separate consents under the Act and does not form part of this S36 application.

A species-by-species assessment of the potential cumulative effects of the Development is given under the following sub-headings. This considers the schemes listed in *Table 9.7 List of Schemes Most Important to Cumulative Assessment* and those additional schemes identified in *Chapter 4: Approach to EIA*. It seeks to determine whether the Development could act cumulatively with any of these schemes to negatively affect the conservation status of these species within NHZ 14 (or more widely).

9.8.2 Waders

The assessment in *Section 9.7 Assessment of Effects* considered the following wader species: curlew, golden plover, common sandpiper, oystercatcher and snipe.

It was concluded in the assessment in this chapter that there would be negligible effects from the Development on common sandpiper and oystercatcher. With so minimal an effect in isolation, it is highly unlikely that there is any possibility of significant cumulative effects on these species from the impacts of the Development combined with those of other projects.

For curlew, golden plover and snipe, it was concluded that there could be Permanent Adverse effects of Regional Significance for curlew, and of Local Significance for golden plover and snipe, as a result of habitat loss from the Development. Curlew have been shown to forage up to 2 km from nest site (Ewing *et al*, 2018) and golden plover up to 4km (Whittingham *et al*, 2000). The key proposed schemes which could give rise to combined impacts of habitat loss for these schemes are Blarghour Wind Farm and An Carr Dubh Wind Farm, both located on open upland habitat to the south of the Development on the east side of Loch Awe. In addition, the operational wind farms Carraig Gheal and An Suidhe may also be relevant as they may already be exerting impacts of displacement on waders (according to published research). However, no information relating to these latter two schemes could be found.

According to the EIA for An Carr Dubh Wind Farm, up to four golden plover territories were found within the survey area for that project, and up to two curlew territories. However, both species were scoped out of EcIA on the basis that these numbers represent less than 1% of the NHZ 14 populations for both species.

The assessment in this chapter for curlew already concluded a potentially Regionally significant adverse effect on curlew due to the possible loss of two territories. The combined loss of territories due to construction of Blarghour and An Carr Dubh Wind Farms would not increase this to being of National significance (with an estimated national population of 58,800 pairs (Foster *et al*, 2013)). Likewise, with an NHZ 14 breeding population estimated at 1,429 pairs, there is no possibility of the combined impacts of the Development and Blarghour and An Carr Dubh Wind Farms reaching a Regionally significant threshold (with 1% of the population being approximately fourteen pairs). Although an NHZ 14 population estimate is not available for snipe, this species is more common than golden plover and so the preceding argument also applies to this species.

Further, and as set out in *Section 9.9 Mitigation and Monitoring*, the Development will implement large-scale habitat enhancement which will benefit curlew and golden plover and other waders. Other developments, including Blarghour Wind Farm, have proposed similar measures which will further mitigate any cumulative effects.

It was also concluded that construction-related disturbance could lead to adverse effects on curlew and golden plover. This will be mitigated through standard measures to protect nesting birds, including the use of works exclusion zones, such that residual effect will be Negligible (see *Table 9.9*). There is consequently little possibility of the impact of disturbance from multiple schemes giving rise to significant adverse effects on these species.

No significant cumulative effects on waders are therefore predicted from the Development acting in-combination with any other scheme(s).

9.8.3 Passerines

The assessment in *Section 9.7 Assessment of Effects* of this chapter considered several passerine species: grasshopper warbler, skylark, whinchat and wood warbler. These species are all relatively common and have a widespread distribution both nationally and in NHZ 14. For grasshopper warbler, whinchat and wood warbler, losses of habitat from the Development will be so small that they could not feasibly give rise to cumulative effects with other schemes. Loss of habitat for skylark may be greater due to construction of the Headpond and other infrastructure on the open moorland of the higher parts of the Development Site. However, as discussed in *Section 9.9*, a range of habitat creation / enhancement measures are to be delivered by the Development through the LEMP which will improve habitat suitability for species such as skylark.

Such measures are likely to at a minimum compensate for the loss of habitat currently supporting skylark (and also grasshopper warbler and whinchat, which also occupy moorland fringe habitats). There is consequently expected to be Negligible effect on these species from the Development and thus no realistic possibility of a significant cumulative effect arising with other projects.

No significant cumulative effects on passerines are therefore predicted from the Development acting in-combination with any other scheme(s).

9.8.4 Golden Eagle

Golden eagle is considered to be in favourable conservation condition within Glen Etive and Glen Fyne SPA (https://sitelink.nature.scot/site/10113). Moreover, the national survey of golden eagle in 2015 determined that the national population had increased by approximately 15% since 2003 and had reached an abundance meaning that the species is considered to be in favourable conservation status in Scotland (Hayhow *et al*, 2017). Operational schemes are therefore not believed to be acting negatively on the golden eagle population either nationally (where other threats, primarily illegal persecution, are more important) or at the NHZ 14 level. Consequently, there is no evidence to suggest that the Development would act cumulatively with any existing schemes to give rise to negative effects on golden eagle.

Any assessment of loss of golden eagle habitat associated with construction of the Development results in a trivial figure, whether considered at the NHZ 14 or national level. For example, NHZ 14 has 229,700ha of preferred golden eagle habitat. The loss of habitat to both range-holding and dispersing golden eagles from the Development will contribute to an insignificant cumulative loss of such habitat at the scale of NHZ 14.

Furthermore, in terms of other possible impacts on golden eagle, assessment of cumulative effects is complex. For example, several wind farms, including Beinn Ghlas and Beinn an Tuirc, predicted adverse effects on this species. However, despite there being evidence of avoidance of operational wind farms, there is little proof that this has a negative effect on breeding golden eagles. Moreover, there are at least seven wind farms at which golden eagles have established nests nearby following commencement of operation, including on Kintyre.

Confidential Appendix 9.1 Schedule 1 Birds (Volume 6 Confidential Appendices) describes in detail the potential cumulative losses of golden eagle habitat which could arise from construction of the Development and the following nearby consented/proposed wind farms: Blarghour, Ladyfield, and An Carr Dubh. In summary, the increase in habitat loss from relevant golden eagle home ranges as a consequence of the construction of all of these projects combined would be minimal compared to that which will arise from the Development alone. It could not increase the significance of effect predicted on golden eagle from the Development in isolation from being Regionally significant (as stated in *9.7.13 Impacts on Golden Eagle*) to being Nationally significant cumulatively with other schemes.

No significant cumulative effects on golden eagle are therefore predicted from the Development acting in-combination with any other scheme(s).

9.8.5 White-tailed Eagle

The population of white-tailed eagle locally and within NHZ 14 is increasing and expanding. There is consequently no evidence that existing schemes are negatively affecting the conservation status of the species. The assessment presented in *Section 9.7 Assessment of Effects* also concluded that the Development would likewise have Negligible effect on white-tailed eagle. It is therefore very unlikely that the Development could give rise to significant cumulative effects in-combination with any impacts from existing operational schemes.

Furthermore, and as described for golden eagle above, losses of habitat from the Development will be minor when taken in the context of NHZ 14. This is likely to be even more the case for white-tailed eagle than golden eagle given the wider range of habitats that this species exploits and its generally lower sensitivity to human activities.

No significant cumulative effects on white-tailed eagle are therefore predicted from the Development acting in-combination with any other scheme(s).

9.8.6 Black Grouse

Loss of habitat used by breeding black grouse from the Development was assessed as likely having Negligible effect on the local population of this species. The LEMP will see the delivery of habitat creation / enhancement which will directly benefit black grouse, in particular the planting of native broadleaved trees which provide an important food source. Blarghour Wind Farm also proposes to implement habitat enhancement measures aimed at providing benefits for black grouse. There is consequently unlikely to be negative cumulative effect on this species, and it is quite likely that overall there could be a positive effect for the local black grouse population.

It was concluded that construction-related disturbance could lead to Temporary Adverse effects of Local Significance on black grouse. This will be mitigated through pre- and during-construction ornithology surveys and, where necessary, implementation of works exclusion zones (e.g., around lek sites) such that residual effect will be negligible (see *Table 9.9*). There is consequently little possibility of the impact of disturbance from multiple schemes giving rise to significant adverse effects on black grouse.

No significant cumulative effects on black grouse are therefore predicted from the Development acting in-combination with any other scheme(s).

9.8.7 Non-breeding Coastal Waterbirds

All possible impacts of the Development are assessed as having likely having Negligible effects on non-breeding coastal waterbirds. On this basis, and because of the small numbers of birds present in Loch Fyne around the proposed jetty location, **it is highly unlikely that there will be any significant adverse cumulative effects on non-breeding coastal waterbirds arising from the combined impacts of other schemes.**

9.8.8 Cumulative Assessment Conclusion

It is concluded on the basis of the assessment presented above that the Development will not act cumulatively with other schemes to give rise to significant adverse effects on ornithological features, beyond any significant effects predicted for the Development in isolation. This relies on the creation and enhancement of habitat to mitigate / compensate for potential effects on several species, including curlew, golden plover and black grouse and assumes that similar measures will be adopted by all other potentially relevant schemes.

9.9 Mitigation and Monitoring

9.9.1 Embedded Mitigation

The embedded mitigation to be implemented by the Development is set out in *Section 9.7.1 Embedded Mitigation*.

9.9.2 Specific Mitigation

Specific mitigation measures will be implemented to minimise the adverse effects on ornithological features identified in this chapter. Although mitigation is not required where effects are considered to be Not Significant (i.e., they have been assessed as being Locally Significant or of Negligible significance), in some cases, measures will be implemented where these can be readily achieved. Furthermore, in certain instances, measures will be required to ensure compliance with relevant wildlife legislation, even when an insignificant effect on a species was concluded.

9.9.2.1 Wetland Habitat

Although generally implemented as standard best practice, a range of measures will be adopted to ensure that impacts on the hydrology of wetland habitat (including bog and wet heath) will be implemented. This will be particularly important to snipe, other wader species and black grouse, which either nest in such habitat or whose chicks rely on invertebrates found in such habitats. The following measures will be implemented to avoid wetland habitat, where possible, or to maintain hydrological conditions:

- Access tracks and other infrastructure will be micro-sited, where necessary and as far as possible, to minimise damage to or loss of flush or other important wetland habitats, including GWDTE;
- As far as possible, Access Tracks will be constructed via a ‘floating’ method, which retains the underlying substrate *in situ* and promotes continued flow of groundwater;
- Where floating track construction cannot be adopted, the Access Track will be constructed so as to permit the continued flow of surface water from one side to the other. This will involve the installation of culverts or small cross-pipes, incorporated at regular intervals and in particular in areas of obvious water flow.

9.9.2.2 Curlew and Golden Plover

Where breeding by curlew or golden plover is suspected, the ECoW will, as necessary, implement a suitable works exclusion zone of at least 300 m around known or suspected nest location to ensure that the accidental destruction of the nests is avoided and to minimise disturbance to the breeding birds. No works will be permitted to take place within this exclusion zone until otherwise approved by the ECoW. Should the ECoW determine through monitoring that breeding has failed, successfully completed or that birds have moved chicks to other areas, then the exclusion zone may be lifted or moved, accordingly.

9.9.2.3 Golden Eagle

Specific mitigation relating to golden eagle is described in *Confidential Appendix 9.1 Schedule 1 Birds (Volume 6 Confidential Appendices).*.

9.9.2.4 Black Grouse

No black grouse leks were identified within 500 m of any proposed infrastructure during field surveys carried out for the Development. However, should a black grouse lek be identified by pre- or during-construction ornithological surveys within 500 m of any construction area, no works will be permitted to take place within this area during the period of one hour before sunrise until one hour after sunrise, in the months of April and May. This will ensure there is no disturbance to displaying black grouse.

9.9.3 Enhancement

An Outline Landscape and Ecological Management Plan has been drafted for the Development and submitted as part of the Section 36 Application. The oLEMP sets out a range of measures that will be implemented by the Development. This is intended to a) mitigate landscape and ecological/ornithological impacts, and b) beyond this deliver biodiversity and general environmental enhancement. In summary, these measures primarily comprise:

- Establishment of a substantial peatland and upland habitat rehabilitation zone around the Headpond, covering approximately 300 ha (3 km^2). This would be deer-fenced to exclude wild deer grazing, and only conservation-level livestock grazing would be permitted, to improve the condition of over-grazed upland habitats. Burning of blanket bog (and other habitats), of which there is local evidence, would also be excluded. On steeper slopes on lower ground within this area, natural tree regeneration may occur and would not be prevented as long as it comprised native species such as birch, willow *Salix* spp., rowan *Sorbus aucuparia* and hazel *Corylus avellana* (as already exist in extremely small quantity in small retained ravine-like locations south-west of the Headpond);

- Restoration of localised blanket bog exhibiting bare peat exposure, and infilling of drainage grips where locally present;
- Extensive ecologically-appropriate planting of woodland to expand native woodland beside Loch Awe and nearby, in places also providing visual screening of Tailpond infrastructure;
- Rehabilitation of the caravan zone near the Tailpond by a) removal of caravans, non-native plants, ruderal vegetation and hard-standing; b) planting of appropriate native trees (as standards rather than saplings) to suit and expand the existing thin strip of ancient woodland here; and c) translocation of turves (including deep soil) of ancient woodland ground flora from the Tailpond area to this rehabilitation zone, to replace existing soil/vegetation where currently degraded, under existing trees or planted standards.

The oLEMP will be updated pre-construction, including through preparation of Method Statements where necessary, to provide the full level of detail needed to ensure successful delivery of all mitigation and enhancement measures.

The enhancement of moorland habitat, in particular through the exclusion of deer which are having a detrimental impact through over-grazing, will be beneficial to a range of the important bird species considered in this chapter, including curlew, golden plover, snipe, golden eagle and black grouse, as well as a range of other moorland breeding bird species.

9.9.4 Monitoring

In the breeding season prior to commencement of construction and in the breeding seasons throughout the construction phase, the ECoW or another suitably experienced ornithologist will be responsible for carrying out a full programme of survey for sensitive bird species, namely lekking black grouse, breeding waders, breeding raptors and breeding divers. These surveys will follow good practice guidelines as adopted during the fieldwork completed to inform this EIA and referenced in this chapter and in *Appendix 9.1*. The purpose of these surveys will be to determine if and where sensitive bird species establish nest sites, and to therefore allow for appropriate avoidance and/or mitigation measures to be implemented to avoid or minimise impacts upon them. This will be particularly relevant to those bird species listed on Schedule 1 of the WCA, which may not be disturbed when actively breeding. Full details of the pre- and during-construction ornithological monitoring programme will be set out in the Species Protection Plan for the Development, to be submitted to Argyll and Bute Council and NatureScot in advance of the commencement of construction. The results of all during-construction ornithological survey will be provided to NatureScot and (for relevant species) the Argyll RSG.

9.10 Residual Effects

The potential effects of the Development during the construction and operational phases are summarised in *Tables 9.8* and *9.9*, respectively. The specific mitigation measures proposed to minimise the identified effects are outlined in this table and the residual, post-mitigation effect is assessed.

For the purposes of this assessment, only effects which are judged as being Regionally, Nationally or Internationally Significant (according to the CIEEM method for Ecological Impact Assessment) were considered to be Significant in EIA terminology. On this basis, the only Significant adverse effects predicted on ornithological features in the absence of mitigation were as a result of:

- Permanent loss of habitat for curlew;
- Disturbance of breeding curlew during the construction phase;
- Permanent loss of habitat for golden eagle;
- Disturbance of breeding golden eagle during the construction phase;
- Displacement of golden eagle during the construction phase.

With the implementation of mitigation, as described above, in *Confidential Appendix 9.1 Schedule 1 Birds (Volume 6 Confidential Appendices).*, and summarised in *Tables 9.8* and *9.9*, the only remaining significant effects will be:

- Permanent loss of habitat for golden eagle – this is concluded to be **Permanent Adverse effect of Regional Significance**. However, this conclusion has been reached on a very precautionary basis, and it is possible that habitat enhancement delivered by the LEMP could, in the medium-term, reduce effects on golden eagle to Negligible, or to be positive;
- Displacement of golden eagle during the construction phase – this impact is predicted to lead to a **Temporary Adverse effect of Regional Significance**, which cannot be mitigated. At worst, this could last for the entire duration of the construction phase (7 years), but in reality is likely to be less, as works at either end of the construction programme would be much reduced in intensity. At these times, displacement as a result of human activity can reasonably be expected to be much less intense.

Table 0.8 Summary of Effects: Construction

Ornithological Feature	Description of Impact	Effect	Specific Mitigation	Residual Effect	Significance
Glen Etive and Glen Fyne SPA	Detailed assessment provided in *Statement to Inform Habitats Regulations Appraisal (Appendix 6.2)*.	**Negligible**	Specific mitigation to avoid adverse effects on integrity of Glen Etive and Glen Fyne SPA is not required. Mitigation measures to minimise effects on golden eagle outside of SPA are described below.	**Negligible**	**Not Significant**
Curlew	Loss of suitable habitat is estimated to have the potential to result in the loss of two curlew breeding territories. This would represent approximately 1% of the NHZ 14 breeding population.	**Permanent Adverse effect of Regional Significance**	Implementation of the habitat enhancement measures proposed by the LEMP will improve the suitability of habitat across a large area for curlew. However, given the time it may take for the full benefits of this to be realised, a Locally significant residual effect is concluded, on basis that the population may take several years to recover to at least baseline levels.	**Permanent Adverse effect of Local Significance**	**Not Significant**
	Curlew are considered to be highly sensitive to disturbance. Based on the distribution of this species at the Development Site, as identified by field survey, it is considered that two pairs could be subject to disturbance during the construction phase (assuming the loss of another territory within the footprint of the Headpond). This could lead to the temporary loss of two territories from the ZoI of the Development.	**Temporary Adverse effect of Regional Significance**	Surveys for curlew will be carried out prior to the commencement of construction activities and throughout the construction phase. Should breeding by curlew be suspected, the ECoW will implement a works exclusion zone of 300 m around the assumed nest location. This will help to minimise the potential for disturbance to result in the abandonment of the territory. However, some residual disturbance may remain, though this would be unlikely sufficient to cause complete abandonment of both territories. A Locally Significant residual effect is therefore predicted.	**Temporary Adverse effect of Local Significance**	**Not Significant**
	Ornithology surveys will be carried out prior to and during the construction phase, as well as pre-works checks for the presence of nest sites. It is therefore very likely that any breeding curlew within the Development Site will be identified and the location of potential nest sites (which are on the ground) will be known. There is considered to be negligible risk of accidental damage of curlew nests.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks.	**Negligible**	**Not Significant**
Golden plover	Loss of suitable habitat is estimated to have the potential to result in the loss of two golden plover breeding territories.	**Permanent Adverse effect of Local Significance**	Implementation of the habitat enhancement measures proposed by the LEMP will improve the suitability of habitat across a large area for golden plover. Over time this should reduce the residual effects on this species to Negligible (and possibly positive in the longer-term).	**Negligible**	**Not Significant**

Ornithological Feature	Description of Impact	Effect	Specific Mitigation	Residual Effect	Significance
	Golden plover are considered to have medium sensitivity to disturbance. Based on the distribution of this species at the Development Site, as identified by field survey, and assuming that territories are not vacated due to habitat loss, it is considered that three territories could be subject to disturbance from construction activities.	**Temporary Adverse effect of Local Significance**	Surveys for golden plover will be carried out prior to the commencement of construction activities and throughout the construction phase. Should breeding by golden plover be suspected, the ECoW will implement a works exclusion zone of 300m around the assumed nest location. This will help to minimise the potential for disturbance to result in the abandonment of the territory.	**Negligible**	**Not Significant**
	Ornithology surveys will be carried out prior to and during the construction phase, as well as pre-works checks for the presence of nest sites. It is therefore very likely that any breeding golden plover within the Development Site will be identified and the location of potential nest sites (which are on the ground) will be known. There is considered to be negligible risk of accidental damage of golden plover nests.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks.	**Negligible**	**Not Significant**
Other waders: common sandpiper, oystercatcher and snipe	There will be no loss of habitat used by common sandpiper and no loss habitat found to be used by oystercatcher. No snipe territories were found within the proposed footprint of the Development, however suitable habit for this species exists in such areas. Construction has potential to result in direct loss of habitat, and indirect changes to habitat (e.g., through changes to hydrological conditions).	**Permanent Adverse effect of Local Significance**	Standard good practice construction techniques will be adopted to maintain hydrological conditions. The LEMP will enhance habitat which is likely to improve suitability for breeding snipe.	**Negligible**	**Not Significant**
	The assessment concludes that on the basis of the distribution of these species within the ZoI of the Development, and their relative tolerance of human activities, there is unlikely to be a major impact from disturbance.	**Negligible**	None required.	**Negligible**	**Not Significant**
	Ornithology surveys will be carried out prior to and during the construction phase, as well as pre-works checks for the presence of nest sites. It is therefore very likely that any breeding common sandpiper, oystercatcher and snipe within the Development Site will be identified and the location of potential nest sites (which are on the ground) will be known. There is considered to be negligible risk of accidental damage of the nests of these wader species.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks.	**Negligible**	**Not Significant**
Grasshopper warbler	Two grasshopper warbler territories were identified, both outside of the footprint of the Development, and losses of habitat suitable for the species are likely to be very minor.	**Negligible**	Habitat created / enhanced by the LEMP is likely to benefit grasshopper warbler.	**Negligible**	**Not Significant**
	Small passerine species such as grasshopper warbler are not considered to be particularly sensitive to disturbance. The nearest	**Negligible**	None required.	**Negligible**	**Not Significant**

Ornithological Feature	Description of Impact	Effect	Specific Mitigation	Residual Effect	Significance
	construction works to the two estimated territory centres is approximately 65m. This is beyond the distance at which works would be likely to have a disturbance effect on birds at the nest. As described in relation to habitat loss, above, there will also remain extensive areas of suitable habitat for grasshopper warbler in the area, beyond any distance at which disturbance would be expected.				
	On the basis that works will take place away from identified grasshopper warbler territories and optimum habitat for this species, and with mitigation in the form of update breeding bird surveys / timing of vegetation clearance / pre-clearance nest checks, it is considered that the possibility of the accidental destruction of a grasshopper warbler nest is minimal.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks.	**Negligible**	**Not Significant**
Skylark	This species requires a relatively small area during the breeding season, as demonstrated by the density at which it was recorded by the moorland breeding survey. It is therefore likely that sufficient habitat will remain in the area and that there will not be a complete loss of all of those territories estimated to be directly beneath the footprint of infrastructure. However, even if this were to occur, considering the population of skylark within the Development Site and in NHZ 14 more widely, the significance of the effect would not be great enough to be material at anything more than the Local level.	**Permanent Adverse effect of Local Significance**	Habitat created / enhanced by the LEMP is likely to benefit skylark.	**Negligible**	**Not Significant.**
	Small passerine species such as skylark are not considered to be particularly sensitive to disturbance. Pearce-Higgins *et al* (2012) found that densities of skylark actually increased on site during the construction phase of studied wind farms.	**Negligible**	None required.	**Negligible**	**Not Significant**
	Skylark can lay multiple clutches per year. Therefore, even if a nest was accidentally destroyed, it is unlikely to result in major impacts to the overall breeding success of the population within the Development Site.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks.	**Negligible**	**Not Significant**
Whinchat	Construction works could result in the loss of habitat within the territory of one whinchat pair. However, the total area of habitat which will be lost will be minimal (as in the area of the territory it involves upgrading the existing Balliemeanoch (western) Access Track only). There will remain habitat suitable for foraging along the Allt Beochlich and beyond the Access Track.	**Negligible**	Habitat created / enhanced by the LEMP is likely to benefit whinchat.	**Negligible**	**Not Significant**
	Small passerine species such as whinchat are not considered to be particularly sensitive to disturbance. One of the two identified territories is located approximately 200m from nearest works areas and is well beyond the distance at which works would be likely to	**Negligible**	None required.	**Negligible**	**Not Significant**

Ornithological Feature	Description of Impact	Effect	Specific Mitigation	Residual Effect	Significance
	have a disturbance effect on birds at the nest. The other territory was estimated to be centred approximately 30m from the Access Track from Balliemeanoch to the west. Birds nesting here may be subject to slight disturbance from construction works.				
	The 2019 nest sites of the two identified whinchat territories are both believed to be outside of the footprint of proposed construction areas. The potential for accidental destruction of nests is therefore very limited.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks.	**Negligible**	**Not Significant**
Wood warbler	Habitat loss as a result of the upgrading of the Access Track around Inveraray, and construction of the track to the jetty on Loch Fyne, will be minimal and is very unlikely to have a major impact on the nesting or foraging of wood warbler in this area.	**Negligible**	None required.	**Negligible**	**Not Significant**
	Small passerine species such as wood warbler are not considered to be particularly sensitive to disturbance. Although the territories of wood warbler are assumed to be present along much of the Access Track around Inveraray, construction activities are not expected to cause disturbance of breeding birds over any substantial distance. There is a relatively extensive area of suitable mature woodland habitat in this area such that nesting and foraging by wood warbler could occur beyond any distance at which disturbance may occur.	**Negligible**	None required.	**Negligible**	**Not Significant**
	It is unlikely, though not impossible that wood warbler will nest immediately adjacent to the existing track, such that a nest site could be located in the footprint of track upgrade/widening. However, on the basis that it is unlikely that a wood warbler nest would be built within the works area (i.e., immediately adjacent the existing track) and with mitigation in the form of update breeding bird surveys / timing of vegetation clearance / pre-clearance nest checks, it is considered that the possibility of the accidental destruction of a wood warbler nest is remote.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks.	**Negligible**	**Not Significant**
Golden eagle	Loss of habitat. See *Confidential Appendix 9.1* for further details.	**Permanent Adverse effect of Regional Significance**	The LEMP will deliver a range of habitat enhancement measures which could be beneficial for golden eagle as an increase in live prey is possible (e.g., Haworth and Fielding, 2017). However, because this may take several years to be realised (due to time required for habitat to change to new conditions, particularly of reduced grazing pressure) and the lack of absolute certainty about the impact this will have on golden eagle, a precautionary conclusion has been drawn.	**Permanent Adverse effect of Regional Significance**	**Significant**

Ornithological Feature	Description of Impact	Effect	Specific Mitigation	Residual Effect	Significance
	Disturbance of breeding birds. See *Confidential Appendix 9.1* for further details.	**Temporary Adverse effect of Regional Significance**	No blasting to take place within 1.5km of active golden eagle nest during breeding season, subject to on-going monitoring of breeding attempt.	**Negligible**	**Not Significant**
	Displacement. See *Confidential Appendix 9.1* for further details.	**Temporary Adverse effect of Regional Significance**	None feasible. Displacement due to construction activities cannot be mitigated through the LEMP, and effective habitat loss may occur as a consequence for the duration of the construction phase.	**Temporary Adverse effect of Regional Significance**	**Significant**
White-tailed eagle	Although no white-tailed eagle breeding was identified within 6km of the Development, either through field survey or desk study, the population of this species is increasing in NHZ 14. It is therefore possible that pairs may establish within this area in future. However, white-tailed eagle occupy a relatively wide range of habitats which can be used for foraging, and suitable nesting locations in proximity to Loch Awe will be retained.	**Negligible**	Habitat created / enhanced by the LEMP is likely to benefit white-tailed eagle.	**Negligible**	**Not Significant**
	No white-tailed eagle breeding within 6km of the Development was identified by field survey or desk study. This species tends to be more tolerant of humans than, for example, golden eagle.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks.	**Negligible**	**Not Significant**
	White-tailed eagle are not considered to be particularly sensitive to human activities, and on-going construction activities would not be expected to displace birds over great distance. Furthermore, this species uses a wide range of habitats for foraging, including more low-lying areas and open water, meaning that any minor displacement from the upland parts of the Development Site would be very unlikely to affect the overall foraging success of white-tailed eagle in the area.	**Negligible**	None required.	**Negligible**	**Not Significant**
Black grouse	The only identified lek site was beyond 1.5km from the nearest proposed infrastructure, and it is consequently unlikely that habitat within the footprint of Development would be significantly important to birds associated with it. The possible lek to the south of the Balliemeanoch (western) Access Track was also around 600m from any proposed works area. While this could therefore be located within the range of breeding black grouse associated with this lek, it is more likely that habitat closer to the lek would be of greater importance. In particular, the riparian woodland and adjacent habitat along the All Beochlich is highly suitable for black grouse and lies between the possible lek site and the proposed Access Track. It will remain entirely unimpacted by the Development.	**Permanent Adverse effect of Local Significance**	Habitat created / enhanced by the LEMP will benefit black grouse. In particular, native broadleaved tree planting and bog restoration will increase availability of food for this species at various life stages.	**Negligible**	**Not Significant**

Ornithological Feature	Description of Impact	Effect	Specific Mitigation	Residual Effect	Significance
	The only confirmed black grouse lek site was located near Portsonachan, more than 1.5km from the nearest proposed infrastructure (this being the northern Access Track). This is well beyond the distance at which disturbance could be caused by construction activities. The possible lek site south of the Development Site, is located approximately 500-600m from the Balliemeanoch (western) Access Track. It is separated from the Access Track by riparian woodland along the Allt Beochlich, which will provide at least some visual/auditory screening. Considering this and the distance between the Access Track, disturbance of black grouse lekking in this area is unlikely.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks. Should any new black grouse leks be found by these surveys, then suitable buffer zone(s) will be established to prevent activities taking place which could disturb birds attending the lek. Such a buffer zone would only be required in the early morning during the spring period when lekking takes place.	**Negligible**	**Not Significant**
	It is most likely that nesting by black grouse will occur on the lower parts of the Development Site and not in the higher altitude areas where the majority of works will take place. Considering that the impact would extend only a short distance from construction works (up to around 150m) and that the likelihood of nesting by black grouse in proximity to the majority of works areas is low, there is limited potential for disturbance of nesting black grouse to arise. However, if it were to occur, it could result in the failure to raise any young in that breeding season as this species typically only has one brood per year	**Temporary Adverse effect of Local Significance**	Surveys for black grouse will be carried out prior to the commencement of construction activities and throughout the construction phase. Should breeding by black grouse be suspected, the ECoW will implement a works exclusion zone around the assumed nest location. This will help to minimise the potential for disturbance of the nesting birds.	**Negligible**	**Not Significant**
	The probability of a black grouse nest across the majority of proposed works areas is low. The potential for a nest to be destroyed is therefore low. On the basis that it is unlikely that black grouse nest would be present within the works area and with mitigation in the form of update breeding bird surveys / timing of vegetation clearance / pre-clearance nest checks, it is considered that the possibility of the accidental destruction of a black grouse nest is remote.	**Negligible**	Embedded mitigation involving pre-commencement and during-construction surveys and nest checks.	**Negligible**	**Not Significant**
Non-breeding coastal waterbirds	No large aggregations of waterbirds were identified by waterbird surveys, including in the footprint of the proposed jetty. The actual construction of the jetty will also involve minimal habitat loss.	**Negligible**	None required.	**Negligible**	**Not Significant**
	Non-breeding waterbirds are generally considered to be susceptible to disturbance from construction works up to a distance of around 300m, although this can be greater for certain species (e.g., curlew, which were only recorded on one survey, 1km from the jetty location) (Cutts et al, 2013). The largest aggregation of non-breeding shorebirds was recorded more than 500m from the proposed jetty (and comprised four turnstones and five redshanks). Within 200m of the proposed jetty there were only ever small numbers (three or less) of a small number of species. Any impacts	**Negligible**	None required.	**Negligible**	**Not Significant**

Ornithological Feature	Description of Impact	Effect	Specific Mitigation	Residual Effect	Significance
	of disturbance can therefore be expected to minimal given the clearly low importance of the site of the proposed jetty.				
	Disturbance impacts, which could lead to displacement, are expected to be negligible due to the small numbers of waterbirds recorded within 300m of the proposed jetty location. For this reason, works activities are considered unlikely to have a substantial displacement effect, and would impact a small number of birds only, over a small distance. Construction of the jetty could lead to temporary shifts in prey for waterbirds, including fish, due to construction-related noise (particularly from piling) or sediment generation. Such impacts would be temporary, and baseline conditions would be expected to be re-established quickly on completion of construction works.	**Negligible**	None required.	**Negligible**	**Not Significant**

Table 0.9 Summary of Effects: Operation

Receptor	Description of Effect	Effect	Specific Mitigation	Residual Effect	Significance
Glen Etive and Glen Fyne SPA	Detailed assessment provided in *Statement to Inform Habitats Regulations Appraisal (Appendix 6.2).*	**Negligible**	Specific mitigation to avoid adverse effects on integrity of Glen Etive and Glen Fyne SPA is not required. Mitigation measures to minimise effects on golden eagle outside of SPA are described below.	**Negligible**	**Not Significant**
Curlew	Displacement of curlew during the operational phase is unlikely due to the extensive areas of suitable habitat which will remain (and be created/enhanced by the LEMP).	**Negligible**	Habitat enhancement delivered by the LEMP will be beneficial to breeding curlew.	**Negligible**	**Not Significant**
	During the operational phase, the presence of personnel will be infrequent, especially in parts of the Development Site which could be used by curlew for breeding. Moreover, personnel (and vehicles and machinery) would be restricted to constructed Access Tracks, and it is quite likely that curlew would become habituated to the use of Access Tracks during the operational phase. There is consequently little risk of disturbance of breeding curlew.	**Negligible**	None required.	**Negligible**	**Not Significant**
Golden plover	Displacement of golden plover during the operational phase is unlikely due to the extensive areas of suitable habitat which will be created/enhanced by the LEMP	**Negligible**	Habitat enhancement delivered by the LEMP will be beneficial to breeding golden plover.	**Negligible**	**Not Significant**
	During the operational phase, the presence of personnel will be infrequent, especially in parts of the Development Site which could be used by golden plover for breeding. Moreover, personnel (and vehicles and machinery) would be restricted to constructed Access Tracks, and it is quite likely that golden plover would become habituated to the use of Access Tracks during the operational phase. There is consequently little risk of disturbance of breeding golden plover.	**Negligible**	None required.	**Negligible**	**Not Significant**
Other waders: common sandpiper, oystercatcher and snipe	Common sandpiper and oystercatcher are relatively tolerant of human activity and will inhabit areas of the Development Site which are generally away from areas of activity. Only two pairs of snipe were identified in close proximity to proposed infrastructure and there will remain abundant habitat for this species within the Development Site, especially following habitat enhancement delivered as part of the LEMP.	**Negligible**	Habitat enhancement delivered by the LEMP will be beneficial to breeding snipe.	**Negligible**	**Not Significant**
	It is very unlikely that these species will be subject to substantial impact of disturbance during operation because of:	**Negligible**	None required.	**Negligible**	**Not Significant**

Receptor	Description of Effect	Effect	Specific Mitigation	Residual Effect	Significance
	• Common sandpiper is restricted to habitats adjacent to watercourses / waterbodies; • Oystercatcher is tolerant of human activities; • Snipe has a cryptic nature which means it is generally less susceptible to disturbance.				
Grasshopper warbler	Grasshopper warbler are not considered likely to be particularly sensitive to disturbance. The presence of infrastructure and the routine activities associated with the operation of the Development are therefore unlikely to cause displacement of this species over anything more than a small distance.	**Negligible**	None required.	**Negligible**	**Not Significant**
	Operational activities will be much reduced when compared to the construction phase and small passerine species such as grasshopper warbler are not considered to be particularly sensitive to disturbance.	**Negligible**	None required.	**Negligible**	**Not Significant**
Skylark	Skylark are not considered likely to be particularly sensitive to disturbance and there was no evidence of reduced density of skylark during- or post-construction of wind farms in one study (Pearce-Higgins *et al*, 2012). The presence of infrastructure and the routine activities associated with the operation of the Development are therefore unlikely to cause displacement of this species over anything more than a small distance.	**Negligible**	None required.	**Negligible**	**Not Significant**
	Operational activities will be much reduced when compared to the construction phase and small passerine species such as skylark are not considered to be particularly sensitive to disturbance.	**Negligible**	None required.	**Negligible**	**Not Significant**
Whinchat	Whinchat are not considered likely to be particularly sensitive to disturbance. The presence of infrastructure and the routine activities associated with the operation of the Development are therefore unlikely to cause displacement of this species over anything more than a small distance.	**Negligible**	None required.	**Negligible**	**Not Significant**
	Operational activities will be much reduced when compared to the construction phase and small passerine species such as whinchat are not considered to be particularly sensitive to disturbance.	**Negligible**	None required.	**Negligible**	**Not Significant**
Wood warbler	Wood warbler are not considered likely to be particularly sensitive to disturbance. The presence of infrastructure and the routine activities associated with the operation of the Development are therefore unlikely to cause displacement of this species over anything more than a small distance.	**Negligible**	None required.	**Negligible**	**Not Significant**
	Operational activities will be much reduced when compared to the construction phase and small passerine species such as wood	**Negligible**	None required.	**Negligible**	**Not Significant**

Receptor	Description of Effect	Effect	Specific Mitigation	Residual Effect	Significance
	warbler are not considered to be particularly sensitive to disturbance.				
Golden eagle	Displacement. See *Confidential Appendix 9.1* for further details.	**Permanent Adverse effect of Local Significance**	There is little evidence that displacement around operational wind farms has a negative effect on breeding golden eagle (Fielding and Haworth (2010)), and such an effect is unlikely in relation to the Development. Habitat enhancement delivered through the LEMP is likely to compensate for any Locally significant adverse effects which could otherwise arise due to operational phase displacement.	**Negligible**	**Not Significant**
	Disturbance of breeding birds. See *Confidential Appendix 9.1* for further details.	**Negligible**	None required.	**Negligible**	**Not Significant**
White-tailed eagle	Operational phase activities will be much reduced from the construction phase, and the presence of personnel is considered very unlikely to have a major displacement impact on white-tailed eagles. There is also evidence that this species is not displaced by operational wind farms	**Negligible**	None required.	**Negligible**	**Not Significant**
	Operational activities will be much reduced when compared to the construction phase. This species is generally quite tolerant of human activities, and disturbance as a result of routine operation is unlikely.	**Negligible**	None required. However, to ensure compliance with relevant wildlife legislation, it will be necessary to monitor any white-tailed eagle breeding sites within at least 250-500m of the Development (should they become established) to ensure that disturbance is not caused.	**Negligible**	**Not Significant**
Black grouse	Black grouse are considered to have medium sensitivity to disturbance according to Goodship and Furness (2022), with published studies suggesting that birds flushed at distances of between 30-100m from pedestrians and skiers (birds are typically more sensitive to people outside of vehicles than to the passage of people in vehicles). The author of this chapter has also observed black grouse feeding on the batters (slopes) of Access Tracks constructed for Carraig Gheal Wind Farm (on the opposite side of Loch Awe), with no evidence of disturbance by the passage of vehicles. Black grouse are also known to make use of vehicle tracks for lekking (Forrester *et al*, 2007).	**Negligible**	Habitat enhancement delivered by the LEMP will be beneficial to breeding black grouse.	**Negligible**	**Not Significant**
	Black grouse are relatively tolerant of the passage of vehicles and machinery. The relatively low numbers which will access the Development Site during operation are unlikely to have a major disturbance impact on black grouse.	**Negligible**	None required.	**Negligible**	**Not Significant**

Receptor	Description of Effect	Effect	Specific Mitigation	Residual Effect	Significance
Non-breeding coastal waterbirds	If the jetty is retained during the operational phase, it will be used very rarely. Any impacts of disturbance or displacement from its occasional use will be very minor.	**Negligible**	None required.	**Negligible**	**Not Significant**

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Ballimeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 10: Geology and Soils

ILI (Borders PSH) Ltd

July 2024

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

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Inserts

Tables

10. Geology and Soils

10.1 Introduction

This chapter will present the geology and ground conditions impact assessment for the effects on the Development undertaken in accordance with Institute of Environmental Management and Assessment (IEMA) guidelines.

The assessment provides baseline information, discusses appropriate mitigation measures and assess the significance of residual impacts. Consideration will be given to impacts during the construction, operational and decommissioning phases of the Development. Potential impacts on surrounding geology and ground conditions will predominately be associated with the construction phase of the Development.

Hydrogeology and groundwater dependant terrestrial ecosystems (GWDTE) will not be discussed in this chapter. All relevant information for hydrogeology and GWDTEs can be found in *Chapter 11: Water Environment* and *Chapter 8: Terrestrial Ecology.*

This chapter is supported by the following Figures (Volume 3):

- *Figure 10.1: Topography*
- *Figure 10.2: Bedrock Geology*
- *Figure 10.3: Superficial Geology*
- *Figure 10.4: Peat Probe Locations*
- *Figure 10.5: Peat Depth Interpolation*

This chapter is also supported by the following Appendices (Volume 5):

- *Appendix 10.1: Material Management Appraisal (MMA)*
- *Appendix 10.2: Peat Management Plan*

10.2 Legislation and Policy

The assessment has been undertaken in accordance with the European Union (EU) Directives, national, regional and local legislation planning policies as highlighted in *Table 10.1: Directives, Legislation and Planning Policies* as relevant to the Development.

Table 10.1: Directives, Legislation and Planning Policies

Area	Directives, Legislation and Planning Policies
EU	Environmental Liability Directive (2004/35/EC)
	Water Framework Directive (2000/60/EC)
	Dangerous Substances Directive (2006/11/EC)
	Renewable Energy Directive
	Climate Change Act 2008
National	The Environmental Liability (Scotland) Regulations (2009)
	Nature Conservation (Scotland) Act (2004)
	Pollution Prevention and Control (Scotland) Regulations (2012)
	Town & Country Planning (Scotland) Act (1997)
	Scottish National Planning Policy, including National Planning Framework 4 (NPF4)
	Scottish Planning Policy (SPP) (2014)
	Historic Environment Scotland Act 2014
	Planning Advice Note (PAN) 50 (surface mineral workings) (1996)

Area	Directives, Legislation and Planning Policies
	Planning Advice on hydro schemes, December 2013
	Planning Advice on energy storage, December 2013
	Scotland's Zero Waste Plan (2010)
	The Construction (Design and Management) Regulations 2015
	Environmental Protection Act 1990 (as amended)
	The Quarries Regulations 1999
	BS 6164 Code of Practice for Health and Safety in Tunnelling in the Construction Industry (2019)
Regional & Local	Argyll and Bute Local Development Plan (2024)
	Argyll and Bute Renewable Energy Action Plan
	Argyll and Bute Local Development plan – Supplementary Guidance (2016)

10.2.1 National Planning Policy & Legislation

Key national policies that are relevant with respect to geology and ground conditions that have been considered in this assessment are:

- Environmental Protection Act 1990;
- Town & Country Planning (Scotland) Act 1997;
- Nature Conservation (Scotland) Act 2004;
- National Planning Framework (NPF) 4.

NPF4, published in February 2023 sets out the Scottish Government's "spatial principles, regional priorities, national developments and national planning policy" and supersedes NPF 3.

The publication of the NPF4 has illustrated the importance of more considered practices within peatlands. Policy 5 of NPF4 states:

> *"c) Development proposals on peatland, carbon-rich soils and priority peatland habitat will only be supported for:*
> *i) Essential infrastructure and there is a specific locational need and no other suitable site;*
> *ii) The generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets;*
> *v) Restoration of peatland habitats.*
>
> *d) Where development on peatland, carbon-rich soils or priority peatland habitat is proposed, a detailed site specific assessment will be required to identify:*
> *i) the baseline depth, habitat condition, quality and stability of carbon rich soils;*
> *ii) the likely effect of the development on peatland, including on soil disturbance;*
> *iii) the likely net effect of the development on climate emissions and loss of carbon."*

10.2.2 Regional Policy

The Argyll and Bute Local Development Plan 2 (2024) provides the local planning framework for the area. It shows the key development areas, the potential areas for future development, areas that require environmental improvement or regeneration and areas with environmental designations. In addition to setting out local planning policy and identify how land is used and how it can be developed.

10.2.3 Best Practice & Guidance Documents

Guidance on best practice has been used throughout this EIAR to ensure the integration of relevant planning policy and compliance measures during all stages of the Development design. *Table 10.2 Best Practice Guidance* lists best practice guides that have been utilised.

Table 10.2: Best Practice Guidance

Author	Guidance Document
Scottish Government, NatureScot (formerly SNH) and SEPA	Peatland Survey – Guidance on Developments on Peatland (2017)
NatureScot	Advising on Peatland, carbon-rich soils and priority peatland habitats in development management (2023)
Scottish Renewables and SEPA	Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (2012)
SEPA	SEPA Regulatory Position Statement – Developments on Peat (2010)
Scottish Government	Peat Landscape Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, second edition (2017)
Nature Scot (formerly SNH)	Constructed tracks in the Scottish Uplands (2015)
NatureScot (formerly SNH) and FCS	Floating Roads on Peat (2010)
NatureScot and SEPA	Guide to Hydro Construction good practice (2020)
Scottish Renewables, NatureScot (formerly SNH), SEPA, FCS and Historic Environment Scotland	Good Practice during Wind Farm Construction (2019)
Health and Safety Executive	Health and safety at quarries, Quarries Regulations 1999, Approved Code of Practice and guidance, 2nd edition (2013)

The 'Good Practice during Wind Farm Construction' document was produced for wind farm developments, however, principles discussed can be considered as good practice for other similar scale developments in areas with similar infrastructure (Access Tracks) and typical ground conditions seen on wind farms, particularly peat and around the water environment.

10.3 Study Area

The Study Area for the Development is the Red Line Boundary (RLB) plus a 250 m buffer.

10.4 Consultation

Table 10.3: Summary of Consultation Responses in relation to Geology and Soils below summarises the consultation undertaken throughout the EIAR process, including scoping and further pre-application consultation, relevant to Geology and Soils.

Table 10.3: Summary of Consultation Responses in relation to Geology and Soils

Organisation and Type of Consultation	Response	How response has been Considered
Energy Consents Unit (ECU) – Scoping (03/03/2023)	Borrow Pits	Any proposed borrow pits – referred to as *Borrow Pit Search Areas* for the purpose of this application - are shown on *Figure 2.5 Headpond Indicative Arrangement* and a typical detail is shown on *Figure 2.8 Headpond Borrow Pit* (*Volume 3 Figures*).
	Peat and Soils	An Outline Peat Management Plan (PMP) has been undertaken in accordance with Scottish Government guidance and can be seen in *Appendix 10.2 Outline Peat Management Plan (Volume 5 Appendices)*. The Development has been designed to minimise impact of peatlands, where practical.
SEPA – Scoping (12/08/2022)	Peat and Soils	A Preliminary Peat Management Plan (PMP) has been undertaken in accordance with Scottish Government guidance and can be seen in *Appendix 10.2 Outline Peat Management Plan (Volume 5 Appendices)*. The Development has been designed to minimise impact of peatlands, where practical. A detailed peat probing map and interpolated peat depth plan have been included in the application and shown on *Figure 10.4 Peat Probe Survey Results* and *Figure 10.5 Peat Interpolation Plan (Volume 3 Figures)*
	Borrow Pits	Any proposed borrow pits – referred to as *Borrow Pit Search Areas* for the purpose of this application - are shown on *Figure 2.5 Headpond Indicative*

Organisation and Type of Consultation	Response	How response has been Considered
		Arrangement and a typical detail is shown on *Figure 2.8 Headpond Borrow Pit (Volume 3 Figures).*
NatureScot – Scoping (09/09/2022)	Peat and Soils	An Outline Peat Management Plan (PMP) has been undertaken in accordance with Scottish Government guidance and can be seen in *Appendix 10.2 Outline Peat Management Plan (Volume 5 Appendices)*. The Development has been designed to minimise impact of peatlands, where practical.
SEPA – Peat Probing Consultation	Peat	Peat probing regime was amended to include further areas of probing to partially cover issues raised by SEPA. Peat probing undertaken as part of the Blarghour Wind Farm PLHRA reviewed and compared for consistency as per SEPA recommendation.

10.5 Methods

10.5.1 Desk Study

A desk study was carried out on the geology and ground conditions of the Development Site, covering a study area as defined by the RLB shown on *Figure 1.2 The Development Site* (*Volume 3 Figures*) using various publications, documents, publicly available information, discussions with consultees and information from site walkovers.

A review of published geological data has been undertaken to determine the geological and topographical context of the study area. The sources of information are listed in *Table 10.4: Information Sources used for Desk Study* for reference below.

Table 10.4: Information Sources used for Desk Study

Area	Subject	Source
Geology	Site Geology	British Geological Survey (BGS) Onshore Geoindex online viewer
		NatureScot's Carbon and Peatland map 2016
		Scotland's Environment web map
Land Use	Wild Land	NatureScot's Wild Land Areas map and descriptions 2014
Topography	Site Topography	Ordnance Survey Mapping, Scale 1:25,000
Topography	Site Topography	5 m Digital Terrain Model (DTM)

10.5.2 Site Surveys – Peatland Survey

As noted above, NPF4 has defined the responsibility for developers to be conscious about the impact on peatland habitats. Policy 5d states:

> *"Where development on peatland, carbon-rich soils or priority peatland habitat is proposed, a detailed site-specific assessment will be required to identify:*

- The baseline depth, habitat condition, quality and stability of carbon rich soils;
- The likely effects of the development on peatland, including on soil disturbance and;
- The likely net effects of the development on climate emissions and loss of carbon."

Peatland surveys were undertaken in order to obtain information on peat coverage across the Development Site to inform the following:

- Site design and layout to minimise disruption to peatlands; and,
- Post-construction site reinstatement and restoration.

Details and results of the Peatland Surveys are discussed further in *Section 10.6.3 Peat*.

10.5.3 Assessment Scope

The assessment considers the effects during the three phases of the Development lifespan as identified in *Chapter 2: Project and Site Description.* The phases are pre-construction, construction, and operation.

The assessment considers the potential for likely effects on the Geology and Soils in relation to the construction of a Pump Storage Hydro scheme. It establishes the baseline geological conditions of the site, using a desk study along with a targeted peatland survey completed for the Development.

10.5.4 Baseline Data Collection

A qualitative assessment of the potential effect of the proposed Development on the geology of the site has been undertaken using a combination of legislative standards, other statutory policy and guidance, a desk-based study, site surveys and professional judgement. See *Table 10.4: Information Sources used for Desk Study* above for the sources reviewed in the desk study.

Following the review of the desk-based assessment, a peat survey was undertaken- discussed further in *Section 10.6.3 Peat*.

10.5.5 Assessment Methodology

Based on SEPA best practice guidance, peat depths are assumed as follows:

- Peat with depths ≥ 1.0 m is considered as "deep peat";
- Peat ≥ 0.5 m but < 1.0 m is considered as "shallow" peat; and,
- Peat < 0.5 m is assumed to be topsoil.

For the purpose of this assessment, the Development Site is split into two zones:

- Zone 1: Main Development Site (Loch Awe to proposed Headpond location); and,
- Zone 2: Marine Facility on Loch Fyne and infrastructure around Inveraray.

10.6 Baseline Environment

10.6.1 Topography

The main Development Site slopes from the summit of Cruach na Gearr-choise (571 m above ordnance datum (AOD)), along the eastern boundary of the Development Site, towards Loch Awe in the west.

The proposed Headpond is located at Lochan Airigh (360 m AOD) which sits in the valley between Cruach na Gearr-Choise (c. 571 m above ordnance survey datum; AOD) to the east and an unnamed summit (c. 470 m AOD) to the west.

The Tailpond inlet / outlet is located on Loch Awe, south of Balliemeanoch. The top level of the structure is at an elevation of 38.6 m AOD and extends approximately 50 m into Loch Awe. The existing ground slopes steeply to the south-east at a gradient of approximately 14% to the existing farm track, where it levels out and slopes steadily upwards to the proposed Headpond location in the east.

Figure 10.1 Topography (Volume 3 Figures) shows the topography of the study area based upon a 5 m digital terrain model (DTM).

10.6.2 Geology

As shown on *Figure 10.2 Bedrock Geology (Volume 3 Figures)*, the bedrock geology at the main Development Site is dominated by Metabasaltic rock of the Tayvallich Volcanic formation. The Tayvallich Volcanic formation is of the Tayvallich Subgroup which is defined on the British Geological Survey (BGS) as: "*Dominated by calcitic limestone, in part slumped, resedimented; however, east of mid-Deeside the limestone is replaced by psammite and quartzite with thin beds of calcsilicate rock; lavas, hyaloclastites and graphitic pelites present in Tayvallich area; Banffshire Coast - thick semipelite and calc sequence in upper part.*"

This formation covers the majority of the proposed Headpond and the sloping ground to the west, towards Loch Awe.

At the Tailpond inlet / outlet structure (Loch Awe), the bedrock geology is shown to be psammitic in nature of the Loch Avich Grit Formation. The Loch Avich Grit Formation is of the Southern Highland Group, which is defined on the BGS as: "*A thick pile of psammitic and pelitic greywackes and associated rocks, some volcanic."*

The bedrock geology is made up of Tayvallich Volcanic Formation – Metalava and Metatuff and the Tayvallich Slate and Limestone Formation – Pelite, Graphitic to the north and south of the Headpond, respectively. Both of these formations are of the Tayvallich Subgroup, described above.

As shown on *Figure 10.3 Superficial Geology (Volume 3 Figures)*, no superficial deposits are identified across the majority of the main Development Site. This is an indication that bedrock is at or near ground surface. Where superficial deposits are identified, they are generally till, deposits of alluvium and peat.

A review of the Carbon and Peatland 2016 map on Scotland's Soils online map viewer (Scottish Government, 2016) shows the area surrounding the Headpond is a variety of peat soils, mostly peaty gleys with semi-confined peat, peaty gleyed pozdols with peaty gleys with distrophic semi-confined peat and peaty gleys with peaty rankers. The areas along the banks of Loch Awe and going up the slope to the East towards the Headpond is described as brown earths with humic gleys.

A review of the BGS Faults (1:625,000 scale) layer showed the presence of a fault trending south-west – north-east through the proposed Embankment 1, terminating to the east of the Headpond. The BGS indicates that the fault is at rockhead, however, no further information is available. A number of inferred faults are also present around the study area, however, they are out with any proposed infrastructure.

The hydrogeology of the Development Site is discussed in detail in *Chapter 10: Water Environment*, together with details of all known groundwater and surface water abstractions within the Development Site and immediate surrounding area.

10.6.3 Peat

As part of the requirements set out in NPF4, Peatland surveys were undertaken within the study area for the Development. To capture the extent of peat across the site, the following peat probing surveys were undertaken:

- Peat probing along Northern Access Route – August 2021
- Phase I Peatland survey – September 2023

10.6.3.1 Northern Access Route Peat Probing – August 2021

The northern access of the Development is located within the Keppochan and Upper Sonachan Forest and it is proposed that access will be made using existing forestry tracks (to be upgraded) and new Access Tracks.

Two areas of new Access Tracks were surveyed at 50 m centres with 10 m perpendicular offsets. In total, 50 probes were taken, with the majority (54%) of probes having peat depths < 0.5 m depth (assumed topsoil). Shallow peat was measured at 18% of the locations while deep peat was identified in 28% of the probed locations. The deepest peat measured was 3.2 m deep.

10.6.3.2 Phase I Peat Probing – September 2023

Prior to commencing the survey, a desk-based assessment was undertaken to assess the estimated presence of peat across the Development. A review of the BGS Onshore GeoIndex indicated that no peat or peaty soils were present across the site. Further investigation through the National soil map of Scotland indicated that a large, isolated outcrop of peaty podzols and peaty gleys was present around the proposed Headpond area.

The Headpond and surrounding areas were surveyed in a 100 m x 100 m grid, with additional peat probes taken at areas of deep peat / in areas with limited coverage. Additionally, while undertaking the peatland survey, additional features were noted, as follows:

- The northern access to the site was taken via the existing forestry tracks within the Keppochan and Upper Sonachan Forest. The forestry tracks were accessible via vehicle up to 1.5 km from the western edge of the forest at which access was made via foot. The remaining 1.5 km to the edge of the forest was along a severely overgrown access track. A hard subbase could be felt underfoot whilst walking on the overgrown track but years of organic deposit and tree growth made it difficult to traverse on foot.

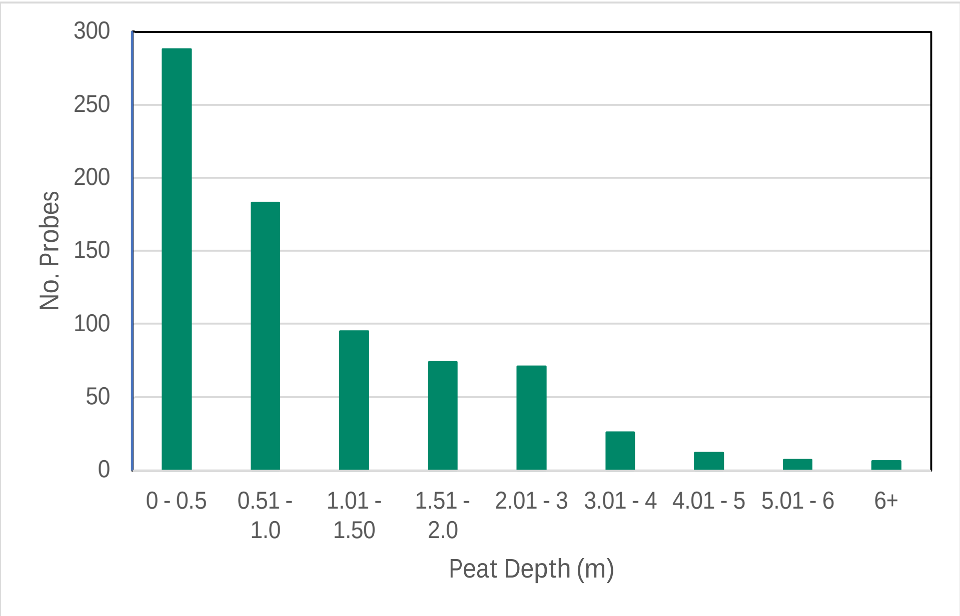
- The southern Access Track went through the current landowner's farmland, the track was in good condition, but it was steep in some sections and a 4x4 vehicle was necessary to drive up. The areas to the side of the track were mostly shallow peat (between 0m and 0.5m) though when coming closer to the proposed location for Temporary Compound 07 some areas of very deep peat (between 3 m and 5 m) were recorded to the west of the track.
- The eastern area of the site generally showed evidence of deeper peat and regularly displayed peaty hollows and peat bogs. The presence of peat in these areas is likely due to the topography, evidenced by small rolling hills which creates dips and pockets that promote the creation of peat as organic material and water are contained in these hollows.
- The western area of the site was notably less peaty. This is likely due in part to the natural topography and lack of conditions for peat development.
- There were many watercourses on site which ranged from many small brooks through peat and grass caused by heavy rainfall, feeding into larger streams going across most of the site and further into the Beochlich Hydro Electric Site.
- The site has regular changes in topography, mainly sloping down from the outer edges of the site to the area where Lochan Airigh is currently located, and further to the reservoir of Beochlich hydro.

Prior to mobilising on site, AECOM consulted with SEPA and proposed to undertake around 550 peat probes across a 100 m x 100 m grid. SEPA requested that a "dynamic probing regime be undertaken", as such, as detailed in Section 10.6.3.2, additional peat probes were taken in areas of deep peat and as requested by SEPA, 1) along the extents of the existing access tracks, 2) along the proposed Access Track and 3) across the proposed Embankments.

In total, 766 peat probes were taken during the Phase I Peat Survey (216 extra probes compared to the proposed 550). The results from the survey are listed below and shown graphically in *Insert 10.1 Peat Depth Range* below.

- 288 probes recorded a depth of peat below 0.5 m (38% of the site surveyed).
- 183 probes recorded a depth of peat between 0.5 m and 1.0 m (24% of the site surveyed).
- 95 probes recorded a depth of peat between 1.0 m and 1.5 m (12% of the site surveyed).
- 75 probes recorded a depth of peat between 1.5 m and 2.0 m (10% of the site surveyed).
- 71 probes recorded a depth of peat between 2.0 m and 3.0 m (9% of the site surveyed).
- The last 7% of the site has depths of peat ranging between over 3.0 m and up to 7.30 m, which equates to 57 locations of very deep peat, mostly located on the outer eastern edges of the survey extents.

All peat probes taken during the peat probing surveys can be seen on *Figure 10.4 Peat Probe Locations* (*Volume 3 Figures*)**.**



Insert 10.1 Peat Depth Range

The results of the Phase I Peat Probing survey were used to create a map of the varying depths of the peat surface across the Development – shown on *Figure 10.5 Peat Depth Interpolation (Volume 3 Figures)***.**

10.6.4 Land Use and Soils

A review of the National Soil Map of Scotland on Scotland's Soils online map viewer (Scottish Government, n.d.) identified the Headpond location is covered with soils described mostly as peaty gleys with semi-confined peat, peaty gleyed pozdols with peaty gleys with distrophic semi-confined peat and peaty gleys with peaty rankers.

At the shoreline of Loch Awe there is evidence of "brown soils", which according to The James Hutton Institute are "*well drained with brownish subsoils where iron oxides created through weathering processes are bonded to silicate clays*" (James Hutton Institute, n.d.).

The Beochlich hydroelectric scheme, situated on Buinne Dhubh watercourse, is located around 2 km southwest from where the Headpond will be constructed. The scheme is a small scale run of river hydro scheme which incorporates a storage reservoir to regulate the flow of Buinne Dhubh and has a capacity of around 1.0 MW. In conjunction with the hydro scheme, there are some existing access tracks that lead from the B840 (Loch Awe) to the hydro scheme.

As per the 2014 Wild Land Areas map and descriptions (NatureScot 2014), the area of the proposed PSH Development is not recognised as Wild Land.

From a geology and ground conditions perspective, the soils at the Headpond are viewed as a sensitive receptor and will be assessed further in Assessment of Effects below. However, the general land use is not viewed as a sensitive receptor and will not be discussed further in this chapter.

10.6.5 Seismic Risk

A review of the BGS Onshore GeoIndex has shown no evidence of historic earthquakes within the Development Site; however, there are a few historic events that have occurred in the wider area as detailed in *Table 10.5: Seismic Activity.*

Table 10.5: Seismic Activity

Type	Easting	Northing	Year	Magnitude	Depth (km)	Distance from Development Site (km)
Modern Instrument Recorded Earthquakes	202612	714498	1993	1.1	0.6	2.7 km south-west
Modern Instrument Recorded Earthquakes	202169	714187	1993	1.3	0.6	3.2 km south-west
Modern Instrument Recorded Earthquakes	203710	720822	1993	1.1	5.9	4.5 km north
Modern Instrument Recorded Earthquakes	206911	720901	2011	2.1	12.2	5.0 km north-east
Modern Instrument Recorded Earthquakes	209478	720656	1999	1.1	6.4	6.5 km north-east
Modern Instrument Recorded Earthquakes	210470	719611	1999	1.3	3.6	6.7 km north-east
Modern Instrument Recorded Earthquakes	206816	724014	2019	1.8	7.0	8.0 km north
Modern Instrument Recorded Earthquakes	203085	724847	1979	1.5	2.7	8.5 km north
Modern Instrument Recorded Earthquakes	213214	717214	2016	1.0	2.5	8.7 km east
Modern Instrument Recorded Earthquakes	199832	708905	2018	2.1	4.7	9.0 km south-west

Type	Easting	Northing	Year	Magnitude	Depth (km)	Distance from Development Site (km)
Modern Instrument Recorded Earthquakes	199164	708879	1980	1.2	N/A	9.2 km south-west
Modern Instrument Recorded Earthquakes	213564	713793	2007	1.6	8.7	9.3 km east
Modern Instrument Recorded Earthquakes	198660	724530	1986	1.5	0.0	10.0 km north

10.6.6 Ground Contamination

Given that the land for the Development is largely uninhabited and unexploited and avoid of large intrusive or potential contaminating historical developments, it is unlikely that the Development Site will contain contamination.

10.6.7 Sensitive Receptors

The value of receptors is based on the definitions provided in *Chapter 4: Approach to EIA.* Sensitive receptors that may be directly or indirectly affected by the Development and the value of each receptor are summarised in *Table 10.6: Sensitive Receptors.*

Table 10.6: Sensitive Receptors

Receptor	Distance from Development	Sensitivity	Reason
Peat	On-site	High	Potential release of carbon due to disturbance (raised concern by SEPA and NatureScot)

10.7 Assessment of Effects

The assessment of effects for Geology and Soils is not as per the standard assessment as described in *Chapter 4: Approach to the EIA*. This approach has been taken as the potential effects on geological and soil receptors are extremely limited. However, the volume of material to be excavated does have the potential to affect other receptors which are contained in other chapters. Therefore, this chapter provides information on the basis of other potential indirect effects from the excavation of material in order to construct the Development, and signposts to the relevant assessments where required.

The superficial deposits identified within the desk study has found that the majority of the soil on the Development Area is peat of Class 2 and 5 which are described as peat soil with occasional peaty soil and peat soil, respectively.

For impacts on hydrogeology and GWDTE refer to *Chapter 10: Water Environment.*

There is likely to be no contaminated land within the study area, therefore any potential impacts from this, on human health and other receptors have been scoped out.

Given the locality of the Development in relation to faults, there is potential for varying rock quality, even at significant depths. To mitigate issues with varying rock quality, which could result in unstable rock faces during underground excavation and tunnelling works, the potential requirement for lining of the tunnels and underground excavations is embedded in the design.

Seismic activity in the area could have the potential to destabilise the Embankment, however, embedded within the design is the legal requirement that the Embankment will be designed constructed, operated and decommissioned in line with the Reservoirs Act 1975, therefore, this is scoped out.

Although the impacts on geology have largely been scoped out, during the construction phase substantial excavation, tunnelling and earthworks will be undertaken.

Approximately 20,110,000 m³ of bulked material will be excavated in order to construct the Headpond Embankments from the tunnelling operations, above and below ground excavations and from the Headpond borrow pit. The Material Management Assessment (MMA) provides detailed calculations of the balance of the Development and can be seen in *Appendix 10.1 Material Management Appraisal (MMA), Volume 5 Appendices.*

As demonstrated in the MMA, there will be no excess material generated from the construction of the Development, with all of the excavated material used on site.

Site Investigation works will be undertaken during the detailed design stage, post consent, to confirm rock properties across the Development Site, in addition to the design optimisation opportunities as detailed in *Chapter 3: Design Evolution and Alternatives*.

10.7.1 Construction Phase

The construction of above-ground infrastructure will require excavation, storage, re-use and waste disposal of peat deposits. As this is a high sensitive receptor, this is expected to have a permanent adverse effect of Medium magnitude resulting in a Moderate significance on peat deposits within the Development Site without mitigation. This is therefore a **Significant** effect.

It is the intention to source aggregate for the construction of the Embankments from an on-site borrow pit, located within the Headpond. Sourcing aggregate from within the site rather than from an off-site quarry has the overall benefit of reducing the number of heavy good vehicles (HGV) on public roads and associated carbon footprint.

The locations of the borrow pit has been influenced by environmental considerations to minimise the impacts on ecology, peatlands, cultural heritage, hydrology and landscape as described within the relevant technical chapters of this EIA Report. The final location, number and estimate of material from each potential site will be determined once full ground investigation works and testing have been completed. The borrow pit will require the use of plant to both extract and crush the resulting rock to the required grading. It is anticipated that most rock will be extracted by breakers however some blasting may be required. Precise details will be confirmed at the construction stage.

- One potential borrow pit (BP01) has been identified within the Headpond area. A typical detail of the borrow pit is shown in *Figure 10.4 Peat Probe Survey Results* and *Figure 10.5 Peat Interpolation Plan (Volume 3 Figures*).
- BP01 is expected to yield a maximum bulked volume of up to 15,790,000 m^3 of aggregate. The bedrock geology where it is located have a mix of metabasaltic rock, metalava and metatuff (Tayvallich Volcanic formation) and pelite, graphitic rock (Tayvallich slate and limestone formation), and some veins of metagabbro and metamicrogabbro (Dalradian supergroup).

10.7.2 Operational and Decommissioning Phase

Peat excavated during the construction phase will be permanently displaced from the areas required for above ground infrastructure. At the end of the construction phase, all peat will be reused on site, as per the *Appendix 10.2 Outline PMP (Volume 5 Appendices).*

Operationally, most of the works will be undertaken underground, within permanent above ground compounds or for maintenance purposes. As such, during operation, there is expected to be no further impact on peat.

At the decommissioning phase of the project, it is expected that a specific decommissioning consent will be issued at the time. Due to the project lifespan (~ 100 years) any life extension, re-use or repowering (Table 1 of Life Extension and Decommissioning of Onshore Windfarms (SEPA, 2016)) will be subject to a detailed of the Development infrastructure, namely the Headpond Embankments, Power Cavern Complex, Access Tunnels and Waterways, at the time of decommissioning. Should life extension, re-use or repowering not be an option at decommissioning, the scheme will be decommissioned. Permanent compounds and Access Tracks may removed and reinstated to pre-construction condition, in accordance with best practice guidance and agreement from the relevant consenting authority and landowners. As such, during decommissioning, there is expected to be no further impact on peat.

10.8 Cumulative Effects

10.8.1 Inter-Cumulative Effects

Inter-project effects were considered for the cumulative developments listed in *Table 4.8 of Chapter 4: Approach to EIA.* No direct combined effect on geology or ground conditions were identified from the Development and the cumulative developments. Shared fault lines and geology between Beochlich hydroelectric site and the Development were considered, however no effect was identified given the distance between the two sites and the safety standards and requirements incorporated into the design.

The potential for indirect combined effects on the transport network was also considered. Although the material management for Beochlich hydroelectric is unknown, no combined effect between the Development and Beochlich Hydroelectric was identified, due to the proposal to retain and re-use excavated material on the Development Site. This is to be managed and implemented via the MMA (*Appendix 10.1: Material Management Appraisal (MMA), Volume 5 Appendices*). Therefore, there are no inter-project cumulative effects anticipated with the cumulative developments.

Intra-project effects were also considered. No potential direct combined effects on geology or ground conditions were identified. Potential indirect combined effects were identified from material management on the transport network, and on human receptors from nuisance such as reduced amenity, dust and noise. If excavated material were transported off-site, this would increase the required number of vehicle journeys to and from the Development Site and create a combined adverse effect of greater significance. However, as demonstrated in the MMA (*Appendix 10.1: Material Management Appraisal (MMA), Volume 5 Appendices*) all excavated material can and will be reused within the Development Site, removing any potential intra-project transport effects.

Amenity effects from noise and dust generation as a result of material excavation, transportation within the Development Site and storage could be compounded as a result of the overlapping construction programme for the different Development Components. The Outline Construction Environment Management Plan (CEMP) (*Appendix 3.1 Outline CEMP, Volume 5 Appendices*) provides mitigation in relation to generation of dust, noise and other emissions.

Therefore, there are not expected to be any significant cumulative effects on geology or ground conditions, and other shared receptors.

10.9 Mitigation and Monitoring

10.9.1 Embedded Mitigation

Post-consenting SI works will confirm soil and rock properties to assist the detailed design. SI works are likely to include additional peat probing to inform the exact routes / location of above and below ground infrastructure.

The Phase 1 Peat Probing survey identified areas of peat > 1.0 m in depth across the Development. The following embedded mitigation measures have been included in the design, with respect to peat:

- Where Access Tracks are present, areas of peat > 1.0 m have been avoided where possible, however, where this was not feasible, floating Access Tracks have been defined.
- Where peat > 1.0 m was identified within the Headpond at elevations below the BWL (374 m AOD). Peat in this area will not be excavated and left in-situ.

Within the Headpond basin, in elevations above BWL (374 m AOD) peat will be permanently lost. The Outline PMP (*Appendix 10.2 Peat Management Plan, Volume 5 Appendices*) has been produced which demonstrates the approximate volumes of peat expected to be disturbed / excavated, the potential re-use options and handling and storage methods to be used.

10.10 Residual Effects

In accordance with the methodology described in *Chapter 4: Approach to EIA*, potential effects have been assessed prior to mitigation, with the residual effects after implementation of the mitigation measures detailed in *Table 1.7: Potential and Residual Effects*.

As demonstrated in *Table 1.7: Potential and Residual Effects*, there are no significant residual effects anticipated to remain after the implementation of mitigation

Table 1.7: Potential and Residual Effects

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Peat	Excavation for Development Site above ground infrastructure, resulting in loss of peat and release of carbon into the atmosphere.	Moderate Adverse	Layout developed to minimise infrastructure in areas of peat > 1.0 m where possible. Where unavoidable floating Access Tracks and alternative construction methods to be utilised. Peat within Headpond in elevations below BWL (374 m AOD) to be left in-situ and not disturbed. Appropriate peat guidance to be adhered to. Outline PMP (*Appendix 10.2, Volume 5 Appendices*) to be implemented and updated to Final PMP post consent.	Minimisation of peat disturbance of peat reducing the magnitude of the effect from Medium to Negligible.	Minor Adverse (**Not Significant**)

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AECOM

Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 11: Water Environment

ILI (Borders PSH) Ltd

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1	July 2024	Submission	DL	David Lee	Technical Director

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11 Water Environment

11.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) identifies and assesses the potential effects of the Development on the water environment. For this assessment the water environment includes the water quality of surface water features, fluvial hydromorphology of watercourses and the geomorphology of lochs/lochans, and quality, flows, and levels of groundwater features. Where there are water dependent ecosystems, these are also considered in this assessment when determining the importance of water features.

There is interaction between environmental topics and therefore this chapter should be read in conjunction with:

- Chapter 6 Terrestrial Ecology;
- Chapter 7 Aquatic Ecology;
- Chapter 8 Marine Ecology;
- Chapter 10 Geology and Ground Conditions;
- Chapter 12 Water Resources; and
- Chapter 18 Marine Physical Environment and Coastal Processes.

Potential impacts and effects on the water environment receptors have been described for the construction and operation phases of the Development. Further, the approach to mitigating potential impacts during all phases have been described with reference to good practice guidance and design, which is described later in *Section 11.9*.

This chapter is also supported by the following figures (which are provided in Volume 3: Figures) and technical appendices (which are provided in Volume 5: Appendices):

- Figure 11.1 Surface Water and Groundwater Receptors and Attributes – Wider Context;
- Figure 11.2a Surface Water and Groundwater Receptors and Attributes – Headpond Study Area;
- Figure 11.2b Surface Water and Groundwater Receptors and Attributes – Loch Fyne Study Area
- Figure 11.3a Surface Water and Groundwater Receptors and Attributes – Headpond Study Area;
- Figure 11.3a Surface Water and Groundwater Receptors and Attributes – Loch Fyne Study Area;
- Appendix 11.1 Water Quality Monitoring Results;
- Appendix 11.2 Water Framework Directive Assessment;
- Appendix 11.3 Private Water Supplies Assessment;
- Appendix 11.4 Watercourse Crossings; and
- Appendix 11.5 Outline Water Management Plan.

11.2 Legislation and Policy

Legislation, planning policy and guidance relevant to this assessment and pertinent to the Development is outlined in this section (please note that regulations transferring powers from the European Union to the United Kingdom authorities are not listed).

11.2.1 Legislation

The following national legislation is relevant to the Development and will be considered as part of this assessment:

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR) (‘the CAR Regulations’) (Ref 11.1);
- Water Environment Water Services (‘the WEWS Act’) (Scotland) Act 2003 (Ref 11.2);
- Environmental Liability (Scotland) Regulations 2009 (Ref 11.3);
- Pollution Prevention and Control (Scotland) Regulations 2012 (PPC) (Ref 11.4); and

- The Climate Change (Scotland) Act 2009 (Ref 11.5).

11.2.2 Planning Policy

Applications for energy developments in Scotland with an electrical generation capacity in excess of 50 MW are made to and determined by the Scottish Ministers in accordance with the provisions of Section 36 of the Electricity Act (1989) and any direction deeming planning permission to be granted under Section 57(2) of the Town and County Planning (Scotland) Act 1997. (Ref 11.7). There are legal, policy and advice documents which are material considerations to the decision-making process of this process, covering relevant legislation, national and local planning policy, and advise notes/supplementary guidance, and these are described in the following sections.

11.2.3 National Planning Framework 4 (NPF4)

The National Planning Framework 4 (NPF4), published in February 2023 (Ref 11.8), replaces the previous National Planning Framework 3 (NPF3) (Ref 11.12). NPF4 sets out the Scottish Government spatial development principles, regional priorities, national developments and national planning policy, covering six spatial principles which aim to deliver sustainable places, liveable places and productive places.

Pumped Storage Hydro (PSH) is identified in NPF4 as necessary to support energy security, diversity of the electricity supply, and to reduce carbon emissions. This includes refurbishment of existing sites and the development of new the Developments. Policy 11 within the NPF4 outlines that such Energy Developments should demonstrate within their project designs and mitigation that impacts to hydrology, water environment and flood risk are addressed.

11.2.4 Scottish Planning Policy (SPP)

SPP was published in June 2014, its purpose is to set out national planning policies that reflect priorities of the Scottish Ministers for operation of the planning system and the development and use of land through sustainable economic growth (Ref 11.9). SPP aims to promote a planning process that is consistent across Scotland but flexible enough to accommodate local circumstances. SPP demonstrates a commitment to sustainable growth through a balance of development in appropriate places.

SPP outlines that planning should look to '*promote protection and improvement of the water environment, including rivers, lochs, estuaries, wetlands, coastal waters and groundwater, in a sustainable and co-ordinated way*'.

11.2.5 Planning Advice Notes and Specific Advice Sheets

Planning Advice Notes (PANs) and Specific Advice Sheets (Ref 11.10) set out detailed advice from the Scottish Government in relation to a number of planning issues. PANs and Specific Advice Sheets relevant to the Development could include:

Table 11.1 Planning Advice Notes and Specific Advice Sheets

Planning Advice Notes and Specific Advice Sheets	Key Requirements relating to the Water Environment	The Development
PAN 79 Water and Drainage (Ref 11.31)	All new developments require the Sustainable Drainage Schemes (SuDS) to provide treatment to waste water.	Each temporary and permanent compound will incorporate SuDS where possible. The design of surface water drainage systems, incorporating appropriate attenuation and treatment measures, will be undertaken post-consent as part of a Detailed Design Strategy. This could be prepared pursuant to a planning condition.
Hydro the Developments (Ref 11.34)	States that priority should be given to schemes which can provide significant energy contribution but minimise impacts to the water environment. The document suggests that discussions with SEPA to gain advice on water environment protection, especially where significant impacts are identified.	SEPA was contacted to have a meeting concerning the water environment. At the time of writing no meeting was arranged.
Planning and waste management (Ref 11.35)	States that there should be environmental protection considerations to mitigate any potential effects on the water environment.	Mitigation measures are outlined *Section 11.9* of *Chapter 11*, within the CEMP and within oWMP *(Appendix 11.5*).

11.2.6 River Basin Management Plan

The River Basin Management Plan (RBMP) sets out a range of actions to address impacts to the water environment. RBMP outline actions for public bodies and land managers and are produced by SEPA on behalf of the Scottish Government. The Development site is within the RBMP. In summary, the RBMP provides the following:

- The conditions of the water environment;
- Pressures which could or are impacting the water environment; and
- Actions to address any impacts.

11.2.7 Local Planning Policy - Argyll and Bute Local Development Plan

The Argyll and Bute Local Development Plan (LDP2) (Ref 11.14) was formally adopted on 28 February 2024 and provides the local planning framework (excluding the area covered by the Loch Lomond and Trossachs National Park. The this replaces the LDP (Ref 11.13) submitted in 2015. LDP 2 will provide a land use framework for the next 10 years is currently under preparation for which a draft has been made available for consultation.

The LDP 2 includes various policy allocation changes as well as new additions that may be of relevance to the Development and will therefore be considered following its adoption (see *Table 11.2*).

Table 11.2 List of water environment related policies outlined in LPD 2

Policy Number	Description
Policy 04 – Sustainable Development	"*In preparing new development proposals, developers should seek to demonstrate the following sustainable development principles… Avoid having significant adverse impacts on land air and water environment."*
Policy 30 – The Sustainable Growth of Renewables	"*The Council will support renewable energy development where these are consistent with the principles of sustainable development, and it can be adequately demonstrated that there would be no unacceptable environmental effect… will be assessed against the following criteria… effect of hydrology, the water environment and flood risk"*
Policy 59 – Water Quality and the Environment	*Proposals for development that could affect the water environment will be assessed with regard to their potential impact on:* *a) Water quality and quantity, ecological status including morphology and hydrology (i.e. flow rate) chemical and biological status;* *b) Riparian habitats and wildlife;* *c) Geomorphic processes;* *d) Leisure and recreational facilities and users;* *e) Economic activity.* *… Developments that may have a significant detrimental impact on the water environment will not be permitted unless it can demonstrate that the impacts can be fully mitigated"*

11.3 Consultation

Table 11.3 lists the consultation that has taken place in preparing this assessment.

Table 11.3 Summary of Consultation

Consultee	Key Issue	Action Taken
SEPA	Require mapping of proposed buffers, additional flood risk and any related CAR applications. Map and assessment of Groundwater Dependent Terrestrial Ecosystems (GWDTE).	A map of the Groundwater Dependent Terrestrial Ecosystems is included in *Figure 6.5 (Volume 3: Figures)*. Existing CAR licences can also be

Consultee	Key Issue	Action Taken
	"*The site layout must be designed to avoid impacts upon the water environment…. where activities such as watercourse crossings, watercourse diversions or other engineering activities in or impacting on the water environment cannot be avoided… a minimum buffer of 50m around each loch or watercourse. If this minimum buffer cannot be achieved each breach must be numbered on a plan with an associated photograph of the location, dimensions of the loch or watercourse and drawings of what is proposed in terms of engineering works*"	viewed on these *Figure 11.2 (Volume 3: Figures).* Flood Risk information can be viewed in *Chapter 12: Flood Risk and Water Resources (Volume 2: Main Report)*. A 50 m buffer around each of the lochs/lochans and watercourses has been incorporated into the design. These buffers can be viewed in *Figure 11.3a* and *11.3b (Volume 3: Figures)*. *Table 11.33* lists any breaches of the buffer zones with justification to the breach. Details of each of the watercourse crossing can also be found within *Appendix 11.4 (Volume 5: Appendices).*
SEPA	Meeting held on the 19th of March 2024 between AECOM and SEPA to discuss the key impacts of the Development. The topics of discussion include the potential impact on the hydromorphology of watercourses, effects of thermal stratification on Loch Awe in the Summer, as well as pollution risks during construction works.	No action required from the meeting apart from continued engagement throughout the CAR licensing process.
NatureScot	"*impacts of construction on groundwater dependent terrestrial ecosystems (GWDTE) receptors, peatland habitats, and peat resources is likely to include a loss or a degradation of their hydrological, hydromorphological and ecological characters, associated with the issue of water quality on and off-site*."	The assessment of GWDTE and other terrestrial ecosystems are included in *Chapter 6: Terrestrial Ecology (Volume 2: Main Report)*. A map of the Groundwater Dependent Terrestrial Ecosystems (GWDTE) is included in *Figure 6.5 (Volume 3: Figures)*. Chapter 11 uses the GWDTE to help evaluate the importance of the groundwater aquifers. The assessment on peat can be found within *Chapter 10: Geology and Ground Conditions (Volume 2: Main Report).*
Marine Scotland Science	"*Potential impacts on fish populations associated with construction and operation of the Development include:* *Deterioration of water quality due to the release of sediment associated with the construction of the Embankment, Access Tracks/tunnels and buildings and stockpiled material, the release of hydrocarbons as a result of a fuel spillage and the release of concrete from mixing plants;* *The disturbance and/or removal (through excavation/erosion/deposition) of fish habitat e.g. Allt Beochlich, and Arctic charr spawning areas in Loch Awe;* *…* *Change in water quantity and flow regimes through abstraction/discharge and the creation of impenetrable surfaces e.g. Access Tracks/tunnels and buildings;* *…* *Change in water temperature*"	The assessment on impacts on fish are assessed *Chapter 7: Aquatic Ecology (Volume 2: Main Report).* This assessment within this chapter considers impacts during construction works in *Section 11.7*. Construction works will use good practice measures as outlined in CEMP to ensure impacts to water quality a mitigated. This assessment also considers changes in hydrology and water quality during operation in *sections 11.7.36* to *11.7.77*. This includes consideration of the risk of changes in water temperature.
Argyll and Bute Council	"*The applicant is requested to submit full details of the Water Management Plan and Surface Water Drainage Strategy, including the Emergency Response Management Plan, and* *mitigation measures within their Flood Risk Assessment. It will be important that the Development does not attribute to an increase in excess surface and ground water accumulations. It will also be important that the development does not attribute to an increase in pollution and any siltation/spoil entering Loch Awe, including the Oban and Kintyre groundwater bodies, and private water supplies*." "*The applicant is advised to adhere to good practice measures for working in and near to watercourses during the construction phase, and should include:* *Installation of silt interception traps to minimise unchecked contaminated run-off;* *Appropriate artificial drainage must be designed and installed;* *Fuels and other chemicals must be stored securely within the site construction compound;* *Appropriate wash-out facilities must be available for vehicles and machinery*;	Construction works will use good practice measures as outlined in a CEMP, to ensure impacts to water quality a mitigated. Further details are provided in *Section 11.9*. A Water Management Plan and Surface Water Drainage Strategy will be included as part of the mitigation measures to be prepared subject to a pre-commencement planning condition. An assessment of Flood Risk is provided in *Chapter 12: Flood Risk and Water Resources* (Volume 2).

Consultee	Key Issue	Action Taken
	Trenches and excavations must be covered at the end of each working day."	
Balliemeanoch Public Questionnaires (Private Water Supplies Questionnaire)	A member of the local community identified a Private Water Supply (PWS) which supplied Sonachan Farm and a PWS which supplied two properties (Cruachan View and Sonachan View). They also noted previous works in Sonachan woodland around NN 06667 20040 which impacted the PWS for Sonachan View.	The information provided has been considered in *Appendix 11.2 PWS Assessment (Volume 5*) and in this chapter.
Scottish Water	*"We would request further involvement at the more detailed design stages, to determine the most appropriate proposals and mitigation within the catchment to protect water quality and quantity"*	No action required from the meeting apart from continued engagement.
MOWI Fish Farms	*"We would expect the Water Environment and the Water Resources impact assessments outlined in the Scoping* *Report to be expanded to examine the specific risk to the fish farms and, if required identification of appropriate mitigation measures and actions"* *"We would stress the importance of maintaining water quality throughout the catchment during the construction phase, especially for Loch Awe in respect of the health and welfare of both native and farm raised fish."*	Construction works will use good practice measures as outlined in a CEMP, to ensure impacts to water quality a mitigated. Further details are provided in Section 11.9. A Water Management Plan and Surface Water Drainage Strategy will be included as part of the mitigation measures to be prepared subject to a pre-commencement planning condition. The CEMP, Surface Water Drainage Strategy and the Water Management Plan will be implemented throughout the catchment. The assessment of water levels and impacts to fish farms can be found in *Chapter 12: Flood Risk and Water Resources* (Volume 2).

11.4 Study Area

The Development Site lies within the Argyll and Bute region of western Scotland, south of Portsonachan on the southern margin of Loch Awe, and Inveraray on the northwestern side of Loch Fyne.

For the purpose of this impact assessment, a 1 km study area around areas of new development or temporary works has been used within which water features that may be affected by The Development have been identified. For these water features, the baseline also considers downstream attributes beyond the 1 km study area as water quality impacts can sometimes propagate along watercourses. The distance downstream is usually determined by the nature of the risk, rate of conveyance, dilution and dispersion potential. However, for this the Development the ultimate downstream receptors are considered to be Loch Awe and Loch Fyne. Given the size of these water features it is not expected that any impacts would propagate any further downstream.

Consideration has also been given to any surface water or groundwater bodies or water dependent ecological sites outside this study area up to 2 km from the Development Site boundary if it is considered that they might be hydraulically linked.

The study area is determined by the location of new development and construction works and access routes. This generally consists of a new inlet and outlet structure to Loch Awe at Balliemeanoch, the proposed Headpond area located near Lochan Airigh, a new wharf extending out into Loch Fyne, and new and improved Access Tracks and tunnels in between, together with temporary compound areas.

11.5 Methods

11.5.1 Assessment Scope

As described in the introduction to this chapter, the assessment of potential effects on the water environment includes consideration of impacts on the water quality of surface water features, fluvial hydromorphology of watercourses and the geomorphology of freshwater lochs/lochans, and quality, flows, and levels of groundwater features. Where there are water dependent ecosystems, these are also considered in this assessment when determining the importance of water features. However, impacts on ecological receptors are assessed in *Chapter 7: Aquatic Ecology* and *Chapter 8: Marine Ecology*; impacts on water resources and flood risk are assessed in *Chapter 13: Water Resources*. Impacts from contaminated land on surface or groundwater receptors is presented in *Chapter 10: Geology and Ground Conditions*. The physical impact of works to the edge of Loch Fyne, including the construction of a new jetty, are assessed in *Chapter 18: Marine Physical Environment and Coastal Processes*, with assessment of the physical impact to the shore of Loch Awe assessed in this chapter.

Table 11-4 Scope of Assessment

Impact	Relevant receptors	Development Phase
Groundwater Quality and Flow	Oban and Kintyre Groundwater Body	Construction
		Operation
	Superficial Groundwater Body	Construction
		Operation
Surface Water Quality – Spillage Risk	All surface water features that may be directly or indirectly as identified later	Construction
		Operation
Surface Water Quality – Suspended Fine Sediment	All surface water features that may be directly or indirectly as identified later	Construction
Surface Water Quality – Change in Water Level	Loch Awe	Operation
Surface Water Quality – Thermal Stratification	Loch Awe	Operation
Surface Water Quality – Algal Blooms (not stratified loch conditions)	Loch Awe	Operation
Surface Water Quality – Discharge from Headpond (Temperature)	Loch Awe	Operation
Surface Water Quality – Risk from concrete residue	Loch Awe	Operation
Surface Water Quality – Compensation Flow downstream or the Embankment	Loch Awe, Allt Beochlich and Beochlich Lochan	Operation
Hydromorphology – Construction of Embankments	All surface water features that may be directly or indirectly as identified later	Construction
		Operation
Hydromorphology – watercourse crossings	All surface water features that may be directly or indirectly as identified later	Construction
		Operation
Hydromorphology – sediment runoff	All surface water features that may be directly or indirectly as identified later	Construction
Hydromorphology – hardstanding area	All surface water features that may be directly or indirectly as identified later	Construction
		Operation
Hydromorphology – Tailpond inlet / outlet structure	Loch Awe	Operation

The potential impacts that may occur during decommissioning would be similar to those described for the construction phase, plus the need to dewater the Headpond and restore the Site where structure have been built. Decommissioning of the Development Site should seek to restore the Development Site to its pre-development form, restoring water bodies and features. Although it has been agreed during the EIA scoping process that decommissioning impacts can be excluded from the EIA, on the basis that their scale and type of impact would be consistent with those predicted for the construction phase, the outcome of restoring the site will likely be beneficial overall. Reference to decommissioning and site restoration is therefore included to ensure that appropriate plans, measures and future commitments are recognised and can be captured in any planning consent granted.

11.5.2 Methodology for Determining Baseline Conditions and Importance of Receptors

11.5.2.1 Baseline Data Collection

The following sources of information have been used to inform the baseline upon which effects have been assessed (see references section for hyperlinks and accessed dates):

- Online Ordnance Survey digital maps (Ref 11.15);
- Met Office website (Ref 11.16);
- SEPA website (Ref 11.17);
- SNH Standing Waters Database (Ref 11.18);
- Scotland's Aquaculture website (Ref 11.19);
- Scotland's Environment website (Ref 11.20);
- Scotland's soils website (Ref 11.21);
- National River Flow Archives website (Ref 11.22);
- British Geological Survey (BGS) website (Ref 11.23); and
- SEPA data request for:
  - Any available bathymetry, storage-depth curves and surface and depth-profiling water quality data;
  - Water quality data for any feeder streams to these lochs that are monitored;
  - Information on any water quality models that exist for these lochs;
  - Assessment / comments on water quality differences between these lochs / catchments;
  - Records of any pollution incidents affecting water features within the 1 km Study Area (Development Site boundary –1km buffer);
  - Any ecological surveys undertaken on lochs and feeder streams, including fish, macro-invertebrates, macrophytes etc;
  - Information on licensed water abstractions and discharges within the 1 km Study Area; and
  - Information on any other attributes of these water features that we should be aware of when undertaking the impact assessment.
- PWS data from Argyll and Bute Council;
- Online literature search; and
- Ecology survey data about protected species from *Chapter 7: Aquatic Ecology*.

A walkover survey of the study area was carried out on the 9th and 10th of August 2023 in generally dry weather but with occasional showers. The survey was carried out by a team of surveyors consisting of a hydromorphologist and a hydrogeologist. The purpose of the survey was to identify and characterise surface water receptors, to consider the flow pathways between water features and across the Study Area, and to make general observations about the character of the landscape and other relevant features that could influence the sensitivity and importance of water features and the prediction of potential effects from the Development. Four water quality samples were also collected from Lochan Airigh and Beochlich, and upstream and downstream reaches of Allt Beochlich (see *Figure 11.3a: Surface Water and Groundwater Receptors and Attributes – Headpond Study Area (Volume 3 Figures*).

11.5.3 Methodology for Assessing Construction, Operation and Decommissioning Effects

11.5.3.1 Source-Pathway-Receptor Approach

The qualitative assessment of potential likely significant effects during the construction and operational phases of the Development has been based on a source-pathway-receptor approach. For an impact on the water environment to exist, the following is required:

- An impact source or cause of effect (such as a structure over a watercourse, the release of polluting chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or the loss or damage to all or part of a water feature, cuttings/excavations and associated dewatering activities capable of causing temporary or permanent changes to groundwater level or flow pattern and quality (as in the case of groundwater));
- A receptor that is sensitive to that impact (i.e., water features and the services they support) that could potentially be affected;
- A pathway by which the above two are linked (i.e. all three elements must be present before a potential impact linkage can be realised).

The first stage in applying the source-pathway-receptor approach is to identify the causes or sources of potential impact from a development. The sources have been identified through a review of the details of the Development, including the size and nature of the Development, potential construction methodologies and timescales etc.

The next step in the approach is to undertake a review of the potential receptors; that is, the water environment receptors themselves that have the potential to be affected. Water features, including their attributes, have been identified through desk study and site surveys as described later in *Table 11.24*.

The last stage of the approach is to determine if there is a viable exposure pathway or a ‘mechanism’ linking the source to the receptor. This is determined in the context of local conditions relative to water receptors within the Red Line Boundary and surrounding environs, such as topography, geology, climatic conditions, land use and the nature of the impact (e.g., the mobility of a liquid pollutant or the proximity to works that may physically impact a water feature or be a source of water pollution).

Activities associated with the future maintenance and management of the may include the full draw down of the Headpond for maintenance but are unlikely in their own right to result in a significant adverse effect. The need to temporarily lower water levels in the Headpond for inspection of the Embankment, or the emergency drainage of the Headpond in the event of an emergency, are considered to be events that are consistent with normal operation, and thus the effects described for operation of the Development reflect these circumstances as well.

Please refer to *Section 11.7* for further details of the impact assessment outcomes.

11.5.4 Assessment Methodology

11.5.4.1 Significance Criteria

The assessment of effect significance outlined within the below sections is consistent with the terminology and criteria outlined within *Chapter 4: Approach to EIAR*.

The sensitivity of receptors, or importance, of the potentially affected water environment features has been established on the basis of a four-point scale, using the criteria presented in *Table 11.5* which has been modified from Design Manual for Roads and Bridges (DMRB) LA 113 Road drainage and the water environment to include hydromorphology (Ref 11.24).

Whilst other disciplines may consider ‘receptor sensitivity’, ‘receptor importance’ is considered here. This is because when considering the water environment, the availability of dilution means that there can be a difference in the sensitivity and importance of a water feature. For example, a small drainage ditch of low conservation value and biodiversity with limited other socio-economic attributes is very sensitive to impacts, whereas an important regional scale watercourse, that may have conservation interest of international and national significance and support a wider range of important socio-economic uses, is less sensitive by virtue of its ability to assimilate discharges and physical effects.

The magnitude of adverse or beneficial impacts has been determined by the seven-point scale presented in *Table 11.6* taking DMRB LA 113 Road drainage and the water environment into account (Ref 11.24).

The significance of effects has been determined using the matrix presented in *Table 11.7*. The assessment has considered the magnitude of impacts and the importance of the resources / receptors that could be affected in order to classify the effect. Where the matrix allows a range of effect, professional judgement will be used to determine the residual significance.

Table 11.5 Receptor sensitivity descriptors (reproduced and adapted from Chapter 2 (Volume 2)

Importance	Groundwater	Surface Water	Hydromorphology
Very High	Principal aquifer providing a regionally important resource and/ or supporting a site protected under International and UK legislation Ecology and Nature Conservation Groundwater locally supports Groundwater Dependent Terrestrial Ecosystems (GWDTE).	Watercourse having a WFD classification shown in a River Basin Management Plan (RBMP) and Q951 ≥1.0 m3/s Site protected/ designated under International or UK habitat legislation (SAC, SPA, SSSI, Water Protection Zone (WPZ), Ramsar site. International Designated Salmonid/ Cyprinid fishery. Species protected by international legislation.	Unmodified, near to or pristine conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and loch type.
High	Principal aquifer providing locally important resource or supporting river ecosystem and/ or supporting sensitive habitats of national importance. Groundwater supports a GWDTE.	Watercourse having a WFD classification shown in a RBMP and Q95 m3/s <1.0 m3/s. Major Cyprinid Fishery. Species protected under International or UK legislation Ecology and Nature Conservation	Conforms closely to natural, unaltered state and will often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and loch type. Deviates from natural conditions due to direct and/ or indirect channel, floodplain, bank modifications and/ or catchment development pressures.
Medium	Aquifer providing water for agricultural or industrial use with limited connection to surface water. Secondary Aquifer. Groundwater of limited value because its quality does not allow potable or other quality sensitive uses.	WFD not having a WFD classification shown in a RBMP and Q95 >0.001 m3/s.	Shows signs of previous alteration and/ or minor flow/ water level regulation but still retains some natural features or may be recovering towards conditions indicative of the higher category.
Low	Unproductive Strata	Watercourses not having a WFD classification shown in a RBMP and Q95 ≤0.001 m3/s.	Substantially modified by past land use, previous engineering works or flow/ water level regulation. Watercourses likely to possess an artificial cross-section (e.g. trapezoidal) and will probably be deficient in bedforms and bankside vegetation. Watercourses may also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category.

Table 11.6 Magnitude of Effect

Impact	Criteria
High Adverse	Results in a loss of attribute and/ or quality and integrity of the attribute.
Medium Adverse	Results in impact on integrity of attribute, or loss of part of attribute.
Low Adverse	Results in some measurable change in attribute’s quality or vulnerability.
Negligible	Results in impact on attribute, but of insufficient magnitude to affect the use or integrity.
Low Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring.
Medium Beneficial	Results in moderate improvement of attribute quality.
High Beneficial	Results in major improvement of attribute quality.
No Change	No change to the quality of the attribute

11.5.4.2 Significance of Effect

The significance of effects has been determined using the matrix presented in *Table 11.7.* Effects classed as moderate or greater are considered 'Significant' in planning terms (shaded in *Table 11.7*).

Table 11.7 Matrix for assessment of significance

Magnitude	Importance				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

The impact is then described as either long-term/short-term, temporary/permanent, direct/indirect and certain/uncertain. These descriptors are defined below.

- Long-term/Short-term: describes length of time an impact is likely to last for.
- Temporary/Permanent: describes whether an impact last or remain indefinitely.
- Direct/indirect: describes whether a receptor is impacted by an impact directly or indirectly.
- Certain/Uncertain: describes the certainty of the impact predicted.

11.5.4.3 Water Framework Directive Assessment

A WFD Assessment *(Appendix 11.2 (Volume 5: Appendices))* has been produced based on a combination of desk study, hydromorphological walkover, aquatic ecology and water quality surveys. This assessment considers whether the Development has the potential to:

- Cause deterioration in ecological status and potential of water bodies.
- Prevent water bodies from meeting their objective of 'Good' ecological status/ potential.
- Prevent or compromise WFD objectives being met in other water bodies or water dependent protected areas downstream of the Development.

The assessment is qualitative and is based on the same source-pathway-receptor approach described earlier. However, the objective of the assessment is to see whether there is compliance with the above objectives rather than a significance of effect.

In undertaking the assessment, consideration has been given to the conservation objectives for any ecologically sensitive sites, where these might be more stringent. The WFD assessment is presented in EIAR *Appendix 11-2*. The WFD Assessment covers all of the freshwater bodies which could be impacted by the scheme. This includes Loch Awe, Allt Beochlich, River Aray and the Oban and Kintyre Groundwater Body.

The following aquatic ecology surveys have taken place; macroinvertebrate, macrophyte, fish, fish eDNA (Loch Awe), fish and freshwater pearl mussel habitat assessment, pond PSYM (Lochan Airigh). Further information can be found within *Chapter 7: Aquatic Ecology (Volume 2: Main Report)* and *Appendix 7.1 (Volume 5: Appendices)*.

11.5.5 Limitations and Assumptions

The EIAR process enables informed decision-making based on the best possible information about the environmental implications of a Development being made available. However, it is common for there to be some uncertainty as to the exact scale and nature of the environmental impacts predicted. Where there is uncertainty of design, reasonable worst-case assumptions have been made, and these are described more in *Section 11.9.*

A data request was made to SEPA in July 2023. However, SEPA did not provide information on existing water quality and hydrological data. Therefore, the assessment is based on data available from online sources and a literature search. For many water bodies in the study area there was no long-term water quality or hydrological data and for others the data that was available was limited or obtained some time ago (and thus may not be wholly representative of current conditions). No digital bathymetry or water depth-storage data was provided by SEPA and therefore the potential effects from the Development on water quality, hydrology and loch stratification has been assessed qualitatively and based on background information and certain assumptions defined in the impact assessment section.

The Private Water Supply (PWS) data was supplied by the Argyll and Bute Council and from a questionnaire completed by members of the public at public exhibition events held at Inveraray Inn on 19th July 2023, with a second event held on 7th August 2023 at Dalmally Community Hall. The data collected from the Argyll and Bute Council does not clarify whether the coordinates correlate to the property served by the PWS or the actual PWS location. For the purposes of this assessment, it has been assumed that the coordinates received from Argyll and Bute Council correspond to the location of the PWS. It is possible that there are unknown PWS.

PWS data was received on the 1st of June 2023 from the Argyll and Bute Council and so only represent the PWS that were recorded at that time. The council confirmed that the data received was up to date on the 28th of February 2024.

Water samples were collected at Allt Beochlich, Beochlich Lochan and Lochan Airigh on the 9th of August 2023 as part from the Development Site walkover survey. A single water sample from each sampling location was collected (See *Appendix 11.1*). This only provides a 'snapshot' of water quality at the time it was taken, including the flow conditions, and the suite of analysis was for key parameters only.

The duration over which water will be stored in the Headpond is not defined and will vary. However, as stated in *Chapter 2: Project and Site Description*, it is unlikely that there will be many days when the Development will complete a full pump / generation cycle, due to fluctuation in energy demand. If it were to be stored for long periods of time (weeks or months) this could potentially alter its water quality character compared to Loch Awe, from where it was abstracted. Shorter timescales between energy generation are less likely to affect water quality. It is assumed that the Development will be used frequently enough that this is not an issue. However, were the Development not to be used for a long period of time (i.e. several months), water quality may need to be checked prior to its re-use. Therefore, for this scenario has also been assessed within the chapter.

The Blarghour Wind Farm Access Track may be used for the Development if it is constructed and the necessary land rights can be secured. For the purposes of this assessment, it has been scoped out of the assessment. It is assumed any impacts from the track will be considered within the separate Blarghour Wind Farm planning documents.

There were no detailed construction methods available at the time of writing this chapter and so assumptions concerning the construction were made. Similarly, only indicative designs for possible watercourse crossings are available reflecting an arch and a pipe culvert option.

11.6 Baseline Environment

11.6.1 Study Area, Topography, Land Use and Climate

The study area is characterised by hilly upland with elevations up to approximately 570 m Above Ordnance Datum (mAOD). The land use is predominantly open moorland, interspersed with large areas of coniferous plantations, and with improved grassland for livestock and small urban developments along the fringes of Loch Awe and Loch Fyne. A complex pattern of watercourses and small lochs drain this upland area towards Loch Awe and Loch Fyne.

The Development Site is situated in a highland area known as Mid Argyll in Western Scotland. The main Development Site (consisting of the Headpond and underground works) lies on the northwest facing slopes above Loch Awe and the hamlet of Balliemeanoch, east of the A819 (see *Figure 11.1 Surface Water and Groundwater Receptors and Attributes – Wider Context*) (*Volume 3 Figures*). Abstraction and discharge infrastructure will be required along the shore of Loch Awe. Two options for the Development Site access of the A819 extend to the northwest and southwest (if the Blarghour Wind Farm extension is permitted, constructed, and the rights secured). Highway works and a new jetty are proposed along the shore of Loch Fyne to the south of Inveraray. Land use within the Development Site and 1 km study area generally consists of upland moors, coniferous forest and open water, with isolated roads, utilities and power lines, and properties.

The proposed Headpond location lies over Loch Airigh and a large portion of the Allt Beochlich at approximately 350 mAOD. The ground elevation reduces towards Loch Awe to the west of the Headpond, to around 40 mAOD.

On the National River Flow Archive website (Ref 11.22), the nearest catchment with rainfall statistics is Abhainn a' Bhealaich at Braevallich (NM957075), approximately 10 km southeast of the Development Site. Standard Annual Average Rainfall (SAAR) for the period 1961-1990 is 2489 mm per year.

The days of rainfall above 1mm is also recorded by the Met Office (Ref 11.40). Dunstaffnage Station located at Loch Linnhe north of Oban is the closest station. *Chart 11-1* shows the average rainfall data from Dunstaffnage Station from 1991 to 2020. October to January have the highest number of rainfall days above 1 mm and rainfall totals, while the spring to mid-summer months of April to July had the lower number of rainfall days above 1 mm and rainfall totals. The rainfall totals are higher than average in a Scotland and UK context and exhibit a distinct trier period from mid-spring to mid-summer.

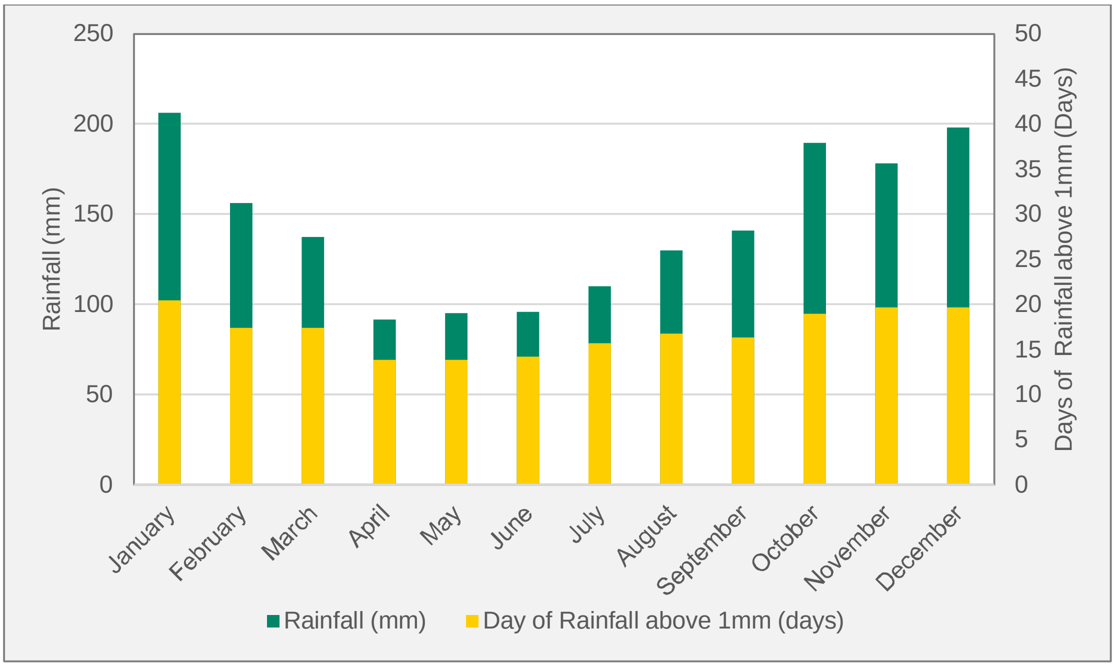


Chart 11-1: Days of rainfall above 1mm (days) sourced from Dunstaffnage Station from 2023 (Ref 11.40)

11.6.2 Geology and Soils

The geology of the area is shown on the Geological Map Sheet No. 37 W – Furnace (Ref 11.25) and also on Geology of Britain GeoIndex Viewer (Ref 11.23). Please refer to *Figure 10.2 Bedrock Geology (Volume 3 Figures)*. Further detail on Geology and Soils can be found within *Chapter 10*.

The bedrock geology of the Development Site is dominated by formations mostly Pre-Cambrian in age (>540 million years (Ma)) that are part of the Dalradian Supergroup. This is a metasedimentary and igneous succession deposited on the eastern edge of Laurentia between the late Neoproterozoic (approximately 800 Ma) and early Cambrian (approximately 510 Ma) periods. Some of these formations are part of the Tayvallich Subgroup, made up of limestones and slates. Another formation in the area is the Loch Avich Grit Formation, consisting of Psammites and Pelites. The thickness of the Tayvallich Subgroup is in the range of 100-250 m in the area, the parent unit (being the Argyll Group) has a thickness of up to 9 km. There are a series of metamorphosed igneous bodies, originally igneous rocks formed by intrusions of silica-poor magma, later altered by low-grade metamorphism. To the south of the Development Site there are younger units, in the form of an igneous dyke suite injected into the country rocks. This is the North Britain Siluro-Devonian Calc-Alkaline Dyke Suite formed approximately 398-423 million years ago in the Devonian and Silurian periods.

A fault runs approximately southwest to northeast through the southern edge of the Development Site for approximately 11 km and terminates approximately 1 km north of Eredine, under Loch Awe.

Figure 10.3 Superficial Geology (Volume 3: Figures) displays that no superficial deposits are identified across the majority of the main Development Site. This is an indication that bedrock is at or near ground surface. Where superficial deposits are identified, they are generally Till, deposits of Alluvium and Peat along the shore of Loch Awe.

According to the Scotland's Soils website (Ref 11.21), the vast majority of the study area is underlain by soils described as 'peaty gleys with peaty rankers' and 'peaty gleyed podzols with peaty gleys with dystrophic semi-confined peat'. Along Loch Awe and Loch Fyne there are 'brown earths with humic gleys' and 'humus-iron podzols with peaty gleys'.

From the peat probing assessments carried out in August 2021 and September 2023 it was found that there were 57 locations with peat depths ranging between 3 m to 7.3 m on the outer eastern edges of the survey extents (see *Figure 10.4: peat Probe Locations (Volume 3: Figures)).*

11.6.3 Hydrogeology

The bedrock hydrogeological information is relatively limited but seems to show that the Dalradian rocks are generally without groundwater except at shallow depths (Ref 11.26). MacDonald (2005) (Ref 11.27) lists the bedrock aquifer productivity of Dalradian rocks as being in the low category (in some cases very low category). For these categories, low is defined as 0.1 to 1 l/s and very low as <0.1 l/s. These quantities would only be suitable for supplying private resources and even then, resources may tend to be variable. The presence of fracture zones in a locality may enhance the yields from any wells, but locating these zones can be difficult. Although hydraulic property information is very difficult to obtain in these areas, it can be assumed that the permeabilities of the bedrock are likely to be low.

The superficial deposits (although limited in extent) and peat are likely to contain groundwater at shallow depths. Flow would likely follow the topography of the surface and underlying bedrock. It is likely that this shallow groundwater is supporting GWDTEs including local watercourses, and maybe in hydrological connectivity with still water features (e.g. Lochan Airigh).

Ecology surveys have identified a number of terrestrial ecosystems which have the potential to be dependent on groundwater (See *Chapter 7: Aquatic Ecology (Volume 2: Main Report)* and *Figure 6.5 (Volume 3: Figures)* for further detail). For this assessment, any habitat that may be dependent on upwelling groundwater, groundwater flow, or a constant or seasonally high groundwater table (including perched) will be considered. *Chapter 6: Terrestrial Ecology (Volume 2: Main Report)* identifies areas as having values of Moderate, High or Moderate to High GWDTE potential. In summary the following areas have been identified as having potential GWDTEs:

- **The Headpond and Embankment** have a mixture of moderate (part only), moderate to high, high (part only) and high classified GWDTE. The majority of these are situated to the northwestern edge of the Headpond and Embankment. There are also a number of High classified GWDTEs along Allt Beochlich and tributaries.
- **Track from Loch Awe to Headpond** has a mixture of moderate, moderate to high and high potential GWDTE. The High potential GWDTE are mostly situated along Allt Beochlich and tributaries. There is also of high (part only) GWDTE situated along the bank of Loch Awe (NN 00870 15815).
- **Blarghour Wind Farm Access Track** has a number of high classified GWDTEs situated around the entrance from A819 (NN 08826 12453) as well as some isolated patches of GWDTEs along the track.
- **Inveraray** has an area of high, moderate to high and moderate GWDTE just south of the Upper Avenue (NN 08711 07960). There is also a moderate (part only) GWDTE situated along Loch Fyne (NN 08895 07433).

The majority of these GWDTE are situated around the northwest side of the proposed Headpond area (NN 03256 16310) and have been classed as High or Moderate. There are also a number of GWDTE located around Allt Beochlich (NN 01895 15524) which have been classed as Moderate, High or Moderate to High. However, as discussed within *Chapter 7: Aquatic Ecology (Volume 2: Figures),* it is likely that the majority of these GWDTE are ombrogenous (rain-fed) especially within the areas of blanket bog.

The whole study area is underlain by the Oban and Kintyre WFD groundwater body (ID: 150698) (Ref 11.28) designated under the RBMP for Scotland (Ref 11.29). This WFD groundwater body covers an area of approximately 2,663 km^2 and is currently classed as Good (2022, Cycle 3) (*Table 11.8*).

Table 11.8 Groundwater WFD Status (Ref 11.41)

RBMP Parameter	Oban and Kintyre groundwater body (ID: 150698) (2022) Cycle 3
Overall status	Good
Quantitative status	Good
Saline Intrusion	Good
Surface Water Interaction	Good
Water balance	Good
Chemical status	Good

RBMP Parameter	Oban and Kintyre groundwater body (ID: 150698) (2022) Cycle 3
Chem – Surface Water Interaction	Good
Specific pollutants	Good
Chromium	Good
Zinc	Good
Manganese	Good
Other Substances	Good
Nitrate	Good
Priority substances	Good
Cadmium	Good
Lead	Good
Drinking Water Protected Area	Good
Priority substances	Good
Atrazine	Good
Simazine	Good
Other Substances	Good
Epoxyconazole	Good
Nitrate	Good
General tests	Good
Priority substances	Good
Atrazine	Good
Simazine	Good
Trichloroethene	Good
Benzene	Good
Specific pollutants	Good
Chromium	Good
Other Substances	Good
Electrical Conductivity	Good
Epoxyconazole	Good
Nitrate	Good
Free Product	Good
Vinyl Chloride	Good
Water quality	Good

11.6.4 Surface Water Features

Surface water features (and their attributes) within the study area and extending to Loch Awe and Loch Fyne are described in this section. Under the WFD, 'water bodies' are the basic management units, defined as all or part of a river system or aquifer. Water bodies form part of larger 'river basin districts' (RBD), for which RBMPs are used to summarise baseline conditions and set broad improvement objectives. This baseline is presented by each water body, noting that some features are present within the catchments of designated WFD water bodies rather than being designated as a WFD water body in their own right. The baseline is also organised first by those water features and WFD water bodies that are within the Loch Awe catchment, before those that are in the Loch Fyne catchment.

As not all the watercourses in the study area are named, and some have multiple tributaries, each watercourse has been given a unique reference number. These can be seen on *Figure 11.1 Surface Water and Groundwater Receptors and Attributes – Wider Context (Volume 3 Figures)* and are referred to in the following baseline summary.

11.6.4.1 Loch Awe Catchment

Within the study area and the Loch Awe catchment there are the following water features. For smaller features we have given them a unique project specific reference (see in brackets below) which are present on *Figure 11.2a Surface Water and Groundwater Receptors and Attributes – Headpond Study Area* and *Figure 11.3a Surface Water and Groundwater Receptors and Attributes – Headpond Study Area* in *(Volume 3: Figures).*

Table 11.9 Summary of Catchment

Sub Catchment	Water Features
Loch Awe	Allt na Cuile Riabhaiche and tributaries (LA2)
	Allt a Chrosaid and small (unnamed) lochan (LA5)
	Allt na Dail Ferna (LA11)
	Allt na Fainge (LA12)
	Allt a' Ghreataidh (LA13)
	Allt Blarghour and tributaries (LA16)
Allt Beochlich and tributaries (LA6)	Loch Breac-liath (LA1)
	Lochan Airigh (LA7)
	Beochlich Lochan (LA8)
	Lochan Dubh (LA9)
	Lochan Romach (LA10)
Alt Mor and tributaries (LA14)	Unnamed Lochs (LA15)
Cladich River (LA17)	Keppochan River and tributaries (LA3)
	Archan River and tributaries (LA4)

The above water features and their attributes are described in more detail in the following sections.

11.6.4.2 Loch Awe

Loch Awe is a loch water body within the River Awe catchment of the Scotland RBD (ID: 10085) (Ref 11.30). The Loch covers an area of around 38.5 km^2 making it the third largest freshwater loch in Scotland. At approximately 41 km in length, it is also the longest freshwater loch in Scotland. The Loch is aligned on a southwest to northeast axis typically 1 km wide, with two arms at the northeast end on either side of the northern basin. The eastern arm extends to the mouth of the River Orchy, which is the largest single fluvial input to the Loch (i.e. around 40% of the Loch's catchment and with an estimated daily mean flow of around 31 m^3/s). The western arm ends at the Loch Awe Barrage and the start of the River Awe, that drains the Loch to the sea. The Loch Awe Barrage is operated by Scottish and Southern Electricity (SSE) who control water levels in order to provide water storage for hydroelectric power generation at Inverawe Power Station. Balliemeanoch Hamlet and the Development is located approximately in the middle on the southern bank of the Loch.

According to '*The Ecology of Scotland's Largest Lochs'* (Ref 11.43), Loch Awe reaches to a maximum depth of around 94 m in the southwest of the Loch southwest of Eredine (southern basin). A second smaller distinct basin is located between Cladich and Loch Awe in the northeast and has a maximum depth of around 75 m (i.e. the northern basin). Between the southern and northern basins, and for more than half the Loch's total length, the Loch bed is undulating but typically does not exceed around 50 m depth. These basins and depressions can also be visualised with Ordnance Survey Maps (Ref 11.15).

Loch Awe is isothermal from late autumn to spring each year, thereafter there is development of stratified conditions until the following autumn (Ref 11.43). Therefore, it is classed as a monomictic loch (i.e. overturning once a year; mixing fully from late autumn and being thermally stratified during the warmer summer months). However, according to Tippett (1978) (Ref 11.44) where water depths are only 25 m deep thermal stratification does not occur.

The depth of the upper limit of thermocline is around 11 m and its maximum development is around June and July. At the surface the temperature of the Loch is around 15°C in the summer and around 3.4°C in the winter. It has also been noted that during the winter, Loch Awe water temperatures can drop to around 3.4˚C, although no inverse stratification has been observed (Ref 11.43).

Tippett (1978) (Ref 11.44) investigated the potential impact of the Cruachan pump-storage hydro scheme shortly after it was constructed on Loch Awe, including thermal stratification and therefore water quality and planktonic communities. It was observed that the additional mixing due to water exchange with the Headpond resulted in a local deepening of thermocline and sharpening of the metalimnion early in the season. However, this effect waned later in the summer as the surface water warmed in response to more intense incident sunlight, and the overall depth of the epilimnion deepened. The epilimnion in the northern basin ranged from 8 m early in the summer to up to 18 m towards the end of July.

Chemistry data was requested for Loch Awe from SEPA (requested July 2023), but at the time of writing nothing has been received. However, in *'The Ecology of Scotland's Largest Lochs'* some basic chemistry information was available, see *Table 11.10*. Overall, with a very low conductivity and chemical concentrations it is suggested that Loch Awe is an oligotrophic loch (Ref 11.43). However, Loch Awe has still had a history of algal blooms which is discussed further at *Table 11.10*.

Table 11.10 Chemistry data from Table 4.4 in *The Ecology of Scotland's Largest Lochs* (Ref 11.43)

Parameter	Unit	Mean value from November 1977 to October 1978 (Ref 11.43)
pH	pH units	6.9
Conductivity	μS/cm at 20˚C	41
Alkalinity (as $CaCO_3$)	mg/l 1^{-1}	8.97
Calcium	mg/l 1^{-1}	4.01
Magnesium	mg/l 1^{-1}	0.99
Sodium	mg/l 1^{-1}	4.47
Potassium	mg/l 1^{-1}	0.27

The water body is designated under the WFD as a heavily modified water body due to morphological (impoundment) pressures for hydropower power generation, which cannot be addressed without a significant impact on water storage for hydroelectricity generation. The overall status of the water body has remained as Moderate Ecological Potential between 2015 to 2022 (*Table 11.11 Loch Awe WFD quality (Ref 11.41)*), as not all mitigation/improvement measures have been implemented. However, the overall ecological status is currently Poor, and has been since 2011. The chemical status of Loch Awe is Good (since 2014). The hydromorphology of Loch Awe is also classed as Poor, with the overall hydrology of the water body being classed as Poor (Ref 11.41).

Table 11.11 Loch Awe WFD quality (Ref 11.41)

River Basin Management Plan (RBMP) Parameter	Loch Awe (2022) (Cycle 3)
Overall status	Moderate ecological potential
Pre-HMWB status	Poor
Overall ecology	Poor
Physico-Chem	Good
Dissolved Oxygen	High
Total Phosphorus	Good
Salinity	High
Acid Neutralising Capacity	High
Biological elements	Moderate
Alien species	Good
Fish	Good
Fish ecology	Good
Fish barrier	High
Aquatic plants	Moderate
Phytoplankton	High

River Basin Management Plan (RBMP) Parameter	Loch Awe (2022) (Cycle 3)
Other aquatic plants	Moderate
Macrophytes	Moderate
Specific pollutants	Pass
Ammonium	Pass
Hydromorphology	Poor
Morphology	Moderate
Overall hydrology	Poor
Water quality	Moderate

There are two existing hydro-electric power (HEP) developments operating on Loch Awe. SSE operate the 30.5-megawatt (MW) Inverawe Power Station, which abstracts water from the River Awe Barrage. The other development is the Cruachan Power Station, a 440 MW pumped storage scheme operated by Drax and located at the centre of the east and west arms of the northern basin. In 2023 a Section 36 of the Electricity Act 1989 application was granted for a second power station at Loch Awe ('Cruachan Expansion') which would add a further 600 MW generating capacity.

A review of online aerial photography has identified a fish farm approximately 10 km southwest of the proposed abstraction and discharge point of the Development into Loch Awe just south of Balliemeanoch. This fish farm is Braevallich Fish Farm, operated by MOWI. Elevated phosphorus levels from freshwater fish farming have been identified by SEPA as a pressure on this water body, although measures have been put in place to resolve this by 2024.

Loch Awe is also an important water body for tourism and recreation, including scenic views and heritage. Boats, kayaks and canoes can be hired, and although it is not a designated bathing water, it is known to be popular for wild swimming. Migrating salmon also pass through the Loch, and it is an important location for trout fishing with the season running from the 15th of March to the 6th of October each year (Ref 11.47).

11.6.4.3 Water Features in the Loch Awe Catchment

Within the Loch Awe Catchment, the majority of water features drain directly into Loch Awe. However, there are two sub-catchments; Allt Beochlich (LA7) and Cladich River (LA17) which also capture a number of watercourses and lochans. Loch Breac-liath (LA1), Lochan Airigh (LA7), Beochlich Lochan (LA8), Lochan Dubh (LA9) and Lochan Romach (LA10) all drain into Allt Beochlich (LA7) then towards Loch Awe. Keppochan River (LA3) and Archan River and tributaries (LA4) both flows towards the Cladich River (LA17).

From the site walkover on the 9th and 10th of August 2023, it was observed that Allt Beochlich has a predominantly steep, stable bedrock typology, with a series of waterfalls and numerous smaller steps and pools. In lower gradient reaches, coarse sediment depositional features were noted, which were comprised of gravel and cobbles (Photo 11-1). Historic maps indicate that the watercourse has remained very stable over time, with only minor changes to planform notable (Ref 11.46). Sediment transport is disrupted by the presence of the Allt Beochlich hydro scheme, including a storage reservoir, which has been operational since 1998 (Ref 11.45).

Smaller watercourses have similar geomorphological characteristics to the Allt Beochlich, with generally steep gradients, bedrock or step pool typology with some coarse sediment deposits including gravel and sand sized material.

Two water samples were collected (at NN 02518 15125 and NN 04199 16152) during the Development Site walkover and sampling. Both appeared to have clear water with a slight brown tinge reflective of the humic acids leached from peat rich soils, with no odour. More details of the site walkover can be found in *Appendix 11.1 Water Quality Monitoring and Site Walkover*.

The current flows and velocity of Allt Beochlich and surrounding water features is unknown. However, it is likely that flows are similar to Abhainn a'Bhealaich at Braevallich, which has Q95 flows of around 0.09m^3/s (see *Chapter 13 Water Resources* for more details). The catchment at Abhainn a'Bhealaich is similar to other ungauged catchments in the area, including Allt Beochlich.

Photo 11-1 Images of Allt Beochlich (LA6) at NGR NN 03806 15879 facing southeast (left) and NGR NN 04124 16081 facing northeast on the 9th and 10th of August.

Allt Beochlich also has a number of lochans, and tributaries associated with them which are included in *Table 11.9*. *Table 11.13* displays a list of the water features found within the Loch Awe Catchment alongside their national grid reference (NGR), a description summary, location to the Development and whether they have been scoped in or out for further assessment.

This includes Lochan Airigh (LA7) and Beochlich Lochan (LA8), which can be viewed on Photo 11-2 and Photo 11-3. Lochan Airigh is a small lochan with an area of approximately 24,000 m^2. From the site visit on the 9th and 10th of August 2023, the Lochan was observed to have gravel, sand and cobbles on the base on the Lochan with clear water and with no submerged/floating macrophytes and just small amount of emergency plants in the littoral zone. From Lochan Airigh there is a small watercourse which exits the Lochan at NGR NN 04241 16359 and flows into Allt Beochlich at NGR NN 04202 16148.

Beochlich Lochan is an artificial/heavily modified lochan and located online with Allt Beochlich. The timeframe of its creation was unavailable on satellite imagery and on historic maps. It was observed from the Development Site walkover to have a silty base with clear water and with no submerged/floating macrophytes and just small amount of emergency plants in the littoral zone. It has an area of approximately 30,000 m^2 and on the western side is dammed with a small hydro scheme. During the time of the site walkover on the 9th and 10th of August 2023 the Lochan appeared to be drawn down. More details on the Development Site walkover can be viewed in *Appendix 11.1 Water Quality Monitoring and Site Walkover.*

Photo 11-2: Beochlich Lochan (LA8) at NGR NN 02900 15396 facing east on the 9th of August

Photo 11-3: Lochan Airigh (LA7) at NGR NN 04250 16351 facing north on the 9th of August

There are three WFD classified watercourses found within in the Loch Awe catchment, these include Allt Beochlich (ID: 10275), Allt Blarghour (ID: 10274) and Cladich River (ID: 10281) (LA6, LA16 and LA17 on *Figure 11.1 Surface Water and Groundwater Receptors and Attributes – Wider Context (Volume 3 Figures)).* Allt Blarghour is approximately 8.5 km in length, Allt Beochlich is 7.7 km long and Cladich River is 13.1 km long. Cladich River has also been classified as a heavily modified water body due to a water storage hydropower scheme.

Table 11.12 Loch Awe Catchment Rivers WFD Quality (Ref 11.41)

River Basin Management Plan (RBMP) Parameter	Allt Blarghour (2022) Cycle 3	Allt Beochlich (2022) Cycle 3	Cladich River/Allt an Stacain (2022) Cycle 3
Overall status	Moderate	Moderate	Moderate
Pre-HMWB status	Moderate	Moderate	Moderate
Overall ecology	Moderate	Moderate	Moderate
Physico-Chem	Good	Good	n/a
Temperature	High	High	n/a
Reactive phosphorus	High	High	n/a
Dissolved Oxygen	High	High	n/a
Acidity	Good	Good	n/a
pH	Good	Good	n/a
Biological elements	Good	Good	High
Invertebrate animals	Good	Good	n/a
Macroinvertebrates (RiCT/WHPT)	Good	Good	n/a
Macroinvertebrates (ASPT)	Good	Good	n/a
Macroinvertebrates (NTAXA)	High	High	n/a
Fish	High	High	High
Fish barrier	High	High	High
Hydromorphology	Moderate	Moderate	Moderate
Morphology	High	High	High
Overall hydrology	Moderate	Moderate	Moderate
Modelled hydrology	Poor	Poor	Bad
Hydrology (medium/high flows)	Poor	Poor	Bad
Hydrology (low flows)	High	High	Bad
Ecological indicators	n/a	Pass	Pass
Water quality	Good	Good	n/a

Table 11.13 displays a list of the water features found within the Loch Awe Catchment alongside their national grid reference (NGR), a description summary, proximity to the Development and whether they have been scoped in or out for further assessment. All water features listed below will be assessed, including scoped out features, during pre-construction surveys to identify any other flow pathways not identified below. All features will be mitigated against all temporary construction impacts through the implementation of CEMP and the oWMP *(Appendix 11.5 (Volume 5: Appendices)).*

Table 11.13 Surface Water Bodies Within the Loch Awe Catchment (Ref 11.41)

Loch Awe Catchment	ID as labelled in Figure 11.1, 11.2a and 11.3a	NGR	Description Summary	Direction and Distance to the Development	Scoped in/out and justification
Loch Awe	N/A	NN 00437 16188	A loch water body within the River Awe with an area of 38 km^2. Important for migratory Atlantic salmon, brown trout and other fish species.	All water features within the Main Area drain into Loch Awe. There is a Tailpond inlet / outlet where water will be abstracted and discharged.	**Scoped In** Proximity to works
Loch Breac-liath	LA1	NN 03446 16419	Small lochan approximately 16,000 m^2. Small watercourse drains from LA1 to LA11 in a southwestern direction. This lochan is a part of the Allt Beochlich (LA6) catchment area.	200 m upgradient of proposed Embankment and 270 m, 300 m and 400 m downgradient of PC17, PC18 and PC19.	Scoped Out No identified flow paths
Allt na Cuile Riabhaiche and tributaries	LA2	NN 06346 19768	Watercourse to the northeast of the Headpond with approximately six tributaries. Drains into Loch Awe and is sourced from approximately NN 04467 17403.	Tributaries cross the Upper Sonachan / Keppochan Forest track that will be used for access.	**Scoped In** Permanent works to existing or new Access Track and any temporary pollution risks associated with that.
Keppochan River and tributaries	LA3	NN 07270 19990	Watercourse to the northeast of the Headpond flowing into the Archan River (LA4) at NN 08243 20949. Sourced from approximately NN 06805 18264.	Crosses the Upper Sonachan / Keppochan Forest track that may be used for access.	**Scoped In** Permanent works to existing or new Access Track and any temporary pollution risks associated with that.
Archan River and tributaries	LA4	NN 08466 20254	Sourced from NN 07567 19267 and drains into the Cladich River which then flows into Loch Awe.	Crosses the Upper Sonachan / Keppochan Forest track that may be used for access	**Scoped In** Permanent works to existing or new Access Track and any temporary pollution risks associated with that.
Allt a Chrosaid and small upstream (unnamed) lochan	LA5	NN 02937 16523	Sourced from a small lochan at NN 03543 16978 and drains into Loch Awe.	PC21 is situated 29.1 m south of LA5. Upgrade to the existing B840 crossing	**Scoped In** Permanent works to existing or new Access Track, permanent compound within 50m of feature. Temporary pollution risks associated with works.
Allt Beochlich and tributaries	LA6	NN 03502 15714	LA6 flows from Lochan Dubh (LA10) and into Beochlich Lochan	Situated within the Red Line Boundary, tributaries cross the	**Scoped In** Permanent change to catchment and

Loch Awe Catchment	ID as labelled in Figure 11.1, 11.2a and 11.3a	NGR	Description Summary	Direction and Distance to the Development	Scoped in/out and justification
			(LA8) with approximately 11 tributaries flowing into LA6 including the tributary sourced from LA8. From Beochlich Lochan (LA8), the watercourse flows into Loch Awe.	proposed Access Track and temporary works area. LA6 and tributaries are within the proposed Headpond, and Embankment locations thus will be lost to the Development. Compensation flow will be provided downstream of Headpond.	temporary pollutions risks associated
Lochan Airigh	LA7	NN 04278 16440	LA7 is a small lochan with 23,700 m^2 area. On the site visit it was observed to have gravel and cobbles on the base on the lochan and to have clear water.	Situated within the location of the proposed Headpond, thus will be lost to the Development	**Scoped In** Permanent removal of lochan. Temporary pollutions risks associated
Beochlich Lochan	LA8	NN 03030 15414	LA6 drains into LA8 at NN 03136 15420 and is dammed on the western end at NN 02926 15391 where a small hydropower scheme is situated.	TC07 will be located 33.2 m upgradient of LA8. PC09 is situated upstream of lochan. Construction of the Headpond and associated activities are within the catchment.	**Scoped In** Permanent works to existing or new Access Track. Temporary pollution risks associated with works.
Lochan Dubh	LA9	NN 06699 16031	Situated north of the Headpond area, LA6 is sourced from the lochan (LA9). It has an area of approximately 70,000 m^2.	Situated 1300 m upstream of Headpond area	Scoped Out More than 1000 m upstream from proposed works.
Lochan Romach	LA10	NN 02811 15735	Small lochan with an area of 23,800 m^2	PC20 and Access Track crossing situated 100 m upstream of LA10.	**Scoped In** Permanent works to new Access Track. Temporary pollution risks associated with works.
Allt na Dail Ferna	LA11	NN 04325 17712	Sourced from NN 04274 17563 and drains into Loch Awe. There are approximately five tributaries.	200 m downgradient of PC13	Scoped Out No Flow Paths identified
Allt na Fainge	LA12	NN 01216 16501	Drains into Loch Awe and is the convergence of two unnamed watercourses which are sourced from NN 02669 16737 and NN 01721 16753 respectively.	Upgrade to the existing B840 crossing	**Scoped In** Permanent works to existing or new Access Track. Temporary pollution risks associated with works.
Allt a' Ghreataidh	LA13	NN 01200 16313	Drains to Loch Awe and is sourced from NN 01721 16753	Upgrade to the existing B840 crossing	**Scoped In** Permanent works to existing or new Access Track.

Loch Awe Catchment	ID as labelled in Figure 11.1, 11.2a and 11.3a	NGR	Description Summary	Direction and Distance to the Development	Scoped in/out and justification
					Temporary pollution risks associated with works.
Alt Mor	LA14	NN 01160 16630	Drains to Loch Awe and is sourced from an unnamed loch at NN 03598 17435 (LA16).	Upgrade to the existing B840 crossing	**Scoped In** Permanent works to existing or new Access Track. Temporary pollution risks associated with works.
Unnamed Lochs	LA15	NN 03507 17306	Three unnamed lochs, one having the largest area of 18,000 m^2	LA15 270 m downgradient of PC19	Scoped Out No identified flow paths
Allt Blarghour	LA16	NN 02500 13006	Approximately 8.5 km in length and is sourced from the south of Cruach Mhor and flows into Loch Awe near Blarghour.	The proposed Blarghour Wind Farm extension access route, which may be used for the Development	Scoped Out Blarghour Wind Farm extension not considered in this assessment
Cladich River/Allt an Stacain	LA17	NN 09638 22424	Heavily modified river sourced from Lochan Sron Mor and flows into Loch Awe.	600 m downstream of Sonachan / Keppochan Forest track that may be used for access. But may be affected by any impacts to LA3 and LA4 as they are hydraulically linked.	**Scoped In** By indirect water quality and temporary risks from LA3 and LA4
Unnamed Water course	LA18	NN 01125 15692	Small stream sourced from approximately NN 01190 15648 and flows into Loch Awe at NN 00726 15673	Upgrade to the existing B840 crossing	**Scoped In** Permanent works to existing or new Access Track. Temporary pollution risks associated with works.

11.6.4.4 Loch Fyne Catchment

Within the study area and the Loch Awe catchment there are the following water features (with project specific reference in brackets). See *Figure 11.1 Surface Water and Groundwater Receptors and Attributes – Wider Context (Volume 3: Figures).*

Table 11.14 Summary of Catchments within Loch Fyne

Sub Catchment	Water Features
Loch Fyne	Crom Allt and tributaries (LF2)
River Aray and tributaries (LF1)	Allt Riabhachan (LF3)
	Allt Bail' a' Ghobhainn (LF4)
	Erallich Water (LF5)
	Allt Phàruig (LF6)

The above water features and their attributes are described in more detail in the following sections.

11.6.4.5 Loch Fyne

Loch Fyne is a sea loch off the Firth of Clyde and forms part of the coast of the Cowal Peninsula. Loch Fyne is both the longest and the deepest of Scotland's sea lochs, with a length of approximately 70 km and a maximum depth of around 185 m (Ref 11.15). Water depths are in excess of 130 m off Inveraray in the upper loch, becoming shallower (i.e. < 50 m) in the lower loch, before deepening again as the Loch widens south of Castleton (Ref 11.48). *Chapter 8 Marine Ecology* and *Chapter 18 Marine Physical Environment and Coastal Processes (Volume 2)* provide more details on marine ecology and physical processes in Loch Fyne, with these topics only summarised in this section where they are relevant to the water quality assessment.

From the site walk walkover conducted on the 9th and 10th of August 2023 and a review of online Ordnance Survey maps and aerial imagery (Ref 11.15), the main water features located within the study area and the Loch Fyne catchment have been identified in *Table 11.17*.

Loch Fyne is a WFD designated water body with a Good Overall status (2022) Cycle 3 (*Table 11.15*). The upper Loch Fyne is a marine protected area which is designated for the protection of flame shell beds (*Limaria hians*), horse mussel (*Modiolus modiolus*), and ocean quahog (*Arctica islandica*). It is also a designated shellfish water and supports migratory fish like salmon and sea trout. The Loch also has marine mammals such as bottlenose dolphins and harbour seals which sometimes temporarily visit (See *Chapter 8 Marine Ecology* for more details).

Table 11.15 Loch Fyne WFD Classification (Ref 11.41)

River Basin Management Plan (RBMP) Parameter	Loch Fyne (2022) Cycle 3
Overall status	Good
Pre-HMWB status	Good
Overall ecology	Good
Physico-Chem	High
Dissolved Oxygen	High
Dissolved inorganic nitrogen	High
Biological elements	Good
Invertebrate animals	Good
Benthic invertebrates (IQI)	Good
Alien species	Good
Macroalgae	Good
Macroalgae (FSL)	Good
Macroalgae (RSL)	Good
Phytoplankton	High
Specific pollutants	Pass
Unionised ammonia	Pass
Hydromorphology	High
Morphology	High
Water quality	Good

11.6.4.6 Water Features in the Loch Fyne Catchment

The majority of watercourses within the Loch Fyne catchment drain into River Aray (*Photo 11-4*), this includes Erallich Water, Allt Riabhachan, Allt Bail' a' Ghobhainn and Allt Phàruig. The River Aray is approximately 13.4 km in length and is sourced NGR NN 08442 19859 and drains into Loch Fyne. From the Development Site surveys conducted in August 2023 it was noted that River Aray is a relatively wide river (approximately 20 m wide). The river appears to have been historically modified through straightening, embanking and the construction of several weirs which remain in place in the present day. Coarse sediment deposition was noted downstream of the minor road crossing adjacent to Garden Cottage. Depositional features are dominated by gravel and cobble sized material. Upstream of the bridge, this reach of the river is straight, wide and with a uniform bed profile. Downstream of the bridge, the river has a more natural form. There is no gauge situated on the River Aray, therefore no reliable Q95 data. Using gauges in the surrounding area with rivers with similar catchments, the river is assumed to a Q95 value of around 0.2 to 0.4 m^3/s.

The Erallich Water (*Photo 11-5*) has a steep, stable, bedrock typology, with numerous stable boulders. According to OS maps (Ref 11.15), Erallich Water has around 12 tributaries including Allt nan Ord, Allt an t-Sluichd and Allt Criche. OS Maps also note a number of waterfalls on some of the upstream tributaries (Ref 11.15).

Allt Riabhachan, Allt Bail' a' Ghobhainn and Allt Phàruig are smaller watercourses. Allt Riabhachan includes a number of lochans upstream such as at NGR NN 07082 09158, NN 07696 08713 and NN 06151 08142.

Crom Allt and tributaries (LF2) is a series of small drains and watercourses situated to the west of Inveraray and which flow directly into Loch Fyne.

Photo 11-4: A left and B right: Images of River Aray taken on the 9th of August 2023 at NGR NN 09165 09859. A looks upstream and B looks downstream towards the minor road bridge.

Photo 11-5: Image of Erallich Water at NGR NN 07790 11867 27th of September 2023 taken during an aquatic ecology survey looking downstream.

The River Aray (ID: 10224) (LF1) (*Photo 11-4*) and Erallich Water (ID: 10225) (LF5) have been classified as having an overall Moderate Ecological Status (2022). *Table 11.16* provide details of the latest WFD classification (2022) for these water bodies (Ref 11.41).

Table 11.16 Loch Fyne Catchment WFD Quality (Ref 11.41)

River Basin Management Plan (RBMP) Parameter	River Aray (2022) Cycle 3	Erallich Water (2022) Cycle 3
Overall status	Moderate	Moderate
Pre-HMWB status	Moderate	Moderate
Overall ecology	Moderate	Moderate
Physico-Chem	Good	Moderate
Temperature	High	n/a
Reactive phosphorus	High	n/a
Dissolved Oxygen	High	n/a
Acidity	Good	n/a
pH	Good	n/a
Biological elements	Moderate	n/a
Invertebrate animals	High	n/a
Macroinvertebrates (RiCT/WHPT)	High	n/a
Macroinvertebrates (ASPT)	High	n/a

River Basin Management Plan (RBMP) Parameter	River Aray (2022) Cycle 3	Erallich Water (2022) Cycle 3
Macroinvertebrates (NTAXA)	High	n/a
Fish	Moderate	Moderate
Fish ecology	Moderate	Moderate
Fish barrier	High	High
Hydromorphology	Good	High
Morphology	Good	High
Overall hydrology	Good	High
Modelled hydrology	Good	High
Hydrology (medium/high flows)	High	High
Hydrology (low flows)	Good	High
Water quality	Good	n/a

Table 11.17 displays a list of the water features found within the Loch Awe Catchment alongside their national grid reference (NGR), a descriptive summary, proximity to the Development and whether they have been scoped in or out for further assessment. All water features listed below will be assessed, including scoped out features, during pre-construction surveys to identify any other flow pathways not identified below. All features will be mitigated against all temporary construction impacts through the implementation of CEMP and the oWMP *(Appendix 11.5 (Volume 5: Appendices)).*

Table 11.17 Surface Water Bodies Within the Loch Fyne Catchment

Loch Fyne Catchment	ID	NGR	Description Summary	Direction and Distance to the Development	Scoped in/out
Loch Fyne	N/A	NN 09845 07941	Sea loch off the Firth of Clyde, forming part of the coast of the Cowal Peninsula. Loch Fyne is both the longest and the deepest of Scotland's sea lochs, with a length of approximately 70 km and a maximum depth of around 185 m.	Jetty to be for the delivery of materials and equipment located within Loch Fyne	**Scoped In** This chapter considered water quality impacts. Physical impacts are assessed within *Chapter 8: Marine Ecology* and *Chapter 18: Marine Physical Environment and Coastal Processes* (Volume 2)
River Aray and tributaries	LF1	NN 09003 10169	Approximately 13.4 km in length, sourced north of Loch Fyne around NN 08442 19859. It drains into Loch Fyne at NN 09809 09049. LF1 has approximately 13 tributaries which drain into it.	Proposed road upgrades cross the River Aray at NN 09165 09855.	**Scoped In** Permanent works to existing Access Track. Temporary pollution risks associated with works.
Crom Allt and tributaries	LF2	NN 08592 07409	A small drain sourced from NN 07391 07522 with around five ditches/watercourses flowing into it.	Temporary works and proposed Access Tracks cross part of Crom Allt at NN 08415 07691	**Scoped In** Permanent works to existing or new Access Track. Temporary pollution risks associated with works. Within the vicinity of jetty works.
Allt Riabhachan	LF3	NN 08433 09902	A tributary to River Aray, forms at the convergence of two watercourses. One is sourced from a lochan at NN 05600 07946 and passes through two other lochan at NN 06082 08126 and NN 07670 08698. The other is sourced at NN 06377 09325 and passes through one lochan at NN 07065 09119.	Application Boundary is situated 275 m downstream of the receptor.	Scoped Out Due to distance between the works and the receptor and no known flow pathways.
Allt Bail' a' Ghobhainn	LF4	NN 08308 10695	A tributary to River Aray and is sourced at NN 05424 09119.	Application Boundary is 650 m downstream (south) and 1100 m north (upgradient).	Scoped Out Due to distance between the works and the receptor and no known flow pathways.

Loch Fyne Catchment	ID	NGR	Description Summary	Direction and Distance to the Development	Scoped in/out
Erallich Water	LF5	NN 08926 12373	Rises from around NN 03063 10620 and drains in River Aray at NN 08926 12373. LF5 is approximately 8.4m in length and has multiple tributaries flowing into it.	Situated within red line boundary and approximately 150 m south (downstream) of the Blarghour Wind Farm Access route. However, has a number of tributaries which cross the access route.	Scoped Out The Blarghour Wind Farm Access not considered in this assessment. This route will only be used for the Development if the Blarghour Wind Farm extension is consented.
Allt Phàruig	LF6	NN 09101 12612	A tributary to River Aray and is sourced at NN 10749 12759.	Situated 230 m east of the Application Boundary and proposed Blarghour Wind Farm Extension Access track.	Scoped Out All construction activity is situated to the west of the River Aray, while the Allt Phàruig is situated to the east so no known pathways.

11.6.4.7 Surface Water Quality

Appendix 11.1 displays the observational and laboratory results from the Development Site walkover conducted on the 9th and 10th of August 2023. Four water samples were collected from Beochlich Lochan, Loch Airigh and Allt Beochlich (upstream and downstream of Beochlich Lochan). In summary, the following points can be made:

- While on the Development Site, all samples were clear or clear with a slight brown tinge (reflecting humic acids leached from peat rich catchments) with no odour or evidence of pollution.
- Samples were compared to their corresponding Environmental Quality Standard (EQS) (Ref 11.42). All samples which had a EQS were below the level or were at their limit of detection.
- Each of the locations have a similar overall chemistry with a neutral pH and a relatively low electrical conductivity.
- Beochlich Lochan, Lochan Airigh and Allt Beochlich (downstream of Beochlich Lochan) all had a low turbidity ranging from <1.0 NTU to 1.2 NTU. While the sample collected from Allt Beochlich upstream of Beochlich Lochan was slightly higher at 4.8 NTU. Both river samples were recorded at <2 mg/l for Total Suspended Solids (TSS) while the loch samples had a slightly higher TSS measured as 3 mg/l, although in all cases this is very low.
- Biochemical Oxygen Demand (BOD) at the sampling locations was low between <1.0 mg/l to 1.2mg/l reflecting natural, unperturbed conditions.
- Dissolved Organic Carbon (DOC) ranged from 9 mg/l to 11 mg/l.
- Nitrate as NO3 at the sampling locations ranged between 0.71 mg/l to 0.76 mg/l, which is very low.
- Ammoniacal Nitrogen at the loch samples were measured as 22 µg/l, which is higher than at Allt Beochlich which was measured at 15 µg/l, although both are relatively low.
- All semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), Petroleum Hydrocarbons, Monoaromatics and Oxygenates were below their limit of detection.
- The majority of heavy metals arsenic, chromium, cadmium, lead, mercury and nickel are below their limit of detection.

Although a single water sample from each sampling location only provides a ‘snapshot’ of water quality at the time it was taken, including the flow conditions, and the suite of analysis was for key parameters only, as a whole the data suggest the quality of water in water features in the study area is generally very good and unpolluted, as would be expected in a rural, upland area such as this.

SEPA has three non-routine water quality monitoring points located close on Cladich River, and the western and eastern tributaries to Cladich River. These samples were collected in 2017 and show the water chemistry to be similar to the samples collected in August 2023 for nearby water features. The results are summarised in *Table 11.18* and these locations can be viewed in *Figure 11.1 Surface Water and Groundwater Receptors and Attributes – Wider Context (Volume 3 Figures)*. Concentrations of chloride were slightly higher and there were higher values recorded for BOD, nitrate, total phosphorous, ammoniacal nitrogen and Total Dissolved Solids (TDS) than in the limited data collected for this baseline, suggesting that this watercourse may be more affected by discharges of treated sewerage or diffuse agricultural pollutants in surface water runoff.

Table 11.18 SEPA Monitoring Locations on Cladich River and Tributaries

Description	Unit	SEPA.1 Western Tributary of Cladich River NN 09140 20701	SEPA.2 Eastern Tributary of Cladich River NN 09221 20711	SEPA.3 Cladich River Impoundment NN 09457 20944
Nitrite (as N)	mg/L	<0.007	<0.007	<0.007
Reactive Phosphorus (as P)	mg/L	<0.008	<0.024	<0.008
Ammoniacal Nitrogen (as N)	mg/L	<0.024	<0.148	<0.024
Total Phosphorus (as P)	mg/L	0.027	<0.148	0.0795
Nitrate (as N)	mg/L	<0.148	0.166	<0.148
Total Oxidised Nitrogen (as N)	mg/L	<0.148	0.351	<0.148
Biochemical Oxygen Demand - ATU suppressed	ATU	<2.8	5.48	6.54
Suspended Solids (105°C)	mg/L	3.2	14	6.9
Cadmium (filtered using 0.45µm membrane)	mg/L	6.28	19.4	7.6
Lead (filtered using 0.45µm membrane)	pH units	6.6	26	9.28
Chloride	mg/L	10.6	86	49.3
Chemical Oxygen Demand	mg/L	42.4	110	73
Electrical conductivity (at 20°C)	µS/cm	51.7	260	106

11.6.5 Environmental Impact Events

SEPA supplied information related to environmental impact events that occurred in Loch Awe and Loch Fyne in the past five years and details are provided in *Table 11.19*.

Table 11.19 Environmental Events

Event	Loch	Date	Description	Impact	Cause
ENV/0892170	Loch Awe	27/05/2018	Blue Green Algae	Category 3 - Minor	Naturally Occurring
ENV/0886903	Loch Awe	05/07/2017	Portsonachan Hotel sedimentation of water supply	Category 4 - other	Operational Failure
ENV/0886182	Loch Awe	29/05/2017	Blue Green Algae	Category 4 - other	Naturally Occurring
ENV/0889988	Loch Fyne	05/02/2018	Oil from Semples Inveraray overflowing into surface drain and into Loch Fyne	Category 4 - other	Other
ENV/0892935	Loch Fyne	26/06/2018	Brown effluent Leaching into ground causing algal bloom in ditch near Inveraray	Category 4 - other	Duty of Care

Data sources provided by SEPA also note that blue-green algal blooms have been an annual problem within Loch Awe. These are listed in *Table 11.20*, however, were not included in the list of environmental events provided by SEPA. This may be because they are observations from members of the public and so may not be classified as ‘events’.

Table 11.20 Blue-Green Algae Records

Date	Blue green recorded location
29th May 2021	Loch Awe

19th July 2021	Loch Awe
22nd July 2021	Loch Awe
25th July 2021	Loch Awe, Dalavich
15th October 2021	Loch Awe
30th May 2022	Loch Awe
23rd July 2022	Loch Awe
23rd June 2022	Loch Awe
28th August 2022	Loch Awe
29th September 2022	Loch Awe, Dalavich
29th November 2022	Lochaweside Cabins
12th June 2023	Loch Awe, Dalavich

11.6.6 Private Water Supplies (PWS)

Argyll and Bute Council supplied PWS data within the Site and surrounding area. The locations of these can be viewed on *Figure 11.1 Surface Water and Groundwater Receptors and Attributes – Wider Context (Volume 3 Figures)*, and full details and assessment of each of the PWS is presented in *Appendix 11.3 Private Water Supplies (Volume 5: Appendices).*

From the PWS assessment found in *Appendix 11.3 (Volume 5),* all PWS can be scoped out of further assessment. This is because they are either distant from the nearest works, situated along the Blarghour Wind Farm Access Track, which is not considered in this assessment as it is assumed to be constructed, or have no pathways present as identified in the PWS assessment in *Appendix 11.3 (Volume 5).*

11.6.7 Other Abstractions

There are a number of CAR abstraction licences situated within the 1 km Study Area (noting that Cruachan power station (CAR/L/1012107) is outside of this distance). They are summarised in *Table 11.21* and can be viewed in *Figure 11.2a Surface Water and Groundwater Receptors and Attributes – Headpond Study Area (Volume 3 Figures)* (note unique reference number in *Table 11.21*).

Table 11.21 SEPA CAR Abstraction Licences

Ref. (see Figure 11.2a)	Authorisation Number	Site	Authorisation Status Date	Site NGR
C1	CAR/L/1010507	Beochlich Hydro, Balliemeanoch, Dalmally, PA33 1BW	April 1, 2006	NN 01183 16536
C2	CAR/L/1115819	Allt Mor Hydro, Balliemeanoch	December 23, 2013	NN 01260 16820
C3	CAR/L/1115821	Allt a'Chrosaid Hydro, Balliemeanoch	December 23, 2013	NN 01190 16110

11.6.8 Aquatic Ecology and Protected Species

Information provided by SEPA indicates that there are several species present in the study area. *Table 11.22* shows that Atlantic salmon and brown trout were found in both River Aray (LF1) and Erallich Water (LF5).

A number of species including Atlantic salmon, brown trout, lampetra and arctic char were found within Loch Awe. Although brown trout, lampetra and arctic char are not considered protected species, they are included in Scotland's Biodiversity List and so therefore should be consideration when assessing the importance of features.

The non-native rainbow trout *Oncorhynchus mykiss* was also identified, although it is assumed specimens are escaped stocked fish or farmed fish, as there are no self-sustaining populations within Scotland.

Table 11.22 Fish Species (SEPA data) (Protected Species in Red[1])

Water feature	Survey	Species Found
Loch Awe	N/a	Stone loach, northern pike, three-spined stickleback, lampetra, rainbow trout, European perch, common minnow, common roach, Atlantic salmon, Brown trout and arctic char.
River Aray (LF1)	August 2018	Atlantic Salmon and brown trout
Erallich Water (LF5) (Scoped out of further assessment)	August and September 2018	

No protected macrophyte species were identified in the desk study. Species previously listed under the International Union for Conservation of Nature (IUCN) Red List are now all listed as Least Concern.

A number of invertebrates have been identified in Allt Beochlich and River Cladich, see *Table 11.23*. No macroinvertebrate species with national or local designation were identified within the study area.

Table 11.23 Invertebrates Species (SEPA data)

Water Feature/Course	Survey	Species Found
Allt Beochlich (LA7)	October 2014	Ecdyonurus, Heptageniidae, Rhithrogena semicolorata, Baetis rhodani, Paraleptophlebia submarginata, Dicranota, Leptophlebiidae, Chironomidae, Simuliidae, Oligochaeta, Polycentropus flavomaculatus, Chloroperla tripunctata, Protonemura meyeri, Leuctra, Hydraena gracilis
River Cladich (LA17)	June 2014	Serratella ignita, Hydropsyche siltalai, Riolus, Hydraena gracilis, Hydropsyche pellucidula, Baetis rhodani, Scirtidae, Simuliidae, Alainites muticus, Baetis scambus, Chironomidae, Empididae, Oligochaeta, Veliidae, Leptophlebiidae, Diura bicaudate, Paraleptophlebia, Ecdyonurus, Electrogena lateralis, Leuctra fusca, Leuctra, Isoperla grammatica, Lepidostoma hirtum, Rhyacophila dorsalis, Caenis rivulorum, Hydroptila, Elmis aenea, Oulimnius, Limnius volckmari, Hydroptilidae, Sericostoma personatum, Polycentropus flavomaculatus, Rhyacophila dorsalis, Caenis rivulorum, Lepidostoma hirtum, Mystacides, Ecdyonurus, Baetis rhodani, Simuliidae, Paraleptophlebia submarginata, Oligochaeta, Limnius volckmari, Chironomidae, Scirtidae, Gammarus pulex, Oulimnius tuberculatus, Lymnaea peregra, Protonemura praecox, Hydraena gracilis, Perlodes microcephala, Isoperla grammatica, Leuctra hippopus, Chloroperla tripunctata, Hydropsyche pellucidula, Hydropsyche siltalai

AECOM conducted a number of aquatic ecology surveys including Freshwater Pearl Mussel survey, eDNA surveys, macrophyte surveys, macroinvertebrate surveys, fish and fish habitat surveys. Further details can be found within *Chapter 7: Aquatic Ecology* (*Volume 2: Main Report*) and *Appendix 7.1 (Volume 5: Appendices).* From the results the following can be concluded:

- No optimal riverbed Freshwater Pearl Mussel habitat (boulder-stabilised deposits of clean sand) was observed at any of the surveyed sites;
- No rare or notable macrophyte species were recorded within any of the watercourses. The macrophyte communities encountered are considered to be of no greater than local nature conservation value;
- No rare or notable macrophyte species were recorded within either of the survey sites on Loch Awe, Lochan Airigh (LA7) or Lochan Breac-Laith (LA1);
- The majority of survey sites were classified as having Moderate conservation values for macroinvertabrates, while three sites (Erallich Water, Allt Beochlich and tributary of River Aray) received relatively high conservation values. The sites of Loch Awe received a Low conservation value at NGR NN 00683 15657, at the site of the inlet, and very high conservation value at NGR NN 07693 26840, near the confluence of Loch Awe and River Awe;
- Due to the high gradient, steep banks and the number of impassable barriers for migration throughout the catchment, migratory species including salmon, sea trout, sea lamprey and river lamprey are considered unlikely to be present and utilising the flowing water features for spawning throughout the west of the Site. Watercourses throughout the study area did contain brown trout. Atlantic salmon were also found in one watercourse Allt Criche, a tributary of Erallich Water (LF5); and
- There were two eDNA sampling locations for 2021 and 2023 for Loch Awe. Species found during these surveys included: european eel, carp, chub, stone loach, northern pike, minnow, roach, perch, rainbow

[1] Listed in Annex II of the Habitats Directive and in the Conservation (Natural Habitats, &c.) Regulations 1994 (Ref 11.49)

trout, Atlantic salmon and brown trout. Non-native rainbow trout is likely present due to the proximity of the sampling site to the fish farm, from which numerous escapes have been documented in the past.

11.6.9 Other Designations

The entire study area (excluding Loch Fyne) is within the Oban and Kintyre Groundwater Drinking Water Protected Area. These have been defined by the SEPA in line with the requirements of the Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013 to fulfil the requirements of the WFD. These are areas where land use is causing pollution of the raw water and action is being undertaken to reduce this risk to reduce the need for extra treatment of raw water.

There are no other designations (SSSI, SPA, Ramsar, SAC) within the study area.

11.6.10 Importance of Water Features

Table 11.24 shows the importance of the water features assessed from the above baseline information.

Table 11.24 Water Feature Receptor and their Importance

Water Feature	Water Quality Importance	Hydromorphology Importance
Loch Awe	**High Importance -** Classified as having a moderate WFD status. The Loch is a large water feature with relevance at the national scale. It has migratory fish passing through it, such as brown trout, arctic char and Atlantic salmon, which are either protected species or are on Scotland Biodiversity List, plus European eel was detected in eDNA sampling. However, the loch itself is not designated as a national or international nature conservation site. It is also not a designated bathing water, but is known to be popular for wild swimming and other recreational activities including water sports/fishing. There are also two other hydro developments drawing water from it or using it as a Tailpond, and a commercial fishery operated by MOWI in the southern basin. On balance, Loch Awe is considered to be of high importance for water quality.	**Medium Importance -** The Loch has a WFD classification of Moderate for morphology and is classified as a Heavily Modified Water body.
Loch Fyne	**High Importance -** Loch Fyne is both the longest and the deepest of Scotland's sea lochs. It is a marine protected area hosting species such as horse mussel, flame shell, and ocean quahog.	n/a
Bedrock Aquifer - Oban and Kintyre groundwater body	**Low Importance -** Essentially unproductive, with some minor fracture flow at shallow depths in the weathered zone.	n/a
Superficial Aquifers – Peat	**Medium Importance -** Supports a number of groundwater springs which supply PWS (see *Appendix 11.3 (Volume 5)*). Areas of wet heath, rushy marsh and wet woodland have also been identified on site walkovers as potential GWDTEs details of their location can be viewed in *Figure 6.5 (Volume 3)*. However, has been classified as medium importance as the aquifer does not cover the entirety of the site and the majority of GWDTE will likely be rain-fed rather than groundwater supported.	n/a
River Aray and tributaries (LF1)	**High Importance -** LF1 has moderate WFD classification and SEPA has also identified Atlantic salmon and brown trout within the water body, therefore giving the watercourse a High Importance	**High Importance -** LF1 conforms closely to a natural, unaltered state and exhibits well-developed and diverse geomorphic forms and processes characteristic of river type, with abundant bank side vegetation. Some reaches show deviation from natural conditions due to direct and/or indirect channel, floodplain, and/or catchment development pressures.
Crom Allt and tributaries (LF2)	**Low Importance -** A collection of small ditches and watercourses. Does not have its own WFD classification. Therefore, has been considered as Low Importance.	**Low Importance -** Minor, partly artificial watercourse.
Allt na Cuile Riabhaiche and tributaries (LA2)	**Low Importance -** A relatively small watercourse which drains into Loch Awe that does not have its own WFD status.	**Low Importance -** Minor, relatively unmodified watercourse.
Keppochan River and tributaries (LA3)	**Low Importance -** A relatively small watercourse which drains into the Archan River (LA4) and does not have its own WFD status.	**Low Importance -** Minor, relatively unmodified watercourse.

Water Feature	Water Quality Importance	Hydromorphology Importance
Archan River and tributaries (LA4)	**Low Importance -** A relatively small watercourse which drains into Loch Awe that does not have its own WFD status.	**Low Importance -** Minor, relatively unmodified watercourse.
Allt a Chrosaid and small lochan (LA5)	**Low Importance -** A relatively small water body which is a part of the Allt Beochlich catchment. The lochan does not have its own WFD status	**Low Importance -** Minor, relatively unmodified watercourse.
Allt Beochlich and tributaries (LA6)	**Medium Importance -** A Moderate status classified water body and supports a small hydro the Development (CAR/L/1010507). No salmon was found within the watercourse only brown trout. It also has an estimated Q95 flow of 0.09m^3/s.	**Medium Importance -** A relatively natural watercourse, however there are modifications in terms of the construction of a small artificial lochan and changes to the flow regime for a small 1 MW local hydro scheme that has an impact on the status.
Lochan Airigh (LA7)	**Low Importance –** A relatively small water body which is a part of the Allt Beochlich catchment. The lochan does not have its own WFD status	n/a
Lochan Beochlich (LA8)	**Low Importance -** A relatively small water body which is a part of the Allt Beochlich catchment. The lochan does not have its own WFD status. The water body is dammed at its western side, which is to support a small hydro scheme.	n/a
Lochan Romach (LA10)	**Low Importance -** A relatively small water body which is a part of the Allt Beochlich catchment. The lochan does not have its own WFD status.	n/a
Allt na Fainge (LA12)	**Low Importance -** A relatively small watercourse which flows into Loch Awe that does not have its own WFD status.	**Low Importance -** Minor, relatively unmodified watercourse.
Allt a' Ghreataidh (LA13)	**Low Importance -** A relatively small watercourse which flows into Loch Awe that does not have its own WFD status.	**Low Importance -** Minor, relatively unmodified watercourse.
Alt Mor (LA14)	**Medium Importance -** A relatively small watercourse that does not have a WFD status but does support an abstraction licence for the Alt Mor Hydro the Development (CAR/L/1115819).	**Low Importance -** A relatively natural watercourse, however, modifications for a small hydro scheme has an impacted on the status.
Cladich River/Allt an Stacain (LA17)	**Medium Importance -** Heavily modified river sourced from Lochan Sron Mor and flows into Loch Awe with a Moderate WFD classification.	**Medium Importance -** A relatively large watercourse which is heavily modified on account of hydrological impacts related to hydropower generation.
Unnamed Watercourse (LA18)	**Low Importance -** Small stream sourced from approximately NN 01190 15648 and flows into Loch Awe at NN 00726 15673.	**Low Importance -** Minor, relatively unmodified watercourse.

11.7 Assessment of Effects

This section presents the findings of the assessment for the construction/demolition phases and the operational phase. The approach to the assessment is based on the methodology set out earlier in *Section 11.5.*

11.7.1 Assessment of Construction Effects

During the construction phase there is the potential for adverse effects on the water environment from site run-off contaminated by excessive fine sediments (including the potential wash out of fine sediment from temporary spoil storage, Embankments, and Access Tracks), which may reduce water quality, smother habitats and physically impact aquatic organisms; chemical spillages; and physical changes to the form and function of water features as a consequence of:

- Vegetation clearance, topsoil/subsoil stripping and stockpiling.
- General construction activities including runoff and activities at temporary Construction Compounds, the movement of plant and other vehicles, and their maintenance and cleaning.
- Large scale earthworks including construction Embankments and use of large temporary material storage areas.

- Works in, over, under and adjacent to water features including construction of the Tailpond inlet / outlet in Loch Awe, temporary jetty in Loch Fyne, the Embankments and Headpond, and multiple watercourse crossings (as identified in *Appendix 11.4 (Volume 5: Appendices)* and in *Figure 11.3a: Surface Water and Groundwater Receptors and Attributes – Headpond Study Area* and *Figure 11.3b: Surface Water and Groundwater Receptors and Attributes – Loch Fyne Study Area (Volume 3: Figures)).*
- Excavation of tunnel portals and tunnelling of the Waterways, Access and Construction Tunnels.
- Temporary and permanent watercourse diversions and impoundments.
- Dewatering and abstraction operations for underground works.
- Excavation, crushing and transportation by overland conveyors of excavated materials to temporary stockpile locations.
- The batching and use of concrete and other cementitious products including the washing out of plant and equipment.
- Construction of temporary and permanent Access Tracks.

11.7.2 Effects on Groundwater

The high-pressure and low-pressure tunnels are to be constructed using drill and blast. The tunnels will be lined with either precast concrete, steel segments or reinforced shotcrete and this will prevent groundwater from entering the tunnels. Once constructed, the tunnel lining and the circular cross-sectional shape of the tunnels will allow groundwater to flow smoothly around them. The Power Cavern Complex is likely to be constructed using drill and blast techniques.

As shown on *Figure 2.11 Cross-section of Development (Volume 3: Figures)*, the depth of the low-pressure tunnel below existing ground level will range between approximately 20 mAOD at the Tailpond inlet / outlet end to approximately -50 mAOD (at its deepest point) at the Power Cavern Complex, after which the high-pressure tunnel starts and rises to approximately 350 mAOD into the Headpond. PC05, PC06 and PC14 will be used as the tunnel portal compounds.

The construction and ongoing presence of the tunnels have the potential to affect both shallow and deeper groundwater. However, as stated in the baseline there is only minor fracture flow within the Oban and Kintyre groundwater body. Therefore, it is unlikely that the bedrock aquifer will be impacted. Where individual fissures result in inflows, spray concrete will be used to seal the cavern walls. This process will unlikely cause any impacts to groundwater flow of the aquifer, as the aquifer has a low productivity and so there will unlikely be any abstraction/pumping required.

The portals for the construction and Access Tunnels are to be located along the Access Track. The portals will be constructed by excavation into the bedrock, and as such, it is not envisaged that sheet piling will be required.

The construction of the Headpond will require excavations down to bedrock, with the potential to interact with shallow groundwater. Any effects are likely to be temporary until the Headpond has been lined and filled, when the system will become 'effectively closed'.

There could be some small impacts from contaminated run-off from fuels, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances which might be stored and/or used on the Development Site infiltrating the aquifer. Main areas of risk include the Headpond area, underground tunnels and the Power Cavern Complex. However, as the aquifer has a low productivity and low permeability this is unlikely to be a major impact.

For the low importance Oban and Kintyre groundwater body, negligible adverse impacts are predicted from construction of Headpond, underground tunnels and the Power Cavern Complex, when considering the low productivity of the aquifer. Therefore, these construction works are predicted to result in a **negligible adverse effect (not significant)** for both water quality and groundwater flow impacts.

The construction tunnels, Waterways and Power Cavern Complex will be too deep to significantly impact the superficial aquifer. However, there may be some small impacts from contaminated run-off from fuels, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and/or used on the Development Site infiltrating the aquifer. In particular, at PC05, PC06 and PC14 where there will be a lot of activity to construct the portals and within the Headpond area where there will be a lot of earthworks. The Headpond area, PC06 and PC13 both also have potential GWDTE situated nearby. However, as mentioned earlier in this chapter, many of the identified GWDTE will likely be rainwater fed rather than by groundwater supported. The superficial aquifer is also not widespread across the Development Site, instead will be situated within small areas of peat, gravel and other superficial deposits. This, alongside Good Practice Mitigation outlined in Section 11.9, any contaminated run-off from any of the works will not be widespread, resulting in a low adverse impact. Therefore, for the medium importance superficial aquifer there is a short term and temporary **minor adverse effect (not significant).** Direct impact and effects concerning the GWDTE are assessed in more detail in *Chapter 6: Terrestrial Ecology (Volume 5: Main Report).*

As mentioned, the superficial aquifer is not widespread across the Development Site. Therefore, works will unlikely have any impact to groundwater flow within the medium importance superficial aquifer, and only a negligible adverse impact is predicted, resulting in a **negligible adverse effect (not significant).**

As mentioned, the superficial aquifer is not widespread across the site. Therefore, works will unlikely have any impact to groundwater flow within the medium importance superficial aquifer resulting in a Negligible impact, and thus a **negligible adverse effect (not significant).**

11.7.3 Effects to Surface Water Quality

11.7.3.1 Construction Site Run-off - Excess Fine Sediments

The water environment and the flora and fauna that it supports may be adversely affected by excessive fine sediment contained within construction site run-off, dewatering activities or from works directly affecting water features. Run-off laden with fine sediment is principally generated by rainfall falling onto land that has been cleared of any vegetation where the ground may be compacted, reducing infiltration. Surface water runoff from the temporary compound areas, Headpond, stockpiles, Access Tracks and mud deposited on the main road accesses to the Development Site are also all potential sources. Other potential sources of fine sediment contaminated water include that which is generated by the construction activities themselves (e.g. vehicle washing), debris from the use of overland conveyors to move spoil from below ground works to temporary stockpile locations, dewatering of excavations, and from works directly within water features themselves.

Generally, excessive fine sediment in run-off is chemically inert and affects the water environment through smothering riverbeds and plants, temporarily changing water quality (e.g. increased turbidity and reducing photosynthesis), and by causing physical and physiological adverse impacts on aquatic organisms (e.g. abrasion, irritation etc.). However, where powdered grouts and cements are used this may also contaminate site run-off if not carefully used and may result in significant changes in pH and have other toxic effects on fauna and flora (for example, cement is quite high in chromium). Sediment in run-off may also be a vector for other chemicals, with hydrocarbons known to have a high affinity to adsorb to the surface of sediment particles, although the risk of chemical spillages is primary considered separately in the next section. In addition, sediment-laden run-off also has the potential to impact fish (e.g. Atlantic salmon and lamprey) present in any watercourses. However, whilst the presence of protected fish species is considered in the importance setting of water features such as Loch Awe, any potential impact on fish such as Atlantic salmon (e.g. direct mortality or physical injury and disruption of their migratory pathway) is considered in *Chapter 7: Aquatic Ecology*.

Section 11.8 provides details of the embedded mitigation measures that are taken into account in this initial impact assessment. This includes the implementation of good practice, standard pollution prevention measures that will be described in a Construction Environmental Management Plan (CEMP), Water Management Plan (WMP) and Sediment Management Plan (SMP). An outline WMP (oWMP) is provided in *Appendix 11.5 (Volume 5: Appendices).*

The risk of water pollution depends on many factors such as the type of development, its location, the timing and duration of the works, and any measures that are implemented to provide mitigation. The risk will also vary at different times during the works and locations across the Development Site. This is a reason why the oWMP (See *Appendix 11.5, (Volume 5: Appendices)*) does not prescribe measures for the contractor but sets the outcomes to be achieved and a pallet of options to be considered. The greatest risk of adverse impacts to water features from this Development will likely occur from the construction of the Headpond and its Embankments, made more challenging due to the presence of a number of watercourses flowing through that location and needing to be carefully managed during the works. Management of spoil from underground construction of tunnels and the Power Cavern Complex, and any works in, over and immediately adjacent to water features represent the highest risk. Please refer to *Chapter 10: Geology and Soils* for further details on materials generation and management.

Furthermore, as part of the pre-construction works, trees and other shrubs (most of the Development Site is covered by grassland) will be removed from the working area, which would increase the potential for soil erosion and reduces the buffering effect on any uncontrolled site run-off. However, this effect will likely be temporary during the construction period.

Table 11.25 displays the potential impacts and effects from construction site runoff containing high levels of fine sediments or direct works in or over water features.

Table 11.25 Impacts and Effects on Surface Water Feature from Construction Site Runoff Containing High Levels of Fine Sediments or Direct Works in or Over Water Features

Water feature	NGR	Direction and Distance to the Development	Importance	Impact	Effect
Loch Awe	NN 00437 16188	All water features within the Main Area drain into Loch Awe. There is a Tailpond inlet / outlet where water will be abstracted and discharged.	High	**Low adverse impact -** Sediment laden runoff could enter Loch Awe from water features draining into it, such as LA6, causing an indirect temporary impact. However, through the implementation of a CEMP, a WMP and a SMP risks can be effectively managed. Construction works associated with the Tailpond inlet / outlet works could also lead to increased sediment run-off and disturbance of sediments in the Loch itself. This includes dredging of the bed to deepen the water adjacent to the Tailpond inlet / outlet, although this will be undertaken in a dry working environment behind a cofferdam and a silt curtain. Overall, a direct, short term and temporary but uncertain low adverse impact is predicted.	**Moderate Adverse (significant)**
Loch Fyne	NN 09845 07941	New jetty to be constructed and used for the delivery of materials and equipment, particularly abnormal loads.	High	**Low adverse impact -** Works associated to jetty would lead to works directly in the Loch that may disturb sediment temporarily while vibro-driven piles are installed. There may also be associated areas of new hard standing that would involve vegetation clearance. Particulates may also wash off the jetty during its use. No dredging will be required at the jetty. Overall, a direct, short term and temporary but uncertain low adverse impact is predicted.	**Moderate Adverse (significant)**
Allt na Cuile Riabhaiche and tributaries (LA2)	NN 06346 19768	Tributaries cross the Upper Sonachan / Keppochan Forest track that will be used for access.	Low	**Negligible adverse impact -** Some sediment-runoff could indirectly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	Negligible adverse (not significant)
Keppochan River and tributaries (LA3)	NN 07270 19990	Crosses the Upper Sonachan / Keppochan Forest track that may be used for access.	Low	**Negligible adverse impact -** Some sediment-runoff could directly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	Negligible adverse (not significant)
Archan River and tributaries (LA4)	NN 08466 20254	Crosses the Upper Sonachan / Keppochan Forest track that may be used for access.	Low	**Negligible adverse impact -** Some sediment-runoff could directly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	Negligible adverse (not significant)
Allt a Chrosaid and small lochan (LA5)	NN 02937 16523	PC21 is situated approx. 30 m south of LA5. Upgrade to the existing B840 crossing.	Low	**Negligible adverse impact -** Some sediment-runoff could indirectly and directly wash from new crossings and upgrades to the existing track. Sediment runoff could also occur from works associated to the permanent compound. However, this will likely only be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	Negligible adverse (not significant)
Allt Beochlich and tributaries (LA6)	NN 03502 15714	Situated within the Development Planning Boundary, tributaries cross the proposed Access Track and temporary	Medium	**Medium adverse impact –** There will be a significant amount of earthworks and intrusive construction works directly to the Allt Beochlich catchment within the Headpond area, including challenges maintaining downstream flows while constructing the	**Moderate Adverse (significant)**

Water feature	NGR	Direction and Distance to the Development	Importance	Impact	Effect
		works area. LA6 and tributaries are within the proposed Headpond, and Embankment locations thus will be lost to the Development but will remain receptors downstream while it is being constructed.		Embankments and Headpond infrastructure. There will be at time large slopes and areas of bare earth that may create significant volumes of sediment-laden runoff. Standard mitigation measures can be effective, but they will need to be implemented on a large scale. Proprietary measures in addition to construction SuDS are expected to be required. The impact downstream of Lochan Beochlich (LA8) will only be permanent, long term, certain, Low Adverse as that lochan as fine sediment is likely to be deposited in the basin.	
Lochan Airigh (LA7)	NN 04278 16440	Situated within the location of the proposed Headpond, thus will be lost to the Development.	Low	**No impact** as this water feature will be lost to the Development. Loss of this water feature is considered under permanent hydromorphological effects in the 'Operation' impact assessment section that follows.	N/A
Lochan Beochlich (LA8)	NN 03030 15414	TC07 will be located approximately 33 m upgradient of LA8. PC09 is situated upstream of lochan. Construction of the Headpond and associated activities are within the catchment.	Low	**Medium adverse impact -** Lochan Beochlich is an artificial lochan located online with the Allt Beochlich. All of the works described for 'Allt Beochlich and tributaries (LA6) catchment' above apply, plus runoff from TC07 (PC09 is downstream), which together could lead to the introduction of fine sediment, that is likely to be washed and deposited in this lochan as it is the first Stillwater basin downstream.	Minor Adverse (not significant)
Lochan Romach (LA10)	NN 02811 15735	PC20 and Access Track crossing situated 100 m upstream of LA10.	Low	**Negligible adverse impact -** Some sediment-runoff could directly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	Negligible adverse (not significant)
Allt na Fainge (LA12)	NN 01216 16501	Upgrade to the existing B840 crossing.	Low	**Negligible adverse impact -** Some sediment-runoff could directly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	Negligible adverse (not significant)
Allt a' Ghreataidh (LA13)	NN 01200 16313	Upgrade to the existing B840 crossing.	Low	**Negligible adverse impact -** Some sediment-runoff could directly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	Negligible adverse (not significant)
Alt Mor (LA14)	NN 01160 16630	Upgrade to the existing B840 crossing.	Medium	**Negligible adverse impact -** Some sediment-runoff could directly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	Negligible adverse (not significant)
Cladich River/Allt an Stacain (LA17)	NN 09638 22424	600 m downstream of Sonachan / Keppochan Forest track that may be used for access. This watercourse may be impacted indirectly via any impacts to LA3 or LA4 as they are hydraulically linked.	Medium	**Negligible adverse impact -** Sediment laden run-off could indirectly wash into Cladich River from Keppochan River (LA3) and Archan River (LA4). However, this will likely be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only. There would also be increased dilution and dispersion further downstream.	Negligible adverse (not significant)
River Aray and tributaries	NN 09003 10169	Proposed road upgrades cross the	High	**Negligible adverse impact -** Some sediment-runoff could directly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with	Minor adverse (not significant)

Water feature	NGR	Direction and Distance to the Development	Importance	Impact	Effect
(LF1)		River Aray at NN 09165 09855.		standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	
Crom Allt and tributaries (LF2)	NN 08592 07409	Temporary works and proposed Access Tracks cross part of Crom Allt at NN 08415 07691	Low	**Negligible adverse impact -** Some sediment-runoff could directly and indirectly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with mitigation, is predicted to have a temporary negligible adverse impact only. There may also be some works associated with jetty construction which could increase sediment run-off. Such as increased areas of hardstanding. This will also likely only be small amounts, and thus has a short term, temporary, uncertain negligible adverse impact.	Negligible adverse (not significant)
Unnamed watercourse (LA18)	NN 01125 15692	Upgrade to the existing B840 crossing.	Low	**Negligible adverse impact -** Some sediment-runoff could directly wash from new crossings and upgrades to the existing track. This will likely be small amounts, and with standard mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only.	Negligible adverse (not significant)

11.7.3.2 Construction Site Run-Off – Spillage Risk

During construction, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and/or used on the Development Site. Leaks and spillages of these substances could pollute nearby surface water features if their use is not carefully controlled and if spillages enter existing flow pathways. Like excessive fine sediment in construction site run-off, the risk is greatest where works occur close to and within water features.

To allow such substances to enter a watercourse could be in breach of the Pollution 13 Prevention and Control (Scotland) Regulations 2012 (Ref 11.36), the Environment Act 2021(Ref 11.37) and Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) (Scotland) Regulations 2003 (Ref 11.38), and therefore measures to control the storage, handling and disposal of such substances will need to be in place prior to and during construction.

As with the risk from construction site run-off, the risk to the water environment is greatest where these activities occur close to and within water features. The areas most at risk include water features listed in *Table 11.26*.

Table 11.26 Impacts and Effects to Surface Water Feature from Site Run-off – Spillage Risk

Water feature	NGR	Direction and Distance to the Development	Importance	Impact	Effect
Loch Awe	NN 00437 16188	All water features within the Main Area drain into Loch Awe. There is a Tailpond inlet / outlet where water will be abstracted and discharged.	High	**Low adverse impact -** Contaminated runoff could indirectly enter Loch Awe from water features draining into it, such as LA6. Chemical spillages from works associated with the Tailpond inlet / outlet could also directly occur. However, with the implementation of good practice and standard mitigation measures, a low adverse short term, temporary, uncertain impact is predicted.	**Moderate adverse (significant)**
Loch Fyne	NN 09845 07941	New jetty to be constructed and used for the delivery of materials and equipment, particularly abnormal loads.	High	**Low adverse impact -** Works associated with the construction and operation of the jetty could lead to spillages of chemical substances. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain low adverse impact is predicted.	**Moderate adverse (significant)**
Allt na Cuile Riabhaiche and tributaries (LA2)	NN 06346 19768	Tributaries cross the Upper Sonachan / Keppochan Forest track that will be used for access.	Low	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, an indirect, short term, temporary, uncertain negligible adverse impact is predicted.	Negligible adverse (not significant)

Water feature	NGR	Direction and Distance to the Development	Importance	Impact	Effect
Keppochan River and tributaries (LA3)	NN 07270 19990	Crosses the Upper Sonachan / Keppochan Forest track that may be used for access.	Low	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain low adverse impact is predicted.	Negligible adverse (not significant)
Archan River and tributaries (LA4)	NN 08466 20254	Crosses the Upper Sonachan / Keppochan Forest track that may be used for access.	Low	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain low adverse impact is predicted.	Negligible adverse (not significant)
Allt a Chrosaid and small lochan (LA5)	NN 02937 16523	PC21 is situated approx. 30 m south of LA5. Upgrade to the existing B840 crossing.	Low	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain low adverse impact is predicted.	Negligible adverse (not significant)
Allt Beochlich and tributaries (LA6)	NN 03502 15714	Situated within the Development Planning Boundary, tributaries cross the proposed Access Track and temporary works area. LA6 and tributaries are within the proposed Headpond, and Embankment locations thus will be lost to the Development but will remain receptors downstream while it is being constructed.	Medium	**Medium adverse impact -** There will be a significant amount of construction and intrusive works to the Allt Beochlich catchment within the Headpond area, including challenges maintaining downstream flows while constructing the Embankments and Headpond infrastructure. Standard mitigation measures can be effective, but they will need to be implemented on a large scale. Proprietary measures in addition to construction SuDS are expected to be required.	**Moderate Adverse (significant)**
Lochan Airigh (LA7)	NN 04278 16440	Situated within the location of the proposed Headpond, thus will be lost to the Development	Low	**No impact** as this water feature will be lost to the Development. Loss of this water feature is considered under permanent hydromorphological effects in the 'Operation' impact assessment section that follows.	N/A
Lochan Beochlich (LA8)	NN 03030 15414	TC07 will be located approximately 33 m upgradient of LA8. PC09 is also situated upstream of lochan. Construction of the Headpond and associated activities are within the catchment.	Low	**Medium adverse impact -** Lochan Beochlich is an artificial lochan located online with the Allt Beochlich. All of the works described for 'Allt Beochlich and tributaries (LA6) catchment' above apply, plus direct runoff from TC07 and PC09. A direct, short term, temporary, uncertain medium adverse impact Is predicted.	Minor Adverse (not significant)
Lochan Romach (LA10)	NN 02811 15735	PC19 and Access Track crossing situated 100 m upstream of LA10.	Low	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain negligible adverse impact is predicted.	Negligible adverse (not significant)
Allt na Fainge (LA12)	NN 01216 16501	Upgrade to the existing B840 crossing	Low	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain negligible adverse impact is predicted.	Negligible adverse (not significant)
Allt a' Ghreataidh (LA13)	NN 01200 16313	Upgrade to the existing B840 crossing	Low	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain negligible adverse impact is predicted.	Negligible adverse (Not significant)

Water feature	NGR	Direction and Distance to the Development	Importance	Impact	Effect
Alt Mor (LA14)	NN 01160 16630	Upgrade to the existing B840 crossing	Medium	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain negligible adverse impact is predicted.	Negligible adverse (not significant)
Cladich River/Allt an Stacain (LA17)	NN 09638 22424	600 m downstream of Sonachan / Keppochan Forest track that may be used for access. This watercourse may be impacted indirectly via any impacts to LA3 or LA4 as they are hydraulically linked.	Medium	**Negligible adverse impact -** Contaminated run-off could indirectly wash into Cladich River from Keppochan River (LA3) and Archan River (LA4). However, this will likely be small amounts, and with mitigation, is predicted to have a short term, temporary, uncertain negligible adverse impact only. There would also be increased dilution and dispersion further downstream.	Minor adverse (not significant)
River Aray and tributaries (LF1)	NN 09003 10169	Proposed road upgrades cross the River Aray at NN 09165 09855.	High	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain negligible adverse impact is predicted.	Negligible adverse (not significant)
Crom Allt and tributaries (LF2)	NN 08592 07409	Temporary works and proposed Access Tracks cross part of Crom Allt at NN 08415 07691	Low	**Low adverse impact –** Works associated with the jetty and movement of equipment and materials could result in chemical spillages affected this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain negligible adverse impact is predicted.	Negligible adverse (not significant)
Unnamed watercourse (LA18)	NN 01125 15692	Upgrade to the existing B840 crossing.	Low	**Negligible adverse impact -** Chemical spillages could occur during works to upgrade the existing track including new crossing of this watercourse. However, with the implementation of good practice and standard mitigation measures, a direct, short term, temporary, uncertain negligible adverse impact is predicted.	Negligible adverse (not significant)

11.7.3.3 Water Supply and Foul Drainage

It is assumed that water will be tankered in for temporary and permanent compounds and that foul waste will be collected disposed of off-site. Therefore, there will be no impacts to any of the surrounding water features.

If there is an alternative method this would require a CAR licence and would be subject to a temporary foul drainage strategy.

11.7.4 Effects on Hydromorphology

There is potential for adverse impacts to the hydromorphology of surface water features from construction works, especially from the new Embankments for the Headpond and upgraded watercourse crossings, works to the shore of Loch Awe, but also from fine sediment deposition that may be introduced into the channel via surface water runoff from new hardstanding and exposed areas stripped of vegetation and where the soil may become compacted due to the movement of construction vehicles.

11.7.5 Construction of Embankments and Headpond

The main Embankment to be constructed to create the Headpond is proposed to cross the Allt Beochlich, which will completely block its natural course. The channel of the watercourse in this location and downstream is dominated by bedrock and therefore it is very stable and has a low sensitivity to physical modifications. Construction of the Embankment is likely to require the construction of a temporary culvert to convey the flow while the Embankment is constructed, resulting in disruption to sediment transport depending on the design of the culvert and likely changes to the flow regime.

Significant geomorphological change events normally occur in watercourses around a 50% Annual Exceedance Probability Event (AEP). The construction of the temporary culvert and Embankment may result in changes to the natural flow regime and reduce the occurrence of these events during construction. Coarse sediment transported within the channel upstream of the Embankment may be blocked, resulting in a reduced sediment load to downstream reaches. However, this impact already occurs due to the presence of the reservoir and small hydropower scheme approximately 1.5 km downstream of the proposed Embankment location. It is therefore assessed that the impact of the Embankment construction on sediment transport in this reach downstream of the proposed Embankment will be low adverse, which given the medium importance of the Allt Beochlich for hydromorphology, results in a direct, long term, permanent **minor adverse effect** (**not significant**).

11.7.6 Watercourse Crossings

Watercourse crossings have the potential to prevent movement of coarse sediment, which could lead to excess accumulation upstream and starvation of supply downstream that could trigger localised erosion. There are several access route options proposed as part of the Development, which will be either created or upgraded depending on a number of factors. Effects will be permanent for the majority of crossings, as Access Tracks will be retained through the operation phase. The potential watercourse crossings identified are shown on *Figure 11.3a: Surface Water and Groundwater Receptors and Attributes – Headpond Study Area* and *Figure 11.3b: Surface Water and Groundwater Receptors and Attributes – Loch Fyne Study Area (Volume 3 Figures)* and presented in *Appendix 11.4 (Volume 5 Appendices)*. The number and types of crossings listed by potential access route are summarised

Table 11.27. The watercourse crossings are grouped into the following routes Balliemeanoch to Headpond (labelled B#), Forest Access (labelled F#), Castle Access (labelled C#) and Inveraray Access (labelled I#).

Where there are existing crossings, culverts are currently in place, with track widths of approximately 3 m – 5 m. It is proposed to widen the track to 10 m width for construction, using a pipe culvert, in keeping with the current arrangements. There will be local impact to watercourses due to the length of the affected bed and banks being increased. However, in the context of the overall watercourse length this is not significant. In addition, no significant deposition or erosion was noted upstream or downstream of existing crossings, indicating that the existing crossings are not currently causing major geomorphological impacts. Therefore, the magnitude of impact is assessed to be negligible adverse, which given the low or medium importance of the receptors for hydromorphology, results in a **negligible adverse effect (not significant)**.

New crossings are proposed on small tributaries, using an open culvert structure (i.e. an arch) with a minimum width of 10 m for the construction phase. Many of these tributaries have small catchments above the proposed crossing locations and therefore it is not anticipated that there will be excess sediment accumulation or downstream erosion. Watercourses tend to be steep and with bedrock or step pool typology and very limited superficial deposits. This means that there will be limited coarse, transportable material that can be eroded into the channel. Where multiple crossings are proposed at different locations on the same watercourse, the cumulative loss of channel and banks has been assessed, for the Allt Beochlich, the loss is approximately 0.02% of the main stem length. All other watercourses with multiple crossings will be subject to even lower percentage impact. Therefore, new watercourse crossings are unlikely to significantly impact sediment transport processes. Therefore, the magnitude of impact is assessed to be negligible adverse, which given the low or medium importance of the receptors for hydromorphology, results in a **negligible adverse effect (not significant)**.

Table 11.27 Watercourse Crossings by Route

Route	Water feature	Watercourse Crossings affected (upgrades)	Water feature	Watercourse Crossings affected (New Crossings)
Balliemeanoch to Headpond	Allt na Fainge (LA12)	B1	Allt Beochlich trib (LA6)	B8
	Allt a' Ghreataidh (LA13)	B2	Lochan Romach trib (LA10)	B9
	Allt a Chrosaid (LA5)	B3	Allt Beochlich trib (LA6)	B10
	Unnamed (LA18)	B4	Allt Beochlich trib (LA6)	B11
	Unnamed (LA18)	B5	Allt Beochlich (LA6)	B12
	Allt Beochlich trib (LA6)	B6	Allt Beochlich (LA6)	B13
	Allt Beochlich trib (LA6)	B7	Allt Beochlich (LA6)	B14
			Allt Beochlich (LA6)	B15
			Allt Beochlich trib (LA6)	B16
			Allt Beochlich trib (LA6)	B17
			Allt Beochlich trib (LA6)	B18
			Allt Beochlich trib (LA6)	B19
			Allt Beochlich trib (LA6)	B20
			Allt Beochlich trib (LA6)	B21
			Allt Beochlich (LA6)	B22
			Allt Beochlich trib (LA6)	B23

Route	Water feature	Watercourse Crossings affected (upgrades)	Water feature	Watercourse Crossings affected (New Crossings)
			Allt Beochlich trib (LA6) Allt Beochlich trib (LA6) Allt Beochlich trib (LA6) Allt Beochlich trib (LA6) Allt Beochlich trib (LA6)	B24 B25 B26 B27 B28
Forest Access	Allt na Cuile Riabhaiche trib (LA2) Allt na Cuile Riabhaiche trib (LA2) Keppochan River trib (LA3) Keppochan River trib (LA3) Archan River and trib (LA4) Archan River and trib (LA4) Cladich River/Allt an Stacain trib (LA17)	F5 F6 F7 F8 F10 F11 F12	Allt na Cuile Riabhaiche trib (LA2) Allt na Cuile Riabhaiche and tributaries (LA2) Allt na Cuile Riabhaiche and tributaries (LA2) Allt na Cuile Riabhaiche and tributaries (LA2) Archan River and trib (LA4)	F1 F2 F3 F4 F9
Castle Access	All crossing River Aray and tributaries (LF1) including a temporary bridge	C1 C2 C3 C4	Not applicable	Not applicable
Inveraray Access	All crossing Crom Allt and tributaries (LF2)	IN1 IN2 IN3 IN4	Not applicable	Not applicable

11.7.7 Sediment Runoff

During construction, soil and fine sediment runoff can impact watercourses by unnaturally increasing sediment load. In some river systems, this can change the nature of the channel bed features, with the potential to trigger erosion and instigate channel change. The Outline SWMP (*Appendix 10.5 (Volume 5: Appendices)*) includes measures to attenuate construction site run-off and manage the risk of fine sediment being deposited in the channel. This has the potential to affect the Allt Beochlich (LA8), its tributaries and other watercourses outlined in *Table 11.24*, however the steep gradient and bedrock typology will result in rapid flushing of fine sediment through the system. Therefore, in the context of the Development Site and proposed embedded mitigation, a negligible adverse impact is predicted, which given the **medium** importance of the Allt Beochlich for hydromorphology, results in a **negligible adverse effect (not significant)**.

The construction of hardstand areas has the potential to increase run-off to watercourses, which could cause increased flows and erosion downstream. The proposed temporary compounds and potentially affected watercourses are listed in *Table 11.28*. The area of hardstanding to be introduced is small within the context of the catchment area of the watercourses downstream of the proposed compounds and is therefore unlikely to cause a detectable increase in flows. Surface water runoff from temporary compounds will also be attenuated and treated using SuDS. Therefore, the impact is assessed to be negligible in all cases.

Table 11.28 Temporary Compounds and Affected Water Features

Compound Name	Affected Watercourse	Direction and distance between compound and water feature	Importance	Impact	Effect
TC01 and TC02	Loch Awe	50-60 m upgradient	High	**Negligible adverse**	Minor adverse effect (not significant)
TC02	Allt a Chrosaid (LA5) and Allt a Geataidh	Approx. 20 m to north and approx. 15 m to south and approx. (respectively)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC03	Allt a Chrosaid (LA5) and Allt a Geataidh	Approx. 60 m to north and approx. 80 m to south and approx. (respectively)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)

Compound Name	Affected Watercourse	Direction and distance between compound and water feature	Importance	Impact	Effect
TC04	Allt a Chrosaid (LA5)	Approx. 20 m to south (across slope)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC05	Unnamed tributary discharging directly to Loch Awe	Approx. 70 m to north (across slope)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC06	Small tributary to Allt Beochlich (LA6)	Approx. 30 m to north (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
TC07	Allt Beochlich (LA6)	Approx. 65 m to north (upgradient)	Medium Importance	**Negligible adverse**	Negligible adverse effect (not significant)
TC08	Small tributary to Allt Beochlich (LA6)	0m (on upgradient side)	Medium Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC09	Allt Beochlich (LA6)	0 m	Medium Importance	**Negligible adverse**	Negligible adverse effect (not significant)
TC10	Tributary to Allt Mor (tributary to Allt Beochlich (LA6))	Approx. 70 m to south (upgradient)	Medium Importance	**Negligible adverse**	Negligible adverse effect (not significant)
TC11	Small tributary to Allt Beochlich (LA6)	Approx. 50 m to north (upgradient)	Medium Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC14	Allt na Cuile Riabhaiche and tributaries (LA2)	Approx. 55 m to northwest (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC15	Allt na Cuile Riabhaiche and tributaries (LA2)	Approx. 80 m to southeast (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
TC16	Small tributary to Allt Beochlich (LA6)	Approx. 50 m to west (upgradient)	Medium Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC17	Unnamed tributary to Loch Airigh	150 m to west (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC18	Unnamed small lochan and tributary to Loch Airigh	110 m to west (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC19	Unnamed small lochan and tributary to Loch Airigh	110 m to west (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC20	Unnamed tributary to Lochan Romach	100 m to west (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC21	Allt a Chrosaid	30 m to south (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)

11.7.8 Assessment of Operational Effects

The main pathway for impacts to water quality in Loch Awe during operation of the Development is from, and as a consequence of, the exchange of water between the Headpond and the Loch. Before describing the potential impacts and determining the significance of effects, it is worth considering the design and parameters of operation.

11.7.8.1 Tailpond Inlet / Outlet Design

The Headpond will hold c. 53 M m3 of water with the maximum drawdown associated with normal operation being 46 m (i.e. between 274 and 420 mAOD), but this may not be an everyday occurrence. This corresponds with a maximum discharge from the outlet of around 494 cubic m3/s. To maintain a design discharge and abstraction velocity of no greater than 0.3 m/s (which is required to minimise the risk of sediment scour and entrainment of salmon smolts) and a suitably sized screen mesh, the Tailpond inlet / outlet screen will be 148 m wide and 19 m high. This also requires the loch bed to be reprofiled and dredged to depth of c. 18.2 m AOD. Bathymetric survey undertaken of the shoreline for the Development shows water depths of around 40 m deep offshore from the Tailpond inlet / outlet. This is consistent with the contours shown on online OS maps, which show water depths in the portion of the Loch close to the Tailpond inlet / outlet structure up to around 50 m (Ref 11.15).

11.7.8.2 Tailpond Inlet / Outlet Operation

The operation of the Development will depend on water level constraints within Loch Awe as well as electricity generation market conditions. The time required to fully discharge or fill the Headpond is around 30 hours of continuous operation. However, the duration and frequency of operation will reflect energy generation needs at a particular time and cannot be predicted with certainty. Water quality impacts on Loch Awe will depend on the operation of the Development. For example, more frequent and larger discharges may have more influence on water quality in Loch Awe or disrupt seasonal thermal stratification. On the other hand, holding the water in the Headpond for longer may lead to greater alteration in quality from that in Loch Awe before it is discharged back. There will also be periods where water levels need to be drawn down for maintenance or inspections of the Embankments, or potentially in the unlikely event of an emergency, although the rate of discharge to Loch Awe would be comparable to normal operation and so this is not assessed separately. Similarly, during drought conditions, the scheme will not operate, thus this scenario is not considered any further. Overall, where appropriate, the following impact assessment considers the range of different operating conditions and applies the precautionary principle.

11.7.8.3 Potential Water Quality Impacts

During operation of the Development there could be water quality impacts on Loch Awe as a result of the following impact mechanisms:

- A reduction in water levels resulting in changes in water quality through the concentration of existing chemical compounds and reduced dilution.
- Changes to the seasonal thermal stratification of the water column and associated impacts on water quality and risk of algal blooms.
- Potential impact on Loch Awe directly from operational discharges (e.g. temperature, nutrients and concrete residues post construction).
- Pollution risk from chemicals and sediment in routine surface water runoff from, or spillages on, new impermeable surfaces.

Although the above water quality impact mechanisms have been itemised for ease of discussion, they would not happen in isolation of each other, and the overall effect on Loch Awe would be a product of the synergies of them all.

In addition, as is the nature of impacts on water quality, they are unlikely to be constant and will vary over time. Changes in water quality may also influence ecological processes and populations of different species, which may lead to additional, indirect changes in water quality, which are difficult to predict. For an assessment of impacts on aquatic ecology as a consequence of the above water quality impact mechanisms please see *Chapter 7: Aquatic Ecology*.

11.7.8.4 Impact on Water Quality in Loch Awe From Changes in Water Level

Significant changes in water level can potentially lead to the concentration of pollutants in a still water body. However, operation of the Development will be limited to between a loch water level of 35.3 mAOD and 36.4 mAOD (i.e. a water level range of 1.1 m), given that other third-party abstractors and compensation flows along the River Awe need to be considered (see *Chapter 13: Water Resources*). Comparing the maximum volume of discharge and water level operation restrictions the following can be stated:

- Maximum water depth close to the outlet is up to 50 m, and so a c. 1 m change is unlikely to significant concentrate any chemical substances in the water column. The risk would be slightly greater between June/July and mid-late autumn when the Loch is likely to be stratified. This is because when there is a shallower epilimnion, there would be a smaller volume of water to dilute chemical compounds. However, even under these circumstances the epilimnion may still be up to approximately 20 m deep (Ref 11-44).
- Regardless of the operating conditions referred to in the above point, the volume of the Headpond is approximately 53M m^3, which if it was all abstracted from Loch Awe (which has a surface area of around 38.5 km^2) would result in an average level change across the total surface area of Loch Awe of around 1.37 m (assuming a relatively flat gradient across the loch and no inflows). Again, the risk would be greater during periods of thermal stratification.
- Related to point two above, the maximum abstraction is approximately 0.45% of the total estimated 1.2 km^3 of water held in Loch Awe at any given time.

In practice, the maximum abstraction from Loch Awe to the Headpond is unlikely to occur, plus inflowing streams and any direct rainfall will constantly be replenishing the Loch. For example, operation of five hours would be expected to result in a lowering of water level in Loch Awe of around 0.18 m only. The drawdown for 10 hours of operation would be 0.36 m, and for 15 hours of operation, 0.53 m, respectively. On the basis of the above, fluctuations in water level alone are unlikely to materially alter water quality in Loch Awe. Therefore, an indirect, long term, permanent but unlikely negligible adverse impact is predicted. On a high importance receptor this results in a **minor adverse effect (not significant)**.

11.7.8.5 Impact on Thermal Stratification in Loch Awe

Thermal Stratification in a Monomictic Loch and Water Quality

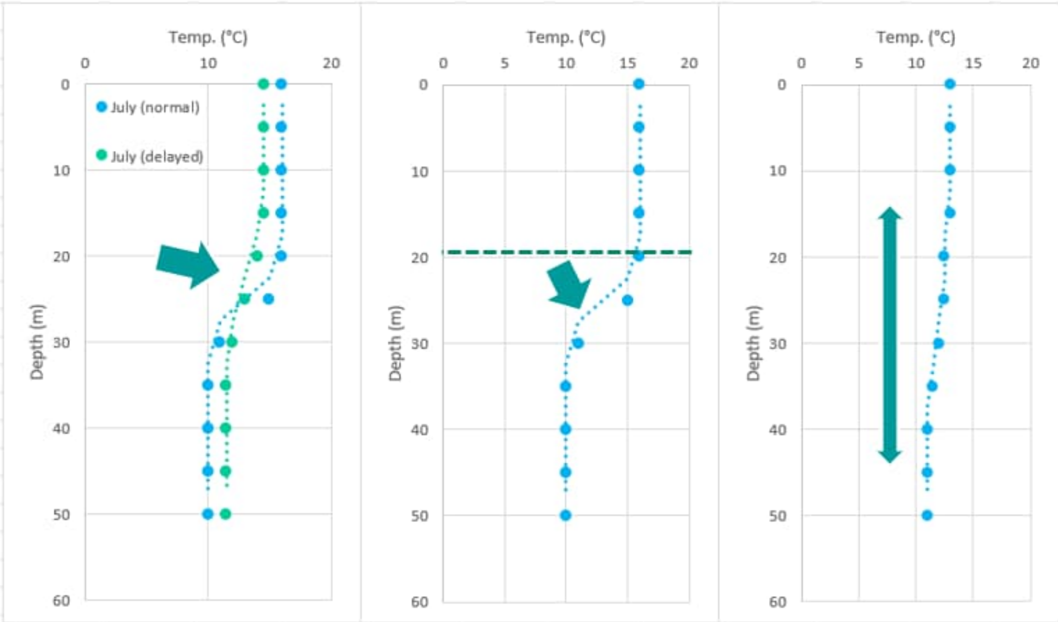
Due to its size and depth, Loch Awe exhibits monomictic seasonal thermal stratification over the summer (typically from late June/July until an overturn event around mid-late autumn). More intense solar radiation in the summer creates a warmer, well mixed upper layer known as the epilimnion. Background data for Loch Awe suggests that this is around 10 m deep early in the summer, increasing to around 20 m deep later in the summer (Ref 11-44), although it will vary 'year on year' and spatially across the Loch at any given time. Beneath the epilimnion is the deeper and colder hypolimnion, separated from the epilimnion by a transition zone known as the metalimnion (or otherwise referred to as the 'thermocline'), which is characterised by a steep temperature gradient. During the autumn, cooling of the epilimnion and wind induced turbulence results in an overturn event that mixes the water column and induces deeper circulation. In monomictic lochs like Loch Awe, this then persists until the formation of thermal stratification the following summer.

Although a natural phenomenon, thermal stratification is generally negative for water quality. Temperature has a significant influence on chemical and biological reactions, and strong temperature gradients (i.e. the thermocline) can significantly limit the diffusion of dissolved oxygen from the water's surface to the bottom of the Loch. There is also reduced mixing by advection and currents between the epilimnion and the hypolimnion. Over time, respiration by aquatic organisms and the aerobic decomposition of organic matter progressively uses up the available dissolved oxygen in the hypolimnion, which is not replaced. In addition to the anoxic conditions that develop, this can lead to the build-up of ammonia that can be toxic to aquatic organisms; the release of sediment-derived bioavailable phosphorus and / or nitrogen; and the reduction of metals in bottom sediments into more soluble, and potentially toxic, forms, such as the formation of methylmercury. Thus, after a period of thermal stratification the water quality in the hypolimnion is expected to be significantly poorer than in the overlying epilimnion. At the same time, there is less dilution and dispersion available in the epilimnion of catchment derived chemical compounds and nutrients (assuming the inflowing water is not so cold and dense that it plunges immediately down into the hypolimnion), which can result in a higher risk of algal blooms occurring under certain conditions (noting that the factors that control such events are complex and varied).

Although there can be intermittent periods of entrainment of hypolimnion water into the epilimnion in monomictic water bodies during a period of thermal stratification (such as from a wind induced internal seiche), at some point in the autumn, the combination of evaporation, air cooling and wind induced mixing of the surface water results in destabilisation of the distinct water layers and permanent overturning until the next summer. This effectively releases the poorer quality water of the hypolimnion low in dissolved oxygen but nutrient rich in bioavailable phosphorous with the epilimnion. Depending on the balance with catchment derived phosphorus, this can encourage the growth of primary produces and potentially result in algal blooms under certain climatic conditions and assuming no other limiting factor (such as the availability of nitrogen) (Ref .11-55). Where a bloom does not occur, there is the potential that higher levels of nutrients persist that 'prime' the loch for early spring blooms the following year. However, overturn does re-oxygenate bottom waters stopping the release of sediment-derived phosphorus and permitting its precipitation (i.e. $FePO4$) as well as carrying algal mass from the epilimnion to lower depths where photosynthesis is more difficult.

11.7.8.6 Potential Impact of the Development

A discussed in the baseline, the increased mixing of the water column due to the exchange of water with a pumped-storage scheme can influence the stability of thermal stratification. Assessing the Cruachan 1 pumped-storage hydro scheme shortly after opening, Tippett (1978) (Ref 11.44) identified that the increased mixing of the upper water column had the effect of delaying the unset of stratification and deepening the thermocline, at least during the early part of the summer before more intense solar radiation compensated for the impact. The dimensions of the existing Cruachan 1 outlet structure are not known, although for the recently consented Cruachan Expansion, the outlet is estimated to be around 18 m wide and 5 m high and discharges into the northern basin of Loch Awe where maximum water depths are up to around 74 m deep. In contrast, the outlet for the Development would be approximately 148 m wide and 19 m high, and located in water that is only up to 50 m deep (but still deep enough for stratification to form). The total discharge and volume of water exchange with Loch Awe is larger for the Development than the current Cruachan 1 pumped-storage hydro scheme, and the consented Cruachan Expansion. Therefore, some impact on the stability of thermal stratification and the position of the thermocline is expected locally in the vicinity of the outlet. Potential outcomes are illustrated in *Diagram 11-1*.



A) Delayed onset of thermal stratification

B) Deepening of thermal stratification

C) Prevention of the formation of thermal stratification – fully mixed water column

Diagram 11-1 Potential outcomes to thermal stratification close to the Tailpond inlet / outlet during operation of the Development

From a thermal stratification perspective, the prevention of thermal stratification would be the absolute worst case (scenario C in *Diagram 11-1*). However, this option would require the greatest disturbance of the water column, and thus is considered the least likely outcome. Disturbance would also likely need to be very regular to maintain the fully mixed water column from stratifying. This was not something that was observed for Cruchan Hydro Scheme (Ref 11-44). More likely is that the disturbance of the water column during operation in the summer may result is the deepening of the thermocline or the delayed onset (scenarios A and B in *Diagram 11-1*). The impact in any given year would depend on the operating regime and many other factors (e.g. weather conditions) and thus would vary. However, although a fundamental characteristic of Loch Awe, this would not necessarily result in an adverse water quality impact as in all cases it would reduce the risk of anoxic bottom waters forming.

The flows along major watercourses draining into Loch Awe have also been examined as they may be considered analogous for the discharge of the Headpond, with some differences (e.g. flow velocity would be greater from the watercourses). Although the operation of the Development will be intermittent; have a control maximum discharge velocity; and enter in relatively deep water, there are some similarities with inflowing watercourses and how they may also interact with a thermally stratified water column. *Table 11.29* provides estimated daily mean flow statistics for a selection of watercourses that flow into Loch Awe.

Table 11.29 Estimated Flows for Certain Loch Awe Inflowing Watercourses

Watercourse and location	Estimated daily mean flow statistics (m^3/s)								
	Min	Q95	Q75	Median/ Q50	Q25	Q10	Max	Mean	STD*
Abhainn a' Bhealaich at Braevallich	0.01	0.09	0.24	0.56	1.78	3.65	48.37	1.40	2.09
Strae at Glen Strae	0.03	0.15	0.47	1.42	4.02	7.97	45.80	3.02	4.06
Avich at Barnaline Lodge	0.06	0.25	0.71	1.49	2.82	4.32	16.65	1.97	1.66
Orchy combined flow (calculated)	0.62	1.98	5.68	12.71	34.59	80.42	681.86	31.08	48.81

Note*: STD standard for standard deviation.

In comparison to the flow rates from the watercourses listed in *Table 11.29*, the flow rate from the Development would be a maximum of 494 m3/s. This is an order of magnitude greater than the maximum flow from the streams entering Loch Awe that are located close to where the Tailpond inlet / outlet structure would be constructed (e.g. Allt Beochlich). However, the maximum flow from the Loch's principle inflowing watercourse, the River Orchy, is estimated to exceed this flow. The width of the channel at the point where the River Orchy flows into the northern basin of Loch Awe is approximately 190 m wide, which is comparable to the width of the Tailpond inlet / outlet structure, and although the depth of river flow would not be as deep as the outlet (i.e. 20 m high), the velocity of the inflow would be much greater than the maximum velocity allowed from the Development (i.e. 0.3 m/s). This illustrates that on occasions Loch Awe may experience a point inflow that is comparable to that from the Development, although flows of this magnitude along the River Orchy would be much less frequent, and more likely to occur at times when Loch Awe is not thermally stratified (i.e. winter).

Given the very large cross-sectional area of the outlet, the volume of water discharged during generation, and the maximum duration that it might occur over (i.e. 30 hours), there is the possibility for local disruption of the stability of thermal stratification in the vicinity of the outlet. Shorter periods of operation or less frequent discharges would likely have a smaller impact on the stability of any stratification. The slow discharge velocity and assumed non-turbulent flow of the discharge would also potentially serve to attenuate any disruptive effects. Furthermore, the water temperature of the discharge (and therefore density) may encourage the discharge to either rise to the surface of the epilimnion forming a temporary plume of warmer water or if colder and more dense, it may sink into the hypolimnion. In either case, this may reduce the spatial extent of any disruption but may encourage mixing locally. Following completion of the generation cycle and the cessation of the discharge, the natural factors controlling the formation of thermal stratification in Loch Awe are expected to re-assert themselves, and over time thermal stratification in the vicinity of the outlet is likely to re-establish. However, this depends on the frequency of the Developments operation. Regular operation and operation for longer durations are more likely to continuously disrupt thermal stratification, depress the thermocline, or delay onset of stratification in the vicinity of the outfall.

11.7.8.7 Summary

It is difficult to predict how the routine operation of the Development will influence the seasonal thermal stratification in Loch Awe as this depends on many natural and operational variables at any given time. The depth of the Tailpond inlet / outlet structure is expected to exceed the typical depth of the thermocline in Loch Awe when thermally stratified, but this is based on limited and fairly old data; we are unaware of any recent water quality data recording the depth of the thermocline in this Loch and in particular the basin nearest the proposed outlet, and later there are recommendations for future monitoring to be undertaken.

There are many variables controlling the formation and spatial extent of seasonal thermal stratification in Loch Awe, and the subsequent deterioration of water quality in the hypolimnion, and these are difficult to predict. Similarly, there are multiple parameters related to the operation of the Development that will also influence how discharges from the outlet may influence seasonal thermal stratification in Loch Awe. Given this uncertainty, it is important that the precautionary principle is applied to any assessment, but also that future operation of the Development is carefully monitored and adjusted as necessary. Overall, the operation of the Development has the potential to influence thermal stratification in Loch Awe as set out earlier, but the impact would be limited to the core summer months of June-August after which overturn is expected to occur with autumn cooling and increased incidence of storms, with no impact at other times of the year when the water column would naturally be fully mixed. The impact is also likely to be restricted to the basin into which the outlet discharges in the central part of the loch, and should not affect the deeper northern or southern basins (noting that shallower water between the Tailpond and the northern basin may not stratify).

Although this impact represents a potential disruption of a natural process, from a water quality perspective it may not actually result in any particular deterioration in water quality. This is because thermal stratification (and subsequent overturn) tends to be associated with a reduction in water quality. Reduced stratification or maintaining a fully mixed water column reduces the potential for poorer water quality to form in bottom waters, particularly the release of bioavailable nutrients that can lead to algal blooms occurring under certain conditions. Indeed, preventing thermal stratification is one method that can be applied to control algal blooms where internal recycling of nutrients is a primary factor (Toffolon et al; 2013) by preventing the release of sediment-derived nutrients and increasing the mixing depth of nuisance blue-green algae (Dodds, 2002). However, it remains important that water quality conditions in Loch Awe are investigated before and during the operation of the Development and any changes in water quality aquatic ecology monitored. This data can then be used to optimise operation to minimise any significant adverse effects.

Based on the above appraisal of the risk from the Development, the seasonality of the impact and its expected restricted spatial extent, a low adverse impact is predicted on Loch Awe, which on a water feature of high importance, results in a **moderate adverse effect (significant)**.

11.7.8.8 Impact on Water Quality in Loch Awe – Headpond Discharges (Temperature)

Separately to the potential changes to the stability of seasonal thermal stratification as discussed above, consideration has also been given to whether the temperature of the water discharged from the Headpond might alter water temperature in Loch Awe outside of seasonal stratification.

The temperature regime of a loch is controlled by climatic factors as well as the volume and bathymetry of the loch. Solar radiation warms the water, whilst convection heat loss cools the water, with the net balance of the two controlling the surface water temperature at any given time. A loch with a small surface area to depth ratio will tend to receive less solar radiation to volume of water and thus may be expected to be cooler than a loch with a large surface area and shallow depth. There are many other factors that will moderate the balance of solar radiation to heat convection, such as wind induced mixing, water quality (e.g. turbidity levels can influence how deep solar radiation can penetrate into the water column), loch aspect and shading (e.g. by local topography, trees etc.), and locally by inflowing streams. Overall, the combination of climate and bathymetry, moderated by these other lesser factors, controls loch water temperature.

The Headpond will be filled repeatedly with water abstracted from Loch Awe as the Development generates and re-charges. Once in the Headpond the abstracted water will begin to take on the character reflective of the environmental characteristics of the Headpond. The longer the water is stored in the Headpond at any time the greater potential for differences in water quality between Loch Awe and the Headpond to develop. It is difficult to predict these changes with any certainty but there are factors that can be considered to determine how likely water temperature may change. Water will also pass through deep tunnels and generator turbines prior to discharge, and this could also contribute to any changes in water temperature observed in Loch Awe:

- Based on the volume and bathymetry of the Headpond it is not expected that water temperature will be significantly different to that in Loch Awe. The Headpond will remain a large and deep water body, and at slightly higher elevation surrounding air temperature may also be slightly cooler. Freshening flows from feeder streams associated with the Allt Beochlich catchment that will be severed by the filling of the Headpond will also help to moderate water temperature in the Headpond.
- During power generation water would pass through tunnels deep beneath the hillside. At a maximum depth of around 400 m below ground level there could be an increase of 10-20oC to the temperature of bedrock surrounding the tunnels. The tunnels will be lined with either concrete or steel. Concrete has a high thermal conductivity and steel has a very high thermal conductivity so this heat could be transferred to the water in the tunnels. However, water would pass through the tunnels relatively quickly and the large volumes will likely have a cooling effect on the tunnels themselves.
- If the discharged water is warmer than that in Loch Awe it would likely rise and form a plume across the surface of Loch Awe dissipating and dispersing the further from the outlet, and increasingly so once the Headpond has emptied (as it is a non-continuous discharge). In the less likely event that the water is cooler upon discharge, it is likely to plunge deeper into the Loch, before dissipating and dispersing. Under both scenarios, once the Headpond has emptied it is expected that after a short period of time water temperature conditions would return to ambient reflective of the balance of solar radiation and convection heat loss as moderated by a range of other factors at any given time.

Overall, a localised negligible adverse impact is predicted on Loch Awe, which is of high importance or water quality, resulting in a **minor adverse effect (not significant).**

11.7.8.9 Impact on Water Quality in Loch Awe – Risk from Concrete Residues

When first constructed there may be a concrete residue left on the Embankment damming the Headpond, which will be lined with concrete. The vast majority of the Headpond basin will not be lined with concrete. During commissioning of the Headpond this concrete residue may be washed off and that might lead to a small increase in pH of the water in the Headpond. However, due to the large storage volume it is expected that this effect would be small and would be short-term as any residue is washed off over time. As the Development will be operated through a number of initial cycles this residue would be washed off and further diluted and dispersed in Loch Awe. Overall, a negligible adverse impact on the high importance Loch Awe is predicted, resulting in a short-term, temporary but **minor adverse effect (not significant).**

11.7.8.10 Impact on Water Quality in Loch Awe – Increased Risk of Algal Blooms (Not Stratified Loch Conditions)

Loch Awe has a history of blue-green algae blooms as outlined in *Section 11.6 Baseline Environment*. Therefore, it is also important to consider whether the operation of the Development might increase the frequency of such events occurring in the future. This section considers the risk of increasing the frequency and duration of algal blooms when Loch Awe is not stratified. The impact of the Development on thermal stratification, and implication for the risk if algal blooms was discussed earlier.

Algae blooms are the rapid growth of algae or algae-like bacteria in a water body. In some lochs, algal blooms are a natural occurrence, particularly where there is an abundance of nutrients and periods of quiescent climatic conditions. However, harmful algal blooms occur when colonies of algae grow at a rapid rate and produce toxins or have other harmful effects on people, marine animals, terrestrial animals, birds and water quality. Many harmful algal blooms occur due to excessive growth of blue-green algae (i.e. cyanobacteria). However, non-toxic algae blooms can also deplete oxygen levels within a water body as they decay, and other than toxins produced by some forms of cyanobacteria, this is perhaps the most significant water quality risk. In addition, as algae grow, they consume carbon dioxide and this can result in significant increases in water pH, which is also relevant to a range of water quality and biological processes. Large and dense algal blooms may also smother littoral habitats and substrates within a water body and reduce light availability for photosynthesis by blocking sunlight at the surface. Where the water body thermally stratifies, the decay and decomposition of algae can accelerate the depletion of dissolved oxygen in the hypolimnion, and thus may exacerbate the risks to water quality upon overturn as discussed earlier. This includes encouraging further release of sediment-derived nutrients and the potential to seed additional algae blooms following overturn.

Tippett (1978) (Ref 11.44) found that the productivity of phytoplankton reduced around the vicinity of the Cruachan Hydro Scheme power station. It was also found that phytoplankton populations within the Headpond are much lower and less diverse than Loch Awe (Ref 11.44). It is not clear what the causal mechanisms were for these effects, but the regular passing of water between the Headpond and Loch Awe via turbines and screens, the increased mixing in the vicinity of the Tailpond inlet / outlet, and other possible changes to the local aquatic ecosystem may be influencing factors. It is possible that similar changes to the phytoplankton populations occurs in the vicinity of the Tailpond inlet / outlet for the Development during operation. This would imply that the risk from algal blooms from the operation of the Development would be lower, although this is a complex issue.

Furthermore, regardless of species, algal blooms respond in similar ways to key environmental factors such as nutrients, temperature and light, by employing similar growth and defence strategies to maximise growth (Wehr et al 2014). However, this is not to say that the factors controlling algal blooms are not numerous or the processes complex, which they are. Excluding changes to thermal stratification, which has been discussed above, water temperature and nutrient levels are the two principal factors that the Development may influence during its operation. However, it is predicted that the operation of the Development is unlikely to significantly encourage more frequent algae blooms because:

- The water temperature of water discharged from the Headpond is not expected to be significantly warmer than that in Loch Awe (see section on 'Impact on water quality in Loch Awe – Headpond discharges (temperature)' above).
- It is not anticipated that water in the Headpond will be significantly enriched by nutrients as the water in the Headpond would be abstracted from Loch Awe or otherwise from small feeder streams draining an upland catchment that is not expected to have a high nutrient load. The flow from these streams would also otherwise drain to Loch Awe naturally.
- Overtime, sediment may build up in the Headpond, which raises the possibility of persistent recycling of nutrients and an increasing source of excess nutrients to Loch Awe. However, sediment build up rates are expected to be low because of the character of the upland catchment and likely low primary productivity in the Headpond. Regular generation cycles will also reduce the risk of anoxic bottom water conditions developing that encourage the release of sediment-derived phosphorus. The build-up of sediments could be monitored and at an appropriate point in the future, excess sediment could be removed for disposal in accordance with waste legislation prevailing at the time.
- The risk of nutrient enrichment is greater if water in the Headpond became stagnant for an extended period of time and nutrients were allowed to build up, particularly in the longer term when there may be more sediment stored in the basin that could be a source of nutrients under certain conditions, and if the Headpond is not recharged. However, regular operation would prevent this, and even after full draw down, the volume of water left in the Headpond remains large (i.e. > 6 Mm^3 to dilute nutrients). As mentioned previously, the nutrient levels in the Headpond are not expected to be high.
- There is a high dilution and dispersion potential in un unstratified Loch Awe.

Overall, a long term but intermitted negligible adverse impact is predicted, which on the high importance Loch Awe, results in a **minor adverse effect (not significant)** without mitigation.

11.7.8.11 Surface Water Runoff and Spillage Risk During Operation

During operation there is a low risk that small quantities of oil or fuel may be spilled from service vehicles and the routine maintenance of fixed plant. The greatest risk would be for any works undertaken to fixed plant as part of the outlet / inlet structure due to the proximity to Loch Awe or to the Headpond. This risk would apply permanently and for the long term during the operation of the Development, but any impact would be more temporary, short term and unlikely to occur. To manage the risk, all maintenance operations would be carried out in accordance with the Operators Environmental Management System, which will include measures to avoid spillages of chemical substances. There will be SuDS measures implemented on above ground installations (where possible or otherwise proprietary measures included) that will help capture and treat runoff from new impermeable surfaces. The design of surface water drainage systems, incorporating appropriate attenuation and treatment measures, will be undertaken post-consent as part of a Detailed Design Strategy. This could be prepared pursuant to a planning condition. *Table 11.30* outlines the potential impacts and effects to water features from potential spillage risks during operation.

Table 11.30 Impacts and effects to surface water feature from surface water runoff and spillage risk from new urban surfaces

Loch Awe Catchment	NGR	Direction and Distance to the Development	Importance	Impact	Effect
Loch Awe	NN 00437 16188	All water features within the Main Area drain into Loch Awe. There is a Tailpond inlet / outlet where water will be abstracted and discharged.	High	**Negligible adverse impact -** Potential spillages from works associated to the Tailpond inlet / outlet structure. A Low, uncertain, direct impact is predicted in the long-term.	Minor Adverse (Not significant)
Allt na Cuile Riabhaiche and tributaries (LA2)	NN 06346 19768	Runoff and spillage risk from Access Tracks that also cross the Upper Sonachan / Keppochan Forest.	Low Importance	**Negligible adverse impact -** Potential spillages from Access Track. A direct but unlikely negligible impact is predicted in the long-term..	Negligible (Not significant)
Keppochan River and tributaries (LA3)	NN 07270 19990	Runoff and spillage risk from Access Tracks that also cross the Upper Sonachan / Keppochan Forest.	Low Importance	**Negligible adverse impact -** Potential spillages from Access Track. A direct but unlikely negligible impact is predicted in the long-term.	Negligible (Not significant)
Archan River and tributaries (LA4)	NN 08466 20254	Runoff and spillage risk from Access Tracks that also cross the Upper Sonachan / Keppochan Forest.	Low Importance	**Negligible adverse impact -** Potential spillages from Access Track. A direct but unlikely negligible impact is predicted in the long-term, although any impact from a spillage would be temporary.	Negligible (Not significant)
Allt a Chrosaid and small lochan (LA5)	NN 02937 16523	Runoff and spillage risk from PC21 and upgraded crossing of B840 crossing. PC21 is situated approximately 29 m south of LA5.	Low Importance	**Negligible adverse impact -** Potential chemical spillages from Access Track and in surface water runoff from PC21. A direct but unlikely negligible impact is predicted in the long-term, although any impact from a spillage would be temporary.	Negligible (Not significant)
Allt Beochlich and tributaries (LA6)	NN 03502 15714	Runoff and spillage risk from Access Track and PC09.	Medium Importance	**Negligible adverse impact -** Potential spillages from Access Track and PC09. A direct but unlikely negligible impact is predicted in the long-term, although any impact from a spillage would be temporary.	Negligible (Not significant)
Lochan Beochlich (LA8)	NN 03030 15414	Runoff and spillage risk from PC09 situated upstream of lochan.	Low Importance	**Negligible adverse impact -** Potential spillages from Access Track and PC09. A direct but unlikely negligible impact is predicted in the long-term, although any impact from a spillage would be temporary.	Negligible (Not significant)
Lochan Romach (LA10)	NN 02811 15735	Runoff and spillage risk from PC19 and Access Track that is situated 100 m upstream of LA10.	Low Importance	**Negligible adverse impact -** Potential spillages from Access Track and PC19. A direct but unlikely negligible impact is predicted in the long-term, although any impact from a spillage would be temporary.	Negligible (Not significant)
Allt na Fainge (LA12)	NN 01216 16501	Runoff and spillage risk from upgraded B840 crossing.	Low Importance	**No Impact –** No material changes in traffic flows serving the development and the area of road effected is small.	N/A

Loch Awe Catchment	NGR	Direction and Distance to the Development	Importance	Impact	Effect
Allt a' Ghreataidh (LA13)	NN 01200 16313	Runoff and spillage risk from upgraded B840 crossing.	Low Importance	**No Impact –** No material changes in traffic flows serving the development and the area of road effected is small.	N/A
Alt Mor (LA14)	NN 01160 16630	Runoff and spillage risk from upgraded B840 crossing.	Medium Importance	**No Impact –** No material changes in traffic flows serving the development and the area of road effected is small.	N/A
Cladich River/Allt an Stacain (LA17)	NN 09638 22424	600 m downstream of Sonachan / Keppochan Forest track that may be used for access. But may be affected by any impacts to LA3 or LA4 as they are hydraulically linked.	Medium Importance	**Negligible adverse impact -** Contaminated run-off could wash into Cladich River from Keppochan River (LA3) and Archan River (LA4). A Low, uncertain, direct impact is predicted in the long-term.	Negligible (Not significant)
Unnamed watercourse (LA18)	NN 01125 15692	Runoff and spillage risk from upgraded B840 crossing.	Low	**No Impact –** No material changes in traffic flows serving the development and the area of road effected is small.	N/A
River Aray and tributaries (LF1)	NN 09003 10169	Runoff and spillage risk from upgraded road across the River Aray at NN 09165 09855.	High Importance	**No Impact –** No material changes in traffic flows serving the development and the area of road effected is small.	N/A
Crom Allt and tributaries (LF2)	NN 08592 07409	Runoff and spillage risk from proposed Access Tracks that also cross part of Crom Allt at NN 08415 07691	Low Importance	**No Impact –** No material changes in traffic flows serving the development and the area of road effected is small.	N/A

11.7.8.12 Compensation Flow Downstream of the Embankment

The Development lies within the catchment of the Buinne Dhubh watercourse, which becomes the Allt Beochlich watercourse (LA6) downstream of a man-made impoundment (referred to as Beochlich Lochan) at around NN 03034 15412. Beochlich Lochan (LA8) is approximately 1.8 ha in area and supplies a local 1MW 'run of river' hydroelectric power (HEP) scheme that opened in 1998. Allt Beochlich and Buinne Dhubh watercourse is also a WFD designated water body (both considered within LA6).

The construction of the Headpond will result in the loss of approximately 5.4 km^2 of LA6 catchment (approximately 45%) broadly upstream of the confluence of the overflow from Lochan Airigh (LA7) to the Buinne Dhubh watercourse. This includes flows from Lochan Dubh and a number of 1st and 2nd order tributaries of the Buinne Dhubh watercourse that drain the west facing slopes of Cruach na Gearr choise mountain (see *Figure 2a Surface Water and Groundwater Receptors and Attributes – Headpond Study Area (Volume 3: Figures)*).

The loss of a large proportion of the catchment could result in significant changes in hydrology and the flow regime downstream of the Headpond impoundment. Without a compensation flow the remaining downstream reach would be depleted with reduced flows when compared to the current baseline. Depending on the morphology of the channel at any given location, reduced flows may correspond to a drying up of parts of the bed with the reduced wetted permitter corresponding with reduced aquatic habitat along the river corridor. Reduced flows may also mean less dilution of chemical substances or the flushing of excess fine sediment. During prolonged warm weather there may also be longer periods of lower flows and lower oxygen levels, when compared to the baseline situation.

The impact of the loss of catchment would be most significant closest to the impoundment and upstream of any unaffected tributaries. A significant tributary flows into the Buinne Dhubh watercourse just upstream of the Beochlich Lochan. Thus, the worst affected reach would be around 600-700 m long (i.e. between the Headpond Embankment and the confluence with this tributary). The impact downstream of the man-made impoundment at Beochlich Lochan would be less pronounced as the flow regime is already modified by the operation of the local HEP scheme. Other tributaries regularly join the main channel of Allt Beochlich including those draining north from woodland to the south and from Lochan Romach to the northeast. However, without a compensation flow, the future flow regime will be depressed.

The Development abstracts water from Loch Awe and thus unlike conventional hydro-power schemes does not require use of any flow from within the catchment. Given the storage volumes in the Headpond there will always be a source of water from which to provide a compensatory flow. During detailed design, a passive structure will be designed that allows a compensatory flow to be passed forward. Details of this can be determined as part of a future CAR licence application. Overall, although a compensation flow can be provided, the construction of the Headpond and its operation is expected to result in a flow regime along the Allt Beochlich that is further altered from that as a result of the local HEP scheme. However, the impact would be most pronounced between the Headpond Embankment and the first major downstream tributary of the Allt Beochlich which is a reach of around

700-800 m. A permanent, long term and direct medium adverse impact is predicted on the medium importance Allt Beochlich resulting in **minor adverse effect (not significant)**.

11.7.8.13 Impact on Groundwater

The key factor identified affecting groundwater during the operation phase is the ongoing presence of the Waterways, Power Cavern Complex and Access Tunnels. As the Waterway will be lined, the risk of groundwater entering the tunnels or pumped water leaking to ground is minimal. At the depth of Power Cavern Complex, the amount of fracturing will reduce and so the inflow will also reduce (especially with the construction methods mentioned under section 11.7.2 Effects on groundwater). The magnitude of impact on all groundwater receptors is considered to be negligible adverse, resulting in a **negligible adverse effect (not significant**), considering the low importance of groundwater in this study area.

The Headpond Embankment will be concrete-lined and filled with water fed from Loch Awe (i.e. it will be a 'closed' system and should not interfere with local groundwater). No groundwater resource or water quality issues are expected during the operation phase. The magnitude of impact on all groundwater receptors is considered to be negligible, which on the low importance underlying bedrock groundwater body results in a **negligible adverse effect (not significant)**. On the high importance superficial groundwater body a negligible adverse impact also results in a **negligible adverse effect (not significant).**

11.7.8.14 Effects on Hydromorphology

The Development will result in the loss of some water features, as well as having the potential for other adverse impacts to their hydromorphology from loss of discrete channels, changes to the flow regime, permanent watercourse crossings, and changes in rate and volume of runoff from permanent above ground installations during the operation phase.

11.7.8.14.1 Construction of Embankments and Headpond

The main Embankment for the proposed Headpond will cross the Allt Beochlich and will completely block its natural course and infill the entire valley. The subsequent flooding of the Headpond will inundate the valley, resulting in the permanent loss of the main channel, a number of first and second order tributaries, and Lochan Airigh. Loch Airigh is considered to be of low importance for water quality. Its loss is a high adverse impact, which results in a **moderate adverse effect (Significant).** The construction of the Headpond will also result in changes to the flow regime downstream and the associated capacity of the watercourse to transport coarse sediment. The design will include a structure to allow natural flows to be passed forward to the downstream channel (i.e. a compensation flow). When the reservoir is full, the scheme will affect approximately 1.7 km of the main stem channel (from the proposed Embankment site to the proposed top water level) and several tributaries to the Allt Beochlich. The affected reaches will be drowned within the reservoir and will not be functional as discrete watercourses. It is therefore assessed that the permanent impact of the Headpond would be medium adverse, which given the medium importance of Allt Beochlich for hydromorphology, results in a **moderate adverse effect (Significant).**

The impact of the change to the transport capacity of the Allt Beochlich downstream of the main Headpond Embankment will be limited, assuming as natural a flow regime as possible can be maintained Drowning of reaches of the watercourses upstream may however impede sediment transport through the flow route. Sediment transport is also already disrupted due to the presence of the reservoir (i.e. Lochan Beochlich, LA8) and a small hydropower scheme approximately 1.5 km downstream of the proposed Embankment location. The channel of the watercourse in this location is dominated by bedrock and therefore it is very stable and has a low sensitivity to physical modifications therefore significant channel change is not anticipated. It is therefore assessed that the permanent impact of the Embankment on sediment transport in this reach will be medium adverse, which given the medium importance of the receptor for hydromorphology, results in a **moderate adverse effect (Significant).**

Permanent compound PC09 is located over the Allt Beochlich, downstream of the main Headpond Embankment. It is assumed that the watercourse would be diverted around the compound, resulting in a long term, permanent impact, affecting around 80m of the channel length. In this location, the channel has a shallower gradient than upstream, and coarse sediment depositional features are present. An appropriate channel design will be required, including translocation of existing coarse sediment and maintenance of the current channel gradient where possible. It is therefore assessed that the permanent impact of the diversion of the Allt Beochlich around PC09 will be low adverse, which given the medium importance of the receptor for hydromorphology, results in a **minor adverse effect (not significant).**

11.7.8.14.2 Watercourse Crossings

The majority of the river crossings outlined Section 11.7.6 in will be retained as permanent routes, therefore the operation phase impact has already been assessed.

11.7.8.14.3 Runoff from Hardstand Areas

Surface water runoff from permanent compounds will need to be managed and this may require new surface water outfalls to watercourses where infiltration is not possible. The construction of new hardstanding areas also has the potential to increase run-off to watercourses, which could cause erosion downstream. The area of hardstanding to be introduced is small within the context of the catchment areas of the watercourses downstream of the compound and is therefore unlikely to cause a detectable increase in flows. Surface water runoff from permanent compound areas will also be attenuated and treated using SuDS or other proprietary measures. Finally, the watercourses that might receive flows are predominantly stable, with bedrock typology, and will be generally resistant to severe erosion. The proposed permanent compounds and potentially affected watercourses are listed in *Table 11.31* below.

Table 11.31 Permanent Compounds and Affected Watercourses

Compound Name	Affected Watercourse	Direction and distance between compound and water feature	Hydro-morphological Importance	Impact	Effect
PC03	Allt a Chrosaid (LA5) and Allt a Geataidh	Approx. 60 m to north and approx. 80 m to south and approx. (respectively)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC05	Unnamed tributary discharging directly to Loch Awe	Approx. 70 m to north (across slope)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC06	Small tributary to Allt Beochlich (LA6)	Approx. 30 m to north (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC09	Allt Beochlich (LA6)	0 m	Medium Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC14	Allt na Cuile Riabhaiche and tributaries (LA2)	Approx. 55 m to northwest (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC17	Unnamed tributary to Loch Airigh	150 m to west (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC18	Unnamed small lochan and tributary to Loch Airigh	110 m to west (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC19	Unnamed small lochan and tributary to Loch Airigh	110 m to west (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC20	Unnamed tributary to Lochan Romach	100 m to west (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)
PC21	Allt a Chrosaid	30 m to south (upgradient)	Low Importance	**Negligible adverse**	Negligible adverse effect (not significant)

11.7.8.14.4 Loch Awe Tailpond Inlet / Outlet Structure

The permanent Tailpond inlet / outlet structure on the shore of Loch Awe will not alter the size, shape or morphology of the Loch. However, there will be approximately 150 m of bank modified from natural green bank to artificial grey bank, due to the presence of the structure. There will be some loss of the marginal zone of the Loch over this length, with the water close to the outlet becoming deeper than at present. Within the size and scale of Loch Awe the impact is assessed to be negligible. As Loch Awe has been classified as medium importance for hydromorphology, this results in a **negligible adverse effect (not significant).**

11.7.9 Decommissioning Phase

Hydropower assets are very durable and, consequently, it is very rare for large-scale hydro projects to be decommissioned. Rather, they may be refurbished or adapted. However, it is assumed that if the decommissioning of the Development is required, then similar activities to the construction, potentially with additional crushing of construction materials and removal of drainage pipework containing residual water and sediment (as per *Chapter*

2: Project and Site Description). These works could result in similar impacts on the water environment as during the construction phase, albeit at a lower scale and smaller spatial distribution, and with minimal excavation and earthworks.

It is likely that the following decommissions activities would occur:

- Water could be drained from the Headpond and released at an agreed rate and timescale through the appropriate licensing regime into Loch Awe;
- The Waterways and tunnel portal entrances will be blocked off with local spoil;
- The Tailpond inlet / outlet structure will be removed;
- The control building, substation and battery housing will be removed;
- To prevent any incident with the Headpond filling up, the scour valves will remain open, and the spillway pipe and the Headpond inlet / outlet structure will be left in place.

During decommissioning, surface water run-off containing excessive amount of fine sediment or chemicals such as fuel oil may enter and contaminate nearby water features such as Loch Awe if the works are not managed correctly. It is assumed that the works would be undertaken in accordance with a Decommissioning Environmental Management Plan (DEMP) which would have a similar scope to the CEMP and also refer to good practice guidance, as set out later in *Section 11.9*. It is also assumed that a Sediment Management Plan would be agreed with SEPA, and relevant actions would be implemented at decommissioning stage. However, with standard mitigation, the potential impacts and effects as described for the construction phase would typically occur. Following decommissioning of the infrastructure on site, a Water Features Restoration Plan should be implemented, to allow for reinstatement of river processes in the affected reaches. This may require removal of fine sediment and replanting. The reinstatement should be informed by preconstruction photographic survey and mapping. This could result in significant beneficial effects to the water environment if implemented.

As decommissioning is expected to require its own consents and licences at the time, it is assumed that any management plans that are required will be prepared at a later stage.

11.8 Cumulative Effects

Intra-relationship and inter-relationship cumulative effects have been considered as part of this water environment impact assessment, and the results presented below.

11.8.1 Inter-Cumulative Effects

The cumulative effects assessment is based on the Developments identified in *Chapter 4: Approach to EIA.* The Cumulative Developments identified are those that are reasonably foreseeable - i.e. in the public domain (e.g. at scoping stage or has been consented but not yet under construction / constructed at the point of writing the assessment / at submission).

Inter-relationship cumulative effects have assessed qualitatively where committed development is proposed that could have cumulative effects with water features that may be affected by the Development, either during construction or operation phases.

Table 4.8 in *Chapter 4: Approach to EIAR* lists all the committed developments in the wider area around the Development Site that have been considered by this EIAR. *Table 11.32* provides a summary of potential cumulative effects with these committed developments.

Table 11.32 Cumulative Effects

Development	ECU/ABC Reference	Description	Distance to Tailpond and Tunnel Portals (m)	Distance to Headpond (m)	Cumulative Effect
Cruachan Hydro Scheme	unknown	440 MW pumped storage hydro scheme that uses Loch Awe as a Tailpond. Operational since 1965	10689	11017	Cumulative impacts on water level within Loch Awe, which could influence water quality. Disturbance of the water column during seasonal thermal stratification could also lead to more widespread changes in Loch Awe.

Development	ECU/ABC Reference	Description	Distance to Tailpond and Tunnel Portals (m)	Distance to Headpond (m)	Cumulative Effect
Cruachan Expansion	ECU00004492	Increasing the capacity of the existing PSH scheme by up to 600 MW.	10674	11003	However, Cruachan Power Station is situated within the north basin over 17 km from the Development. Thus, there will unlikely be any interaction between the operation of the two pumped storage schemes and therefore cumulative effects in terms of water quality.
Blarghour Wind Farm - Consented	EC00005267	Wind farm development comprising 17 turbines with a total installed capacity of 57.8 MW.	1105	169	If built and the necessary land rights secured, the wind farm Access Track will also be used to access the Balliemeanoch Main the Development Site. Therefore, there may be inter-cumulative effects with increased traffic flow. Which could lead to potential contamination impacts at water crossings. However, appropriate mitigation measures will limit this. Additionally, the Balliemenaoch vehicles movements on the track will likely be very low, thus a very low impact.
Blarghour Wind Farm Variation	ECU00004481/ ECU00004754 / 23/00537/S36	To increase the height from 136.5 m to 180 m.			

11.8.2 Intra-Cumulative Effects

There is the potential for intra-relationship effects between the assessment of effects of water quality, morphology and ecology. Firstly, it is important that the biological value of water features is carefully taken into account and that any physical modifications or river enhancements also consider the effects on ecological receptors. Generally, it is assumed that by improving water quality, hydraulic conditions and morphological diversity there would be associated biological benefits. Alternatively, on rare occasions, modified river morphology may support a sensitive ecological receptor or have heritage value, and these themselves may be important features that then restrict the type of hydromorphological improvements that can be made.

There are also potential intra-relationship effects which occur between shallow superficial aquifers, GWDTEs and geology/ground conditions. The removal of peat could impact the natural flow regime of rain-derived superficial aquifers and thus GWDTEs.

11.9 Mitigation and Monitoring

The following section describes the mitigation and monitoring that is proposed to avoid, minimise, reduce and compensate for predicted adverse effects to acceptable levels or to ameliorate non-significant effects in accordance with good practice.

11.9.1 Embedded Mitigation

There are a number of potential water quality, morphological, hydrological and drainage impacts that could occur as a result of the Development. With mitigation however, the potential impacts could be avoided, minimised and/or reduced. Mitigation measures that have been designed into the Development and are therefore considered as 'embedded mitigation' have been taken into consideration in the assessment of the significance of effects on the water environment. A more detailed description of the embedded mitigation relevant to a particular effect / receptor is provided in this section. Details of the Development and other mitigation measures can be found within *Chapter 2: Project and Site Description* and the scheme drawings can be found within *Volume 3: Figures* of this EIAR Chapter, *Figures 2.5* to *2.18.*

11.9.1.1 50 m Water Feature Buffer

The Development Components have been sited to avoid water features where possible, although for large spatial components such as the Headpond, this is practically not possible. As per the advice from SEPA (see *Table 11.3*) all 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. This will help to mitigate the risk from construction and operation phase runoff (including chemical spillages) as well as avoid physical impacts. However, in addition to the Headpond, there are some locations where it is not possible to maintain this 50 m buffer zone. Many of these occurrences relate to watercourse crossings (either new crossings or where an existing crossing may need to be modified), but there are others. In their EIA scoping opinion response SEPA requested that where the 50 m buffer could not be maintained that these breaches should be clearly identified in the EIAR. Each breach is listed in *Table 11.33* alongside the justification for the breach. They are also shown on *Figure 11.2a: Surface Water and Groundwater Receptors and Attributes – Headpond Study Area* and *Figure 11.2b: Surface Water and Groundwater Receptors and Attributes – Loch Fyne Study Area (Volume 3 Figures).*

Table 11.33 Breaches of 50 m buffer zone

Water Feature	Proposed Works/Component	Proximity to works	Justification for breach of 50 m buffer zone
Loch Awe	TC02	Bank edge	Compounds are located to facilitate the construction of the Tailpond inlet / outlet structure that is located on the margins of Loch Awe and thus need to be located within the 50 m buffer zone.
	PC03	Compound 46.5m from Loch Awe	
River Aray and tributaries (LF1)	Upgrade existing watercourse crossing - C1, C2 and C3 *(Appendix 11.4 (Volume 5: Appendices))*	Crosses watercourse	Cannot be moved as access required to avoid vehicles moving through Inveraray.
Crom Allt and tributaries (LF2)	Upgrade existing watercourse crossing – IN1, IN2, IN3 and IN4 *(Appendix 11.4 (Volume 5: Appendices))*	Crosses watercourse	Cannot be moved, access required to avoid vehicles moving through Inveraray.
Allt na Cuile Riabhaiche and tributaries (LA2)	New watercourse crossing – F1, F2 and F3 Upgrade existing watercourse crossing - F4, F5 and F6 *(Appendix 11.4 (Volume 5: Appendices))*	Crosses watercourse	Cannot be moved as required for access to the Development Site.
Keppochan River and tributaries (LA3)	Upgrade existing watercourse crossing – F7 and F8 *(Appendix 11.4 (Volume 5: Appendices))*	Crosses watercourse	Cannot be moved as required for access to the Development Site.
Archan River and tributaries (LA4)	Upgrade existing watercourse crossing – F11 *(Appendix 11.4 (Volume 5: Appendices)*	Crosses watercourse	Cannot be moved as required for access to the Development Site.
Allt a Chrosaid and small lochan (LA5)	PC21	Compound approx. 29 m upgradient from water feature	Located to avoid impacts to other environmental receptors such as peat.
	Upgrade existing watercourse crossing – B3 *(Appendix 11.4 (Volume 5: Appendices)*	Crosses watercourse	B840 crossing.
Allt Beochlich and tributaries (LA6)	Embankment and Headpond	Cuts off Allt Beochlich catchment area	Cannot be moved as a major component of the design.
	PC09	Compound area includes a reach of Allt Beochlich upstream of proposed Embankment	Located to incorporate area for the compensation flow scheme to compensate the downstream flow to LA6 thus must be positioned close to the watercourse.
	TC08	Situated immediately upgradient of a tributary of Allt Beochlich	Located to incorporate area for the compensation flow scheme to compensate the downstream flow to LA6 thus must be positioned close to the watercourse.

Water Feature	Proposed Works/Component	Proximity to works	Justification for breach of 50 m buffer zone
	PC06	Compound is approx. 33 m upgradient from a tributary of Allt Beochlich	Portal for tunnel. Located to avoid impacts to other environmental receptors such as peat.
	Upgrade existing watercourse crossing – B4, B5, B6 and B7 New watercourse crossing - B10, B11 and B12, New watercourse crossing - B17, B18, B19, B20, B21, B22, B23, B24, B25 and B26 (Appendix 11.4 Volume 5)	Crosses watercourse	Crossings required for Access Tracks.
Lochan Airigh (LA7)	Embankment and Headpond	Lochan Airigh will be completely lost to the Development	Cannot be moved as a major component of the design.
Lochan Beochlich (LA8)	TC07	Compound is approx. 33 m upgradient from Lochan Beochlich	Located to avoid impacts to other environmental receptors such as peat.
Allt na Fainge (LA12)	Upgrade existing watercourse crossing – B1 (Appendix 11.4 Volume 5)	Crosses watercourse	Existing B840 crossing.
Allt a' Ghreataidh (LA13)	Upgrade existing watercourse crossing – B2 (Appendix 11.4 Volume 5)	Crosses watercourse	Existing B840 crossing.
Unnamed Watercourse (LA18)	Upgrade existing watercourse crossing – B4 and B5 (Appendix 11.4 Volume 5)	Crosses watercourse	Existing B840 crossing.

11.9.1.2 Management of Water Quality Risks From Permanent Development

Each of the permanent and temporary compounds will include sustainable drainage and / or proprietary drainage measures to intercept and treat surface water run-off from the Development during construction and operation.

During construction, measures may include temporary earth ponds / settlement lagoons, ditches, fabric silt fences, the use of silt busters or lamella clarifiers, dewatering / sediment bags (e.g. silt tubes), silt curtains, and measures to manage spillage risks such as designated bunded refuelling areas. Spoil storage and processing from the construction of the Headpond will be within the Headpond area at TC15. Further details are provided later in this section under 'Standard Mitigation.'

To minimise the risk of chemical spillages, a cut off drain will be installed at the toe of the new Embankment to collect water run-off during construction and prevent it, and any chemicals that may have been spilled, propagating from the Development Site without treatment.

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 swales to capture and treat any runoff. The design of surface water drainage systems, incorporating appropriate attenuation and treatment measures, will be undertaken post-consent as part of a Detailed Design Strategy. This could be prepared pursuant to a planning condition. The type of treatment measure and the number of treatment train components will be determined during detailed design. This will be informed by a water quality risk assessment applying the Simple Index Approach described in C753, The SuDS Manual (Ref 11.51).

11.9.1.3 Headpond and Interception of Watercourses

Allt Beochlich will be intercepted from around NN 03855 15923 by the Embankment. This will cut off much of Allt Beochlich Catchment area including multiple tributaries and Lochan Airigh. This area will be completely lost to the Development. Flow downstream of NN 03855 15923, will be compensated with a compensation flow scheme. More details of this can be found below at, 'Compensation Flow'.

11.9.1.4 Embankment Construction Method

At this stage there is no detailed construction method for the construction of any of the two proposed Embankments For this assessment it has been assumed that a concrete box culvert will be constructed offline in the location of the main Embankment along the face of the Headpond but adjacent to the Allt Beochlich. The Allt Beochlich will then be diverted through the culvert, which will allow flows to be maintained while the Embankment is constructed either side and over the culvert. The culvert will be plugged to allow the Headpond to fill once construction of the Embankments and associated infrastructure is complete.

11.9.1.5 Tailpond Inlet / Outlet

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. 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. Also, the spillway outlet will contain energy dissipation components to reduce the force of the water entering the Loch and causing scour of the bed.

The loch bed of Loch Awe will be reprofiled to accommodate a new level of 18.2 m AOD. The Tailpond inlet / outlet structure will be approximately 18 m deep (within the bank of Loch Awe). The tailrace divides into Loch Awe from the Lower Gatehouse just upstream of the outlet which is fronted by two sets of screens 74 m wide and around 19 m high. The majority of the structure is either sub-surface within the bank of Loch Awe or beneath the water level of the Loch (as shown on *Figure 2.16 Indicative Tailpond inlet / outlet Cross Section (Volume 3: Figures)*). The Tailpond inlet / outlet structure consists of an inclined screen and a screen cleaning mechanism, stoplog, rock armour and silting chamber.

11.9.1.6 Allt Beochlich Compensation Flow

To ensure that significant impacts on the downstream flow regime for LA6 are avoided, including ecology and the local HEP scheme, it is proposed to ensure that a suitable compensation flow is maintained at all times. Unlike other HEP schemes, water for the pumped storage scheme is abstracted from Loch Awe rather than the catchment in which the Headpond is located. Flow into the catchment from further upstream can be effectively passed forward to maintain downstream flows and the existing flow regime as far as practically possible. The outlet from the Headpond to the LA6 watercourse downstream of the Embankment will be set at a low elevation within the Headpond so that a source of water is always present regardless of whether the Headpond is in a charged or uncharged state. There are options for how the compensation flow is defined. It could be linked to a control catchment or water level in the Beochlich Lochan so that a penstock is automatically opened or closed to allow a certain flow through the compensation outlet, or a defined flow could be maintained at all times.

It is proposed that the compensation flow will be determined at a later stage as part of the CAR Licence application. In advance of this, a programme of water level and flow monitoring will be undertaken on the LA6 (and tributaries) as well as potentially level monitoring in the LA8 (if such data is not already recorded for the local HEP scheme). This data will inform determination of a suitable compensation flow regime that maintains as close to the current flow regime as is practical. This also the potential to benefit hydromorphological processes, as the compensation flow structure could be designed with a natural bed, to allow transport of coarse sediment from the upstream catchment to the downstream reach.

11.9.1.7 Design of Watercourse Crossings

Two types of watercourse crossings are proposed, outlined on Drawing S03-Z0-02-DR-CE-300601. Closed pipe culverts will be used where existing crossings are to be upgraded and open arch culverts will be used where new crossings are required. During the site survey, a number of existing crossings were viewed and photographed. The crossing type at the visited sites were closed pipe culverts, which appear to have minimal impact on flow and geomorphological processes due to the channel typology (See *Appendix 11.4*). SEPA have created guidance on good practice for river crossings (Ref 11.52) which describes the impact on rivers from different types, replicated in *Diagram 11-2* below. The figure shows that single span structures which retain the natural channel bed have less impact than closed culverts. Therefore, it is proposed that arched culverts will be used for new crossings, to minimise the impact of new Access Tracks.

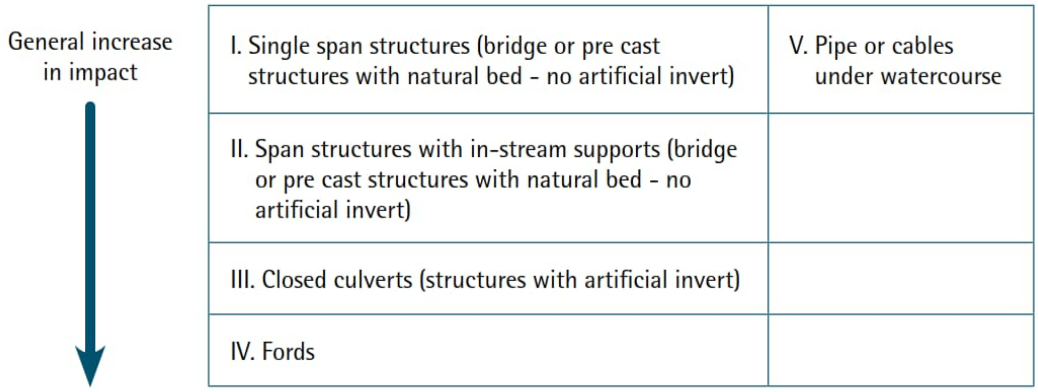


Diagram 11-2 River crossing types extracted from SEPA document wat-sg-25

All crossings are proposed to be permanent, except for B27 and B28 located on a tributary to the Buinne Dhubh, where the temporary construction track on the north side of the Headpond will be constructed. Watercourse crossings are described in *Appendix 11.4*, including which are existing crossings to be upgraded and which will be new.

Wherever there above ground installation, the nearest water body might have an outfall. The detailed drainage strategy will provide this information.

11.9.1.8 Loch Fyne Jetty

A jetty will be constructed within Loch Fyne which will be used for delivery of abnormal indivisible loads (AILs) of materials and equipment during construction, removed post construction and reassembled during operation for maintenance when required. The jetty will be used for delivery of a maximum of 10 shipments (estimated based on a combination of the number of AILs and units that can be carried on a barge appropriate for the size of the Marine Facility) and only at high tide due to the tidal nature of the Loch and the design of the jetty.

The jetty will be constructed with driven piles (not drill and grout) to reduce impacts from dispersion of fine suspended material. Runoff from the jetty is assumed to flow directly to the Loch.

Mitigation measures outlining the protection measures for marine ecologies is described within *Chapter 8: Marine Ecology (Volume 2: Main Report)* and for measures protecting the marine physical environment see *Chapter 18: Marine Physical Environment and Coastal Processes (Volume 2: Main Report)*.

11.9.1.9 Management of Groundwater

The contractor will aim to stem any uncontrolled water/ ingress into Waterways, the Power Cavern Complex and Access Tunnels using a combination of sprayed concrete and/or other forms of lining as appropriate. A significant amount of the construction will be at great depth, where the amount of fracturing will reduce, and therefore inflow will also reduce.

The amount of interaction with the underlying groundwater body will be minimal. Although no springs have been found in this area, if during construction water ingress to the Headpond is discovered, the possible installation of a granular fill beneath the lining may be required.

11.9.2 Standard Mitigation

The Outline Water Management Plan (oWMP) (See *Appendix 11.5, (Volume 5: Appendices)*) 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.

The oWMP has been developed and will be implemented by the contractor and would support the Construction Environmental Management Plan (CEMP) by describing the measures to protect the water environment during the construction works in greater detail, with reference to specific construction activities and programme e.g. for earthworks or works affecting specific waterbodies.

The mitigation listed in this section will be implemented in accordance with the CEMP and oWMP, and reflect any conditions imposed by SEPA or other statutory consultees through the consenting and future CAR application processes.

11.9.2.1 Control of Construction Water Environment Risks

A CEMP referring to a range of standard mitigation measures will be prepared and implemented by the Contractor as necessary to protect the water environment from pollution and physical impacts during construction works.

Pollution prevention mitigation measures that accord with legal compliance and good practice guidance are to be implemented to:

- Control and minimise the risk of pollution to surface waters and groundwater by managing construction site runoff and the risk of chemical spillages;
- Control the storage, handling and disposal of potentially polluting substances during construction;
- Manage water removed from excavations to ensure to protect nearby water features from any pollution risk but also to support flows if there is a risk of reductions to baseflow.
- If necessary, provide compensatory discharges to surface water features or GWDTEs that are groundwater fed to minimise impacts on the water level and flows to these receptors and any third-party users; and
- Avoid and minimise the risk of damage to physical form and processes of water features.

11.9.3 Secondary Consents

The construction of the Development will be undertaken in accordance with good practice as detailed below. It is assumed that all temporary works will be carried out under the necessary consents/permits (e.g. CAR licences as required under the Water Environment (Controlled Activities) Regulations 2011, (Ref 11.1), and that the contractor will comply with any conditions imposed by any relevant permission. The contractor will ensure that all permits/consents are obtained in advance of any relevant works in, over, under or near watercourses.

11.9.4 Standard Good Practice

There are many ways in which construction pollution risks to the water environment can be dealt with. All works to be undertaken in line with the CEMP for the Development, which shall be developed in the design phase and refined for the consented project in advance of and during construction. Central to this will be a programme of water quality monitoring (described later under *section 11.9.4 Additional Mitigation)* and the implementation of a temporary drainage system. The temporary drainage system will be prepared in accordance with good practice guidance. There will be no direct discharges to groundwater or surface waters without appropriate treatment (where required to meet consent standards); the contractor will ensure that there is adequate space to ensure that appropriate drainage control measures can be implemented for the duration of the construction works; and all secondary consents will be complied with. Further details are provided in the following sections.

11.9.4.1 Management of Construction Site Run-Off

Mitigation measures to management run-off are detailed in the oWMP and are therefore not repeated here in detail. Below is a summary of measures:

- Avoidance of wet weather working where practical, especially site clearance, earthworks and works to water features;
- Appropriate separate storage of topsoil/subsoil and materials, and at least 20 m from water Features on flat ground;
- Any earth bund/ stockpile to be present for longer than two weeks will be either seeded, covered using geotextiles, or other pressures provided to ensure it is not a source of excessive fine sediment in runoff to water features;
- The implementation of a temporary drainage system and other measures to manage pollution risk during construction (e.g., fabric silt fences, lagoons, bunds, straw bales, sandbags, lamella clarifiers or other proprietary measures as may be required) etc.;
- Any dewatering of excavations will include measures where necessary to filter the water prior to discharge to a watercourse or ground (there shall be no discharge of any construction site runoff to existing ponds); and
- The control of mud deposits at entry and exits to the Site using wheel washing facilities and/ or road sweepers operating during earthworks or other times as considered necessary.

Construction works directly affecting water features will require careful management and the implementation of stringent working practices and mitigation. This applies to the construction of the Tailpond inlet / outlet structure within Loch Awe, and to other minor watercourses that may be crossed by new or upgraded Access Tracks, or to which new surface water drainage connections are made.

All works within Loch Awe are to be undertaken behind two levels of containment. Firstly, it is proposed to install a site-specific silt curtain around the working area that would be designed so that it is tailored to the shoreline and anchored to the bed. Secondly, and once the silt curtain has been installed, a cofferdam would be constructed. Any fine sediment mobilised during the construction of the cofferdam would be contained within the silt curtain and would not propagate from the close vicinity of the work and will over time resettle to the bed. Water behind the cofferdam would be pumped out using baffles to prevent any bed / bank erosion or further disturbance of any fine sediment on the loch bed.

Any works in the channels of smaller watercourses will be undertaken in a dry working environment, where possible, with flow temporarily over-pumped or flumed or isolated from the working area using sand/ pea gravel bags or other similar and inert barrier.

11.9.4.2 Management of Spillage Risk

To prevent chemicals, fuels / oils and other such substances from entering the water environment, measures to control the storage, handling and disposal of these substances would be put in place prior to and during construction. The CEMP and oWMP provide detailed information relating to the control of spillages and leaks, and these are not repeated here. However, in summary they include:

- Spill kits will be available on the site in watertight containers (e.g. works near watercourses) and carried on all mobile plant. They would be regularly checked and topped up, especially after use. Appropriate training would be given to all construction workers in their use.
- Storage of fuel and chemicals would be in accordance with GPP 8: Safe storage and disposal of used oils (Ref 11.39).
- Surface water drains on local roads or within the Development compound area will be identified by the contractor and where there is a risk that fine particulates or spillages could enter them, they would be protected (e.g. covers or sandbags).
- Any containers/tanks of contaminating substances (e.g. fuel) onsite would be leak-proof and kept in a safe and secure building or compound from which they cannot leak, spill or be open to vandalism. The containers would be protected by temporary impermeable bunds (or drip trays for small containers) with a capacity of 110% of the maximum stored volume. Areas for transfer of contaminating substances (including refuelling areas) would be similarly protected.
- Any permanent oil storage tanks and temporary storage of 201 litres or more of oil in drums and mobile bowsers, and ancillary pipe work, valve, filters, sight gauges and equipment requiring secondary containment, e.g. bunding or drip trays.
- No oil would be stored within 20 m of a watercourse and potentially further if ground is angled towards a water body except for fixed/large plant associated with the construction of new bridges/culverts or hand tools.
- Where possible re-fuelling will be undertaken in designated areas within main compounds or satellite compounds. It is possible that refuelling of mobile plant may be required by mobile fuel bowser. This will not be undertaken within 20 m of a water feature, and only on flat land (or otherwise a greater distance and other measures may be required subject to an on-site risk assessment) and with a drip tray/plant nappy. Certain semi-mobile very large plant (e.g. crane) may need to be located close to watercourses and potentially within 20 m. Due to the difficulties in moving plant such as this they may need to be refuelled in situ. Again, a site-specific risk assessment will need to be undertaken by the contractor.
- Biodegradable hydraulic oils would be used where possible in all plant and only in equipment working in or over watercourses.
- Any plant, machinery or vehicles would be regularly inspected and maintained to ensure they are in good working order and clean for use in a sensitive environment. This maintenance is to take place offsite if possible or only at designated areas in the site compound.
- All fixed plant used on the Development Site to be self-bunded.
- Mobile plant to be in good working order, kept clean and fitted with plant 'nappies' at all times.
- An Emergency Response Plan or similar titled plan would be prepared and included in the CEMP.

- Spill kits and oil absorbent material to be carried by mobile plant and located at high-risk locations across the Development Site and regularly topped up.
- All construction workers would receive spill response training.
- The Development Site is to be secure to prevent any vandalism that could lead to a pollution incident.
- Construction waste/ debris are to be prevented from entering any surface water drainage or water feature.
- Any site welfare facilities would be appropriately managed, and all foul waste disposed of by an appropriate contractor to a suitably licensed facility. The main compound will have accommodation and welfare facilities. It is expected that a suitably sized storage tank will be provided that would be periodically pumped out by a specialist contractor so that the water could be disposed of at a suitably licensed waste facility.

11.9.4.3 Concrete Batching Plants and Use

Any on-site concrete batching facilities will be located at least 50 m from any water feature, on flat ground, and suitable impermeable hardstanding, so that surface water run-off can be intercepted for either treatment or disposal off-site at an appropriate licensed waste facility. It is assumed that water for use in the process will be delivered to the site from a commercial source rather than abstracted locally. If a local abstraction is proposed in the future, this will be subject to an abstraction licence from SEPA, and thus will not be granted if it is to have significant adverse effects on the water environment or any third-party users.

Significant amounts of concrete will be required for various construction components. This will be a mixture of precast and cast in-situ. Where possible, concrete would not be batched on-site and would instead be delivered on an ‘as and when’ basis in ready mixed lorries. If on-site batching is required these facilities would be located on flat impermeable hardstanding at least 50 m from any watercourse and with a surface water drainage system that is isolated so that no run-off may enter any natural water feature.

Particular care would be taken with the delivery and use of concrete and cement as it is highly corrosive and alkaline. No washing out of delivery vehicles to take place on site without suitable provision for the washing out water and provision of a suitable location (e.g. geotextile wrapped sealed skip, container or earth-bunded area) that is lined with a geotextile to prevent infiltration to ground. Such washing would not be allowed to flow into any drain and the final CEMP/ WMP would contain a methodology for dealing with any washing out water, or wheel wash. Wash water would be adequately contained, prevented from entering any drain, and removed from the Development Site for appropriate disposal at a suitably licensed waste facility.

11.9.5 Additional Mitigation

11.9.5.1 Water Quality and Flow Monitoring Plan

A Water Quality and Flow Monitoring Plan and subsequent delivery of that monitoring is proposed for the following requirements:

- Due to the nature and scale of the Development and the proximity of works to numerous water features and some PWS, it is necessary that a programme of water quality monitoring is carried out in advance of and during the construction phase.
- There is limited data available on water quality, phytoplankton composition and thermal stratification of Loch Awe, and thus it is necessary to gather additional baseline data in advance of the commissioning of the Development in order that subsequent monitoring during initial years of operation have a baseline reference.
- The construction of the Headpond and severance of the upper Allt Beochlich catchment requires the determination of a suitable compensation flow, and this will require flow monitoring of the catchment to generate a baseline flow duration curve.

The following sections describe the need and requirements of the above monitoring in further detail.

11.9.5.2 Pre-construction and Construction Phase Water Quality Monitoring – Water Features

During construction it is proposed to undertake a water quality monitoring programme to ensure that mitigation measures are operating as planned and managing the risk of water pollution effectively. Monitoring will help to ensure that should pollution occur it is identified as quickly as possible and appropriate action is taken in line with the Emergency Response Plan. To support the construction phase monitoring, a pre-construction baseline will need to be determined.

The scope of the water quality monitoring programme will be developed at a post-consent stage and in consultation with SEPA and other relevant stakeholders. Water quality monitoring will be required of all potentially affected water features and may include daily visual and olfactory observations or after heavy or prolonged rainfall, in situ monitoring using a calibrated hand-held probe, and potentially grab samples on a regular or ad hoc basis for analysis at an accredited laboratory.

To ensure that monitoring during construction is effective it will be necessary to carry out pre-construction monitoring. There is no guidance on how long or frequent this should be, but it is recommended that as a minimum there are 12 monthly visits taking in a range of flow and weather conditions. The scope of pre-construction water quality monitoring, and monitoring during construction will be set out in the Water Quality and Flow Monitoring Plan, likely pursuant to a pre-commencement planning condition.

Any secondary permissions that are required for works affecting, or for temporary discharges to, the water features and watercourses in and around the Development, such as a CAR or water abstraction licences, will be obtained prior to any relevant works taking place on site, and preferably in advance of all works (save enabling works where not relevant to these secondary consents).

11.9.5.3 Pre-Construction and Construction Phase Water Quality Monitoring – PWS

The PWS identified within *Appendix 11.3 (Volume 5: Appendices)* were mostly sourced from surface water or from groundwater springs. A visit to each of the PWS will be carried out to confirm the source of each of the PWS and to inform subsequent pre-construction and construction phase monitoring. With regards to the identified PWS sourced from groundwater, water levels will also be monitored prior to any construction activities to determine the normal response pattern and then during construction to identify any changes to supply. Water quality should also be monitored pre-construction and during construction.

To ensure that monitoring during construction is effective it will also be necessary to carry out pre-construction monitoring. In keeping with the monitoring for water features, it is recommended that as a minimum there are 12 monthly visits prior to construction starting. The scope of pre-construction and construction phase water quality monitoring of PWS will also be set out in the Water Quality and Flow Monitoring Plan, which we assume would be required pursuant to a pre-commencement planning condition.

Finally, if it were to be determined that any effects were due to construction, then the provision of an alternate supply would be needed to be provided. It is advised that trigger levels for both levels and quality are set after the pre-construction monitoring has been undertaken.

11.9.5.4 Flow Monitoring

The construction of the Headpond and severance of the upper Allt Beochlich catchment requires the determination of a suitable compensation flow for aquatic habitats and the continued and uninterrupted operation of the small local HEP scheme. The basis of this compensation flow will require the generation of a flow duration curve, which will require monitoring of the flow at multiple locations. This may involve continuous stage monitoring combined with spot flow gauging or other suitable method depending on site constraints to data collection. It is recommended that this data is collected over a minimum of 12 months prior to any works occurring in order for a robust baseline flow duration curve to be generated. The data will also need to be interpreted in the context of the weather conditions during the monitoring period, to account for whether the monitoring was carried out in a drier or wetter year than average, as well as consider the future influence of climate change.

11.9.5.5 Baseline Water Quality Monitoring During Pre-Commissioning

The scope of baseline water quality monitoring of Loch Awe pre-commissioning of the Development will be defined in the Water Quality and Flow Monitoring Plan.

In the absence of any additional data from SEPA, it is recommended that water temperature profiling of Loch Awe is undertaken to establish a baseline for any thermal stratification of the Loch in the basin nearest to the Tailpond inlet / outlet. This will establish when thermal stratification occurs and the depth of the thermocline during the period of stratification prior to overturn sometime in the autumn. It is expected that this monitoring can be achieved by installing one or two monitoring buoys fitted with a temperature sonde and an automated variable depth measuring system plus telemetry. The monitoring should be implemented so that at least two seasons of data can be collected prior to commissioning of the Development. Monitoring should cover the period May through to post overturn in the autumn.

In addition to temperature profiling of the water column, it is also recommended that baseline water quality and phytoplankton samples are collected from the Loch over a 12 month period. Samples will need to be collected from near the surface and at depth so that the effects of thermal stratification can be assessed. Samples below the surface can be collected using a van dorn sampler or similar. The frequency of sampling may need to be reasonably high during the period of thermal stratification (e.g. every two weeks). It may be possible to add additional sondes to the monitoring buoys, although some analysis may require collection of grab samples for laboratory analysis.

11.9.5.6 Baseline Water Quality Monitoring During Post-Commissioning

Water quality monitoring of Loch Awe as described above should continue during the initial years of operation to determine actual changes in stratification to inform management measures. In addition, it is proposed that the water quality within the Headpond is also monitored on a routine basis during operation of the Development. Visual / olfactory observations, in-situ measurements using either a hand-held or permanently installed water quality probe, and regular water samples for laboratory analysis may be required (including phytoplankton). The purpose of the monitoring is to build up an understanding of how water quality changes whilst it is stored in the Headpond as well as out this may influence water quality in Loch Awe upon discharge.

These measures are in addition to the operational requirements and daily observations which will be undertaken in the Headpond and Tailpond inlet / outlet, and the introduction of the screens at both inlet / outlets to prevent debris entrainment.

This preventative measure will support decisions about operation to ensure that unforeseen water quality impacts on Loch Awe are avoided. If water quality monitoring results remain stable and operation of the Development is consistent it may be possible to reduce or even stop routine water quality monitoring.

The monitoring of water ingress to Power Cavern Complex may also be required during the operation phase.

11.9.5.7 Sediment Management Plan

Although it is predicted that sediment transport along the Allt Beochlich will be relatively unaffected due to steep gradient, low sediment load and the commitment to provide a suitable compensation flow downstream of the Headpond Embankment, in keeping with good practice a Sediment Management Plan will be prepared. This will consider the impact of the Development in the long term on downstream sediment transport and include measures to ameliorate any adverse impacts. The Sediment Management Plan will also set out details of how frequent sediment in the Headpond will be monitored and when action to remove sediment may be required (also informed by long term water quality monitoring). It is assumed that the plan can be prepared pursuant to a pre-construction planning condition in consultation with SEPA.

11.9.5.8 Water Features Restoration Plan (Decommissioning)

Following decommissioning of the infrastructure on site, a Water Features Restoration Plan should be implemented, to allow for reinstatement of river processes in the affected reaches. This may require removal of fine sediment and replanting. The reinstatement should be informed by preconstruction photographic survey and mapping.

11.9.5.9 Summary of List of Commitments

To summarise the additional mitigation measures, the following will be produced and may be secured through an appropriate planning condition:

- Water Quality and Flow Monitoring Plan (and subsequent baseline, pre-construction and construction phase water quality, PWS and flow monitoring).
- Water Management Plan including an Emergency Response Plan.
- Detailed Drainage Strategy.
- Sediment Management Plan.

In addition to the above:

- A CAR Licence and a Water Abstraction Licence (Scotland) will be required for permission to impound and divert watercourses, abstract and discharge water to and from Loch Awe, temporary works in, over, under water features, and to determine what compensation flow will be required downstream of the main Headpond Embankment and along the Allt Beochlich.
- A Water Features Restoration Plan will be required following decommissioning of the infrastructure on site to inform the reinstatement of river processes in the affected reaches. This may be defined and included as part of a future planning application to cover the decommissioning of the Development rather than this application.
- Details of SuDDS and culverts will be included in the detailed design strategy.

11.10 Residual Effects

A WFD Assessment has been provided in *Appendix 11.2 (Volume 5: Appendices)* which focuses on the following WFD water bodies; Loch Awe, Allt Beochlich, River Aray and the Oban and Kintyre groundwater body. Overall, it concludes that, based on the current understanding of the Development and availability of data only localised and temporary adverse impacts to the Oban and Kintyre groundwater body, River Aray and Loch Awe. However, Allt Beochlich consists of a permanent alteration and loss of the catchment area. Therefore, the physical changes could lower its current WFD status as well as the entire flow regime.

Table 11.34 and *Table 11.35* present a summary of the residual effects of the construction and operation of the Development on the water quality and hydromorphology of surface and groundwater bodies. Table 11.34 Summary of Effects: Construction

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Loch Awe	**Water Quality – Sediment Runoff** Potential contamination associated with: • Sediment-laden runoff associated to earthworks; and • Sediment washing downstream from Allt Beochlich and other water courses within the catchment.	Moderate adverse	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP. Additional mitigation includes a programme of water quality monitoring pre- and during construction works.	Minor adverse	Not significant
	Water Quality – Contaminated Runoff Potential contamination associated with runoff of chemical spillages from PC03 and TC01. Pollutants also associated to Allt Beochlich and other water courses within the catchment which wash downstream	Moderate adverse	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP. Additional mitigation includes a programme of water quality monitoring pre- and during construction works.	Minor adverse	Not significant
Loch Fyne	**Water Quality – Sediment Runoff** Increased areas of hardstanding/bare earth could lead to an inflow of sediment	Moderate adverse	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP. Additional mitigation includes a programme of water quality monitoring pre- and during construction works.	Minor adverse	Not significant
	Water Quality – Contaminated Runoff Works associated with the jetty may involve various fuels and construction chemicals which could be at risk of entering Loch Fyne	Moderate adverse	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP. Additional mitigation includes a programme of water quality monitoring pre- and during construction works.	Minor adverse	Not significant
Bedrock Aquifer - Oban and Kintyre groundwater body	**Groundwater Quality** Potential contamination to aquifer during the drilling of the power tunnels and excavation of the Headpond	Negligible	Tunnel will be lined during progress. Good Practice Guidelines will be followed to limit contamination	Negligible	Not significant
	Groundwater Flow Change to the groundwater flow	Negligible	No abstraction required; no other mitigation required	Negligible	Not significant
Superficial Aquifers	**Groundwater Quality** Potential contamination from surface runoff from Access Tracks, compounds and Headpond.	Minor adverse	Good Practice guidelines outlined in the above mitigation section, the CEMP and within the oWMP	Negligible	Not significant
	Groundwater Flow Change to the groundwater flow	Negligible	Aquifer is not widespread across the site. Therefore, the Development will not change flow direction. No mitigation required.	Negligible	Not significant
River Aray and tributaries (LF1)	**Water Quality - Sediment Runoff** Potential contamination sediment-laden runoff from Inveraray bypass	Minor adverse	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Minor adverse	Not significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
	Water Quality – Contaminated Runoff Chemical spillages associated to Access Tracks	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant
	Hydromorphology Potential widening or replacement of the road bridge and associated disruption of sediment transport processes.	Negligible	Retain the same type of bridge or improve for morphology or use a temporary bridge	Negligible	Not significant
Crom Allt and tributaries (LF2)	**Water Quality - Sediment Runoff** Sediment-laden run-off from works associated to Inveraray Jetty and water course crossing.	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant
	Water Quality – Contaminated Runoff Chemical spillages associated to Access Tracks				
	Hydromorphology Potential lengthening or replacement of Access Track culvert. Potential for disruption of sediment transport processes.	Negligible	Retain the same type of culvert or improve for morphology.	Negligible	Not significant
Allt na Cuile Riabhaiche and tributaries (LA2)	**Water Quality - Sediment Runoff** Construction Site Run-off from Keppochan forest Access Track. Sediment-laden run-off also has the potential to contaminate receptor.	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant
	Water Quality - Contaminated Runoff Construction Site Run-off from Keppochan forest Access Track. This could include accidental spillages from fuels and other construction chemicals.				
	Hydromorphology Potential lengthening or replacement of existing Access Track culvert on three tributaries. Creation of new crossings on two tributaries. Potential for disruption of sediment transport processes.	Negligible	Retain the same type of culvert or improve for morphology for existing crossings. For new crossings, a natural channel bed should be retained.	Negligible	Not significant
Keppochan River and tributaries (LA3)	**Water Quality - Sediment Runoff** Construction Site Run-off from Keppochan forest Access Track. Sediment-laden run-off also has the potential to contaminate receptor.	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant
	Water Quality - Contaminated Runoff Construction Site Run-off from Keppochan forest Access Track. This could include accidental spillages from fuels and other construction chemicals.				
	Hydromorphology Potential lengthening or replacement of existing Access Track culvert in two locations. Potential for disruption of sediment transport processes.	Negligible	Retain the same type of culvert or improve for morphology.	Negligible	Not significant
Archan River and tributaries (LA4)	**Water Quality - Sediment Runoff** Construction Site Run-off from Keppochan forest Access Track. Sediment-laden run-off also has the potential to contaminate receptor.	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
	Water Quality - Contaminated Runoff Construction Site Run-off from Keppochan forest Access Track. This could include accidental spillages from fuels and other construction chemicals.				
	Hydromorphology Potential lengthening or replacement of existing Access Track culvert in two locations. Creation of a new crossings on one tributary. Potential for disruption of sediment transport processes.	Negligible	Retain the same type of culvert or improve for morphology for existing crossings. For new crossings, a natural channel bed should be retained.	Negligible	Not significant
Allt a Chrosaid and small lochan (LA5)	**Water Quality – Sediment Runoff** Sediment laden runoff from construction Site Run-off from B840 diversion, and PC21 (PC21) **Water Quality – Contaminated Runoff** Accidental spillages from construction chemicals and materials entering LA5 from the B840 upgrade tracks and crossings or from PC21	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant
	Hydromorphology Potential lengthening or replacement of Access Track culvert. Potential for disruption of sediment transport processes.	Negligible	Retain the same type of culvert or improve for morphology.	Negligible	Not significant
Allt Beochlich and tributaries (LA6)	**Water Quality – Sediment Runoff** Potential sediment inflow could be associated with the following: • The Access Tracks; • Increased hardstanding areas from compounds (PC06, TC07, TC08, PC09, TC16, PC17, PC18, PC19 and TC11) increasing runoff; • Inflow of sediment laden runoff from Headpond excavations **Water Quality – Contaminated Runoff** Potential contamination could be associated with the following: • Contaminated runoff from compound PC06, TC07, TC08, PC09, TC16, PC17, PC18, PC19 and TC11; and • Contaminated runoff from Access Tracks.	Moderate adverse	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP. Additional mitigation includes a programme of water quality monitoring pre- and during construction works.	Minor adverse	Not significant
	Hydromorphology Construction of Embankment and heapond	Low adverse	No additional mitigation proposed.	Minor adverse	Not significant
	Hydromorphology Creation of a new crossings and potential for disruption of sediment transport processes.	Negligible	A natural channel bed should be retained.	Negligible	Not significant
	Hydromorphology Diversion or over pumping of river during construction resulting in disruption to sediment transport.	Low adverse	No mitigation proposed.	Minor adverse	Not significant
Lochan Airigh (LA7)	**Water Quality – Sediment Runoff** No impact as this water feature will be lost to the Development. Loss of this water feature is considered under	N/A	N/A	N/A	N/A

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
	permanent hydromorphological effects in the 'Operation' impact assessment section that follows.				
	Water Quality – Contaminated Runoff No impact as this water feature will be lost to the Development. Loss of this water feature is considered under permanent hydromorphological effects in the 'Operation' impact assessment section that follows.	N/A	N/A	N/A	N/A
Lochan Beochlich (LA8)	**Water Quality – Sediment Runoff** Potential sediment inflow associated to run-off from works associated to Headpond and Embankment construction. This also includes works being carried out at TC07 and PC09.	Minor adverse	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Minor adverse	Not significant
	Water Quality – Contaminated Runoff Contaminated run-off from spillages associated to Embankment and Headpond construction				
Lochan Romach (LA10)	**Water Quality – Sediment Runoff** Some sediment-runoff could wash from new crossings and upgrades to the existing track into the lochan.	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant
	Water Quality – Contaminated Runoff Spillages of construction materials from Access Track and watercourse crossing				
Allt na Fainge (LA12)	**Water Quality – Sediment Runoff** Potential contamination associated to run-off from works associated to B840 Access Track and crossings. Sediment laden run-off also has the potential to contaminate water feature.	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant
	Water Quality – Contaminated Runoff Spillages of construction materials from Access Track and watercourse crossing				
	Hydromorphology Potential lengthening or replacement of Access Track culvert. Potential for disruption of sediment transport processes.	Negligible	Retain the same type of culvert or improve for morphology.	Negligible	Not significant
Allt a' Ghreataidh (LA13)	**Water Quality – Sediment Runoff** Potential contamination associated to run-off from works associated to B840 Access Track and crossings. Sediment laden run-off also has the potential to contaminate water feature.	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant
	Water Quality – Contaminated Runoff Spillages of construction materials from Access Track and watercourse crossing				
	Hydromorphology Potential lengthening or replacement of Access Track culvert. Potential for disruption of sediment transport processes.	Negligible	Retain the same type of culvert or improve for morphology.	Negligible	Not significant
	Water Quality – Sediment Runoff	Negligible		Negligible	Not significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Alt Mor (LA14)	Potential contamination associated to run-off from works associated to B840 Access Track and crossings. Sediment laden run-off also has the potential to contaminate water feature.		Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.		
	Water Quality – Contaminated Runoff Spillages of construction materials from Access Track and watercourse crossing				
	Hydromorphology Potential lengthening or replacement of Access Track culvert. Potential for disruption of sediment transport processes.	Negligible	Retain the same type of culvert or improve for morphology.	Negligible	Not significant
Cladich River/Allt an Stacain (LA17)	**Water Quality – Sediment Runoff** Potential sediment inflow associated to LA3 and LA4	Minor adverse	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP. Additional mitigation includes a programme of water quality monitoring pre- and during construction works.	Negligible	Not significant
	Water Quality – Contaminated Runoff Potential contaminated runoff associated to LA3 and LA4				
Unnamed watercourse (LA18)	**Water Quality – Sediment Runoff** Potential sediment inflow associated to B840 crossing	Negligible	Embedded mitigation includes good Practice guidelines outlined in the above mitigation section including reference to a CEMP, WMP and a SMP.	Negligible	Not significant
	Water Quality – Contaminated Runoff Potential contaminated runoff associated to B840 crossing				

Table 11.35: Summary of Effects: Operation

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Loch Awe	**Water Quality** Changes in water level leading to a concentration of pollutants in a still water body.	Minor adverse	A programme of water quality monitoring is proposed that will be defined in a Water Quality and Flow Monitoring Plan.	Minor adverse	Not significant
	Water Quality Thermal Stratification	Moderate adverse	A programme of water quality monitoring is proposed that will be defined in a Water Quality and Flow Monitoring Plan.	Moderate adverse	**Significant**
	Water Quality Headpond discharges (temperature)	Minor	A programme of water quality monitoring is proposed that will be defined in a Water Quality and Flow Monitoring Plan.	Minor adverse	Not significant
	Water Quality Discharge of concrete residues from Headpond	Minor adverse	No mitigation is proposed (impact is uncertain and precautionary and would be very short term and temporary)	Minor adverse	Not significant
	Water Quality Potential risk of algal blooms	Minor adverse	A programme of water quality monitoring is proposed that will be defined in a Water Quality and Flow Monitoring Plan.	Minor adverse	Not Significant
	Hydromorphology Loss of approximately 150m of natural bank and marginal area due to the Tailpond inlet / outlet structure.	Negligible	No mitigation is proposed	Negligible	Not significant
Bedrock Aquifer - Oban and Kintyre	The key factor identified affecting groundwater during the operation phase is the ongoing presence of the Waterways, Power Cavern and	Negligible	The Waterway and Headpond will be lined so will be within a 'closed' system. No other mitigation required.	Negligible	Not significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
groundwater body	Access Tunnels. The Headpond will be concrete-lined and filled with water fed from Loch Awe (i.e. it will be a 'closed' system and should not interfere with local groundwater). No groundwater water resource or water quality issues are expected during the operational phase.				
Superficial Aquifers – Peat	The Headpond will be concrete-lined and filled with water fed from Loch Awe (i.e. it will be a 'closed' system and should not interfere with local groundwater). No groundwater water resource or water quality issues are expected during the operational phase.	Negligible	The Waterway and Headpond will be lined so will be within a 'closed' system. No other mitigation required.	Negligible	Not significant
Allt na Cuile Riabhaiche and tributaries (LA2)	**Water Quality** Contamination from potential spillages from the Keppochan Forest Access Track	No Impact	N/a	N/A	N/A
	Hydromorphology Potential lengthening or replacement of existing Access Track culvert on three tributaries. Creation of new crossings on two tributaries. Potential for disruption of sediment transport processes.	Negligible	No mitigation is proposed	Negligible	Not significant
Keppochan River and tributaries (LA3)	**Water Quality** Contamination from potential spillages from the Keppochan Forest Access Track	Negligible	Proposed operational process and spillage risk management measures	Negligible	Not significant
	Hydromorphology Potential lengthening or replacement of existing Access Track culvert in two locations. Potential for disruption of sediment transport processes.	Negligible	No mitigation is proposed	Negligible	Not significant
Archan River and tributaries (LA4)	**Water Quality** Contamination from potential spillages from the Keppochan Forest Access Track	No Impact	N/a	N/A	N/A
	Hydromorphology Potential lengthening or replacement of existing Access Track culvert in two locations. Creation of a new crossings on one tributary. Potential for disruption of sediment transport processes.	Negligible	No mitigation is proposed	Negligible	Not significant
Allt a Chrosaid and small lochan (LA5)	**Water Quality** Contamination from potential spillages from PC18 and PC19	Negligible	Proposed operational process and spillage risk management measures	Negligible	Not significant
	Hydromorphology Potential lengthening or replacement of Access Track culvert. Potential for disruption of sediment transport processes.	Negligible	No mitigation is proposed	Negligible	Not significant
Allt Beochlich and tributaries (LA6)	**Water Quality** Sediment build-up from Headpond discharge	Negligible	Sediment build-up would also be monitored and when necessary (at an appropriate point in the future), could be removed for disposal in accordance with waste legislation prevailing at the time.	Negligible	Not significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
	Water Quality Contamination from potential spillages from PC09 and Access Track.	Negligible	Proposed operational process and spillage risk management measures	Negligible	Not significant
	Hydromorphology Creation of a new crossings and potential for disruption of sediment transport processes	Negligible	No mitigation is proposed	Negligible	Not significant
	Hydromorphology Loss of 5.4 km^2 of catchment with numerous tributaries, resulting in changes to the downstream flow regime due to the Embankment. Reduction in sediment transport downstream due to the Embankment and inundation of reaches.	Moderate adverse	Large opening in the emankment with a natural channel bed to allow for the current flow regime to be retained.	Minor adverse	Not significant
Lochan Beochlich (LA8)	**Water Quality** Sediment build-up from Headpond discharge	Negligible	Sediment build-up would also be monitored and when necessary (at an appropriate point in the future), could be removed for disposal in accordance with waste legislation prevailing at the time.	Negligible	Not significant
	Water Quality Contamination from potential spillages from PC09 and Access Track.	Negligible	Proposed operational process and spillage risk management measures	Negligible	Not significant
Lochan Romach (LA9)	**Water Quality** Contamination from potential spillages from PC20 and Access Track.	Negligible	Proposed operational process and spillage risk management measures	Negligible	Not significant
Allt na Fainge (LA12)	**Water Quality** Contamination from potential spillages from Access Track.	No Impact	N/a	N/A	N/A
	Hydromorphology Creation of a new crossings and potential for disruption of sediment transport processes.	Negligible	No mitigation is proposed	Negligible	Not significant
Allt a' Ghreataidh (LA13)	**Water Quality** Contamination from potential spillages from Access Track.	No Impact	N/a	N/A	N/A
	Hydromorphology Creation of a new crossings and potential for disruption of sediment transport processes.	Negligible	No mitigation is proposed	Negligible	Not significant
Alt Mor (LA14)	**Water Quality** Contamination from potential spillages from Access Track.	No Impact	N/a	N/A	N/A
	Hydromorphology Creation of a new crossing and potential for disruption of sediment transport processes.	Negligible	No mitigation is proposed	Negligible	Not significant
Cladich River/Allt an Stacain (LA17)	**Water Quality** Contamination from LA3 and LA4 could wash into LA17	No Impact	N/a	N/A	N/A

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Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 12: Water Resources and Flood Risk

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

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12 Water Resources and Flood Risk

12.1 Introduction

This chapter of the EIA Report provides an assessment of the potential effects of flood risk and water resources from the Development. This chapter is informed by the following appendices contained within *Volume 5: Appendices* of the EIAR:

- Appendix 12.1: Water Resources Assessment
- Appendix 12.2: Flood Risk Assessment

Chapter 2: Project and Site Description (Volume 2: Main Report) details the project and site description of the required works to implement the Development.

Detail on relevant water environment sections including water quality, hydro morphology and hydrogeology please see *Chapter 10: Water Environment (Volume 2: Main Report).*

Consultation has been undertaken with SEPA, this is further explained within *Section 12.3 Consultation*.

12.2 Legislation and Policy

This section outlines the relevant legislation, planning policy and guidance relevant to this assessment and admissible to the Development (please note that regulations transferring powers from the European Union the United Kingdom have not been included within this section).

12.2.1 Legislation

A number of specific regulations have been enacted to implement the statutory European and national legislation into UK law – these regulations include:

- EU Directive 2000/60/EC (Water Framework Directive (WFD)), transposed into the (Ref 1)
- Water Environment and Water Services Act (Scotland) 2003 ('the WEWS Act') (Ref 2).
- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) in respect of discharges to surface or groundwater ('the CAR Regulations') (Ref 3);
- Flood Risk Management (Scotland) Act 2009 and the Flood Risk Management (Flood Protection Schemes (Ref 4), Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010 ('the Flood Risk Management Act') (Ref 5); and
- Reservoirs (Scotland) Act 2011 (Ref 6).

This legislation aims to protect and enhance the status of aquatic ecosystems, prevent further deterioration of such ecosystems, promote sustainable use of available water resources, and contribute to the mitigation of floods and droughts.

12.2.2 National Planning Policy

Planning Advice Notes (PAN) provide national guidance and SEPA (statutory consultee) have produced a range of guidance documents covering a range of environmental issues. These documents relevant to the water environment are listed below:

- National Planning Framework 4 (NPF4) (2023) (Ref 7)
- PAN 51 – Planning, Environmental Protection and Regulation (Revised 2006) (Ref 8)
- PAN 61 – Planning and Sustainable Urban Drainage Systems (2001) (Ref 9)
- PAN 79 – Water and Drainage (2006) (Ref 10)
- PAN 1/2013 – Environmental Impact Assessment (Ref 11)

- SEPA Interim Position Statement on Planning and Flooding; (2006) (Ref 12)
- SEPA Engineering activities in the water environment: Good practice guide – River Crossings (Ref 13); and
- SEPA Technical Flood Risk Guidance for Stakeholders (Version 12, 2022) (Ref 14).

12.2.3 Local Planning Policy

The Argyll and Bute Local Development Plan 2 (Ref 15) was adopted in February 2024. The plan sets out the policies preferences on two conditions: the type of development, and the area within which it should take place. Site specific proposals are included with the purpose of the plan to encourage development and possible changes in land use in areas of lower flood risk that will serve the public interest.

Policy 55 – Flooding

Development proposals should avoid areas that are susceptible to flooding and promote sustainable flood risk management.

Potential development areas are broken down into three types to examine the most appropriate for development types, to minimise risk to the council residents. These are as follows:

a) All types of development within areas with a probability of flooding of less than 1:1000 annual probability of flooding are acceptable in terms of this policy unless local circumstances and/or the nature of the development dictate otherwise;
b) All types of development, excluding essential infrastructure, within area with a probability of flooding between 1:1000 and less than 1:200 annual probability of flooding are acceptable in terms of this policy unless local circumstances dictate otherwise.
c) Within flood areas (1:200 or greater annual probability of flooding) only those categories of development indicated in criteria i), ii) or ii) of this policy may be acceptable.

The indicated criteria, see above, that described the acceptable developments within flood areas (1:200 or greater Annual Exceedance Probability) are as follows:

i) Redevelopment of residential, commercial, and industrial development and which are of an equally or less vulnerable use within built-up areas providing flood prevention measures to a 1:200 year plus climate change standard already exist or are under construction. Water resistant materials/ construction together with a suitable freeboard allowance as appropriate;

ii) Development on undeveloped and sparsely developed areas within the functional flood plain and compromising:

- Essential development such as navigation and water-based recreation use and essential transport and some utilities infrastructure; and an alternative lower risk location is not achievable;
- Essential infrastructure which should be designed and constructed to remain operational during floods;
- Certain water compatible recreational, sport, amenity and nature conservation uses providing adequate evacuation procedures are in place.

iii) Development, which is in accord with flood prevention or management measures as specified in association with a Local Development Plan 2 Allocation or development brief.

The requirements of Argyll and Bute Council state that all development proposals at risk of flooding or in a flood risk area, under section d), shall demonstrate that:

d) All development proposals at risk of flooding or in a flood risk area shall demonstrate that:
i) All risks of flooding are understood and addressed;
ii) There is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes;
iii) The development would remain safe and operational during floods;
iv) Flood resistant and resilient materials and construction methods are used, and
v) Future adaptations can be made to accommodate the effects of climate change.

If proposals are subject to potential flooding and do not comply with parts a),b),c) or d) of this policy, see above, or to advice of the Environment Protection Agency (SEPA). The planning authority (Argyll and Bute) must exercise the 'precautionary principle' and refuse development proposals.

In all cases development proposals will be subject to assessment using Flood Risk Management Plan: Highland and Argyll Local Plan District; Flood Risk Management Plan: Clyde and Loch Lomond Local Plan District; and The River Basin Management Plan for Scotland 2021-2017 (see LDP2 T16 Technical Working Note: Flood Risk Framework).

Policy 61 – Sustainable Drainage Systems

All proposed developments should incorporate Sustainable urban Drainage Systems (SuDS) where appropriate including existing ponds, watercourse, or wetlands as positive features in development schemes, these should be designed in accordance with the CIRCIA SuDS Manual (C753).

Policy 62 – Drainage Impact Assessment

The Council will require developers to demonstrate that all development proposals incorporate proposals for SUDS measures in accordance with technical guidance. Developers will be required to submit a Drainage Impact Assessment (DIA) with the following categories of development:

- *Development of six or more new dwelling houses;*
- *Non-householder extensions measuring 100 square metres or more; AND,*
- *Other non-householder developments involving new buildings, significant hard standing areas or alterations to landform.*

Developments excluded from the above three categories might also require a DIA when affecting sensitive areas such as areas affected by flooding, contamination, or wildlife interest.

In all cases the Council will encourage the use of sustainable options for waste and surface water drainage.

12.3 Consultation

This section outlines the consultation that has been conducted previous to the draft of this EIA chapter. Consultation with the statutory consultee, SEPA, was conducted via Teams on the 19th of March 2024. Further details regarding consultation on water resources can be found within *Table 12-1 Summary of Consultation*, please see below.

Table 12.1 Summary of Consultation

Consultee	Key Issue	Summary of Response	Action Taken
Scottish Environmental Protection Agency (SEPA)	Rate of change of Loch Awe level	The rate of change in Loch Awe level will be 20cm to 1m levels for drawdown/ increase depending on period (season) of operation, please refer to *Table 1* within *Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*.	Operation parameters of a minimum level of 35.95 mAOD and 37.00-37.65 mAOD are proposed for Loch Awe. SEPA will need to review this once submitted, contextualising the parameters with the Loch levels.
	Cumulative impacts	Ratings of cumulative effects of downstream of the barrage of Loch Awe have been developed. SSE operate the barrage downstream, however, they have provided no information.	Assumptions of the barrage have been adopted and inputted into the flood model, please see *Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*. Estimated dimensions and levels for the radial gates that control the outflow to River Awe were derived from the Flood Risk Assessment (FRA) report for the Cruachan expansion.
	Consideration to the existing run-of-river hydro scheme	The 'Hands-off' operating regime is to be included within	Please see *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices)* where

Consultee	Key Issue	Summary of Response	Action Taken
		the proposed headwater design.	the tailpond structure will adopt the 'hands-off' operating regime when Loch Awe is at 37.67 mAOD (50% AEP event). This will be reduced with a 10% AEP rainfall event to 37mAOD to reduce flood risk downstream of the headwater pond.
MOWI	Assessment of water level changes on the mooring systems and containment measures for stock at the Tervine and Braevallich fish farms	Water levels will be kept within normal fluctuations of Loch Awe through the operational regime. The water levels will be controlled through a CAR license from SEPA.	The operation regime with 'hands-off' minimal level 35.95 mAOD and maximum level of 37.65 mAOD.
	Assessment of water level changes to shoreside from infrastructure such as spillways and vessel pontoons.	Operation regime is proposed to limit the water levels during periods of high and low water levels. Based on a no discharge/ abstraction from Loch Awe. An assessment of variation of change has been conducted based on the proposed generation and abstraction rate. The rate of change has been found to be in line with the current changes in Loch Awe based on the review of Historic Levels. The rate of change (fluctuation) of water levels has been found to be higher as a result of the scheme operation.	The operational regime ' hand-off' water levels, with a minimal level of 35.95 mAOD and maximum level of 37.65 mAOD.
Argyll and Bute Council	In the event of flooding or low loch levels what potential cumulative impacts this would generate if the consented Cruachan Expansion scheme is also operating and extracting water at its maximum operational capacity. Please expand on the point " Impacts on the marine environment in cumulation with Cruachan and its proposed expansion in terms of water extraction and discharge should be carefully detailed.	The potential cumulative impacts have been identified within this Chapter, 12. These however are deemed low or negligible for flooding and low flow through the introduction of the operational regime. The Cruachan Expansion regime was included within the baseline environment for the loch levels; therefore, the operational regime is built upon Loch Awe existing hydropower usage.	The operational regime ' hand-off' water levels, with a minimal level of 35.95 mAOD and maximum level of 37.65 mAOD. This is based on historical water levels and therefore the scheme should not pose a risk to marine/aquatic life.

12.4 Study Area

Balliemeanoch, the Development Site, is a pumped storage hydro proposed within the council boundaries of Argyll and Bute, western Scotland. The study area expands from the southern border of Loch Awe along the A85, south of Portsonachan to Inveraray on the northwestern side of Loch Fyne.

Loch Awe is a freshwater lake with an expansive catchment area, please see *Table 12-2* for more detail. Loch Awe is dammed by the Awe Barrage which is located on the River Awe northeast of the Loch (NGR: NN04520 286890), operated by Scottish and Southern Electric (SSE). The Barrage contains a Borland fish pass and two hydro intake arrangements. These include a turbine on the compensation flow and a penstock that diverts water downstream to the Inverawe Power Station (25MW).

The Development is a 1.5GW pumped storage hydro that utilises Loch Awe as its Tailpond, generating a Headpond located in the proximity of Lichan Airigh, as it above reservoir. The water will be transported through below-ground tunnels and a generation station. An above-ground Tailpond inlet / outlet structure will allow for the abstraction/generation of water between the two reservoirs. Please see *Chapter 2: Project and Site Description* for further details.

For the purpose of the Water Resource Assessment- *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices)*, the Loch Awe catchment was assessed to calculate the inflows to Loch Awe (gauged and ungauged), to determine the baseline levels of Loch Awe and the regulation of the Awe barrage (water level vs discharge). From the assessment the Loch Awe catchment has total catchment area of 815 km^2, this is tabulated into gauged and ungauged areas, as follows:

Table 12-2 Gauged & Ungauged catchments within the Loch Awe catchment

Gauged/ ungauged catchment	Name	Area (km^2)	Gauged Years
Gauged	Orchy @ Glan Orchy	251.2	47
Gauged	Strae @ Glen Strae	36.2	47
Gauged	Lochy @ Inverlochy	47.7	46
Gauged	Avich @ Barnaline Lodge	32.1	44
Gauged	Abhain a Bhealaich @ Braevallich	24.1	43
Ungauged	Headpond catchment	5.37	N/A
Ungauged	Loch Awe area	38.5	N/A
Ungauged	Remainder catchment modelled	380.73	N/A

A second report was generated, the Flood Risk Assessment (*Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*) additionally considers the flood risk that this development poses to the site itself and downstream of the Awe barrage. Downstream of the Awe barrage has various sensitive receptors, the three analysed within the FRA are the road and infrastructure around Loch Awe A85 and the Taynuilt Potentially Vulnerable Area (PVA) that sits at the mouth of the River Awe, west of the Awe Barrage.

The study area is regulated by the location of the new development, including the construction works (above & below ground infrastructure) and the planned access routes. A brief summary of the infrastructure proposed is:

- The Tailpond inlet / outlet structure to Loch Awe,
- The Headpond located in the proximity of Lochan Airigh,
- New Access Tracks extending from the Tailpond inlet / outlet to the of the Headpond,
- Tunnels will be constructed below ground;
- Temporary Construction Compounds.

Please see *Chapter 2: Project and Site Description (Volume 2: Main Report)* for further details.

Loch Awe has an existing hydropower scheme Cruachan PSH scheme, 440W, with an expansion of Cruachan 2 delivering 600MW additional output within generation mode. This scheme uses Loch Awe as their Tailpond; therefore, this has been included within the baseline loch water levels, please see *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices).* An additional three smaller hydro schemes also operate using water from Loch Awe; Allt Beochlich, River Avich and Loch Nant.

12.5 Assessment Scope

The assessment considers the effects during the three phases of the Development lifespan as identified in *Section 12.16 – 12.19* of *Chapter 2: Project and Site Description*. The phases include: pre-construction, construction, operation and decommissioning.

The assessment considers; the proposed run-of-river hydro scheme, at the four stages mentioned above in relation to Flood risk and Water Resource.

Flood Risk Assessment

The Flood Risk Assessment (FRA) (*Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices))* was undertaken to assess the impact of flooding on the proposed site during construction and operation. *Section 12.6* summarises the work undertaken to assess the flood risk to the site and downstream of the Awe Barrage. The FRA considers the peak level in the Loch Awe and peak flow at the Loch Awe Barrage within the fluvial model to assess the risk of the Development during construction and operation.

Water Resources Assessment

The Water Resource Assessment (*Appendix 12.1 Water Resources Assessment (Volume 5: Appendices))* reviews the current water resource usage within Loch Awe and the working parameters or key receptors. It develops the potential impact on water resources as a result of the development and addresses appropriate mitigation measures to reduce the impact of the Development including outlining the operational rules.

12.5.1 Baseline Data Collection

The following sources have been utilised to assess the baseline environment in which effects of the Development may impact. Data has been obtained from the following sources, to inform Flood Risk Assessment study:

- Site information and development proposals
- Scottish Environmental Protection Agency (SEPA) flood risk mapping (Ref 16)
- Ordnance Survey (OS) mapping; and
- Loch Awe Water Levels – Drax Ltd. (Ref 17)
- The proposed expansion of Cruachan PSH scheme Flood Risk Assessment (Ref 18)

Sources of data in regard to the water resource assessment (*Appendix 12.1 Water Resources Assessment (Volume 5: Appendices)*), are as follows:

- SEPA Gauge data, for five rivers in the Loch Awe catchment, covering 48% of the catchment area,
- HadUK-Grid rainfall dataset, for rainfall estimates over Loch Awe,
- Hydro-PE HadUK-Grid dataset, for evapotranspiration, converted to evaporation values over Loch Awe using Environmental Agency advice,
- Loch Awe level data provided by Drax,
- Loch Awe Barrage operating range targets, from the Cruachan expansion application.

12.6 Assessment method

Water resource assessment

- To assess the current water resource usage within Loch Awe an understanding of the water levels (inflow and outflow), dependent on the Awe Barrage (NN04520 28689) was assessed to determine the impact of the Development. A water balance model was used to understand the statistical relationship between the level and the outflow dependent on the seasonality, please see *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices).,* for further details.
- Secondly, a Loch Awe reservoir model was built within Flood Modeller version 5.1. This was set up to estimate the generation and abstraction potential of Loch Awe in reference to the seasonality, as discussed in section 3 within *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices).*
- To assess the impact of the Development to the water levels and activity of the Awe Barrage, an assumed operation was added, either abstraction or generation. These results were compared to the baseline with operation input.
- These results were re-run with a cyclical operation of the Development including abstraction and generation for 5 hours and 4.06 hours, respectively, for each day. These were either modelled beginning with abstraction or generation, to compare effects on Loch Awe. The results were crossed referenced to the distribution of level changes from the hourly record of loch levels from 2019-2021 provided by Drax.

Flood Risk Assessment

- A HEC-RAS model was built to assess the fluvial flood risk to the Development itself and downstream of the Development, by calculating the peak water level in Loch Awe and peak flow at the Loch Awe Barrage.

- The model was built along a 4km arm between the Loch Awe and River Awe. Upstream of the model was represented as a reservoir unit based on the water resource analysis and the downstream extent of the model was defined by the Awe Barrage. The inflow from the upstream component was estimated by FEH catchment characteristics run in a ReFh2 model. The barrage gates were modelled with 4 sluice gates to open at 37.0 mAOD. The model was run for 3 to 4 days to simulate a 72-hour rainfall event. This gave results of the peak water level for the design storm event of 0.5% AEP+59%CC, giving an indication of the potential receptors of flood risk at this design event.
- A sensitivity analysis was conducted on the model by running two additional scenarios of:
    - Increasing the inflow by 20%,
    - Reduction of the outfall capacity of the Awe Barrage, by reducing the gates by 20%.
- Other sources of flood risk were assessed by SEPA flood risk maps and site observations/reports, see *Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)* for additional information.

12.6.1 Limitations And Assumptions

The Water Resources Assessment (*Appendix 12.1 Water Resources Assessment (Volume 5: Appendices)*), sets up a water balance model to understand the statistical relationship between the level of Loch Awe and outflow from the Awe Barrage. One inflow element inputted within this model, ungauged inflows, was estimated by scaling the flow at the Orchy gauge based on the catchment area. This data was interpolated due to the limited gauged data within the catchment. This estimate did not include inflows, north and south of catchment, generating an inaccurate result of inflows to Loch Awe. Please refer to *Volume 5: Appendices*, *Appendix 12.1 Water Resources Assessment*, *Figure 3* where the inaccuracies of inflows are recorded.

The water balance model results show the generalised assumed relationship between loch level and outflow from the Barrage. The model showed inaccuracies of outflow (Awe Barrage operation) with many points out with the trend line, showing higher outflow during periods of lower loch levels, please see *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices).*

The second model set up within the Water Resource Assessment was the ‘behavioural analysis’ model. The model included Loch Awe as a reservoir unit and the scheme as an abstraction unit. The water balance model results, described above, determined the loch level to outflow relationship within the model.

Calibration of the ‘behavioural analysis’ model included within the water resource analysis deemed the model to overestimate outflows from the flow-level boundary during prolonged periods of low levels, most notably within winter operation with data obtained from the water balance model. Therefore, the model was adapted to assume that there was zero outflow when the loch Awe level was below 35.5 mAOD in winter and 36.0 mAOD in summer. For further details please see *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices).*

To assume the potential impact of the Development operation on Loch Awe levels the ‘reservoir’ model was run with either, an assumed generation of abstraction to Loch Awe. The first round of model scenarios was run with either 10%, 20%, 50% or 100% generation/abstraction, with the model split between summer and winter.

The second scenario was run with a cyclical operation of the Development. This runs a model with either a 5-hour generation or 4.06 hour abstraction per day to return the Loch Awe level to its original state. This equates to the same amount of water ~ 7 million m^3. This model assumed that the operation of the barrage gates is not adjusted during cyclical operation.

The Flood Risk Assessment set up a HEC-RAS model to determine the peak water level of Loch Awe along River Awe and at Awe Barrage, please see *section 12.6* and *Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)* for further details.

Two components of the Flood Risk Assessment fluvial model’s geometry are assumed due to limitations to acquire data. The depth of the channel from Loch Awe to the Loch Awe Barrage is assumed from a previous Bathymetry survey conducted in 1904.

Secondly, the geometry of the barrage & sluice gates was assumed due to SSE declining to provide data. The geometry from the previous Flood Risk Assessment Report for the Cruachan expansion was used as an input into the model.

The FRA fluvial model build includes an estimation of the upstream inflow, based on previous assumptions from the reservoir model, including a new parameter of FEH catchment characteristics inputted within an RefH2 model inputted upstream within the model setup.

The FRA (*Appendix 12.2 Flood Rish Assessment (Volume 5: Appendices))* and Water Resources Assessment (*Appendix 12.1 Water Resources Assessment (Volume 5: Appendices))* have been based on available information. With regard to the modelling within the FRA and water resource review, multiple assumptions were inputted within the model due to lack of information.

12.6.2 Baseline Environment

The baseline flood risk and water resource conditions relevant to this assessment are outlined in the following sections.

The Development Site is situated between Loch Awe and Loch Shira water environment areas. The Development Site sits at Balliemeanoch on the border of Loch Awe. The Site is bordered by the B840 along the edge of Loch Awe to the west and Loch Shira to the east. Further details of the general hydrological setting are explained within *Chapter 11: Water Environment (Volume 2: Main Report).*

Water Resource – Loch Awe and River Awe

Loch Awe and River Awe are water resources for the existing Cruachan Power station, located roughly 66km away from the Development, in Dalmally. Details of the operational arrangements of the Cruachan scheme were provided by Drax, see *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices)* for further details.

Loch Awe spans from Ford to Stronmilchan. The Loch discharges through the existing barrage constructed for the Loch Awe power station spilling west into the River Awe at the upstream end of the Loch. The barrage effectively controls the Loch Awe and subsequently Loch Etive. River Awe flows west through Balure into Loch Etive discharging to Ardmuckingnish Bay a small coastal embayment, southwest of the Development.

During drought conditions, SSE is required to release water from upstream catchments and reservoirs to provide minimum ‘compensation’. A minimum pass forward flow must be maintained to the River Awe over the Awe Barrage with a minimum water level maintained.

Minimum environmental flows must be maintained in the River Awe at all times. This is achieved through the opening of radial gates on the Awe Barrage. This is undertaken by SSE based on water levels in the loch.

The Cruachan Hydro Power Scheme, 440 MW scheme, extracts water from Loch Awe, generally operating on a daily cycle. A daily water level dataset measured at the Cruachan intake was acquired from Drax from 2013 till 2021. The daily water level data is shown within Figure 2 of the *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices),* shows that the target water level range is from 35.95 mAOD to 37.15 mAOD. From further assessment of these water levels, the winter operating range is exceeded 25% of the time and during summer operation water levels drop below the range approximately 30% of the time.

Direct Flood Risk to the Development

SEPA flood maps were accessed from the SEPA website, for the following sources of flooding: fluvial, pluvial, coastal, groundwater. The SEPA flood risk maps indicated that fluvial, pluvial, and coastal flooding were potential sources of flooding to the site. These maps are strategic level maps and are used to give an indication of the flood risk to a development, however, do not contain adequate detail to correctly map flood risk to planned sites or induvial properties.

As the Development Site is to be protected to a 0.5%AEP+ 59%CC event, in line with SEPA Vulnerability Land Use guidance; SEPA flood maps were analysed for the potential fluvial flood risk. The maps showed the largest fluvial flood risk follow the Allt Beaochlich, tributary to Loch Awe. However, the maps do not give an indication of flood risk from smaller watercourses in close proximity to the Development Site. The locations of the fluvial risk would pose a risk to the following development components: Tailpond inlet / outlet structure and the access route to the Headpond. There are existing structures along the access route including the B840, a gate house with associated building and infrastructure. During a flooding event that directly effects the Development, the above-mentioned receptors would have a moderate risk of flooding.

Direct Pluvial Flooding to the development

The potential pluvial flooding was assessed by SEPA flood maps, the maps showed a large high likelihood area around the Allt Beochlich along the A815, with further ponded areas of high likelihood of flooding along the A815 to Loch Awe. During construction, emphasis should be made to the potential of surface water flooding in these areas with appropriate mitigation measures to eliminate the risk of contaminated surface water released into the natural environment.

The nature of the Development will see an increase in steeply graded and semi-impermeable surfaces within the area, therefore it should be expected that an increase in run-off will be experienced. Leaving multiple receptors at risk of infrastructure flooding.

Direct Coastal/Tidal Flooding to the development

The SEPA flood maps show the level of coastal flooding is kept within the surrounding water environment and Loch Awe. An elevation assessment of the surrounding area and the Development Site showed the minimum elevation to be 35.5 mAOD. The surrounding water bodies and watercourses are additionally not tidally influenced.

Direct Groundwater flood risk to the development

There are no known records of groundwater flooding, and it is unlikely in this location due to the steep slope and freedom of drainage to Loch Awe. Additionally, the SEPA flood maps showed that there was no risk of groundwater flooding within the site.

The below ground infrastructure may be potentially affected by local groundwater flows to infrastructure within the Power Cavern and Tunnels. It is proposed that the pumped system will serve the below ground infrastructure to mitigate against groundwater flooding. However, during a failure event these pumping systems may be at risk to groundwater flooding. Suitable mitigation including regular monitoring must be put in place to minimise this source of flooding to the Development.

Sensitivity of Receptors

To enable a meaningful assessment of environmental impact to be made in accordance with the guidance in DMRB HD45/09 (Ref 19), the importance of flood risk receptors must be defined.

Offsite properties, residential and non-residential infrastructure would be vulnerable to any adverse change in flood risk and could be caused by the Development. This could result in financial loss and emotional distress to residents, and disruption to transport and services. SEPA guidance suggests that residential properties are classified as Category 2 – Highly Vulnerable Uses with regard to flood risk. The sensitivity of these receptors, including all property types, in reference to the criteria in this assessment, is therefore categorised as **High**.

Site workers, construction and permanent site workers may be sensitive to flood risk at the Development. During periods of severe weather, the usage of the site may be restricted, reducing the risk to workers. SEPA guidance indicated that the Development site is classified under Category 6 – Water Compatible Uses with regard to flood risk. Due to the balance of vulnerable users and the water compatible land use, the sensitivity of these receptors, in reference to the criteria in this assessment, is assessed to be **Low.**

The location of the construction equipment on-site and the use of the Development Site during operation may be necessary but changes to flood risk could cause damage to equipment and pollution incidents. However, equipment located in flood prone areas would be replaceable and is likely to be able to withstand some flooding. The sensitivity of these receptors is therefore assessed to be **Low**.

Loch Awe and the downstream of River Awe are sensitive to changes in water levels during prolonged periods of dry spells which could be altered by the Development. Loch Awe and the existing pumped hydro scheme, Cruachan, are of national importance and therefore its supply of water is essential for its operation. For operation to continue, provisions must be put in place for an environmental minimum flow down the River Awe and sustained Loch Awe water levels. Both waterbodies form part of the operational parameters of the wider catchment. The ability to work within and not compromise the ability of others to work within those operational parameters is therefore essential. The sensitivity of these receptors is therefore accessed to be **High**.

Table 12.3: Sensitivity of Flood Risk and Water Resource

Receptor	Features	Overall Safety
Offsite properties and infrastructure	Health and wellbeing implications of flooding, disruption, and financial cost.	High
Proposed site users	Health and safety	Low
Development infrastructure	Financial cost	Low
Loch Awe, River Awe, and operation of Loch Awe Barrage	Operation of Barrage and Loch Awe water level for the wider water environment	High

Climate Change

According to SEPA guidance Table 2 (Ref 20), rainfall intensity is projected to increase by up to 46% until 2080 due to climate change. The minimum lifetime of the Development is believed to be 100 years; the drainage infrastructure provisions but in place therefore must have an applied rainfall intensity of 46% to reduce the risk of surface water flooding over the developments lifetime. The mitigation measures within the Mitigation and Monitoring section are based on the levels within Loch Awe, with accurate modelling climate change parameters included. These estimates are based on UKCIP2018 which produces rainfall intensity data through a collaboration between DEFRA, the MET Office, and the Environment Agency.

SEPA guidance Table 1 (Ref 20) splits Scotland within twelve river basins to determine the peak river flow allowances for each river basin. As the site sits within Argyll and Bute, the Argyll River basin climate change uplift to the year 2100 was utilised within the fluvial modelling (*Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices))* with a value of 59%. This information is additionally based on the UKCIP2018 data to guarantee accuracy of the estimate.

12.7 Assessment of Effects

The following section will consider the impact of the construction, operation and decommissioning of the Development on the flood risk and water resource receptors as identified in *Table 12.3*, as appropriate.

Construction Effects

During construction these is potential increase in flooding due to:

- An increase in site runoff due to the increase of hardstanding area and compacted ground from site clearance, Access Tracks and Compounds;
- Interim water storage (in attenuation ponds and drainage systems); and
- Increased flows due to dewatering activities.

Temporary impermeable or compacted surfaces, such as those in the compounds, Access Tracks and as a result of pre-construction site clearance, could result in rapid surface water run-off to local watercourse via the surface water drainage system or increased overland flow. In line with the receptors identified within *Table 12.3*, the following effects are assessed below, in the absence of mitigation:

This is considered to of Low magnitude and considering the High sensitivity of offsite receptors; this results in a **Moderate adverse** effect.

The Low magnitude effect considered with the low sensitivity of proposed on-site users and Low sensitivity of the Development, result in a significance of effect of **Minor** and **Negligible** respectively.

It is anticipated that there will be no adverse effects on Water Resources during construction to any receptors identified in *Table 2.3*.

Operation Effects

The operational flood risks associated with the Development are discussed in detail in Flood Risk Assessment (FRA) (*Appendix 12.2-Flood Risk Assessment (Volume 5: Appendices))*. The following is a summary of the risk identified therein which are:

- Risk of flooding from the Headpond including risk of wave action and risk of overtopping;
- Risk of embankment breach;
- Risk of groundwater flooding to above & below ground infrastructure;
- Reduction in water levels in Loch Awe during normal and low water level conditions;
- Increased fluctuation of water level in Loch Awe;
- Increased flood risk downstream of Awe Barrage; and,
- Increased flood risk to the Development.

Discharge under Normal Operating Conditions

The Development will include a discharge to Loch Awe under normal operation, suitable operating parameters must be put in place to ensure the Development does not increase fluvial flood risk downstream from Loch Awe itself or River Awe.

Without appropriate mitigation the effect could be of a medium magnitude on a medium importance receptor, leading to a potential minor adverse effect. The magnitude would however result in an increase in fluvial flood risk, which would be contrary to the guidance set out by Argyll and Bute council in their supplementary guidance of the Flood Risk Management Policy and therefore have been considered further in mitigation and monitoring section.

Risk of Flooding from Headpond

The Development will include the creation of a Headpond, this will impound a substantial amount of water during operation of the Development. Therefore, there is a risk of flooding associated with this component of the Development. However, due to the high standard of design, management and maintenance required under the Reservoir (Scotland) Act 2011 and provided by any responsible operator, this is deemed as a very low risk. This will be in addition to the requirements set out within *Chapter 2: Project and Site Description* to guarantee the safety of the Development.

The headwater pond sitting at an elevation of 360 mAOD is out-with existing flood zone. The Headpond will be designed to accommodate extreme flood events beyond the 1 in 200-year event with climate change in line with the Reservoir (Scotland) Act 2011. This will include the influence of significant wave action due to high winds can damage and erode the Embankment, with potential overtopping of the Headpond.

Breach Analysis

An Embankment breach was considered as a potential operating effect, however as the Headpond will be regulated by the Reservoir Act, as mentioned above (*Risk of Flooding from Headpond*) an assessment of this within the Flood Risk Assessment (*Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices))* was deemed unnecessary.

Groundwater Flooding

The analysis within the FRA (*Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices))* demonstrates that there is no risk of groundwater flooding to the above ground infrastructure, from analysis of the SEPA flood risk maps and reporting from previous site visits. It additionally demonstrates that the design of below ground infrastructure will have to consider local groundwater flows on-site and elsewhere; consider groundwater flows into the Headpond; and ensure that groundwater inflow does not pose a risk to users of below ground areas. Details of the groundwater assessment can be found within *Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*.

Reduction in water levels in Loch Awe during normal and low water level conditions

Water will be extracted from Loch Awe to recharge the Headpond. A maximum operating volume of 53,400,000 m^3 of water will be pumped from Loch Awe through cyclical operations. This equates to a generation rate of 480 m^3/s over 30 hours and abstraction rate of 390 m^3/s over 38 hours, please see the Water Resource Assessment *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices)*, for further details.

Analysis was undertaken corresponding to the normal and low water level in Loch Awe. The analysis of the worst-case scenario showed that the water levels would take up to 14.8 days to return to normal water levels following an isolated generation cycle. Water levels would take 18.8 days to return to normal water levels following a full isolated abstraction cycle from Loch Awe to the Headpond. The impacts are however likely to be shorter based on subsequent abstraction or generation cycle respectively.

For cyclical operation the results show that the Development alters the Loch Awe level by approximately 15 cm at its maximum. The level for the period outside of the Developments operation fluctuates by 5 cm from baseline, which is a minor effect.

Increased Fluctuation in Loch Awe water levels

The variability in Loch Awe was accessed over longer periods of time using daily level data within *Appendix 12.1 Water Resources Assessment (Volume 5: Appendices)*. The variation of the loch levels was seen over several intervals (days) these were 2, 4, 7, 14 and 30. Fluctuations in levels of 20 cm are seen with approximately five hours of operation, this compares to a median fluctuation between two days in the recorded data of 6 cm. The daily variation of Loch Awe with 10 hours of operation is 40 cm, which is at the 98th percentile of 2-day variation. This assessment shows that Loch Awe water levels are sensitive to the operation of the Development.

As mentioned above, Loch Awe is sensitive to water levels. This is a cumulative impact as the environment of the Loch, specifically the aquatic ecology, is dependent on the level of the loch to migrate through the fish pass (lift) at the Awe Barrage, please refer to the *Chapter 7: Aquatic Ecology (Volume 2: Main Report)*.

Flood Risk to the Development

The HEC-RAS fluvial flood risk model built within the Flood Risk Assessment (FRA) assesses the flood risk to the Development to a higher refinement than the SEPA flood maps, described in *Section 12.6*. The model was based on the design event of 0.5%AEP+59%CC. This concluded the flood level at the main area within Loch Awe is 39.8 mAOD.

The potential receptors, annotated within *section 12.6.2 – Direct Flood Risk to the Development* were:

- The Tailpond inlet / outlet structure;
- Access route to the Headpond;
- B840 road; and,
- Gate house and associated building.

The top of the Tailpond inlet / outlet structure sits at an elevation of 38.6 mAOD, therefore this would be completely submerged during the design event. However, this is deemed as flooding compatible, so is not deemed as a flood risk. The B840 that runs on the perimeter of Loch Awe, has an elevation of 40.8 mAOD, with the associated gate houses and storage areas sitting at the same level. These are out with the flood plain within the model's first scenario.

As explained within *Section 12.6*, a sensitivity analysis was applied on the fluvial flood model within A*ppendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*. This increased the fluvial flood level, when increasing inflows by 20%, resulted in a peak level of 40.8 mAOD; decreasing the outflow capacity by reducing the gate dimensions resulted in a peak flooded water level of 40.2 mAOD. Therefore, there is an adequate freeboard for these receptors to the fluvial flood risk and this operational effect is deemed as low.

Increased Flood Risk Downstream

The fluvial flood risk downstream of the development at the Awe Barrage was assessed by the HEC-RAS fluvial model, developed for the Flood Risk Assessment (*Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*). The possible flooded areas downstream of the site are the road and rail infrastructure around Loch Awe, especially the A85 which runs through the Pass of Brander and the Taynuilt Potentially Vulnerable Area (PVA) downstream of River Awe. Increased flood levels in Loch Awe could also lead to increased flood flows in the River Awe. The operating regime of the barrage is not known below the gate opening level of 37.0 mAOD

The results of the flood risk model showed that if generation through the Development caused Loch Awe to rise to a level of 37.67 mAOD which corresponds to a 50% AEP rainfall event (1 in 2-year return period), which is the Developments proposed 'hands-off' limit to stop generation. If this level precedes a flood event, the resultant peak flood level downstream would be 40.0 mAOD.

To ensure that the Development does not create additional flood risk downstream an additional operating restriction is proposed. Where forecasted rainfall amounts for the next three days exceed 150mm (approximately equivalent to a 10% AEP event), the hands-off level will be reduced to 37.0 mAOD. The residual impact of additional flood risk is therefore negligible.

Decomissioning effects

Decommissioning of the Development is assumed to have similar activities to construction, potentially with additional crushing of some construction component materials and removal of drainage pipe networks containing residual water and sediment from the previous operating scheme. The attenuated water from the Headpond will be re-released back to Loch Awe in line with normal operation parameters. Decommission of the Headpond, including the design and completion of works, must be to the satisfaction of a suitable qualified reservoir engineer with certification of being discontinued under the Reservoir (Scotland) Act 2011. This will give confidence to the consideration that the Headpond has the ability to safely attenuate and convey flood flows is considered during the decision process.

The Headpond is impounding, regulating a river, however the scheme will pass flood flows and the Headpond catchment is not a significant area of the total Loch Awe catchment. Therefore the loss of storage will not have a flood risk downstream of the River Awe. Compliance to the Reservoir (Scotland) Act 2011 regulations will ensure that the short and temporary term impacts due to the decommissioning of the Development will be **Negligible**.

12.8 Cumulative Effects

Intra-relationship and inter-relationships cumulative effects have been considered as part of the Flood Risk Assessment (*Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*). and Water Resource Impact Assessment (*Appendix 12.1 Water Resources Assessment (Volume 5: Appendices)*); the results are described below.

12.8.1 Inter-Cumulative Effects

The inter-relationship cumulative effects have been assessed above that could have cumulative effects from the water bodies that will be affected by the Development, either during the periods of construction or operation. However, it is expected that if supplying the similar robust and rigorous approach to mitigating and monitoring as other developed schemes as this proposal, the potential for these significant adverse cumulative effects will be low.

The above assessment has considered the current operational arrangements for Loch Awe ensuring the need for minimum water levels and hence the pass forward environmental flows to the River Awe and operation of the Awe Barrage. It is assumed that all other developments must operate within these levels.

There is a historic existing dam that feeds into the Inverawe hydropower station, located roughly 5 km from the barrage. The Cruachan PSH scheme additionally utilises Loch Awe as its Tailpond, with its own abstraction/generating cycle.

There are another operational hydro power schemes utilising Loch Awe and River Awe. These are historic uses of River Awe and therefore form part of the baseline scenario.

12.8.2 Intra-Cumulative Effects

Intra-project cumulative effects due to components of the Development being undertaken synergistically have been analysed as part of the assessment above.

There is a potential for intra-relationship effects between the assessment of water levels through the flood risk, water resource and the water environment assessments.

Protected species and important and sensitive ecological receptors are expected to be within the watercourses across the site and surrounding areas, to pass through the fish lift (fish pass) at the Loch Awe Barrage, please refer to *Chapter 7: Aquatic Ecology (Volume 2: Main Report).* The chapter concludes that it is unknown at this stage at which levels the fish lift (fish pass) of the Loch Awe Barrage is no longer able to operate. Therefore, careful consideration must be made alongside monitoring to agree upon an operating regime water level to ensure the vitality of the aquatic ecology and water environment around Loch Awe.

12.9 Mitigation and Monitoring

During the construction phase of the project, a Construction Environmental Management Plan (CEMP) will be implemented. The CEMP includes the contents of an Environmental Response and Flood Risk Management Plan. These measures outlined within this document will be implemented to prevent any adverse effects to the previously identified receptors, for all three stages of the Development.

Any Sustainable urban Drainage Systems (SuDS) for surface water storage will be designed appropriately with the correct locations, type, size in line with the CIRCIA SuDS Manual C753 (Ref 21) to be concluded within the detailed design phase (as described within *Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*). As stated, these will be positioned correctly to store overland flow but additionally will consider the effect they may have on the downstream flood risk receptors or connectivity with other water resources to avoid impacts to shared receptors, reducing inter-cumulative effects. A Surface Water Management Strategy (SWMP) will be prepared providing these details, building on the requirements set out in the FRA (*Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*) and submitted to Argyll and Bute council for approval prior to construction.

An effect of operation is the potential of increased flood risk as a result of increased Loch Awe levels and downstream flows in the River Awe. This would be contrary to the guidance outlined within the Argyll and Bute Flood Risk Management Policy supplementary guidance. The comprehensive Flood Risk Assessment (*Appendix 12.2 Flood Risk Assessment (Volume 5: Appendices)*) undertaken assess the areas at risk from the Development, with a design event of 0.5%AEP+59%CC resulting in a flooded water level of 39. 8 mAOD. To mitigate flooding to the Development itself and downstream receptors, the proposed hands-off level for generation is 37.67 mAOD, which corresponds to a 50% AEP flood event. An additional operating regime will be applied to the Development with a hands-off level of 37.0 mAOD when forecasted rainfall amounts for 3 days subsequent exceed 150 mm (which is roughly equivalent to a 10% AEP event).

Abstraction of large quantities of water from Loch Awe during periods of low water levels can have a negative effect on the ability to maintain flow within the River Awe. The significant effect of abstraction, as mentioned above, needs to be mitigated against, therefore it is proposed that abstraction is limited based on a minimum water level in Loch Awe.

To ensure this mitigation procedure is in place, a monitoring arrangement and control procedures will be installed at the Tailpond inlet / outlet structure on Loch Awe to measure the water level, and if necessary, stop the abstraction of water if below the level limit, set out by the operation rules. The operation loch limit based on a set hands off level is to be set at a water level of 35.97 mAOD. This equates to the 95th percentile water level (a level which is exceeded 95% of the time).

The mitigating effect, the operation regime, additionally mitigates against the impact on fish passage at the Awe Barrage, the operating regime is based on the historical variation of Loch Awe, to allow for viability of fish passage. The fluctuation of Loch Awe, posed by the Development is within the existing operating parameters therefore, there should be a negligible effect of fish passage at the Awe Barrage.

Any operational discharges or abstractions required by the Development will be regulated by the CAR license, as supervised by SEPA. Therefore, the appropriate operational levels for either activity will be agreed and secured by this regulatory regime.

The implementation of the above-mentioned operation regime will ensure that the abstraction of water from Loch Awe will have a negligible impact on available water resource.

12.10 Residual Effects

The implementation of the mitigation measures is outlined within *section 12.90 Mitigation and Monitoring.*

Table 12.4: Summary of Effects: Construction

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Off-site properties – High	Flooding due to temporary increase in impermeable area and compacted ground. Temporary water storage and increased flow due to dewatering activities.	Low	Implementation of CEMP. Suitable design of Sustainable urban Drainage Systems.	Negligible	Not Significant
On-site users – Medium	Flooding due to temporary increase in impermeable area and compacted ground. Temporary water storage and increased flow due to dewatering activities.	Medium	Implementation of CEMP. Suitable design of Sustainable urban Drainage Systems. Diverting	Negligible	Not Significant
Development - Low	Flooding due to temporary increase in impermeable	Low	Implementation of CEMP.	Negligible	Not Significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
	area and compacted ground. Temporary water storage and increased flow due to dewatering activities.		Suitable design of Sustainable urban Drainage Systems. Diverting		
Loch Awe, River Awe and operation of the Loch Awe Barrage	Flooding due to temporary increase in impermeable area and compacted ground. Temporary water storage and increased flow due to dewatering activities.	Negligible	Implementation of CEMP. Suitable design of Sustainable urban Drainage Systems. Diverting	Negligible	Not Significant

Table 12.5: Summary of Effects: Operation

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Loch Awe, River Awe, and operation of Awe Barrage- High	Increase flood levels in Loch Awe during flood conditions.	High	Implementation of operational parameters based on maximum level in Loch Awe for generation to reduce flood risk downstream.	Negligible	Not Significant
Offsite properties- High	Increase flood levels in Loch Awe during flood conditions.	High	Implementation of operational parameters based on maximum level in Loch Awe for generation to reduce flood risk downstream.	Negligible	Not Significant
Onsite Users- Low	Increase flood levels in Loch Awe during flood conditions.	Low	Implementation of operational parameters based on maximum level in Loch Awe for generation to reduce flood risk downstream.	Negligible	Not Significant
Development – Low	Increase flood levels in Loch Awe during flood conditions.	Medium	Implementation of operational parameters based on maximum level in Loch Awe for generation to reduce flood risk downstream.	Negligible	Not Significant
Loch Awe, River Awe and Awe Barrage operation- High	Fluctuation of water level within Loch Awe.	High	Implementation of operational parameters of hands-off high and low water levels resembling the existing range in loch levels.	Low	Not Significant
Offsite properties – High	Fluctuation of water level within Loch Awe	High	Implementation of operation parameters with a hand-off value of 37.65mAOD or 37.00mAOD if a flood event proceeds the generation to Loch Awe.	Low	Not Significant
Onsite Users- Low	Fluctuation of water level within Loch Awe	Low	Implementation of operation parameters with a hand-off value of 37.65mAOD or 37.00mAOD if a flood event proceeds the generation to Loch Awe.	Negligible	Not Significant
Development- Low	Fluctuation of water level within Loch Awe	Low	Implementation of operation parameters with a hand-off value of 37.65mAOD or 37.00mAOD if a flood event proceeds the generation to Loch Awe.	Low	Not Significant
Offsite properties – High	Risk of flooding from Headpond	Negligible	Headpond regulated by the reservoir Act	Negligible	Not Significant
Onsite Users – Low	Risk of flooding from the Headpond	Negligible	Headpond regulated by the reservoir Act	Negligible	Not Significant
Development- Low	Risk of flooding from the Headpond	Negligible	Headpond regulated by the reservoir Act	Negligible	Not Significant
Loch Awe, River Awe and Awe Barrage – High	Risk of flooding from Headpond	Negligible	Headpond regulated by the reservoir Act	Negligible	Not Significant
Offsite properties – High	Embankment Breach	Negligible	Headpond regulated by the reservoir Act	Negligible	Not Significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Onsite Users – Low	Embankment Breach	Negligible	Headpond regulated by the reservoir Act	Negligible	Not Significant
Development – Low	Embankment Breach	Negligible	Headpond regulated by the reservoir Act	Negligible	Not Significant
Loch Awe and River Awe water level – High	Reduction in water levels in Loch Awe during low flows	High	Implementation of operational parameters based on minimum level in Loch Awe for abstraction	Low	Not Significant
Offsite properties- High	Reduction in water levels in Loch Awe during low flows	Negligible	Implementation of operational parameters based on minimum level in Loch Awe for abstraction	Negligible	Not significant
Onsite Users- Low	Reduction in water levels in Loch Awe during low flows	Negligible	Implementation of operational parameters based on minimum level in Loch Awe for abstraction	Negligible	Not significant
Development - Low	Reduction in water levels in Loch Awe during low flows	Low	Implementation of operational parameters based on minimum level in Loch Awe for abstraction	Low	Not significant

Table 12-6: Summary of Effects: Decommission

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Loch Awe and River Awe water levels – High	Crushing of development materials and components that may hold residual water (i.e. drainage pipes etc.)	Negligible	These will be designed to be deconstructed by a qualified professional reservoir engineer under the Reservoir Act.	Negligible	Not Significant
Offsite properties – High	Crushing of development materials and components that may hold residual water (i.e. drainage pipes etc.)	Negligible	These will be designed to be deconstructed by a qualified professional reservoir engineer under the Reservoir Act.	Negligible	Not Significant
Onsite Users – Low	Crushing of development materials and components that may hold residual water (i.e. drainage pipes etc.)	Low	These will be designed to be deconstructed by a qualified professional reservoir engineer under the Reservoir Act.	Negligible	Not Significant
Development – Low	Crushing of development materials and components that may hold residual water (i.e. drainage pipes etc.)	Negligible	These will be designed to be deconstructed by a qualified professional reservoir engineer under the Reservoir Act.	Negligible	Not Significant
Loch Awe and River Awe water levels – High	Transporting of attenuated water within Headpond to Loch Awe	Low	This will be designed with the completed works supervised by a qualified professional reservoir engineer under the Reservoir Act.	Negligible	Not Significant
Offsite properties – High	Transporting of attenuated water within Headpond to Loch Awe	Negligible	This will be designed with the completed works supervised by a qualified professional reservoir engineer under the Reservoir Act.	Negligible	Not Significant
Onsite Users – Low	Transporting of attenuated water within Headpond to Loch Awe	Negligible	This will be designed with the completed works supervised by a qualified professional reservoir engineer under the Reservoir Act.	Negligible	Not Significant
Development – Low	Transporting of attenuated water within Headpond to Loch Awe	Negligible	This will be designed with the completed works supervised by a qualified professional reservoir engineer under the Reservoir Act.	Negligible	Not Significant

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Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 13: Cultural Heritage

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Quality information

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1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

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13. Cultural Heritage

13.1 Introduction

This chapter of the EIAR provides an assessment of the effects on heritage assets (archaeological remains, historic buildings and historic landscapes) that are likely to arise from construction, operation, and decommissioning of the Development.

It identifies the location, type and significance of heritage assets and their setting and reports on the predicted impacts of the Development on this resource, and the likely significance of effect. The potential for combined effects and combined cumulative heritage effects of the Development with other developments are discussed in *Section 13.8 Cumulative Effects.*

This chapter is accompanied by:

- Volume 3: Archaeology Figures;
  - 13.1 (Sheets 1 & 2) Designated Heritage Assets within study area
  - 13.2 (Sheets 1 - 8) Non Designated Heritage Assets within study area
  - 13.3 Proposed Works and Heritage Assets within study area
  - 13.4 An Extract Plan of Inveraray in Argyllshire, The Seat of His Grace the Duke of Argyll and Greenick dated 1721
  - 13.5 Survey of Inveraray dated 1756
  - 13.6 Heritage Assets Assessed in Impact assessment
  - 13.7 Designated Heritage Assets within study area with ZTV - Operational Elements Combined and Permanent Tracks
  - 13.8 Heritage Assets Assessed for Impacts on Setting
- Appendix 13.1: Known Archaeology Gazetteers (Volume 5: Appendices);
- Appendix 13.2: Cultural Heritage Photographs (Volume 5: Appendices); and,
- Volume 4: Visualisations.

13.2 Legislation and Policy

13.2.1 Legislation

The assessment was conducted within the context of the legislative and planning framework designed to protect and conserve heritage resources. There are several statutory instruments and policies governing the approach to cultural heritage. The main pieces of legislation are:

- Town and Country Planning (Scotland) Act 1997 (as amended by the Planning (Scotland) Act 2019) (Scottish Government 1997a);
- The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013 (as amended by the Town and Country Planning (Historic Environment Scotland) Amendment Regulations 2015) (Scottish Government 2013);
- Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 (Scottish Government 1997b);
- Ancient Monuments and Archaeological Areas Act 1979 (UK Government 1979); and
- Historic Environment Scotland Act 2014(Historic Environment Scotland 2014).

13.2.2 National Planning Policy

The principal elements of national policy and guidance comprise:

- National Planning Framework 4 (NPF4) (Scottish Government 2023);
- Historic Environment Policy for Scotland ("**HEPS**") (Historic Environment Scotland 2019);
- Our Past Our Future - The Historic Environment Strategy for Scotland (Historic Environment Scotland 2023);
- Planning Advice Note ("**PAN**") 2/2011 – Planning and Archaeology (Scottish Government 2011);
- PAN 71 – Conservation Area Management (Scottish Government 2004); and
- The HES 'Managing Change in the Historic Environment' series of guidance notes (particularly *Managing Change in the Historic Environment: Setting* (Historic Environment Scotland 2016).

NPF4 represents the latest national planning policy document relevant to the Development. Policy 7 relates to cultural heritage and key elements of the policy include 'point h' which relates to scheduled monuments and states:

> *"h) Development proposals affecting scheduled monuments will only be supported where:*
>
> - *direct impacts on the scheduled monument are avoided;*
> - *significant adverse impacts on the integrity of the setting of a scheduled monument are avoided; or*
> - *exceptional circumstances have been demonstrated to justify the impact on a scheduled monument and its setting and impacts on the monument or its setting have been minimised*."

Impacts on non-designated assets are covered by 'points n and o':

> *"n) Enabling development for historic environment assets or places that would otherwise be unacceptable in planning terms, will only be supported when it has been demonstrated that the enabling development proposed is:*
>
> - *essential to secure the future of an historic environment asset or place which is at risk of serious deterioration or loss; and*
> - *the minimum necessary to secure the restoration, adaptation and long-term future of the historic environment asset or place.*
>
> *The beneficial outcomes for the historic environment asset or place should be secured early in the phasing of the development, and will be ensured through the use of conditions and/or legal agreements.*
>
> *o) Non-designated historic environment assets, places and their setting should be protected and preserved in situ wherever feasible. Where there is potential for non-designated buried archaeological remains to exist below a site, developers will provide an evaluation of the archaeological resource at an early stage so that planning authorities can assess impacts. Historic buildings may also have archaeological significance which is not understood and may require assessment.*
>
> *Where impacts cannot be avoided they should be minimised. Where it has been demonstrated that avoidance or retention is not possible, excavation, recording, analysis, archiving, publication and activities to provide public benefit may be required through the use of conditions or legal/planning obligations.*
>
> *When new archaeological discoveries are made during the course of development works, they must be reported to the planning authority to enable agreement on appropriate inspection, recording and mitigation measures."*

Policy 11 relates to energy and as such is also relevant to the Development. 'point e' relates to impacts resulting from renewable developments and states:

> *"e) In addition, project design and mitigation will demonstrate how the following impacts are addressed:*
>
> - *ii – significant landscape and visual impacts, recognising that such impacts are to be expected for some forms of renewable energy. Where impacts are localised and/ or appropriate design mitigation has been applied, they will generally be considered to be acceptable; … [and]*
> - *vii – impacts on historic environment*"

Historic Scotland released 'Our Past, Our Future' in June 2023 (Historic Scotland 2023). The three main priorities identified in this document are:

- Priority 1: Delivering the transition to net zero;
- Priority 2: Empowering resilient and inclusive communities and places; and
- Priority 3: Building a wellbeing economy.

13.2.3 Local Planning Policy

Regional and Local Policy and Guidance

The Argyll and Bute Local Development Plan 2 (LDP2) (Argyll and Bute Council 2024) was adopted on the 28th February 2024 and replaced the original Argyll and Bute Local Development Plan which had been in place since 2015 (Argyll and Bute Council 2015a), and the policies relevant to this chapter of the EIAR are:

- *Policy 15 – Supporting the Protection, Conservation and Enhancement of Our Historic Built Environment. Development proposals will not be acceptable where they fail to:*

  • protect, preserve, conserve or enhance the special characteristics and/or cultural significance of the historic built environment in terms of its location, scale, form, design or proposed use; or

  • avoid any cumulative effect upon the special characteristics and/or cultural significance of designated built environment sites.

  Proposals for development that would affect either a designated or non-designated heritage asset or their setting will be expected to demonstrate that they would enable positive change by balancing the need to secure the long-term sustainability of the asset against the need to address the impacts of climate change and to meet the council's wider regeneration objectives, where appropriate.

- *Policy 16 – Listed Buildings.*

  A development proposal which affects a Listed Building, its curtilage or its wider setting will only be supported when it meets the following criteria:

  • It respects the original structure in terms of setting, scale, design, materials and proposed use, OR

  • The proposal is essential to securing an appropriate use of the Listed Building without undermining its architectural or historic character, or its setting, AND

  • It conforms to national policy and guidance, including but not limited to those set out in the section above 'Related Documents'.

  The developer is expected to demonstrate to the planning authority's satisfaction, that the effect of a proposed development on a Listed Building, its curtilage and wider setting has been assessed and that measures will be taken to protect, conserve and where appropriate enhance the special interest of the asset. The use of appropriate access statements, design statements and conservation plans are expected to facilitate this assessment;.

- *Policy 17 Conservation Areas.*

  Development: There is a presumption against development that does not preserve or enhance the character or appearance of an existing or proposed conservation area or its setting. New development within these areas and on sites affecting their settings must respect the architectural, historic and other special qualities that give rise to their actual or proposed designation and conform to the following national policies and guidance including, but not limited to, those detailed as 'Related Documents' under section 4.39 above and the area's Conservation Area Appraisal and Management Plan (if in place).

  The developer is expected to satisfactorily demonstrate to the planning authority that the effect of a proposed development on a conservation area and its wider setting has been assessed and that measures will be taken to preserve or enhance the special interest of the area. The use of appropriate design statements, character appraisals and conservation plans are expected to facilitate this assessment.

  Applications for planning permission in principle will not normally be considered appropriate for proposed development in conservation areas. The contribution which trees make towards the character or appearance of a conservation area will be taken into account when considering development proposals

- *Policy 19 Scheduled Monuments*

  There will be a presumption against development that does not retain, protect, conserve or enhance a Scheduled Monument and the integrity of its settings. Developments that have an adverse impact on Scheduled Monuments or their settings will not be permitted unless there are exceptional circumstances. New development on sites affecting the settings of scheduled monuments must respect their architectural, historic and other special qualities and conform to the national policies and guidance including but not limited to the 'Related Documents'.

  The developer is expected to satisfactorily demonstrate to the planning authority that the effect of a proposed development on a scheduled monument and its wider setting has been assessed and that measures will be taken to protect, conserve and where appropriate enhance the special interest of the asset. The use of appropriate setting analysis, design statements, character appraisals and conservation plans are expected to facilitate this assessment

- *Policy 20 – Gardens and Designed Landscapes*

  Development proposals affecting nationally important Gardens and Designed Landscapes will be supported where they protect, preserve or enhance their cultural significance, character and integrity and where proposals will not significantly impact upon important views to, from and within the site, or its setting.

  Development proposals should protect and preserve in situ regionally or locally important Gardens and Designed Landscapes and their settings, wherever feasible. All proposals affecting designated or non-designated Gardens and Designed Landscapes or their settings shall be accompanied by an assessment that follows the principles set out in the most up-to-date relevant guidance published by Historic Environment Scotland.

  In assessing proposals for development in or adjacent to gardens and designed landscapes particular attention will be paid to the impact of the proposal on all of the following:

  • The artistic, historical, horticultural, architectural, scenic, and nature conservation interest of the site, AND

  • The site's original design concept, overall quality and setting, AND

  • Trees and woodlands and the site's contribution to local landscape character within the site including the boundary walls, pathways, garden terraces or water features.

- *Policy 21 – Sites of Archaeological Importance*

  There is a presumption in favour of retaining, protecting, conserving and enhancing the existing archaeological heritage and any future discoveries found in Argyll and Bute. When a proposed development would affect a site of archaeological significance, ALL of the following will apply:

  • The prospective developer will be advised to consult the planning authority and its advisors the West of Scotland Archaeology Service (WOSAS) at the earliest possible stage in the conception of the proposal, AND

  • An assessment of the importance of the site will be provided by the prospective developer as part of the application for planning permission or (preferably) as part of the pre-application discussions, AND

  • Relevant policies and guidance including but not limited to the 'Related Documents' must be conformed to.

  When development that will affect a site of archaeological significance is to be carried out, both of the following will apply:

  • Developers will be expected to make provision for the protection and preservation of archaeological deposits in situ within their developments, OR

  • Where the planning authority deems that the protection and preservation of archaeological deposits in situ is not warranted for whatever reason, it shall satisfy itself that the developer has made appropriate and satisfactory provision for the excavation, recording, analysis and publication and, if appropriate preservation of, the remains.

  Where archaeological remains are discovered after a development has commenced both of the following will apply:

• The developer will stop work and notify the WOSAS and the council immediately to enable an assessment of the importance of the remains to be made, AND

• Developers should make appropriate and satisfactory provision for the excavation, recording, analysis and publication of the remains. (Developers may see fit to insure against the unexpected discovery of archaeological remains during work).

Guidance on the approach to the historic environment within the Argyll and Bute Council administrative area can be found within the Historic Environment Strategy 2015-2020 (Argyll and Bute Council and Historic Environment Scotland, 2015). This document, which had not been replaced at the time of writing in 2024, sets out a series of eight key objectives. Together, these provide a framework for the protection, conservation, management and interpretation of the historic environment to allow heritage to play a key role in economic and social growth and expansion in the region; and how to ensure that the heritage of the area continues to provide enjoyment to the local community.

The Argyll and Bute Local Development Plan 2 (LDP) was adopted in February 2024. LDP2 contains the following policies of relevance to this chapter of the EIAR (Argyll and Bute Council, 2024).

- Policy 15 – Supporting the protection, conservation and enhancement of our historic built environment.
- Policy 16 – Listed buildings.
- Policy 17 – Conservation areas.
- Policy 19 – Scheduled Monuments.
- Policy 20 – Gardens and Designed Landscapes.
- Policy 21 – Sites of Archaeological Importance.

13.3 Consultation

Consultation carried out can be found within ***Error! Reference source not found.*** *Summary of Consultation*, below.

Table 13.1 Summary of Consultation

Consultee	Key Issue	Summary of Response	Action Taken
HES Pre-scoping	Early discussions were held regarding a possible workers village located in the grounds of Inveraray Castle.		Comment fed back to the design team and option eventually dropped.
HES	HES provided feedback regarding the potential for impacts on the setting of a number of assets and noted that visualisations might be helpful in assessing impacts. These were as follows: • Inveraray Castle (Inventory of Designed Landscapes DGL00223); • Ballimeanoch chapel and burial ground (Scheduled Monument SM4227); • Carn Dubh Crannog (Scheduled Monument SM4175); • Keppochan cup marked stone (Scheduled Monument SM4186).	Response noted and all assets considered as part of the setting assessment. The ZTV would suggest that there may be some views of the Tailpond from parts of the burial ground, although the site visit suggests that these should be limited due to existing tree cover. Impacts on the setting of Carn Dubh Crannog considered to be minimal. While the ZTV suggests there will be views from the crannog, the ZTV does not take into account tree cover, and mature trees on the headland between the Tailpond and crannog would suggest that there will be no views from the crannog and the Tailpond.	Photomontage created for Balliemeanoch Chapel and Keppochan cup marked stone (*Volume 4 Visualisations*). Agreed that wirelines sufficient for Carn Dubh Crannog. No visualisations required for Inveraray Castle Parkland due to the nature of the works in the final design, although visualisations prepared as part of the LVIA assessment, and a wireline produced from the Category A listed Aray Bridge.

Consultee	Key Issue	Summary of Response	Action Taken
		Views from Keppochan cup marked stone will be limited to the upgraded Access Track servicing the Development Site from the north which is located approximately 800 m south of the asset. As works to the track will be minor, no impacts are predicted and a visualisation was not produced for this site. Further consultation noted that the limited and temporary nature of the works around Inveraray Castle Garden and Designed Landscape was unlikely to result in a permanent impact.	
WoSAS Scoping Opinion	Agreed that main concern was potential for major direct impact on non-designated assets and that mitigation would need to be developed. Also noted that they agreed with the need for a walkover survey of areas to be disturbed.	Scoping response noted.	Details of walkover survey covered in Section 13.6.7 Walkover Survey, details of impact assessment covered in Section 13.7 Assessment of Effects, and details of proposed mitigation covered in Section 13.9 Mitigation and Monitoring.
HES Post-Scoping Consultation	Email and call regarding ongoing impact assessment including visualisations and setting assessment. Provisionally agreed that wireframe from the following assets would be sufficient: • Carn Dubh Crannog (Scheduled Monument SM4175); • Keppochan cup marked stone (Scheduled Monument SM4186). HES to talk to built heritage team to agree additional viewpoints from/around Inveraray Castle and the associated Park and Garden.		Visualisations produced where required, and included in *Volume 4 Visualisations*
WoSAS Post-Scoping Consultation	Email discussions with WoSAS regarding results of the archaeological walkover survey and possible mitigation. WoSAS agreed with the conclusions of the walkover survey of the Headpond, and mitigation suggested.	AECOM Heritage provided outline of results of walkover survey and put forwards mitigation.	Results of walkover survey covered in Section 13.6.7 Walkover Survey. Proposed mitigation outlined in Section 13.9 Mitigation and Monitoring.

13.4 Study Area

Two study areas were established to identify the assets and inform the baseline study. A study area of 1 km from the main red line boundary (covering the Headpond and Tailpond) was used to provide detailed baseline information for the assessment, with a reduced 500 m study area used for the red line boundary for the Marine Facility and temporary access works near Inveraray. This is due to the temporary nature of the Development near Inveraray as well as the large number of assets in the settlement.

A wider 3 km study area was also defined in order to identify assets which may be affected by the Development through change in their setting (*Figure 13.8 Heritage Assets Assessed for Impacts on Setting. (Volume 3 Figures)*). The assessment of effects on setting utilised Zone of Theoretical Visibility (ZTV) data as a filter to determine which designated and non-designated assets fall within areas from which the Development could potentially be visible. Assets which fall within the ZTV were reviewed to evaluate if the Development would be visible in practice (for example, to account for screening) and, if so, to assess if the predicated visual change would affect the significance of the asset.

A full setting assessment has been undertaken on assets where setting contributed to the significance of the asset, to establish if the Headpond or associated infrastructure of the Development would impact upon this significance. Whilst the ZTV has been used to guide the selection of assets for setting assessment, assets which fell outside of the ZTV were still considered to ensure their setting did not include wider landscape views of, to or from the assets which would have the potential to be affected by the Development. Likewise, these assets were considered in so far as they contribute to the settings or group values of other assets within the assessment.

The study areas were agreed in consultation with Historic Environment Scotland (HES) and Argyll and Bute Council's Archaeological Advisor (WoSAS) through the Scoping Opinion.

Where no significant adverse effects on assets were predicted, no further assessment was undertaken. This review of assets within the wider 3 km identified four assets where the Development had the potential to result in impacts on their setting. These included the scheduled monuments of Balliemeanoch Chapel (SM4227), Carn Dubh Crannog (SM4175), and Keppochan cup marked stone (SM4186), where there were the potential for impacts from the main works around the Headpond and associated access works. Potential impacts on setting resulting from the Marine Facility and associated access works near Inveraray were limited to Inveraray Castle Garden and Designed Landscape (GDL00223), and it was agreed with Historic Environment Scotland that a setting assessment would be undertaken for these assets.

13.5 Methodology

13.5.1 Guidance and Standards

This assessment has been undertaken following the Chartered Institute for Archaeologists (CIfA) *Standards and Guidance for Historic Environment Desk-Based Assessment* (CIfA 2020).

13.5.2 Assessment Scope

The assessment considers the effects during the three phases of the Development lifespan as identified in *Section 2.17 Construction – 2.19 Decommissioning* of *Chapter 2: Project and Site Description*, and identifies the assets within the Development Site and the surrounding area and provides an assessment of the potential effects. This is undertaken in order to identify any residual significant effects, after taking into account mitigation by design, and additional mitigation measures to reduce identified effects. The phases include construction, operation, and decommissioning.

For the purpose of this assessment, cultural heritage assets consist of:

- Archaeological features, sites or deposits;
- Built heritage; and
- Historic landscapes.

Cultural heritage assets can be designated or non-designated. Designated assets are those which have been identified by the statutory or local authorities as being of considerable value and as having a series of identifiable characteristics. They consist of Scheduled Monuments, Listed Buildings, Gardens and Landscapes, Historic Battlefields, Conservation Areas, and World Heritage Sites. These are assets which are either offered statutory protection, or are a material consideration in the planning process. Non-designated assets are identified at a local level and can consist of archaeological sites, features or findspots and locally significant buildings or landscapes. They can also consist of records of cropmarks or earthwork features.

The assessment considers and places a 'value/significance' upon these identified assets. The methodology for according a value is explained in detail below in the 'Assessment Methodology' section. The assessment then considers the impact of the Development upon these assets (without regard to the value). Impacts are considered as direct, indirect and cumulative and can result from a number of factors during the construction, operation and, decommissioning of the Development.

Direct impacts consist of physical impacts upon archaeological features and remains during construction. This can be caused by many construction activities such as excavation, construction of Access Tracks, construction of temporary works compounds, and general groundworks.

Indirect impacts occur as a result of change within the setting of an asset that affects its value (significance). This definition of setting impacts as indirect is set out in the HES guidance "Environmental Impact Assessment Handbook" (Historic Environment Scotland 2018). Paragraph 43 also notes that "*When considering setting impacts, visual change should not be equated directly with adverse impact. Rather the impact should be assessed with reference to the degree that the proposal affects those aspects of setting that contribute to the asset's cultural significance".*

13.5.3 Baseline Data Collection

The following sources of information have been reviewed to inform the baseline, and form the basis of the assessment of likely significant effects on cultural heritage:

- The WoSAS Historic Environment Record (HER);
- HES' online data, including Canmore, (accessed through PastMap);
- Argyll and Bute Archive Centre, Lochilphead;
- Oban Library;
- Argyll Estate Archives, Inveraray Castle;
- The National Collection of Aerial Photographs (NCAP), Edinburgh;
- Historic mapping available on the National Library of Scotland website (NLS); and
- An archaeological walkover survey to assess known sites and to assess the area for the potential for additional unrecorded sites.

13.5.4 Assessment Methodology

The impact assessment has considered any impacts to the value (significance) of an asset, either physically or through changes to its setting.

The value (significance) of a heritage asset is determined by professional judgement, guided but not limited to any designated status the asset may hold. The value of an asset is also judged upon a number of different factors including the special characteristics the assets might hold which can include evidential, historical, aesthetic, communal, archaeological, artistic and architectural interests. This value of a heritage asset is assessed primarily in accordance with the guidance set out in SPP and the Historic Environment Policy for Scotland (HESP) (HES, 2019). The value (significance) is defined by the sum of its heritage interests. Taking these criteria into account, each identified heritage asset can be assigned a level of value (significance) in accordance with a three-point scale as set out in **Error! Reference source not found.** Heritage Value (Significance) Criteria, below.

Table 13.2 Heritage Value (Significance) Criteria

Value / Significance	Examples
High	• World Heritage Sites (WHS); • Category A Listed Buildings; • Gardens and landscape on the Inventory of Designed Landscapes of outstanding archaeological, architectural or historic interest; • Registered Battlefields; • Scheduled Monuments; and • Non-designated sites/features of schedulable quality and national importance
Medium	• Category B and C Listed Buildings; • Conservation areas; • Locally listed or non-designated buildings within a Conservation Area; and • Non-designated assets of a regional resource value.
Low	• Non-designated assets of a local resource value as identified through consultation; • Locally listed buildings; and • Non-designated assets whose heritage values are compromised by poor preservation or damaged so that too little remains to justify inclusion into a higher grade.

When professional judgement is considered, some sites may not fit into the specified category in this table. Each heritage asset will be assessed on an individual basis and take account of regional variations and their individual qualities.

Having identified the value of the heritage asset, the next stage in the assessment will be to identify the level and degree of impact to the asset arising from the Development. Impacts may arise during construction or operation and can be temporary or permanent. Impacts can occur to the physical fabric of the asset or affect its setting.

The level and degree of impact (magnitude of impact) will be assigned with reference to a four-point scale as set out in Table 13.3 Magnitude of Change Criteria, below**Error! Reference source not found.**. In respect of cultural heritage, the assessment of the level and magnitude of impact is made in consideration of any development design mitigation (embedded mitigation).

Table 13.3: Magnitude of Change Criteria

Magnitude of Change	Examples
High	Change such that the significance of the asset is totally altered or destroyed. Comprehensive change to setting affecting significance, resulting in a serious loss in our ability to understand and appreciate the asset.
Medium	Change such that the significance of the asset is affected. Noticeably different change to setting affecting significance, resulting in erosion in our ability to understand and appreciate the asset.
Low	Change such that the significance of the asset is slightly affected. Slight change to setting affecting significance resulting in a change in our ability to understand and appreciate the asset.
Negligible	Changes to the asset that hardly affect significance. Minimal changes to the setting of an asset that have little effect on significance resulting in no real change in our ability to understand and appreciate the asset.

An assessment of the level of significant effect, having taken into consideration any embedded mitigation, will be determined by cross-referencing between the significance (heritage value) of the asset (***Error! Reference source not found.*** *Heritage Value (Significance) Criteria*) and the magnitude of impact (*Table 13.3 Magnitude of Change Criteria).* The resultant level of significant effect (*Table 13.4 Criteria for Determining the Significance of Effect*) can be negligible, minor, moderate or major and adverse or beneficial.

Table 13.4: Criteria for Determining the Significance of Effect

Value (Significance)	Magnitude of Impact			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Negligible

An assessment of the predicted significance of effect will be made both prior to and following the implementation of additional mitigation measures to identify the residual effects. This first highlights where mitigation may be appropriate, and then demonstrates the effectiveness of that mitigation, providing a framework for the assessment of the significance of effect which takes mitigation measures into consideration.

All archaeological work will be undertaken in line with guidance published by the Chartered Institute for Archaeologists (CIfA 2020). The setting assessment will follow the Historic Environment Scotland Guidance on Managing Change in the Historic Environment: Setting (Historic Environment Scotland 2016).

13.5.5 Limitations And Assumptions

Data was acquired from third parties; it is assumed that all information is accurate and fit for purpose.

The Historic Environment Records only list known archaeological sites or significant historic landscape features. There is a possibility for the discovery of previously unrecorded archaeological remains.

The proposed Headpond area represents the main focus of works, and this area is a remote upland landscape which is difficult to access. This, coupled with the rough grazing that occupies the Development Site, means that while a walkover survey was undertaken, previously unrecorded assets may survive within the Development Site.

13.6 Baseline Environment

13.6.1 Introduction

Due to the nature of the Development, two study areas were adopted for the assessment of existing baseline conditions. A study area of 1 km was used for the main Development Site (i.e. the Headpond and Tailpond works), while a reduced 500 m study area was used for the temporary work and Marine Facility near Inveraray due to the temporary nature of the works and the large number of assets within the settlement. These combined areas are referred to as the 'study area' throughout the baseline. A further 3 km study area was adopted for assessing the potential impacts on the setting of assets. This was taken from both the main works site and the temporary works areas near Inveraray and is referred to as the 'Wider study area'.

A total of 44 designated assets and 241 non-designated assets identified were recorded across the study area on the WoSAS HER and the Canmore database, with a further 12 assets identified through a review of historic mapping, documentary sources, and walkover survey. Therefore, the total number of assets recorded within the study area is 297.

Most of the non-designated assets recorded within the study area are recorded on both the WoSAS HER and the Canmore dataset. As such, when an asset is recorded in both datasets only the WoSAS reference is provided in the baseline, with a WoSAS prefix used. Where an asset is only listed on Canmore, a 'Canmore' prefix is used. A limited number of assets were recorded as part of the walkover survey, and these have an 'AECOM' prefix.

All assets are presented on *Figures 13.1 Designated Heritage Assets* within study area, and *13.2 (Sheets 1-8) Non-Designated Heritage Assets* within study area (*Volume 3: Figures*), while an appendix of all recorded assets has been included as *Appendix 13.1 Known Archaeological Gazetteers (Volume 5: Appendices)*. Photographs, including site photos taken during the walkover survey, are included in *Appendix 13.2: Cultural Heritage Photographs (Volume 5: Appendices).*

13.6.2 Landscape, Geology, and Land Use

The Development Site includes a large area of varied landscapes, with the main permanent works of the Headpond and Tailpond focused on the eastern shore of Loch Awe and the higher ground that rises above it, while the temporary works associated with the transportation of significant pieces of equipment such as transformers are located near Inveraray on the shore of Loch Fyne.

A full detailed study of the geology is provided in *Chapter 10: Geology and Ground Conditions*, with the following provided as a general overview of site conditions.

The geology of the area is shown on Geological Maps Sheet No. 37E – Lochgoilhead (British Geological Society; BGS, 1990), Sheet No. 29 – Rothesay (BGS, 1892) and Sheet No. 37W – Furnace (BGS, 2008) and on the Geology of Britain GeoIndex Viewer (BGS, 2021), and as also reviewed on the BGS Web Viewer (BGS Geology Viewer - British Geological Survey).

The bedrock geology of the Development is dominated by formations mostly Pre-Cambrian in age that are part of the Dalradian Supergroup. Some of these formations are part of the Tayvallich volcanic formation, which is composed of amphibolitic mafic rocks intercalated with metasedimentary rocks including conglomerates, and the Tayvallich slate and limestone formation. The thickness of the Tayvallich Subgroup is in the range of 100 m – 250 m in the area, with the parent unit being the Argyll Group which has a thickness up to 9 km (BGS, 2021). On the edge of Loch Awe, in the Balliemeanoch region, is the Loch Avit Grit formation, consisting of psammites and pelites.

To the south of the Headpond area, along the proposed southern Access Track, the bedrock is primarily metamorphic rocks, including quartzite, limestone and phyllite, with occurrences of the Loch Tay and Shira Limestones; Tayvallich Slate and Limestone; and the Tayvallich and Loch Avich volcanics. There is an inferred fault line that runs approximately southwest to northeast through the southern edge of the Development Site, for approximately 10 km and terminates approximately 1 km north of Eredine, under Loch Awe. A larger inferred fault runs for 5 km along the western edge of the Development Site under Loch Awe, coming to within 200 m of the red line boundary.

A dyke is present within the red line boundary, about 2 km north of the fault line, the dyke is estimated to be around 5 km long. Of Silurian – Devonian period age range and composed of micro diorite and appinitic-dioritic rock, this igneous rock acts as an intruder to the characteristic sedimentary bedrock in the area.

The superficial deposits in the area appear to be limited, particularly in the areas of higher elevation. On the shore of Loch Awe, there is a mix of till, alluvium, and peat. The glacial history of the area has led to Hummocky Glacial Deposits, made up of diamicton, sand and gravel and formed up to 3 million years ago. On the shore of Inveraray there are raised marine deposits of clay, silt, and sand. Although the British Geological Survey have not mapped peat across the majority of the Development Site, the heritage walkover survey (as well as peat probing) has confirmed that peat deposits do survive in the Headpond area.

The Headpond is centred on the small upland loch of Lochan Airigh (NGR NN 04323 16440) which sits at approximately 357 m above Ordnance Datum (AOD). This is flanked to the west by a ridge of high ground which rises to 472 m AOD and includes the summit of Sròn Bhreac-liath, while to the east it is flanked by the ridge known as Creag na h-lolaire and the summits of Cruach Mhor and Cruach na Gearr-choise which rise to a maximum heigh of 589 m AOD. There are currently no footpaths across the Headpond site, although there are a limited number of animal tracks as the area is used for grazing (sheep), as well as shooting/deer stalking. There have also been some attempts at drainage to improve the land /ground around Lochan Airigh.

The current main access to the site is currently from the west, and is a private farm track that runs from the farmstead of Balliemeanoch which follows the water course of Allt Beochlich which runs from Lochan Airigh into Loch Awe. The upper section of this watercourse has been dammed and houses a small hydro scheme which the existing Access Track serves.

Commercial woodland occupies land to the north and south of the Headpond area, and an existing forestry track through the northern woodland provides a secondary access to the northern end of the Headpond site from the A819 on the eastern side of the Development Site.

The landscape of the Development Site drops from the high ground of the Headpond site, at over 350 m AOD, to the Tailpond area on the shore of Loch Awe at 36 m AOD. This lower landscape is dominated by enclosed improved and semi-improved fields used for pasture along the shore of Loch Awe, with small pockets of woodland. Settlement activity is limited, with the farmstead of Balliemeanoch being the main farmstead, with a limited number of small private houses also located near the loch edge.

The landscape around the proposed Marine Facility site, and associated Access Tracks, is dominated by the designed landscape associated with Inveraray Castle (GDL00223), located on the shore of Loch Fyne to the east of the main Headpond site (centred on NGR NN 09543 08471).

The southern area, around the proposed Marine Facility, is dominated by the southern limits of the parkland which are used as pasture, while the proposed works to improve Access Tracks make use of existing tracks and roads. In the southern area the tracks consist of substantial tracks that serviced an estate quarry, while the track around the north section of the estate is a farm track of varying width.

All areas are dominated by mixed woodland, with the main settlement of Inveraray focused on the shore edge.

13.6.3 Designated Assets

A search of the Historic Environment Scotland database of designated assets recorded a total of 44 designated assets across the study area. This included three scheduled monuments and a single listed building within the larger 1 km study area adopted for the main site, and one scheduled monument, 39 listed buildings, and a single Garden and Designed Landscape for the 500 m study area associated with the temporary works near Inveraray.

While the scheduled monuments represent activity from the prehistoric period onwards, the listed buildings largely date to the post-medieval period with the vast majority located within the settlement of Inveraray, which is also a conservation area, or Inveraray Garden and Designed Landscape which is associated with Inveraray Castle.

There are no World Heritage Site or landscapes on the Inventory of Battlefields within the 1 km and 500 m study areas used for the baseline studies, or the wider 3 km study area used for the setting assessment.

13.6.4 Non-Designated Assets

A total of 241 non-designated assets were recorded on the WoSAS HER and CANMORE Database, of which 181 are within the 1 km study area associated with the permanent works, and 60 in the smaller 500 m study area for the temporary works near Inveraray. A review of historic mapping and the walkover survey also recorded a further four assets within the 1 km study area, and eight assets within the 500 m study area. Like the designated assets discussed above, the non-designated assets represent sites from the various phases of land use and development from the prehistoric period onwards. These include assets linked to prehistoric land improvement, agriculture and settlement, as well as post-medieval agriculture.

13.6.5 Baseline Conditions

Prehistoric (10,000BC to AD400)[1]

A total of 31 assets dating to the prehistoric period have been recorded in the study area, of which 12 are within the 1 km study area for the main works, and nine are in the 500 m study area for the temporary works near Inveraray. These include two scheduled monuments, Carn Dubh crannog in Loch Awe (SM4175) and Keppochan cup marked stone (SM4186), both of which are within the 1 km study area.

While there is no evidence of Palaeolithic activity in the study area, evidence has been found in the wider Argyll area to suggest that humans were exploiting the landscape, if only on a seasonal basis, from as early as 11,000 BC, during the Upper Palaeolithic period. During this period most of Scotland would have been covered with glaciers, however, there would have been warmer periods (interglacial periods) when parts of the ice sheets would melt and withdraw. Flint tools and waste flakes discovered in a cave at Kilmelford (approximately 17 km to the west) could suggest the movement of hunters following migratory herds during one of these warmer periods (Saville and Ballin, 2009).

There is more evidence of human activity in Argyll during the Mesolithic (10,000 to 3,500 BC), with fieldwork over the last twenty years in Scotland identifying a number of sites, although the distribution of these sites would suggest that the main areas being exploited on a seasonal basis were islands/the coastline (Bonsall 1997). Sites dating to this period in the wider Argyll area include a number of sites around the Oban area some 25 km to the west such as Macarthur Cave, Druimvargie Rock Shelter, and Raschoille Cave.

The earliest evidence for human activity within the study area dates to the Neolithic period. Prehistoric assets recorded within the two study areas are largely located on lower ground near Loch Awe and Loch Fyne, or on the lower slopes of the higher ground, a pattern that probably represents the early population exploiting the better/more hospitable ground, as well as the natural marine resources offered by the lochs and watercourses. In most cases the dating of prehistoric assets is difficult due to a lack of excavation or detailed fieldwork, but the earliest remains that can be relatively confidently dated are two pieces of rock art, which are assumed to date to the Neolithic based on their style/form. These include the scheduled Keppochan cup marked boulder which commands views over the north end of Loch Awe (SM4186), as well as a boulder near Erallich Water with cup marks (WoSAS 1585), although recent surveys have been unable to locate the boulder and it is assumed to have been lost.

Other assets that potentially date to the Neolithic include a stone setting near Portsonachan (WoSAS 13846). As with rock art, these types of monument are usually dated to the Neolithic because of their style/form, and their purpose is not fully understood, although they are often found in association with other ceremonial monuments such as burials and rock art. The walkover survey of the Headpond site also noted a possible upright stone which has also been tentatively dated to the Neolithic, although further investigation is required to confirm it is an upright stone/an archaeological feature, or geological (AECOM002).

A number of the prehistoric assets recorded are linked to burial practices and include possible barrows/cairns on the south side of Inveraray (WoSAS 1503; WoSAS 1510; WoSAS 1518; WoSAS 1519), as well as near Loch Awe (WoSAS 1618; WoSAS 1632). Further possible burials had been previously recorded along the Loch Awe area, but recent work has suggested that most of these are probably natural (WoSAS 1573; WoSAS 1574; WoSAS 1603), or later field clearance cairns (WoSAS1635). While these possible burials are more difficult to date without excavation, the potential chambered cairn at Portsonachan is more characteristic of Neolithic burials (WoSAS1618), while the remaining round barrows are more characteristic of late Neolithic/Bronze Age burial practices.

Evidence for settlement activity is limited, and largely restricted to monument types more characteristic of the Iron Age. Settlement remains within the study areas include a crannog along the shore of Loch Awe (WoSAS 1630), as well as a number of possible duns (WoSAS 1639; WoSAS 58226; WoSAS 1735). A possible hut circle has also been recorded (WoSAS 15378), although the form of the structure means it could also be linked to later agricultural activities.

[1] Due to the varied nature of the Scottish landscape, and the resulting variations in settlement/land use, there is no agreed chronology at a national level. As such, the dates that have been assigned to the various periods for the baseline study are those set out in the Regional Archaeological Research Framework for Argyll (RARFA) which was produced as part of the Scottish Archaeological Research Framework (ScARF) (Regional | The Scottish Archaeological Research Framework (scarf.scot)

No clear evidence of Roman activity has been recorded within the study areas, although this is typical for the area with evidence of Roman influence limited in many parts of Scotland including Argyll. Possible Roman pottery sherds were recorded during excavations for a new drain in Portsonachan in the 1960s, although their current location is not known (WoSAS 1615).

While the evidence for prehistoric activity is relatively limited within the study area, the distribution of sites suggests that the main focus of activity through much of the prehistoric period was on the lower-lying land on the lower slopes of the hills and the edge of the lochs. It is possible that the upland area where the proposed Headpond is located was exploited on a seasonal basis, however, the exposed nature of the site as well as the general remoteness would suggest that it was not extensively used during the prehistoric period.

Early Medieval (AD400 – AD1100)

Evidence for activity during the early medieval period is very limited within the study area, with only two assets recorded within the marine facilities study area. These consist of the find spot of a ring (WoSAS 1707), and a carved stone at Inveraray Castle that originally came from Iona (WoSAS 1500). This lack of evidence is common throughout Argyll, with the majority of the limited data available associated with the important religious site at Iona some 70 km to the west, or important sites such as Dunadd Royal Fort approximately 30 km to the southwest (Campbell and Batey 2017).

During the early medieval period, the landscape of the study area fell within the Kingdom of Dál Riata, a Gaelic speaking kingdom with strong ties to Ireland from where its founding members are reported to have originated (Nieke 2006). The Kingdom was divided into three tribal areas, with the study area located within the lands of *Cénel Loairn*, a name which survives in the district of Lorne which lies on the western side of Loch Awe.

While archaeological evidence for settlement activity is limited within the study area, as well as Argyll, documentary sources such as the *Senchus Fer nAlbanI,* record ‘houses’ in the Kingdom required to pay a tribute/provide military service (Lynch 2001). Limited archaeological evidence also suggests that some prehistoric sites, such as crannogs and duns, were reoccupied during the early medieval period, however, these ‘high status’ dwellings must have been accompanied by a large number of smaller farms/houses based on the number of ‘houses’ listed on the *Senchus Fer nAlbanI* (Nieke 2006).

What seems likely is that the main focus of settlement was, as with earlier periods, around the better agricultural land on the loch edges, with the upland areas used for grazing, woodland, or potentially hunting grounds. This distribution of settlements is, however, based on the distribution of the visible ‘higher status’ sites such as crannogs and duns which are often associated with cultivable land, and confirmed sites dating to the early medieval are limited.

The end of the early medieval period, and the end of the Kingdom of Dál Riata, starts with the Norse incursions of the 8th century, although these had a far larger impact on the islands and seaward coastline of Argyll. Evidence for Norse activity in the study area is also absent, while in the wider Argyll landscape it is largely limited to burials and occasional stray finds (Campbell and Batey 2017).

A brief review of placename evidence was undertaken as part of the assessment, but this has failed to identify any elements that are either characteristically Norse or that could be derived from the Gaelic of the period in question, with the exception of the tribal name *Cénel Loairn* discussed above. The one other exception is the term *Airigh*, a Gaelic term associated with sheiling grounds that were key to transhumance/the seasonal use of upland pasture (Bil 1990), with Lochan Airigh noted near the centre of the Headpond area. However, while this area is likely to have been used for transhumance, the term *airigh* continued to be used in the medieval and post-medieval periods, and as such its presence cannot be taken to assume early medieval activity.

Medieval (AD1100 – AD1600)

Only five assets dating to the medieval period have been recorded within the study area for the main works and the Marine Facility. These include the site of Balliemeanoch Chapel located overlooking the farmstead of Balliemeanoch (SM4186), and a cross in the grounds of Inveraray Castle (SM253), both of which are scheduled monuments. The remaining four assets are all non-designated and include a possible motte at Balliemeanoch which has been recorded in documentary sources, but its current location is not known (WoSAS 43241), the original site of Inveraray Castle (WoSAS 1522), and the former church and burial ground of Kilmalieu/Glenaray near Inveraray (WoSAS 1708).

The scheduled cross, which is located within the grounds of Inveraray Castle, is not it in its original position and is assumed to have stood in the centre of the old settlement of Inveraray. Recorded from at least 1474 when it was made a burgh of a barony, the settlement was originally located to the north of its current location on the River Array near the site of the earlier Inveraray Castle (Munro and Gittings 2006) (WoSAS 1522). Originally assumed to have been a fishing hamlet, the settlement grew in importance when the Campbells of Argyle made it their main seat in the 15th century, with courts held there and the growing settlement becoming the county town (Wilson 1868).

It is noted that the main access to Inveraray during this period was by sea, and this lack of good internal routes during the medieval period may have been partially to blame for the lack of development further inland. The remains around Balliemeanoch, including the chapel (SM) and the documentary sources for a possible motte (WoSAS 43241) would suggest that there was some activity around the shore of Loch Awe, although activity on the upland area of the proposed Headpond is assumed to have been limited to pastoral activities/seasonal grazing.

Placename evidence further suggests medieval activity, with the second wave of Gaelic influence evident in place name elements such as *baile* meaning settlement (Duncan 2000) (i.e. Balliemeanoch). However, based on current evidence it would appear that the uplands sections of the study area remained undeveloped during the medieval period, with the main focus of activity in the lowers areas on the shore of Loch Awe and around Inveraray on Loch Fyne.

Post-Medieval (AD1600 – AD1900)

The post-medieval period is the best represented period, with a total of 205 assets recorded within the study area. As with the previous periods, assets in the upland area of the Headpond are limited and largely linked to pastoral activities, while the clear evidence for settlement is found around Loch Awe and Loch Fyne.

Early detailed mapping/surveys of the area are limited, with the county surveys produced during the 16th to early 18th century being relatively inaccurate due to their scale and the detail of the surveys undertaken. The maps produced by Pont between 1583-1614, Jansson between 1588 and 1664, and Schenk in 1690, do not show the Development Site in any detail, although the appearance of some settlement names does provide important information regarding the general settlement pattern and the key areas of activity, with all early surveys showing the main permanent settlements focused on the lower lying land on the edge of Loch Awe and Loch Fyne.

The Pont survey (undated, but assumed to be from 1583-1614) shows *Balemeanach* (AECOM012) as well as Blair Cusan (modern day Cruach Bheac) to the south, and the settlement of Inveraray to the east. While their scale means their accuracy is limited, they do suggest that the area of the Headpond was not settled and may have instead been used for seasonal grazing or transhumance as is supported by the presence of shielings within the Headpond area (WoSAS 44155). This practice was common throughout much of the uplands areas of Scotland, until it started to decline with new hardier breeds of sheep developed during the agricultural revolution of the late 18th and early 19th century (Bil 1990).

The early surveys also fail to provide any clear detail of roads or tracks in the study area, or the wider landscape, and the limited infrastructure was noted as a reason for the lack of development in the region, as well as making aspects such as the movement of cattle/livestock problematic (Duncan 2006). The Cowley Survey of 1734, although limited in detail, does depict a track running in a north-westerly direction from Inveraray, and crossing Loch Awe at an unnamed location. This crossing point is assumed to be the Portsonachan to Kilchrenan crossing, some 5 km north of the Headpond site, and it is possible that the track shown corresponds with a drove road recorded on the lower ground to the northwest of the Site near the alignment of the current A819 (WoSAS 13857).

This lack of good communications, and the problems that could arise from a poor road system, became apparent after the Jacobite rising of 1689, and by the early 18th century moves had been made to create a system of military roads in Scotland (Taylor 1996). The earliest of these roads were built under General Wade, however, a second phase of construction was undertaken under Major Caulfield, and this included a new road from Inveraray to Bonawe and Tyndrum which was constructed between 1757 and 1761. The alignment of this road follows Glen Aray, and the line of the modern A819, located on the eastern side of the study area, with sections incorporated into a modern forestry tack, although most of the original road material has been lost (WoSAS 22536; CANMORE127142; CANMORE 126792; CANMORE 126810). It seems likely that this section of road was, in some parts, an upgrade of the old drove road recorded on earlier surveys, as a road is certainly marked on the General Roy survey produced between 1747 and 1755, some two years before works started on the Caulfield Road in this area.

The Roy survey represents the first detailed mapping of the study area and shows the upland area, where the Headpond is located, as free from features/settlement activity. The focus of settlement continues to be the lower land along the shore of Loch Awe, with some areas of arable fields noted, although all of the uplands appears to be unimproved. This survey also shows the settlement of *Ballmeanach* as a small grouping of houses, while a second grouping of structures named *Curlrulunan* is depicted immediately to the north of *Ballmeanach.* This settlement would appear to relate to the former township site recorded on the HER as Balliemeanoch Cottage (WoSAS 44157).

The Roy survey also depicts a further grouping of structures to the south of *Ballmeanach* named as *Bonachaillich*. Located near a watercourse which appears to be that named Allt Beochlich on modern mapping, the small settlement appears to represent the township recorded on the HER as Allt Beochlich (WoSAS 1578; WoSAS 48741). This settlement survives as a series of earthworks near the proposed site access from the west.

The dominance of arable pastoral agriculture is noted in accounts of the area from the late 18th century, with the uplands described as heath, and the only areas of arable being near the loch edge where some efforts had been made to improve the ground (Campbell 1793). It was also noted that the area still retained extensive woodland around the lower slopes of the high ground, as well as loch edges, and this situation was little changed in the first half of the 19th century when the Second Statistical Account was published (Fraser 1793).

The first detailed and accurate mapping of the study area dates to the late 19th century when the Ordnance Survey produced detailed surveys. This shows the Headpond and Tailpond areas, with the landscape largely resembling the current situation with the upland landscape of the Headpond dominated by unimproved grazing, while the lower areas near Loch Awe have a limited number of enclosed improved fields around the area of Balliemeanoch Farm. The buildings that form the farmstead of Balliemeanoch, which can still be traced in the current farmstead, include the main house, out buildings, a sheepfold, and a small walled garden to the west (AECOM012).

At least one small building is also noted to the south of Balliemeanoch, although the survey would suggest that this building was abandoned/roofless by the time of the survey (WoSAS 44156). A similar situation is also noted slightly further south at Allt Beochlich, where the structures are also depicted as being roofless (WoSAS 1578; WoSAS 48741), and this abandonment and ‘rationalisation’ of the agricultural landscape correlates with the agricultural revolution and clearances which dominated the uplands of Scotland in the late 18th and 19th centuries.

In the main Headpond site, features on the First Edition Ordnance Survey mapping are limited to three small structures marked near Lochan Airidh. Their position corresponds to the locations where shielings have been recorded, and the Ordnance Survey name book suggests that these were ruins at the time the survey was conducted, the surveyors account noting that the Lochan Airidh was most likely named after the ruined shielings (Ordnance Survey) (WoSAS 44155).

While the archaeology and historic mapping would suggest that the upland region of the study area remained undeveloped, with some seasonal grazing throughout the post-medieval period, the situation around Inveraray section of the study area was somewhat different with significant changes in the landscape in the 18th century.

A review of mapping held by the Argyll Archives at Inveraray Castle provided details regarding the development of the designed landscape associated with Inveraray Castle (GDL00223) as well as the village. The original castle, a modest ‘Lairds house or tower’ was located to the east of the current Category A listed castle and was surrounded by the original settlement of Inveraray (WoSAS 1522). However, moves to improve the residence commenced in at the turn of the 18th century when John, 2nd Duke of Argyll, asked Sir John Vanbrugh to design a house ‘befitting the family’s elevation to the Dukedom (Duchess of Argyll 2018).

The earliest detailed survey recorded dates to 1721 and shows an area of land, later known as Fisherland, to the south of the castle and the settlement of Inveraray as a complex parkland with paths cutting through what is assumed to be ornamental woodland (*Figure 13.4 An Extract Plan of Inveraray in Argyllshire, The Seat of His Grace the Duke of Argyll and Greenick dated 1721. Volume 3 Figures*). This survey also shows the area of the current settlement as woodland/parkland, with the original settlement originally located further to the north near the mouth of the River Aray. The southern limits of the parkland appear to be defined by a small water course, sometimes named on modern maps as Cròm Allt, with the area of the Marine Facility falling outside of the designed landscape.

The parkland, or policies, associated with Inveraray Castle represent an extensive designed landscape occupying the shore of Loch Fyne around the settlement of Inveraray. Consisting of extensive woodland, designed, planted, and managed by various Earls and Dukes of Argyll from at least the 17th century, it is the 18th century development of the estate that dominates the present layout. The Vanbrugh design proposed for the 2nd Duke was never to be realised, and it was not until the 1740s that works commenced under the Archibald, 3rd Duke of Argyll, who initially engaged the military engineer Dugal Campbell to design the new castle, before later changing to the English architect Roger Morris (MacInnes 2006). Morris consulted William Adam on the design, and works commenced in 1745 with the felling of 1,000 trees to provide scaffolding, as well as the removal of the existing castle and the relocation of the settlement to its current location.

The Jacobite Rebellion of 1745/46 slowed work, and in 1746 Morris appointed Wiliam Adam, supported by his sons John and Robert, to act as 'Intendant General', a role which resulted in William Adam having a greater input into the design of the house as well as features in the surrounding garden and village (Gifford 1989). This includes the Category B listed Bealach an Fhuarain well-house (LB11520) which is attributed to Adam.

The rebuilding of the castle also appears to have taken place alongside a redesign of the parkland, with an area of extensive woodland that previously existed in an area known as Fisherland, removed. This woodland appears to have been cleared as part of the 1740s work, possibly to supply some of the wood needed for scaffolding, as the General Roy Survey of 1747-1755 does not show extensive woodland in this area, although key routes/approaches on both the 1721 survey (*Figure 13.4 An extract plan of Inveraray in Argyllshire, The Seat of His Grace the Duke of Argyll and Greenick dated 1721 (Volume 3 Figures)*) and the Roy Survey can be clearly traced on the modern landscape including Upper Avenue, which will be upgraded as a temporary Access Track from the Marine Facility.

A survey dated 1756, held by the Argyll Estate Archives, also provides detailed information regarding the Fisherland area, with the cleared woodland now used for a mixture of arable and pasture, with four pockets of woodland retained, or replanted, as decorative features (*Figure 13.5 Survey of Inveraray dated 1756. Volume 3 Figures*). This survey also shows three quarries in the Fisherland area, along with Upper Avenue and an unnamed track/avenue running north-south through the Fisherland area. A structure named as *Bararay* is also marked near the southern end of Upper Avenue, although its purpose is not clear (AECOM006), and this feature now appears to be located under the existing reservoir.

The 1756 survey records a number of other features including the settlement of Inveraray shown in its new position near the shore of Loch Fyne, while other elements of the Inveraray Estate depicted include Bealach an Fhuarain well-house (LB11520), Malt Land with its walled garden (LB11530; LB11535; LB11536; LB11533 WoSAS 72177), and the folly on Dun Na Cuiache (LB11543). This latter asset, located on high ground overlooking the castle and parkland, commands fine views across the estate. A track that runs around the foot of the hill is also depicted on the 1756 survey (and possibly the 1721 survey). This track will be used as a temporary Access Track during construction of the Development.

By the end of the 18th century, it was reported that the population of Inveraray had decreased considerably due to the completion of the castle, and that the main occupation of most inhabitants had returned to fishing (Fraser 1793). It was also noted that the surrounding uplands represented some of the best pasture in Scotland, with some of the largest flocks of sheep recorded in this area.

The first half of the 19th century saw an expansion in woodland around Inveraray Castle and its policies by John, the 7th Duke of Argyll, with extensive areas of woodland planted on the hills surrounding the main parkland (Smith and Campbell 1845). This appears to have reached something of a peak in the 1830s with approximately 450,000 trees planted between 1832 and 1836, although it is noted that the primary type of agriculture practiced outside of the parkland was pastoral with sheep being the dominant form of livestock. Fishing also remained a main source of the town's wealth, with the herring fishing representing the primary activity of most inhabitants during the season.

The First Edition Ordnance Survey plan of the area published in 1871 shows the general layout of the policies much as they appear today, and the main settlement also resembles that which survives (Ordnance Survey Sheet CXXXIII.9, Published 1871). The plan does show two structures in the area of *Bararay* (AECOM006) although these are not named, while a quarry and a series of cisterns are marked on Upper Avenue (AECOM004 and AECOM007 respectively). The central avenue running through the Fisherland area had also been formalised and straightened by the 1871 survey, while the southern lodge is depicted at the southern end of The Avenue (LB13768), and Cherrypark is shown to the west of Inveraray Castle (LB11528). To the north of the Castle, the track that forms the proposed temporary workers access had also been formalised, and a number of features in the woodland to the north are also recorded including old limekilns (LB11541), Beehive Cottage (LB11542), cisterns (AECOM008-AECOM010), and an old quarry (AECOM011) (Ordnance Survey Sheet CXXXIII.6, Published 1871).

By the close of the 19th century, the general form of the policies associated with Inveraray Castle (GDL00223) largely represent those which survive into the modern day, while the settlement pattern of Inveraray Town also changes little from the late 19th century into the modern day.

Modern (AD1900 – Present)

A total of 13 previously recorded assets dating to the modern period were identified within the study area with a further two assets recorded as part of the walkover survey. The majority of the assets were recorded near the temporary works at Inveraray, with most linked to the military training camp established in the grounds in Inveraray Castle in the Second World War (WoSAS 87735; WoSAS 87736). Previously assets recorded around permanent works for the Headpond and Tailpond are largely linked to continued settlement and commercial activity near the loch and include a pier (WoSAS 46067), fish farm (WoSAS 87702), and Tigh an Uisage house (WoSAS 72588).

The two new assets recorded as part of the walkover survey are both linked to quarrying in the Inveraray Estate and include a former quarry (AECOM004) and a series of concrete structures in the woodland near the quarry that were presumably used for loading stone (AECOM005).

As has been noted in the post-medieval section, Inveraray remained the main centre of settlement throughout the modern period, with the settlement pattern changing very little in the first half of the 20th century. The main focus of the settlement remained the area around the pier and Main Street, with a regular ferry service bringing tourists by boat from Glasgow until the outbreak of the Second World War (Smith 2001). The herring trade, that has also been a dominant industry within the town, had also declined by the middle of the 20th century. However, the war years saw the population of the settlement rapidly expand with the establishment of the Combined Operations Training Centre in the grounds of Inveraray Castle (WoSAS 72097; WoSAS 87735; WoSAS 87736).

The primary aim of the base was to train forces in the art of amphibious landings, with all three branches of the armed forces having a presence. Plans held by the Argyll Estate Archives show an extensive base covering the inner area of the Garden and Designed Landscape around Inveraray Castle, with accommodation buildings, messing facilities, ablutions, and training buildings, along with sports facilities such as a football pitch (WoSAS 87735; WoSAS 87736). The camp also extended onto the north side of the River Aray, in the area known as Dutchess Wood, as well as north as far as the estate complex known as Malt Land. The majority of the site was removed after the end of the Second World War, although the footprint of some buildings were observed in Dutchess Wood during the walkover survey, the football pitch remains for public use, and a number of new roads/tracks within the parkland were also retained.

Other assets also linked to the Combined Operations Training Centre include a memorial to a member of the Women's Royal Naval Service who was murdered in 1942 (WoSAS 66814), and a number of landing craft wrecks within Loch Fyne (WoSAS 78923; WoSAS 72227).

In the years that followed the Second World War the settlement of Inveraray expanded to the south, with a large housing estate built in the area of 'Newtown'. This development was within the southern area of the parkland that was originally woodland, but opened up to grazing as part of the 18th century development of the estate. A golf course was also opened in the second half of the 20th century, and this also occupies the southern section of the parkland, while a sewage treatment plant was also constructed in this area in 2002.

While there is clear evidence of development around Inveraray in the 20th century, land use around the Headpond and Tailpond areas appears to have remained dominated by agriculture. Mapping from the 20th century shows the upland area as rough grazing, while the land around Loch Awe has some evidence of improved grazing, with the situation continuing into the present day.

The major change in the landscape near the Headpond was the creation of a small reservoir in the last quarter of the 20th century for a hydroelectric scheme on upper reaches of the Allt Beochlich watercourse. Located some 1 km southwest of the proposed Headpond, and adjacent to two of the proposed temporary compounds, the scheme is serviced by a road running from Balliemeanoch Farm near the shore of Loch Awe which will also provide access to the proposed Headpond.

13.6.6 Aerial Photography and LiDAR Data

A review of aerial photographs held by the National Collection of Aerial Photography (NCAP) in Edinburgh was undertaken as part of the desk-based research. This noted that only a limited number of photographs covered the site, and these were largely unsuitable for detailed consultation due to the quality of the images (i.e. some had cloud cover), or the scale of the images.

A review of satellite images, as well as historic satellite images on Google earth, was also undertaken. The following aerial photographs in the NCAP collection were reviewed (see Table 13.5 Aerial Photographs Reviewed at the NCAP Archive, Edinburgh).

Table 13.5 Aerial Photographs Reviewed at the NCAP Archive, Edinburgh

Sortie	Date	Scale	Frame
HSL/UK/82/0064	22/09/1982	35,000	1346
GEONEX/0021/84	08/06/1984	15,000	158, 159

Sortie	Date	Scale	Frame
MMC/0368	18/09/2001	26,000	0356
MMC/0605	23/05/2004	10,000	32-36, 62-66

A review of online LiDAR data was also undertaken, but this revealed that the Development Site is not covered by any open access LiDAR data, and a LiDAR survey was not commissioned as part of the Development.

No new archaeological or cultural heritage features were observed on the photographs viewed.

13.6.7 Walkover Survey

An archaeological site walkover survey was undertaken between the 24th and 29th September 2023, during which time the archaeologists undertaking the works examined the area of the Headpond, as well as other areas of key infrastructure including Access Tracks, Construction Compounds, and the Tailpond inlet / outlet in Loch Awe, as well as the area of temporary works near Loch Fyne. A number of assets in the surrounding landscape were also examined as part of the assessment into impact on the setting of heritage assets. Due to the varying landscapes of these work areas, they are discussed separately below. Photographs taken as part of the walkover survey are reproduced in *Appendix 13.2: Cultural Heritage Photographs (Volume 5: Appendices).*

Headpond Area

The survey of the main Headpond area, including associated Construction Compounds, confirmed that the area of the proposed works is dominated by rough upland grazing, with some attempts at drainage/improvement visible in the form of drains cut across the area (see *Appendix 13.2, Photographs 13.1 to 13.23 (Volume 5: Appendices)* for general site photos). There are no footpaths across the area of the Headpond which makes access difficult, although a number of sheep trails were observed. The topography, with high ground surrounding all sides of Loch Airigh and the Headpond, did enable views into/across the Headpond area.

An area of previously recorded shielings located within the Embankment 1 works were visited (WoSAS 44155). Located on the south side of Loch Airigh, the complex consists of at least four structures on the east side of a small stream, with a further one/two structures on the west side (*Appendix 13.2, Photographs 13.13 to 13.17 (Volume 5: Appendices)*). The structures vary in size from being small square buildings approximately 2.5 m x 2.5 m, to larger rectangular structures approximately 3-4 m long, suggesting that the site may also have been used for more permanent settlement due to the larger size of some structures.

The walkover did not positively identify any new assets, although four possible features were recorded. On the high ground on the western side of the Headpond, an area of rock outcrop appeared to have been enhanced to form a small cairn or windbreak type structure (*AECOM 001; Appendix 13.2, Photograph 13.18 (Volume 5: Appendices*)). Its prominent position suggests it could be a recent shepherds/walkers cairn, or possibly a windbreak/screen used by deer stalkers, and it did not appear to be of any antiquity.

A possible upright stone was also recorded on a ridge on the eastern side of Loch Airigh, and within the footprint of the Headpond (*AECOM 002; Appendix 13.2, Photographs 13.19 to 13.21 (Volume 5: Appendices)*). The feature was located midway along a slight ridge, the southern end of which sits a above a relatively deep cutting formed by the water course named as Buinne Dhubh, with higher ground surrounding the feature to the northwest, north, and east. The stone appeared to have been positioned in an upright position, with areas of bedrock visible in the surrounding area laying on a different plain. At least one possible mound was also observed in the area, to the north, but this appeared to be natural.

A final possible feature was noted near the lower northeast slopes of Sròn Bhreac-liath, adjacent to a small watercourse (AECOM003). This feature appeared to be a stone pile, but was also associated with an area of better grazing, a feature characteristic of prolonged grazing associated with sheiling grounds (*Appendix 13.2, Photographs 13.22 and 13.23 (Volume 5: Appendices)*). The feature was located adjacent to a small stream/watercourse, and may represent stone being cleared from the watercourse to improve flow, although it may also represent an isolated shieling.

The proposed Access Tracks to be upgraded from the commercial plantation to the northeast were examined. In most cases, the existing tracks were found to be well constructed/recently resurfaced forestry roads up to 3 m wide. In most cases they were at grade, but in a number of areas they were on slight embankments, or in shallow cuttings. A side ditch was also visible in a large number of areas, with any area beyond the track occupied by commercial forestry which has suffered from extensive ground disturbance (*Appendix 13.2, Photographs 13.24 to 13.27 (Volume 5: Appendices)*).

One section of track, approximately 400 m in length, is not currently occupied by an existing track, however, this is occupied by a mixture of mature woodland and recently felled woodland, and as such was very disturbed.

The Access Track in the Three Bridges plantation was also visited, with the existing Access Track also being relatively substantial, but not as well maintained. The proposed track in this area will only be used by the Development if constructed as part of the Blarghour Wind Farm project, and the necessary land rights secured, and as such potential impacts resulting from its construction do not form part of the assessment.

Tailpond/Loch Awe

The landscape of the Tailpond area, on the eastern side of Loch Awe around the farmstead of Balliemeanoch, is dominated by smaller enclosed fields of improved grazing, as well as small pockets of woodland – many of which flank the watercourses that come off the high ground and discharge into Loch Awe (*Appendix 13.2, Photographs 13.28 to 13.38 9 (Volume 5: Appendices)*).

No new assets were recorded as part of the walkover survey in the Tailpond/Loch Awe area, although a number of previously recorded assets in this area were confirmed. The remains of a settlement depicted on historic mapping (WoSAS 1578) were noted adjacent to a temporary compound (*Appendix 13.2, Photograph 13.31 and 13.32 (Volume 5: Appendices*), and the structures nearest the temporary compound appear to have formed part of a more extensive settlement which extends to the south (WoSAS 1578) (*Appendix 13.2, Photograph 13.33 (Volume 5: Appendices)*).

Two areas of previously recorded agricultural remains were also visited (WoSAS 48743 & 96885). These features, possibly linked to field clearance and general land improvement, were relatively ephemeral in nature *(Appendix 13.2, Photograph 13.30 (Volume 5: Appendices))*.

Inveraray/Loch Fyne Works

The walkover survey of the Inveraray/Loch Fyne area included the proposed Access Track upgrades, as well as the jetty and Construction Compounds (*Appendix 13.2, Photographs 13.43 to 13.60 (Volume 5: Appendices)*). All of the proposed works are located within Inveraray Garden and Designed Landscape (GDL00223) which is associated with the Category A listed Inveraray Castle (LB11552).

Access was granted to the upper floors of Inveraray Castle, and this confirmed views were limited due to tree cover, with the areas of the proposed temporary works not visible (Appendix 13.2, Photographs 13.43 to 13.44 (Volume 5: Appendices)). While no new assets were recorded in the surrounding woodland, traces of the former Combined Operations Training Centre (WoSAS 87736) were visible in the form of concrete building foundations within Duchess Lousie Wood (*Appendix 13.2, Photograph 13.45 (Volume 5: Appendices)*).

The proposed northern Access Track follows another existing track through the parkland which runs along the foot of Dùn Còrr-Bhile and Dùn na Cuaiche links and links the A83 to the A819. This track, which varies from 2 m to 3.5 m in width, is largely constructed of stone/gravel, although the northern section has been upgraded to tarmac. As with the southern track, it is also well screened by woodland for most of its length with views in/out very limited (*Appendix 13.2, Photographs 13.46 to 13.48 (Volume 5: Appendices)*).

No new assets were recorded on the track, although a possible 'ha-ha' type feature was observed on its southern side as it passed an area of pasture near the central section of the route (*Appendix 13.2, Photograph 13.47 (Volume 5: Appendices*)).

The folly on the top of Dùn na Cuaiche (LB11543) was visited as part of the initial assessment into potential setting impacts on the parkland. This demonstrated the fine views across the policies afforded from the prominent position, and historic photos taken from the same location also demonstrated how the settlement of Inveraray has grown over the 20th century as it encroached into the southern Fisherland area (*Appendix 13.2, Photographs 13.49 to 13.52 (Volume 5: Appendices)*). The development of the woodland is also clear from Dùn na Cuaiche, and it was noted that the southern Access Track, along Upper Avenue, was not visible, while views of the temporary Marine Facility and associated Compound were also limited due to tree cover and distance.

The southern track, which runs from the proposed jetty on Loch Fyne to the A819, largely follows the track known as 'Upper Avenue' which is recorded on early plans of the parkland. The track survives as a rough stone track between 2 m and 3 m in width, which is flanked by trees for most of its length limiting views to the settlement of Inveraray and Loch Fyne (*Appendix 13.2, Photographs 13.54 to 13.56 (Volume 5: Appendices)*). A modern pumping station is located near its southern end, while a former quarry is located near the northern end (AECOM004) (*Appendix 13.2, Photograph 13.58 (Volume 5: Appendices)*). Concrete structures observed in the woodland adjacent to the track, and near the quarry, are assumed to have been used to load stone from the quarry onto vehicles (AECOM005) (*Appendix 13.2, Photograph 13.55 (Volume 5: Appendices)*).

No previously unrecorded assets were located at the jetty site, or in the fields suggested for temporary compounds. The field in which the most southerly proposed compound is located is currently used for pasture, while the second compound is located in a field of rough pasture which was also found to be very wet and boggy (*Appendix 13.2, Photographs 13.59 and 13.60 (Volume 5: Appendices)*).

13.6.8 Archaeological Potential

There is considered to be low potential for assets of Palaeolithic and Mesolithic date to be present within the Development Site. There are very few assets from these periods from the wider region, and no assets from these periods within the study area. If artefacts of Palaeolithic or Mesolithic age are discovered, they are likely to be of archaeological interest for their potential to provide evidence about activity in the region during these periods and medium significance (heritage value) due to their scarcity in the region.

Although a number of sites have been dated to the prehistoric period, limited fieldwork over the years and a lack of detailed study means that many of these assets are not well understood, and their dating is based on form rather than excavated evidence. Assets include possible settlement remains assumed to date to the later prehistoric period (WoSAS 1639; WoSAS 15378), as well as earlier rock art (SM4186), and possible burials (WoSAS 1503; WoSAS 1510; WoSAS 1519; WoSAS 1574). While the study area has not previously been subject to detailed systematic studies, other large scale upland developments in the region (i.e. windfarms) have not found significant numbers of prehistoric assets on higher ground, and as a result, the potential for discoveries of previously unrecorded assets dating to the prehistoric period is considered to be low. This is also the case for the low-lying section of the study area near Inveraray, which has been better studied and subject to survey. Any prehistoric remains that are identified during construction are likely to be of medium significance as a result, due to the information they could provide relating to land use and development during the prehistoric period.

There is no evidence for Roman activity in the study area, with the assets identified more suggestive of Roman material reaching native sites (WoSAS 1615). Roman activity in the wider area is also very limited, and as a result, the archaeological potential for sites in this area dating to the Roman period is considered to be very low. However, if artefacts of Roman date are discovered they are likely to be of archaeological interest for their potential to provide evidence about activity in the region during these periods and medium significance (heritage value) due to their scarcity in the region.

Evidence for early medieval and medieval activity is also very limited with early medieval material limited to a ring found near Inveraray (WoSAS 1707) and a grave slab removed from Iona (WoSAS 1500), while medieval activity is limited to a former chapel and cemetery (WoSAS 1708). Documentary evidence would suggest that settlement activity within the study area was limited to the better land near the shores of Loch Awe and Loch Fyne, with activity in the upland area of the proposed Headpond limited to seasonal grazing. As a result, the potential for further discoveries dating to the early medieval or medieval period is considered to be low, although any further discoveries would be of archaeological interest and of moderate significance (heritage value) due to the relative scarcity of early medieval and medieval sites in the study area.

There is extensive evidence for activity dating to the post-medieval period within the red line boundary as well as in the study area. This suggests that the land inside the Headpond area was largely used for seasonal agriculture during the post-medieval period, with the pattern of settlement limited to the lower ground and largely representing that which survives today. As a result the potential for the discovery of additional assets dating to the post-medieval period is low. Any further discoveries dating to the post-medieval period would be of archaeological interest, but of low significance (heritage value) due to the volume of post-medieval assets previously recorded.

Although assets dating to the modern period are limited, the cartographic and documentary sources suggest that settlement activity has changed very little during the 20th century, and that the Headpond area has remained unsettled and used for pastoral agriculture. Likewise, the history and development of the area around Inveraray is also well understood, and as a result the potential for new features to be recorded in both the upland and lower lying areas of the study area is considered to be low. The significance (heritage value) of any assets dating to this period would also be considered to be low.

13.7 Assessment of Effects

An effect is defined as a change resulting from a development on the significance of a heritage asset. The following could have effects on assets:

- Physical impacts upon archaeological features and historic landscapes arising during the construction phase; and
- Impacts on the setting of assets arising during the construction and operational phases.

The cultural heritage baseline of the study area has been assessed against the Development to determine likely significant effects. Only those assets which have the potential to be affected, either by proximity to the Development or through changes to setting, are assessed below. All other assets are considered to be unaffected by the Development.

13.7.1 Construction Phase

Impacts resulting from the construction phase have been divided into the impacts resulting from the construction of the permanent works, such as the Headpond, permanent compounds, and Access Tracks, and those associated with the temporary works such as Construction Compounds, temporary Access Tracks , and the Marine Facility.

While a large number of non-designated assets have been recorded within the Limits of Deviation, the vast majority will not be subject to physical impacts as a result of works in the area being below ground (i.e. deep tunnelling), or because the surface works will avoid the assets. As such, assets within the Limits of Deviation that have been scoped out of the impact assessment because they will be avoided are listed in *Appendix 13.1-E (Volume 5: Appendices).*

Assets where there is the potential for physical impacts are discussed below.

Lochan Airigh Sheilings (WoSAS 44155; CANMORE 153637)

A complex of possible shielings, consisting of at least five structures, has been recorded near the Buimme Dhubh burn under the footprint of the proposed Embankment 1 (*Appendix 13.2, Photographs 13.13 to 13.17 (Volume 5: Appendices)*). While undated, the remains are assumed to date to the post-medieval period and represent a type of asset frequently found in the Scottish uplands linked to seasonal grazing. They have archaeological and historic significance due to the information they contain relating to the upland communities that farmed and occupied the land, although they are of a form/type found frequently in the uplands of Scotland, and better examples are known elsewhere in Argyll as well as Scotland in general. As a result, they are considered to be low significance (heritage value).

The Development will completely remove all features associated with the asset through the construction of Embankment 1. The magnitude of impact is considered to be High, which on an asset of low significance (heritage value) equates to a Moderate Adverse significance of effect. This is significant in EIA terms.

Possible Standing Stone (AECOM002)

A possible standing stone was recorded in the upland area of the Development during the walkover survey. Located near the southern end of a short shallow ridge that overlooks the valley of the Buimme Dhubh Burn, the possible upright stone is visible in the immediate surroundings (*Appendix 13.2, Photographs 13.19 to 13.21 (Volume 5: Appendices)*). A search of the stone did not reveal any evidence of markings (such as cup marks), and while it may be a natural outcrop, the positioning of the stone appears to be different to other outcrops on the area. Discussions with WoSAS have also noted that the feature may be part of a long cairn. The possible feature is undated, however, if found to have been deliberately placed it could represent a prehistoric upright stone, or a later post-medieval marker used by shepherds. Features of this type have archaeological and historic significance due to the information their study could provide relating to the people who lived and worked, as well as those who used the landscape for ritual/ceremonial practices. If the feature is a boundary marker it would be considered to be low significance (heritage value) as it would represent a form of asset common in Scotland. If it is found to a prehistoric upright stone it could be considered to be of regional significance and therefore of medium significance (heritage value). As the nature of the asset is currently not fully understood, a worst-case scenario approach has been taken, and the asset has been considered to be of medium significance (heritage value).

The Development will completely remove the feature through the construction of the Headpond. The magnitude of impact is considered to be High, which on an asset of medium significance (heritage value) equates to a Major

Adverse significance of effect. This is significant in EIA terms. However, it should be noted that this is a worst-case scenario based on the asset being a prehistoric standing stone, and investigations may find this not to be the case.

Possible Shieling/Area of Agricultural Activity (AECOM003)

A possible earthwork/stone feature was recorded during the walkover survey near a watercourse on the lower slopesof Sròn Bhreac-liath. The feature was very fragmentary, and may represent stone clearance from the nearby watercourse to help waterflow, however, the greener grass in the area may also suggest a possible shieling or area of seasonal grazing *(Appendix 13.2, Photographs 13.22 and 13.23 (Volume 5: Appendices))*. If found to be a shieling, the remains would have archaeological and historic significance due to the information they contain relating to the upland communities that farmed and occupied the land. However, they are of a form/type found frequently in the uplands of Scotland, and better examples are known from elsewhere in the region as well as Scotland in general. As a result, they are considered to be low significance (heritage value).

The Development will completely remove all features associated with the asset through the construction of Embankment 1. The magnitude of impact is considered to be High, which on an asset of low significance (heritage value) equates to a Moderate Adverse significance of effect. This is significant in EIA terms.

Dumarton-Tarbet-Inveraray-Tyndrum Military Road (WoSAS 21741; WoSAS 21742; CANMORE127142)

The alignment of a section of the military road constructed as part of the 18th century road building programme under Major William Caulfield is located within the northeast section of the Development Site. Recorded through historic mapping, part of the course of the road remains in operation as a forestry track, while the remaining sections of the road have been lost as a result of commercial forestry operations. As such, much of the original road construction is assumed to have been destroyed as a result of later developments including road improvement (for the section used as a forestry track) and commercial planting *(Appendix 13.2, Photograph 13.25 (Volume 5: Appendices))*. Any remains that do survive have the potential to provide archaeological evidence linked to road building in the 18th century. As a relatively common asset type that extends over a large area outside of the Development Site with better preserved sections recorded, and as an asset that has been subject to subsequent developments and appears to have been largely destroyed within the Development Site/does not retain any of its original construction deposits, the asset is considered to be low significance (heritage value).

The Development will involve upgrading an existing Access Track as it crosses the alignment of the Military Road. All traces of the original Military Road would appear to have been lost in this area due to it being a main junction on the existing Access Tracks, and a turning point for forestry vehicles. As a result, the magnitude of impact is considered to be Negligible, which on an asset of low significance (heritage value) equates to a Negligible significance of effect. This is not significant in EIA terms.

Drove Road (WoSAS 13857; WoSAS 21766; WoSAS 1571; CANMORE 23416)

The alignment of a former road or track, assumed to have been used as a drove road, has been recorded through 18th century mapping, and survived as an earthwork into the 1970s[2]. The possible drove road has now been lost as a result of commercial forestry operations in the area, and no remains were observed as part of the walkover survey (*Appendix 13.2, Photographs 13.26 and 13.27 (Volume 5: Appendices)*). Any remains that do survive have the potential to provide archaeological evidence linked to road building in the 18th century, and the development of droving. The asset is a relatively common feature found frequently throughout Scotland, with better preserved sections recorded elsewhere. Furthermore, the asset appears to have been largely destroyed within the Development Site. The asset is, therefore, considered to be low significance (heritage value).

The Development will involve upgrading an existing Access Track as it crosses the alignment of the drove road. All traces of the original drove road would appear to have been lost in this area due to the presence of an existing track and commercial forestry operations. As a result, the magnitude of impact is considered to be Negligible, which on an asset of low significance (heritage value) equates to a Negligible Adverse significance of effect. This is not significant in EIA terms.

Ballimeanoch (WoSAS 44156; CANMORE 153636)

The remains of at least one unroofed building are recorded on the First Edition Ordnance Survey mapping of the area to the south of Balliemeanoch Farm and the Allt na fainge burn. While this structure is not recorded on modern mapping, traces of a possible feature have been recorded on aerial photography and it is assumed to survive as an earthwork. Any remains that do survive have the potential to provide archaeological evidence linked to post-

[2] Craig Nan Sassanach | Canmore

medieval settlement and agriculture in the area. As a relatively common form of asset recorded widely throughout the study area, as well as upland regions of Scotland, the asset is considered to be low significance (heritage value).

The construction of the temporary Access Track should avoid the asset, and the asset would be fenced off during to construction to avoid any accidental damage. However, if the track had to be moved slightly due to ground conditions/topography, it has the potential to result in the partial loss of the feature. The magnitude of impact is considered to be Medium, and on assets of low significance (heritage value) this will result in a Minor Adverse significance of effect. This is not significant in EIA terms.

Allt Beochlich settlement remains (WoSAS 1578; CANMORE 23423)

Remains associated with the small settlement of Allt Beochlich (also recorded as Balliemeanoch and Barr Beithe) are located near an area of an existing track that will be widened as part of the Development (*Appendix 13.2, Photographs 13.31 to 13.33 (Volume 5: Appendices)*). The remains are thought to relate to a small crofting settlement recorded on historic mapping from at least the mid-18th century, but abandoned by the last quarter of the 19th century when the First Edition Ordnance Survey map was produced. Although no detailed surveys have been undertaken, the complex appears to consist of a number of crofts, as well as earthwork dykes, and possible enclosures, most of which are located near the Allt Beochlich burn. The remains have the potential to provide archaeological evidence linked to post-medieval settlement and agriculture in the area, and as such have archaeological and historic value. As a relatively common form of asset recorded widely throughout the study area, as well as upland regions of Scotland, the asset is considered to be of low significance (heritage value)

The upgrade of the existing track should avoid all assets, and any features near the upgraded track would be fenced off during to construction to avoid any accidental damage. However, if the track widening did encroach on earthworks linked to the complex there is the potential for the construction to result in the partial loss of the features. The magnitude of impact is considered to be low, as the worse-case scenario would only see a small element of the complex removed. On assets of low significance (heritage value) this will result in a Minor Adverse significance of effect. This is not significant in EIA terms.

Inveraray Castle Garden and Designed Landscape (GDL00223) and Associated Assets

The following assessment examines the potential for physical impacts on Inveraray Castle Garden and Designed Landscape (GDL00223), as well as components of the estate that may experience physical impacts resulting from the Development. Works proposed within the Garden and Designed Landscape are limited to Access Track upgrades, and the construction of one temporary compound/laydown area, the installation of a temporary Marine Facility, and the construction of a short section of temporary Access Track to service the temporary Marine Facility. All works within the Garden and Designed Landscape are temporary, and are required to bring key components to the main construction site, as well as provide a temporary access for staff to avoid increased traffic movement within the settlement of Inveraray.

As such, assets that have to potential to suffer physical impacts from these temporary works are the Garden and Designed Landscape (DGL00233) and the Category B listed Bealach an Fhuarain well-house (LB11520), as well as a non-designated memorial (WoSAS 66814; WoSAS 92916; CANMORE 340415), and the Combined Operations Training Centre (WoSAS 87736) (see *Appendix 13.2, Photographs 13.43 to 13.60* for representative site photos (*Volume 5: Appendices*)).

The policies associated with the Category A listed Inveraray Castle represent an extensive designed landscape occupying the shore of Loch Fyne around the settlement of Inveraray. Consisting of extensive woodland, designed, planted, and managed by various Earls and Dukes of Argyll from at least the 17th century, although it is the 18th century development of the estate that dominates the present layout. The original castle, a modest ‘Lairds house or tower’ was located to the east of the current Category A listed castle and was surrounded by the settlement of Inveraray.

Works to create a new house and settlement were started in the 1740s when Archibald, 3rd Duke of Argyll engaged the military engineer Dugal Campbell to design the new castle, before later changing to the English architect Roger Morris (MacInnes 2006). This was also accompanied by extensive works in the surrounding landscape, with a survey in the Argyll Estate Archives dated 1721 showing extensive woodland to the south of the house in the low-lying area now occupied by grazing and Inveraray Golf Course. This woodland appears to have been cleared as part of the 1740s work, possibly to supply some of the wood needed for scaffolding, as the General Roy Survey of 1747-1755 does not show extensive woodland in this area, although key routes/approaches on both the 1721 survey and the Roy Survey can be cleared traced on the modern landscape including Upper Avenue.

The policies have continued to be developed throughout the 19th and 20th centuries, with woodland being a dominant feature. In the Second World War, large areas of the estate were used as a miliary camp housing the main training centre for Combined Operations (WoSAS 87736; CANMORE 295425). The majority of the infrastructure linked to this camp was removed in the post-war period, however, a number of roads/tracks survive, while building foundation were identified in Duchess Louise Wood to the north of Inveraray Castle and the River Array during the walkover survey.

While the southern extent of the policies are much altered, with trees removed as part of the mid-18th century works never replaced, a swath of agricultural land changed to a golf course, and a new sewage works and pumping station added near the southern limits of the designated area, the Inveraray Castle landscape represents an outstanding example of a designed landscape.

As a landscape designated a 'Garden and Designed Landscape' the policies are considered to be of High Significance (heritage value). The Category B Listed Bealach an Fhuarain well-house (LB11520) is also considered to be of High Significance due to its Category B status. Both the non-designated memorial (WoSAS 66814; WoSAS 92916; CANMORE 340415), and the Combined Operations Training Centre (WoSAS 87736; CANMORE 295425) are considered to be of regional importance, and therefore of Medium Significance, however, due to their positioning within the Garden and Designed Landscape, and their association with the designated asset, they have been assessed as being of High Significance.

Inveraray Garden and Designed Landscape, and the assets within it that have been considered as part of the assessment, all have archaeological significance due to the information that could be gained from their study, as well as historic significance linked to their role in the overall development of the designed landscape. The well house also has architectural significance associated with its designer, the part it played in the creation of the designed landscape, and design features incorporated into the structure.

The proposed works within the Inveraray Garden and Designed Landscape are limited in nature, with one of the proposed temporary compounds using an existing quarry, while the second has been located in the southern limits of the designed landscape in an area that has been used for pasture since at least the mid-18th century. Upgrade works to the northern track will be limited to local passing places, and these works will be constructed so they can be removed and reinstated.

Upgrade works to Upper Avenue have been consented as part of the An Carr Dubh Wind Farm scheme; however, if the An Carr Dubh scheme was not to go to construction, the works required for the Development would include minor widening of some sections of track and track redressing, with no tree removal required. These works would also be constructed so that the track could be reinstated post-construction.

A review of ZTV data has confirmed that there will be no views of the main permanent works at the Headpond or the Tailpond, and as such the impacts on setting are limited to the temporary works. Furthermore, a site visit confirmed that there will be no views from the upper floors of Inveraray Castle (LB 11552) (*Appendix 13.2, Photographs 13.43 to 13.4 (Volume 5: Appendices)*), and only limited views of the temporary Marine Facility from the folly on Dùn na Cuaiche (LB11543) (*Appendix 13.2, Photographs 13.49 to 13.52 (Volume 5: Appendices)*, and *Volume 4: Visualisations VP1*). A wireline undertaken from Aray Bridge noted that the existing northern staff access, which would be subject to temporary widening in localised areas, would be theoretically visible from the bridge (*Volume 4: Visualisations CH1*). However, there will be no actual views possible due to extensive woodland.

The temporary Construction Compound / laydown area and the jetty are both located near the southern limits of the designated landscape. This area of the parkland has been degraded more than other areas, with the construction a golf course, water treatment works, and an area of houses and industrial units all encroaching on the parkland in the second half of the 20th Century landscape. While the temporary compound / laydown area and jetty will represent a new addition to the landscape in this area, the works will only be used for limited deliveries during the construction period. Furthermore, the works here will be decommissioned after construction.

Additional lighting used temporarily during deliveries will alter the appearance of the parkland as the visitor approaches from the south. However, existing street lighting and housing in this area has already altered the visitor's understanding of this section of parkland. Furthermore, the setting of key elements of the parkland, such as the extensive woodland, inner formal garden, and the various designated built components (such as Inveraray Castle, the well house, and Malt Land) will not be altered by the temporary work.

Due to the limited works required, the magnitude of impact, both within the landscape and upon its setting, is considered to be Negligible, and on assets of high significance (heritage value) this will result in a Minor Adverse significance of effect. This is not significant in EIA terms.

Impacts on Setting

Consultation was undertaken with HES to examine assets for which there was the potential for significant temporary impacts on setting during construction. This identified one asset, Inveraray Castle Garden and Designed Landscape which is discussed above (assets for which there is the potential for permanent impacts on setting are discussed in the Operational Assessment section) (see *Figures 13.6 and 13.7 (Volume 3: Figures)* for plans showing assets assessed and the ZTV associated with the Development).

13.7.2 Operational Phase

A review of designated assets within the 3 km Wider study area, as well as a review of ZTV data and consultation with stakeholders, identified a limited number of designated assets where the Development had the potential to result in a significant impact on their setting. The results of this consultation identified the following assets which were taken forward to full assessment on their setting:

- Balliemeanoch Chapel Scheduled Monument (SM4227);
- Carn Dubh Crannog Scheduled Monument (SM4175); and
- Keppochan Cup Marked Stone Scheduled Monument (SM4186).

The archaeological assets will have been removed during the construction phase therefore there will be no physical effects on archaeological assets during the operational phase. No further effects on the setting of non-designated heritage assets will take place during the operation of the Development.

Balliemeanoch Chapel Scheduled Monument (SM4227)

The site of Balliemeanoch Chapel is located in a hollow on the side of a hill above Balliemeanoch Farm and Loch Awe, and consists of a small enclosure and traces of a structure thought to represent a chapel *(Appendix 13.2, Photographs 13.34 to 13.36 (Volume 5: Appendices)*. There is no documentary or cartographic evidence for a chapel in the area, while the placename evidence does not suggest the feature was a chapel, and its significance is largely associated with the archaeological information that it could hold. As a scheduled monument it is considered to be of high significance (heritage value).

As the feature is located in a slight hollow, the chapel does not appear to have been designed to be prominent in the landscape, or visibly domineering, and if this was indeed a chapel (or chapel of ease) it was likely placed to serve the local population. Topography dictates that views out from the asset are largely to the west and Loch Awe, and therefore away from the Headpond and towards the Tailpond.

While there will be some views of the Tailpond from the asset (See *Volume 4: Visualisations CH5 and CH6*), these will be limited due to existing and proposed woodland screening, as well as the design of the Tailpond infrastructure. Furthermore, the Tailpond will not block or obscure views into the asset, or reduce its dominance on the landscape, both of which are elements that do not appear to have been key to its setting. There will be no views of the Headpond from the asset. As a result, the Magnitude of Change is considered to be Negligible. On an asset of high significance (heritage value) this will result in a Minor Adverse significance of effect which is not significant in EIA terms.

Carn Dubh Crannog Scheduled Monument (SM4175)

Carn Dubh Crannog is located near the west shore of Loch Awe near the settlement of Inverinan in the centre of a small bay like feature (*Appendix 13.2, Photographs 13.39 to 13.42 (Volume 5: Appendices)*). The headland known as Rubha nan Eun to the south, and the loch edge to the north provide screening, and result in the crannog having something of an intimate setting. Archaeological work on the crannog has been limited, although some underwater surveys have confirmed that it is a crannog and not a geological feature. The assets significance is largely associated with the archaeological information that it could hold. As a scheduled monument it is considered to be of high significance (heritage value).

The setting of the crannog is largely limited to the bay in which it sits below the settlement of Inverinan. Views of the asset from the eastern side of the loch are limited due to its relatively small nature and the surrounding shoreline, while views towards and beyond the asset from western shore are also limited – largely because of the prominence of Rubha nan Eun headland. While wirelines (See *Volume 4: Visualisations, CH2 and CH3*) and ZTV date suggest there may be some limited views of the Development possible from the crannog, these are unlikely to be significant due to extensive vegetation and tree cover along bother sides of the loch and Rubha nan Eun headland, as well as the distance between the asset and the Development. Furthermore, the setting of the asset does not appear to extend beyond the bay in which it is positioned. As a result, the Magnitude of Change is considered to be Negligible. On an asset of high significance (heritage value) this will result in a Minor Adverse significance of effect which is not significant in EIA terms.

Keppochan, Cup Marked Stone 600m ESE of. Scheduled Monument (SM4186)

The prehistoric cup marked rock, located some 600 m east-southeast of Keppochan, is positioned in an elevated position at the north end of a ridge of high ground running along the eastern side of Loch Awe (*Appendix 13.2, Photographs 13.61 and 13.62 (Volume 5: Appendices)*). Located at approximately 140 m AOD, the land rises steadily to the south until it reaches 589 m AOD around Cruach Mhòr, some 6 km away, while it drops rapidly to the north and Loch Awe approximately 2 km away. The asset's significance is largely associated with the archaeological information that it could hold. As a scheduled monument it is considered to be of high significance (heritage value).

While the asset is in a prominent position, its small size means that it is not visible from a wide area. The elevated position of the asset does afford it extensive views over the surrounding landscape, although these are most significant to the north and northeast and the north end of Loch Awe and the mountains that rise above it including Ben Cruachan *(Appendix 13.2, Photograph 13.61 (Volume 5: Appendices))*. Views to the south, and the Development are somewhat limited as a result of the topography and the commercial woodland that dominates the landscape *(Appendix 13.2, Photograph 13.62 (Volume 5: Appendices)).*

ZTV data suggests there will be very limited views of the Development, and visualisations produced also demonstrate that views will be negligible due to the distance between the asset and the Headpond, as well as the topography and tree cover (See *Volume 4: Visualisations, Visualisation CH4*). Furthermore, views of the existing forestry track that will be upgraded are also extremely limited, and alterations to the track are unlikely to appear noticeable to the visitor due to the distance between the track and the asset. As a result, the Magnitude of Change to the setting of the asset is considered to be Negligible. On an asset of high significance (heritage value) this will result in a Minor Adverse significance of effect which is not significant in EIA terms.

13.7.3 Decommissioning Phase

The archaeological assets recorded within the footprint of the permanent works, as well as any features that are identified within the temporary works areas, will have been removed during the construction phase, with mitigation undertaken. Therefore there will be no effects on archaeological assets during the decommissioning phase.

Any assets that are avoided and protected by fencing etc during construction will also need to be protected during decommissioning, although the limited information currently available for decommissioning means it is not possible to assess the potential for other physical impacts.

No further effects on the setting of heritage assets will take place during the decommissioning of the Development as the decommissioning works will be temporary.

13.8 Cumulative Effects

The following section provides and assessment of potential cumulative effects on cultural heritage.

13.8.1 Inter-Cumulative Effects

The assessment of likely cumulative effects is based on the cumulative schemes identified in *Chapter 4: Approach to EIA (Volume 2: Main Report)*. A review of these projects was undertaken to see if any to the projects had the potential to result in cumulative impacts on heritage assets, either physical or on the setting of the assets.

The review noted that none of the projects identified as part of the Cumulative Assessment would result in physical impacts on assets assessed as part of the current assessment, and as such the potential for physical cumulative effects was scoped out.

The potential for Cumulative Effects on the setting of assets considered as part of the assessment on the setting of heritage assets was limited to impacts resulting from the permanent works (i.e. the Headpond and Tailpond). Projects more than 10 km from the Development were scoped out, as Significant Cumulative Impacts on the setting of Designated assets considered as part of the setting assessment from this distance were deemed unlikely. This was due to aspects such as distance and the topography. Five projects were identified as having the potential to result in inter-cumulative effects these are:

- Creag Dhubh Substation (Consented);

- Creag Dhubh to Inveraray OHL (Consented);
- Blarghour Wind Farm (Consented);
- Dalmally OHL (Consented); and,
- Balliemeanoch PSH Grid Connection (assumed required to connect the project to the grid).

Balliemeanoch Chapel Scheduled Monument (SM4227)

Due to the limited visibility in most directions from Balliemeanoch Chapel, there is limited potential for any of the above schemes to have a significant impact on the setting of the asset. There are no views of the upper permanent works (i.e. the Headpond), and an assessment of the presence of the lower works (i.e. the Tailpond) will not significantly alter the way the asset is understood. As a result, there will be no cumulative effects when considering the Development against the identified schemes.

Carn Dubh Crannog Scheduled Monument (SM4175)

Carn Dubh Crannog is located in a natural bay on the western side of Loch Awe, with limited views towards the Development. Topography and tree cover also limit views to and from the monument, while its setting is very much the small bay on the loch. While there may be some limited views of both the Development and Blarghour Wind Farm, the distances involved and the extent of vegetation cover means that any impact will not be increased by the developments cumulatively. As a result, there will be no cumulative effects when considering the Development against the identified schemes.

Keppochan, Cup Marked Stone 600m ESE of. Scheduled Monument (SM4186)

The scheduled cup marked stone 600 m east-southeast of Keppochan is located in an elevated position overlooking Loch Awe to the north, but more restricted views to the south due to higher ground. As a result there are no views to the Headpond, and very limited views of the forestry track which will be upgraded. While there are fine views from the asset to the lower and more open land and loch to the north and northeast, it is not clear if these views were key considerations when the cup marks were added to the rock, and therefore it is not clear if its setting contributes to its significance. As a result, there will be no cumulative effects when considering the Development against the identified schemes.

13.8.2 Intra-Cumulative Effects

No intra-cumulative effects on heritage assets have been identified as part of the assessment.

13.9 Mitigation and Monitoring

13.9.1 Embedded Mitigation

Embedded mitigation measures are detailed in *Chapter 3: Evolution of Design and Alternatives (Volume 2: Main Report)*.

A number of embedded mitigation measures will be utilised to reduce potential effects resulting from the Development. Additional mitigation measures could include 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.

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.

13.9.1.1 Additional Mitigation, Compensation and Enhancement

In most cases the construction phase of the Development will result in the loss of assets identified within the Limits of Deviation, and a few different types of mitigation will be suitable. This includes detailed landscape survey to confirm / disprove the presence of previously recorded archaeological remains, archaeological evaluation, and archaeological excavation prior to works commencing. This is also likely to be supported by / followed by an archaeological watching brief of topsoil and subsoil removal during construction.

There is also the potential to add interpretation panels or undertake outreach work to disseminate information gathered as part of any future archaeological surveys or excavation, although this will need to be examined once the full extent of fieldwork is agreed.

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.

No works will be undertaken within Inveraray Garden and Designed Landscape (GDL00223) until the full extent of works have been agreed with HES. This includes, but is not limited to, tree clearance, vegetation removal, cutting back trees and scrub, and track widening.

13.10 Residual Effects

The assessment of residual effects considers various elements of additional mitigation including archaeological survey, excavation, and publication.

The construction phase of works falls into two phases, pre-construction and construction. For the purposes of the cultural heritage assessment, impacts associated with the two phases are considered as a single construction phase of works with sequenced activities extending over the seven-year construction period.

The following tables demonstrate that there are no expected significant effects at operation on cultural heritage assets.

Table 13.6 Summary of Effects: Construction

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Loch Airigh Shielings (WoSAS 44155)	Physical impacts on heritage asset	Moderate	Archaeological survey, excavation, and publication.	Minor	Not Significant
Possible standing stone (AECOM 002)	Physical impacts on heritage asset	Major	Archaeological survey, excavation, and publication.	Moderate	**Significant**[3]
Possible Shieling/Area of Agricultural Activity (AECOM 003)	Physical impacts on heritage asset	Moderate	Archaeological survey, excavation, and publication.	Minor	Not Significant
Dumarton-Tarbet-Inveraray-Tyndrum Military Road (WoSAS 21741; WoSAS 21742)	Physical impacts on heritage asset	Negligible	Archaeological Monitoring	Negligible	Not Significant
Drove Road (WoSAS 13857; WoSAS 21766; WoSAS 1571)	Physical impacts on heritage asset	Negligible	Archaeological Monitoring	Negligible	Not Significant
Ballimeanoch (WoSAS 44156)	Physical impacts on heritage asset	Minor	Archaeological Monitoring	Negligible	Not Significant
Allt Beochlich (WoSAS 1578)	Physical impacts on heritage asset	Minor	Archaeological Monitoring	Negligible	Not Significant
Inveraray Garden and Designed Landscape (GDL00223)	Physical impacts on heritage asset	Minor	Archaeological Monitoring	Negligible	Not Significant
Inveraray Garden and Designed	Temporary impacts on the setting of the asset	Minor	No suitable mitigation	Minor	Not Significant

[3] It should be noted that this is a worst-case scenario based on the asset being a prehistoric standing stone, and further detailed investigations may find this not to be the case.

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Landscape (GDL00223)					

Table 13.7 Summary of Effects: Operation

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Ballimeanoch Chapel (SM4227)	Permanent impact on the setting of the asset	Minor	No mitigation other than embedded mitigation.	Minor	Not Significant
Carn Dubh Crannog (SM4175)	Permanent impact on the setting of the asset.	Minor	No mitigation other than embedded mitigation.	Minor	Not Significant
Keppochan Cup Marked Stone (SM4186)	Permanent impact on the setting of the asset.	Minor	No mitigation other than embedded mitigation.	Minor	Not Significant

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 14: Access, Traffic and Transport

ILI (Borders PSH) Ltd

July 2024

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Quality information

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1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

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14. Access, Traffic and Transport

14.1 Introduction

This chapter considers the potential for likely significant effects resulting from potential impacts associated with the Development. It considers the potential for environmental effects of transport and movement resulting from the pre-construction and construction phase of the Development.

This chapter uses a traffic baseline obtained from 2023 traffic surveys. Traffic surveys were undertaken in June 2023 on the A85, A83, A819, B840 and A815 roads, in the vicinity of the Development Site. The significance of environmental effects for the Development are identified against a 2027 baseline derived from this 2023 traffic data, with a growth factor applied to assess the peak year of construction traffic.

Assessment of the environmental impacts of the Development has been undertaken following the Institute of Environmental Management and Assessment (IEMA) Guidelines, 2023 (the "IEMA Guidelines").[i]

The Development has been assessed by forecasting the level of construction traffic likely to be generated by the Development and comparing the predicted increases against the baseline. A cumulative assessment considering other relevant development has been undertaken and the residual effects of cumulative development considered once mitigation has been implemented.

Mitigation measures for the Development encompass the construction of bypass routes to ensure there will be no construction traffic required to route through the town of Inveraray and a Construction Traffic Management Plan.

Comprehensive traffic management measures will be provided on the A82 and A819 where construction vehicles leave and join the public road network. Where the construction traffic bypass route crosses the River Aray, in the environs of the distillery area, there may be a requirement to provide a temporary bridge across the river as the existing bridge may be weight limited. Further assessment of the existing bridge would be required before any decision is taken on the provision of a temporary bridge and any planning permission that may require.

This chapter is supported by the Figures and Technical Appendix listed in *Table 14.1 Supporting Technical Appendices and Figures* which are referenced throughout the chapter.

Table 14.1. Supporting Technical Appendices and Figures

Document Title	Document Description
Figure 14.1	Study Area Roads
Figure 14.2	Inveraray Study Area Roads
Figure 14.3	Traffic Survey Locations
Figure 14.4	Construction Traffic Schedule
Technical Appendix 14.1	Transport Assessment Report

14.2 Legislation and Policy

For traffic, transport and access the following National, Regional and Local policy and guidance documents have been considered.

14.2.1 National Policy and Guidance

National Transport Strategy NTS2 (2020)

NTS2 sets out an ambitious and compelling vision for Scotland's transport system for the next 20 years. The vision is to have a sustainable, inclusive, safe, and accessible transport system, helping to deliver a healthier, fairer, and more prosperous Scotland for communities, businesses, and visitors.

Four priorities support the vision.

- Reduce inequality.
- Take climate action.
- Help deliver inclusive economic growth.
- Improve health and wellbeing.

Climate Change Plan Update (2020)

The Scottish Government's Climate Change Plan, originally published in 2018, sets out a path to Carbon Neutrality and securing the wider benefits of a greener, fairer, and healthier Scotland. The Plan covers the period of 2018 to 2032.

The Climate Change Plan was updated in 2020 to reflect the impacts of the COVID-19 pandemic and the Government's commitment to a 'green recovery' which captures opportunities of the transition to net zero. The Plan sets new ambitious targets to reduce Scotland's contribution to climate change by 2045.

National Planning Framework 4

The National Planning Framework 4 (NPF4) was adopted by the Scottish Ministers on 13 February 2023, following approval by the Scottish Parliament in January. This replaces National Planning Framework 3 (NPF3) 2014, Scottish Planning Policy (SPP) 2014 and Regional Plans and is now part of the statutory development plan for Argyll and Bute, along with the Local Development Plan.

The NPF4 sets out overarching spatial principles to support the planning and delivery of the three key National Planning Policy areas:

- Sustainable Places.
- Liveable Places.
- Productive Places.

NPF4 published in 2023 identifies 'National Spatial Strategy' and states that development proposals of all forms of renewable, low carbon and zero emissions technologies will be supported including pumped storage hydro. Under Policy 11 (Energy), development proposals for renewable energy projects have to demonstrate how the following impacts are mitigated and addressed:

- Impacts on public access, including long distance walking and cycling routes and scenic routes;
- Impacts on road traffic and on adjacent trunk roads, including during construction; and
- Cumulative impacts.

Transport Assessment Guidance (2012)

Transport Assessment Guidance (TAG) produced by Transport Scotland in 2012 provides guidance and information for the content, methodology and approach of producing Transport Assessments, Transport Statements and Travel Plans in support of proposed development sites. It details the importance of establishing the existing transport infrastructure and travel characteristics, as well as the development proposal itself and the measures which will be included to improve infrastructure and services to encourage sustainable travel to the site.

Planning Advice Note (PAN) 75 – Planning for Transport (2005)

Scottish Planning Advice Note (PAN) 75 – Planning for Transport is a planning circular produced by the Scottish Government which provides good practice on planning and transport. This includes guidance on integrating transport, transport modelling, policy development, development management, planning agreements and environmental assessment.

In terms of Transport Assessments/Statements, it states in Paragraph 41 that "all planning applications that involve the generation of person trips should provide information which covers the transport implications of the development." It identifies that for smaller developments, "the information on transport implications will enable local authorities to monitor potential cumulative impact."

14.2.2 Regional Policies

The Transport (Scotland) Act 2005 placed a statutory duty on the seven Regional Transport Partnerships (RTPs) in Scotland to produce a Regional Transport Strategy (RTS) for their area. The Development within Argyll and Bute is within the Highland Transport Partnership region (HITrans).

HITrans Regional Transport Strategy Refresh (2018)

HITRANS produced a Draft Updated Regional Transport Strategy in May 2017. This remains subject to approval by Scottish Ministers and therefore the RTS produced in 2008 is the currently adopted RTS for the region.

HITRANS' RTS 2008 provides a regional policy context for the Development. It sets out a vision to "enhance the region's viability." To deliver the vision, the strategy notes that the critical issue of connectivity needs to be addressed and thus "improving interconnectivity of the whole region to strategic services and destinations" is included as a delivery objective. The planning objectives for the strategy are to:

- Enable the region to compete and to support growth;
- Enable the people of the region to participate in everyday life;
- Improve the safety and security of travel;
- Manage the impacts of travel on the region's environmental assets; and
- Improve the health of the region's people.

14.2.3 Local Policies

Argyll and Bute Local Development Plan 2

Argyll and Bute Council (ABC) adopted their Local Development Plan (LDP2) in January 2023. The key policies of relevance to this chapter include:

- Policy 30 – The Sustainable Growth of Renewables,
- Policy 35 – Design of New and Existing, Public Roads and Private Access Regimes,
- Policy 37 – Development Utilising an Existing Private Access or Existing Private Road,
- Policy 38 – Construction Standards for Public Roads, and
- Policy 39 – Construction Standards for Private Access.

14.2.4 Guidance

Guidelines for the Environmental Assessment of Traffic and Movement (2023)

Guidelines for the Environmental Assessment of Road Traffic were originally published in 1993 by the Institute of Environmental Assessment and were updated in 2023 by the Institute of Environmental Management & Assessment (IEMA), now named the Environmental Assessment of Traffic and Movement. The scope of the guidelines covers the environmental impact of road traffic associated with development and provide a basis for the systematic and consistent appraisal of the environmental impacts of road traffic and provide the basis for this assessment.

14.3 Consultation

Table 14.2 Summary of Consultation summarises Development consultation undertaken for this EIA, relevant to Traffic and Movement.

Table 14.2 Summary of Consultation

Consultee	Key Issue	Summary of Response	Action Taken
Argyll and Bute Council	Cumulative Impacts	Proposals which would impact the roads network should take account of the cumulative impacts on the network having regards to the fact that a large number of energy related	An assessment of the cumulative impacts of nearby development has been undertaken.

Consultee	Key Issue	Summary of Response	Action Taken
		infrastructure projects are proposed in the area.	
	Excess Rock / Waste Material	A "duty to cooperate" utilising best endeavours between the two S36 hydro proposal developers should be required to ensure waste from Cruachan which could be utilised at Balliemeanoch is not transport away from the local area.	Council position noted.
Transport Scotland	Traffic Data Collection	Transport Scotland required that base traffic in the vicinity of the A85(T)/ A819 junction should be used.	ATC traffic surveys have been undertaken on the A85 both immediately east and west of the A85 / A819 junction and have been included within the assessment.
	Proposed Marine Facility with jetty on the A83	Transport Scotland required that any proposed changes to the trunk road network must be discussed and approved (via technical approval process (by the appropriate area manager. They required that 1:500 scale plans of any new or modified access from the trunk road should be submitted along with visibility splay plans.	Plans of access and traffic management for A83 at jetty produced.
		An abnormal Loads Assessment and swept path analysis is required.	Swept path analysis for abnormal loads from the proposed jetty on the A83 undertaken. Abnormal load route bypasses Inveraray via Upper Avenue to reach A819.

14.4 Study Area

The Development is located at central national grid reference NN 03615 17578 approximately 4.4 km to the south of the village of Portsonachan and 9 km northwest of Inveraray in Argyll and Bute with the red line boundary shown on *Figure 1.1 (Volume 3: Figures)*. The Development Site is generally characterised by upland moorland plateau grazing land. The Headpond location at Lochan Airigh sits at approximately 360 m above ordnance datum (AOD) and 3 km to the east of Balliemeanoch Farm Steading. The temporary construction jetty is located south of Inveraray off the A83. The A819 is approximately 4.8 km to the east of the Development Site, connecting the A83 and the A85. The A83 lies to the south of the Site (joining the A819 at Inveraray), aligned east to west. The A85 connects to the site at Dalmally and routes east to west between Tyndrum and Oban. There are also a number of roads / tracks which lead to the Site.

Study area roads are identified in *Figure 14.1 (Volume 3: Figures)*:

- A819 between Inveraray and Dalmally. It is a single carriageway which is largely rural in character.
- A83 between Rest and Be Thankful and the proposed jetty location. This is a single-carriageway section of trunk road carrying two-way traffic. It is primarily rural in character and passes through the settlement of Inveraray.
- A85 between Taynuilt and east of the A95 / A819 junction. This is a single-carriageway section of trunk road carrying two-way traffic. It is primarily rural in character.
- B840 is a single-track road with passing places between the A819 and Ford, routing adjacent to the banks of Loch Awe.

In addition to the public roads listed above, two dedicated construction traffic routes are proposed in the vicinity of Inveraray. *Figure 14.2 (Volume 3: Figures)* shows these routes. East of Inveraray a dedicated route for construction traffic is proposed between the A83 and A819. This route runs north of Inveraray Castle and avoids the town of Inveraray. This route will be used by construction traffic in both directions. West of Inveraray a new jetty facility is proposed on Loch Fyne. This jetty will be used to deliver abnormal indivisible loads (AIL) into the study area. AIL will leave the jetty and cross directly over the A83 before continuing on a dedicated construction traffic route that links in to Upper Avenue and connects to the A819 north of Inveraray.

Construction traffic will leave the public road from the A819 at Craig nan Sassanach where an existing track access to Old Military Road will route traffic towards the Development site. Upgrades will be required to the network of forest tracks that are proposed to accommodate construction traffic.

The B840 runs along the shore of Loch Awe, west of the Development site. However, HGV construction traffic is not proposed to route via the B840 as it will use the A819 Craig nan Sassanach access. The Tailpond inlet / outlet structure at Loch Awe will require the existing alignment of the B840 to be revised and routed inland over a short distance to bypass the Tailpond inlet / outlet structure.

14.5 Assessment Methodology

14.5.1.1. Environmental Assessment of Traffic and Movement

The methodology for the assessment of significant environmental effects relating to traffic and movement has been informed by the 2021 Scoping Report. The assessment follows the IEMA Guidelines. This approach was endorsed by Transport Scotland in its 2022 scoping response.

Rule 1 and Rule 2 from the IEMA Guidelines are used to identify roads to be included in the assessment:

- Rule 1. Includes highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%).
- Rule 2. Include any other specifically sensitive areas where traffic flows have increased by 10% or more.

The IEMA Guidelines are based upon knowledge and experience of environmental effects of traffic and acknowledge that traffic forecasting is not an exact science. The 30% threshold is based on research and experience of the environmental effects of traffic, with less than a 30% increase generally resulting in imperceptible changes in the environmental effects of traffic apart from within specifically sensitive areas. The IEMA Guidelines consider that forecast changes in traffic of less than 10% in specifically sensitive areas creates no discernible environmental effect, hence the second threshold set out in Rule 2.

Although construction stage and decommissioning stage traffic movements will only be temporary, an increase in traffic during those periods could have an environmental effect on the users of public roads within the study area, and the land-uses that front them, including associated occupiers. As such, the receptors included in this assessment are the public roads and proposed construction haul routes within the study area that will be used by construction stage and decommissioning stage Development traffic. Abnormal Indivisible Loads (AIL) are included in the construction traffic forecast used for the assessment of environmental effects relating to road traffic.

For magnitude of change, the IEMA Guidelines describes that changes in traffic of 30%, 60% and 90% should be considered as ‘slight’, ‘moderate’ and ‘substantial’ respectively. *Table 14.3 Magnitude of Change* reflects the IEMA Guidelines to quantify the magnitude of change for Development traffic.

Table 14.3 Magnitude of Change

Magnitude of Change	Change in Traffic (AAWT)	Description
High	90%+	Alteration to baseline conditions such that post development character or composition of baseline condition fundamentally changed.
Medium	60-90%	Alteration to baseline conditions such that post development character or composition of baseline condition materially changed.
Low	30-60%	Minor shift from baseline conditions such that post development character or composition of baseline condition remains similar to baseline and not materially changed.
Negligible	0-30%	Very little change from baseline conditions. Change is barely distinguishable approximating to no-change situation.

Receptors are locations or land-uses categorised by sensitivity or environmental value. *Table 14.4 Sensitivity of Receptors* describes the receptor sensitivity adopted for the assessment of Development traffic. Study area roads in terms of their sensitivity of receptors is described in *Appendix 14.1 (Volume 5: Appendices)*.

Table14.4 Sensitivity of Receptors

Receptor Sensitivity	Description
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of international importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.
Negligible	The receptor is resistant to change and is of little environmental value.

For the purposes of this assessment, the IEMA Guidelines identify receptors which are considered to be:

- People at home
- People at work
- Sensitive and/or vulnerable groups (including young age; older age; income; health status; social disadvantage; and access and geographic factors)
- Locations with concentrations of vulnerable users (e.g. hospitals, places of worship, schools)
- Retail areas
- Recreational areas
- Tourist attractions
- Collision clusters and routes with road safety concerns
- Junctions and highway links at (or over capacity)

For traffic generated by the Development the significance of effects is derived from a combination of the magnitude of change and the sensitivity of the receiving environment (receptor). *Table 14.5 Significance of Environmental Effects* summarises the approach to deriving the significance of effects. Note. Table shading indicates likely significant effect subject to assessor's professional judgment.

Table 14.5 Significance of Environmental Effects

Magnitude of Change	Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Determining the significance of environmental effects of road traffic combines professional judgment (as per the IEMA Guidelines) with consideration of a number of other factors, including:

- Temporary – where the effect occurs for a limited period of time and the change at a defined receptor can be reversed.
- Permanent – where the effect represents a long-lasting change at a defined receptor which is not reversable.
- Short Term / Medium Term / Long Term.
- Beneficial – an effect beneficial to one or more environmental receptors.
- Adverse – a detrimental, or negative, effect on one or more environmental receptors.

14.5.1.2. Potential Environmental Effects

The potential environmental effects of traffic, transport and access considered in this assessment of the Development are:

- Severance of communities – the perceived division that can occur when it becomes separated by a major traffic route (existing or proposed).
- Fear and Intimidation on and by road users – the effect on the perceived vulnerability of pedestrian traffic relating to changes in traffic flows and or speed.
- Road user and pedestrian safety – the potential for effects on rate and severity of accidents relating to changes in traffic flows.
- Non-motorised Amenity – broadly defined as the relative pleasantness of a pedestrian or cycle journey. The potential for effects relates to changes in traffic flows.
- Non-motorised User Delay – the effect on travel time. The potential for effects relates to changes in traffic flow.
- Road vehicle driver and passenger delay - the effect on travel time. The potential for effects relates to changes in traffic flow, noting that road and junction vehicle capacity assessments are not part of this assessment.
- Hazardous / large loads – scoped out of assessment in accordance with the 2021 Scoping Report.

14.5.2 Assessment Scope

The assessment considers the potential environmental effect of road traffic during the three phases of the Development lifespan as identified in *Section 2.16 – 2.19* of *Chapter 2: Project and Site Description (Volume 2: Main Report)*. The phases include pre-construction, construction and operation. Operational and decommissioning stages have been scoped out of this assessment. Project related traffic has been considered across all three phases to determine the period where the Development will have the biggest effect from a traffic and transport perspective (peak period) which will provide a robust scenario on which to base this assessment.

The environmental assessment of traffic and movement identifies the appropriate worst case traffic generation from the below construction phases:

The Pre-Construction Phase including site clearance; utility diversions; borrow pits; Construction Compound set up; permanent and temporary Access Tracks; public road crossings; sustainable drainage systems; and public paths.

The Construction Phase including delivery of plant and equipment; materials management; construction workforce movements; Headpond construction; Tailpond construction; Waterways construction; Power Cavern Complex construction; Access Tunnel construction; Access Track maintenance; battery housing; and Inveraray temporary Marine Facility with jetty construction.

Figure 14.4 (Volume 3: Figures) summarises the forecast construction traffic across the development programme. It can be seen that month 11 of 2027 (November) is the busiest forecast for Development traffic. This time period has been adopted for the purposes of the environmental assessment of traffic and movement. *Appendix 14.1 (Volume 5: Appendices)* contains the detailed calculation of forecast development traffic.

14.5.3 Baseline Traffic Data

Average Weekday Traffic ("AWT") for public roads within the study area was recorded by ATC survey during June 2023. *Figure 14.3 (Volume 3: Figures)* shows the location of the 2023 traffic surveys and *Appendix 14.1 (Volume 5: Appendices)* contains the results of the survey. The 2023 survey data is used to establish a baseline traffic position. *Table 14.6: 2027 Baseline Vehicle Traffic* summarises the baseline traffic data adopted for this assessment. Traffic growth for 2023 to 2027 of 3.26% is applied to ATC survey data, derived from TEMPro.[ii] Traffic growth calculations are included within *Appendix 14.1 (Volume 5: Appendices)*. This TEMPro factor is effectively a 'low growth' scenario.

The location and extents of the road links listed below are identified in *Appendix 14.1 (Volume 5: Appendices).*

Table 14.6. 2027 Baseline Vehicle Traffic

Road Link	Vehicular Traffic (AWT)					
	2023 Survey			2027 Baseline		
	Car	HGV	Total	Car	HGV	Total
A85 Taynuilt	4,761	183	4,944	4,916	189	5,105
A85 West	4,121	181	4,302	4,255	187	4,442
A85 East	3,590	179	3,769	3,707	185	3,892
B840 Cladich	345	6	351	356	6	362
A819 Dalmally	1,524	89	1,613	1,574	92	1,666
Site Access Track	0	0	0	0	0	0
A819 Site Access	1,589	91	1,680	1,641	94	1,735
A819 Inveraray	1,602	84	1,686	1,654	87	1,741
A819 Inveraray Town	1,771	85	1,856	1,829	88	1,917
Inveraray Bypass	0	0	0	0	0	0
A83 Aray Bridge	3,934	227	4,161	4,062	234	4,297
A83 Garron Bridge	3,854	210	4,064	3,980	217	4,196
A83 Rest and Be Thankful	4,216	312	4,528	4,353	322	4,676
A815 Strachur	2,278	124	2,402	2,352	128	2,480
A83 Inveraray	3,926	222	4,148	4,054	229	4,283
Upper Avenue AIL Route	0	0	0	0	0	0
A83 Lochgilphead	3,232	219	3,451	3,337	226	3,564
B840 Ford	179	2	181	185	2	187

14.5.3.1. Baseline Accident Data

Department for Transport (DfT) accident data obtained from the Crashmap database for the 5-year period has been reviewed (2018-2022). Detail on accident data is shown in *Appendix 14.1 (Volume 5: Appendices).*

A review of this accident data does not support evidence of accident clusters or causations that would require specific investigation in this environmental assessment.

14.5.4 Limitations And Assumptions

Baseline traffic data collected in 2023 has been reviewed and appears robust in that no equipment failures or significant anomalies appear present in the returned data.

DfT accident data obtained from the Crashmap database has been reviewed for the 5-year period reviewed (2018-2022). Accidents recorded in 2022 to the present have not informed this analysis.

For assessment purposes, it is assumed construction traffic generated by the Development appears on all study area roads. This assumption provides a robust assessment of Development traffic on study area roads. However, this will not be the case in reality and there is a number of exceptions to this general assumption contained within this assessment. These are:

- Construction traffic route from A83 jetty to A819 via Upper Avenue carries abnormal load traffic only.
- HGV construction traffic does not route through the town of Inveraray which encompasses the A819 Inveraray Town, A83 Aray Bridge and A83 Inveraray road links.
- HGV construction traffic does not route along the B840 which encompasses the B840 Cladich and B840 Ford Road links.

14.6 Baseline Environment

In line with IEMA Guidelines 2023 study area roads are assessed for the sensitivity of the receptors on each link. The results of this assessment are shown in *Table 14.7 Road Link Sensitivity of Receptors*. The full assessment of each link can be found in *Appendix 14.1 (Volume 5: Appendices).*

Table 14.7. Road Link Sensitivity of Receptors

Road Link	Description	Sensitivity	Reasoning
A85 Taynuilt	Single carriageway with national speed limit of 60mph, largely following the route of the River Awe	Low	Some residential and recreational areas but largely through rural areas with limited activity.
A85 West	Single carriageway with national speed limit of 60mph, includes Kilchurn Bridge.	Negligible	Short stretch of largely rural road with one tourist attractions (Kilchurn Castle) which is set back considerably from the carriageway.
A85 East	Single carriageway with national speed limit of 60mph. Mostly rural section of road.	Negligible	Mostly rural section of road with limited access to residential areas and employment areas.
B840 Cladich	Single track road connecting the A819 to Balliemeanoch. National speed limit of 60mph, largely rural road.	Medium	Rural road with residential properties, unlikely familiar with high volumes of HGV traffic. Recreational areas and tourist attractions on the route including accommodations. Single track road so vulnerable to capacity issues.
A819 Dalmally	Single carriageway with national speed limit of 60mph, largely rural road with very few properties on the route.	Negligible	Very few properties or other land uses on the route, largely rural route.
Site Access Track	Track currently used for local land use access.	Negligible	Access track which interacts with few properties or other land uses.
A819 Site Access	Single carriageway with national speed limit of 60mph, largely rural road with very few properties on the route.	Negligible	Very few properties or other land uses on the route, largely rural route.
A819 Inveraray	Single carriageway with national speed limit of 60mph, largely rural road with very few properties on the route.	Negligible	Very few properties or other land uses on the route, largely rural route.
A819 Inveraray Town	Single carriageway with national speed limit of 60mph, reducing to 30mph within Inveraray. Partially rural and partially urban route	Very High	Large potential to interact with residentials and visitors to the area. Retail and recreational areas with tourist attractions and potential for vulnerable users.
Inveraray Bypass	Track currently used for local land use access and other construction traffic.	Negligible	Minimal likelihood for interaction with residents or visitors.
A83 Aray Bridge	Single carriageway which includes the historic Aray Bridge. Has a national speed limit of 60mph, reducing to 40mph east of Aray Bridge.	Low	Some potential interaction with tourists as a tourist route to Inveraray and the historic Aray Bridge on the route. Aray Bridge also provides a potential capacity constraint on the route.

Road Link	Description	Sensitivity	Reasoning
A83 Garron Bridge	Single carriageway with national speed limit of 60mph, largely rural road with very few properties on the route.	Negligible	Very few properties or other land uses on the route, largely rural route.
A83 Rest and Be Thankful	Single carriageway with national speed limit of 60mph, largely rural road with very few properties on the route. Some employment and tourist attractions on the route.	Low	Some employment and tourist attractions on the route. Potential capacity issues given the route being prone to landslips.
A815 Strachur	Single carriageway with national speed limit of 60mph, reducing the 30mph in urban areas. Largely rural road.	Low	Some interaction with residential properties who may be unfamiliar with high volumes of HGV traffic. Route has a notable accident history with two fatal accidents occurring in the 5 year period 2018-2022.
A83 Inveraray	Single carriageway through urban environment of Inveraray. Speed limit of 30mph.	Very High	High level of interaction with residents and visitors. Employment and retail areas with tourist and recreational areas also present. Likely to be high concentration of vulnerable users.
Upper Avenue AIL Route	Track currently used for local land use access.	Negligible	Minimal likelihood for interaction with residents or visitors.
A83 Lochgilphead	Single carriageway with national speed limit of 60mph, largely rural road with very few properties on the route.	Negligible	Very few properties or other land uses on the route, largely rural route.
B840 Ford	Single track road following the route of Loch Awe. National speed limit of 60mph and largely rural in nature.	Negligible	Very few properties or other land uses on the route, largely rural route. Potential capacity issues with large amount of traffic given it is single track.

Table 14.7 Road Link Sensitivity of Receptors shows that the majority of the road links have sensitivities of negligible to low. The road links around Inveraray (A819 Inveraray Town and A83 Inveraray) have Very High sensitivity in terms of receptors. However, as HGV construction traffic will not be routed through the town of Inveraray. Similarly, the medium sensitivity of receptor identified for the B840 Cladich will not carry HGV construction traffic.

14.7 Assessment of Environmental Effects

14.7.1 The Development – Forecast Traffic Generation

The construction period for the Development is programmed to last between 2027 and 2034. For the purposes of assessing the environmental effects of road traffic, a magnitude of change for study area roads has been established based on forecast Development traffic.

An approximate construction programme has been prepared for the purpose of forecasting traffic flows. *Figure 14.4 (Volume 3: Figures)* shows forecast construction traffic flows distributed across the 7 year programme for each element of the construction process.

Daily traffic flows are based on 22 working days per month. Forecast average daily traffic flows (arrivals and departures) for the busiest construction traffic month are 490 two-way HGV movements (245 arrivals and 245 departures) and 154 two-way Car/LGV movements (77 arrivals and 77 departures). Detailed calculations of forecast construction traffic are included in *Appendix 14.1 (Volume 5: Appendices)*.

For a robust assessment it is assumed all construction materials will be transported to site by road. For assessment purposes no materials, such as aggregate from borrow pits or concrete, are assumed to originate from within the

Site. This assumption is made for assessment purposes, in reality materials are likely to be recovered or generated from within the site.

For a robust assessment it is also assumed that the vast majority of forecast construction traffic will use all Study Area roads. This assumption is very unlikely to occur in reality as the eventual distribution of construction traffic will rule out any real-world requirement for every construction vehicle to use every study area road.

Appendix 14.1 (Volume 5: Appendices) shows network flow diagrams that illustrate the forecast number of Development construction vehicle trips assigned to study area roads. *Table 14.8 Development Construction Traffic* compares forecast construction traffic against baseline traffic to determine the study area roads to be assessed due to either IEMA Guidelines 2023 Rule 1 or Rule 2 conditions being met. Roads to be included in the environmental assessment are marked Y (Yes) or N (No).

Table 14.8. Development Construction Traffic

Road Link	Vehicular Traffic (AWT)							
	2027 Baseline		The Development		The Development % Impact		Environmental Assessment Required	
	HGV	All Vehs	HGV	All Vehs	HGV	All Vehs	HGV	All Vehs
A85 Taynuilt	189	5,105	490	644	259%	12.6%	Y	Y
A85 West	187	4,442	490	644	262%	14.5%	Y	Y
A85 East	185	3,892	490	644	265%	16.5%	Y	Y
B840 Cladich	6	362	0	154	0%	42.49%	N	Y
A819 Dalmally	92	1,666	490	644	533%	38.6%	Y	Y
Site Access Track	0	0	490	644	-	-	N	N
A819 Site Access	94	1,735	490	644	521%	37.1%	Y	Y
A819 Inveraray	87	1,741	490	644	564%	36.9%	Y	Y
A819 Inveraray Town Centre	88	1,917	0	154	0%	8.04%	N	N
Inveraray Bypass	0	0	490	490	-	-	N	N
A83 Aray Bridge	234	4,297	0	154	0%	3.58%	N	N
A83 Garron Bridge	217	4,196	490	644	225%	15.3%	Y	Y
A83 Rest and Be Thankful	322	4,676	490	644	152%	13.7%	Y	Y
A815 Strachur	128	2,480	490	644	382%	25.9%	Y	Y
A83 Inveraray Town Centre	229	4,283	0	154	0%	3.6%	N	N
Upper Avenue AIL Route	0	0	0	0	-	-	N	N
A83 Lochgilphead	226	3,564	490	644	216%	18%	Y	Y
B840 Ford	2	187	0	154	0%	82.4%	N	Y

Table 14.8 shows that all public road links on study area roads must be included in the assessment, apart from the A819 Inverary Town Centre, A83 Aray Bridge and the A83 Inveraray Town Centre. These public roads do not meet the threshold required by IEMA Guidelines 2023 for environmental assessment of traffic and movement, principally as they will not carry HGV construction traffic for the Development.

14.7.2 Assessment of Environmental Effects

14.7.2.1. Severance of Communities

Table 14.9 Assessment of Severance of Communities below presents the significance of effects on the severance of communities as a result of the Development. The significance of effects for severance are based on an assessment of all traffic in accordance with the IEMA Guidelines 2023. The IEMA Guidelines state that:

"The Department for Transport has historically set out a range of indicators for determining the significance of severance. Changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' chances in severance respectively.'

Table 14.9. Assessment of Severance of Communities

Road Link	Receptor Sensitivity	Traffic Increase	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	12.6%	Negligible	Negligible
A85 West	Negligible	14.5%	Negligible	Negligible
A85 East	Negligible	16.5%	Negligible	Negligible
B840 Cladich	Medium	42.49%	Low	Minor
A819 Dalmally	Negligible	38.6%	Low	Negligible
A819 Site Access	Negligible	37.1%	Low	Negligible
A819 Inveraray	Negligible	36.9%	Low	Negligible
A83 Garron Bridge	Negligible	15.3%	Negligible	Negligible
A83 Rest and Be Thankful	Low	13.7%	Negligible	Negligible
A815 Strachur	Low	25.9%	Negligible	Negligible
A83 Lochgilphead	Negligible	18%	Negligible	Negligible
B840 Ford	Negligible	82.4%	Medium	Negligible

Classifying the significance of effects: prior to mitigation, the likely effect of construction traffic on severance is a direct, temporary, **Minor Adverse (Not Significant)** effect.

In terms of severance, the significance of effects for most road links would be negligible. One public road link is forecast to have minor significance of effects: B840 Cladich – this will not carry HGV construction traffic.

14.7.2.2. Fear and Intimidation on and by Road Users

Table 14.10 Assessment of Fear and Intimidation below presents the significance of effects on the fear and intimidation on and by road users as a result of the Development. The IEMA Guidelines state that the extent of fear and intimidation is dependent on:

- The total volume of traffic
- The heavy vehicle composition
- The speed of vehicles
- The proximity of traffic to people

The fear and intimidation assessment has been conducted using the 'degree of hazard' methodology as set out in IEMA Guidelines 2023. The derivation of the fear and intimidation calculations are included in full within *Appendix 14.1 (Volume 5: Appendices).*

Table 14.10 Assessment of Fear and Intimidation

Road Link	Receptor Sensitivity	Level of Fear and Intimidation	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	Negligible	Negligible	Negligible
A85 West	Negligible	Low	Negligible	Negligible
A85 East	Negligible	Low	Negligible	Negligible
B840 Cladich	Medium	Negligible	Negligible	Negligible
A819 Dalmally	Negligible	Low	Negligible	Negligible
A819 Site Access	Negligible	Low	Negligible	Negligible
A819 Inveraray	Negligible	Low	Negligible	Negligible
A83 Garron Bridge	Negligible	Low	Negligible	Negligible
A83 Rest and Be Thankful	Low	Low	Negligible	Negligible
A815 Strachur	Low	Negligible	Negligible	Negligible
A83 Lochgilphead	Negligible	Low	Negligible	Negligible
B840 Ford	Negligible	Negligible	Negligible	Negligible

Classifying the significance of effects: prior to mitigation, the likely effect of construction traffic on fear and intimidation is a direct, temporary, **Negligible (Not Significant)** effect.

14.7.2.3. Road User and Pedestrian Safety

Recorded injury accidents for the most recent 5-year period (2018-2022) were assessed against surveyed 2023 traffic flows on study area roads. This established an historic accident rate by severity per vehicle kilometre travelled on study area roads. A forecast of construction traffic annual vehicle kilometres travelled on study area roads was applied to the historic accident rates. This produced a forecast of annual accidents by severity for Development construction traffic. *Table 14.11 Forecast Annual Injury Accidents on Study Area Roads* summarises the forecast annual injury accidents potentially resulting from the presence of Development construction traffic on Study Area roads.

Table 14.2. Forecast Annual Injury Accidents on Study Area Roads

Road Link	Forecast Annual Injury Accidents by Severity					
	Recorded 2018-2022			the Development (Annual)		
	Slight	Serious	Fatal	Slight	Serious	Fatal
A85 Taynuilt	7	8	1	0.1	0.1	0.0
A85 West	0	0	0	0.0	0.0	0.0
A85 East	0	0	0	0.0	0.0	0.0
B840 Cladich	0	0	0	0.0	0.0	0.0
A819 Dalmally	1	5	0	0.0	0.1	0.0
A819 Site Access	0	3	0	0.0	0.1	0.0
A819 Inveraray	1	1	0	0.0	0.0	0.0
A83 Garron Bridge	3	3	0	0.0	0.0	0.0
A83 Rest and Be Thankful	4	7	0	0.0	0.1	0.0

Road Link	Forecast Annual Injury Accidents by Severity					
	Recorded 2018-2022			the Development (Annual)		
	Slight	Serious	Fatal	Slight	Serious	Fatal
A815 Strachur	3	3	2	0.1	0.1	0.0
A83 Lochgilphead	0	0	0	0.0	0.0	0.0
B840 Ford	0	0	0	0.0	0.0	0.0

Classifying the significance of effects: prior to mitigation, the likely effect of construction traffic on road user and pedestrian safety is a direct, temporary, **Minor Adverse (Not Significant)** effect.

In terms of road user and pedestrian safety, the magnitude of change for most road links is considered to be low as accidents for Development traffic are forecast to be substantially less than 1 'slight' injury accident and substantially less than 1 'serious' injury accident per annum on study area roads. Study Area roads that are proposed to carry HGV construction traffic are low or negligible in terms of sensitivity of receptors, therefore the corresponding significance of effect is considered minor adverse.

14.7.2.4. Non-motorised User Amenity

Table 14.12 Assessment of Non-motorised User Amenity below presents the anticipated effects in terms of non-motorised user amenity. The 1993 IEMA Guidelines suggest that a threshold for judging the significance of changes in pedestrian amenity would be where traffic flow has halved or doubled. It also states that these thresholds are expressed as a starting point for any assessment and therefore, in order to establish a significance of effect, the same 30%, 60%, 90% magnitude of change thresholds as applied in the 'severance of communities' assessment have been used.

The significance of effects for non-motorised user amenity are based on an assessment of all traffic in accordance with the IEMA Guidelines 2023.

Table14.3. Assessment of Non-motorised User Amenity

Road Link	Receptor Sensitivity	Traffic Increase	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	12.6%	Negligible	Negligible
A85 West	Negligible	14.5%	Negligible	Negligible
A85 East	Negligible	16.5%	Negligible	Negligible
B840 Cladich	Medium	42.49%	Low	Minor
A819 Dalmally	Negligible	38.6%	Low	Negligible
A819 Site Access	Negligible	37.1%	Low	Negligible
A819 Inveraray	Negligible	36.9%	Low	Negligible
A83 Garron Bridge	Negligible	15.3%	Negligible	Negligible
A83 Rest and Be Thankful	Low	13.7%	Negligible	Negligible
A815 Strachur	Low	25.9%	Negligible	Negligible
A83 Lochgilphead	Negligible	18%	Negligible	Negligible
B840 Ford	Negligible	82.4%	Medium	Negligible

Classifying the significance of effects: prior to mitigation, the likely effect of construction traffic on non-motorised user amenity is a direct, temporary, **Minor Adverse (Not Significant)** effect.

In terms of non-motorised amenity, the significance of effects for most road links would be negligible. One public road link is forecast to have minor significance of effects: B840 Cladich – this will not carry HGV construction traffic.

14.7.2.5. Non-motorised User Delay

Table 14.13 Assessment of Non-motorised User Delay below presents the forecast effects on non-motorised user delay of the Development. The IEMA Guidelines state that pedestrian delay and severance are closely related effects and can be grouped together and that changes in the volume of general traffic may affect the ability of pedestrians to cross roads. The non-motorised user assessment has therefore been undertaken using the same magnitude of change thresholds as the severance assessment.

The IEMA Guidelines state that *"The Department for Transport has historically set out a range of indicators for determining the significance of severance. Changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' chances in severance respectively.'* These thresholds are used to determine the magnitude of change for the assessment of non-motorised user delay.

The number of two-wheeled movements on Study Area roads from the 2023 traffic survey data is reported in *Technical Appendix 14.1 (Volume 5: Appendices)*. However, it should be noted that roads around the study area are popular among motorcyclists and ATC surveys do not distinguish between motorcycles and pedal cycles. Therefore, the number of cyclists on study area roads is thought to be low as the majority of two-wheeled movements surveys are likely to be motorcycles.

Table 14.4. Assessment of Non-motorised User Delay

Road Link	Receptor Sensitivity	Traffic Increase	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	12.6%	Negligible	Negligible
A85 West	Negligible	14.5%	Negligible	Negligible
A85 East	Negligible	16.5%	Negligible	Negligible
B840 Cladich	Medium	42.49%	Low	Minor
A819 Dalmally	Negligible	38.6%	Low	Negligible
A819 Site Access	Negligible	37.1%	Low	Negligible
A819 Inveraray	Negligible	36.9%	Low	Negligible
A83 Garron Bridge	Negligible	15.3%	Negligible	Negligible
A83 Rest and Be Thankful	Low	13.7%	Negligible	Negligible
A815 Strachur	Low	25.9%	Negligible	Negligible
A83 Lochgilphead	Negligible	18%	Negligible	Negligible
B840 Ford	Negligible	82.4%	Medium	Negligible

Classifying the significance of effects: prior to mitigation, the likely effect of construction traffic on non-motorised user delay is a direct, temporary, **Minor Adverse (Not Significant)** effect.

In terms of non-motorised user delay, the significance of effects for most road links would be negligible. One public road link is forecast to have minor significance of effects: B840 Cladich – this will not carry HGV construction traffic.

14.7.2.6. Driver Delay

Table 14.14 Assessment of Driver Delay below presents the assessment of Driver Delay during the peak construction period of the Development. The IEMA Guidelines state that traffic delays can occur at site entrances and on the highways passing the development site where there is likely to be additional traffic. It is noted that delays are only likely to be significant when the traffic on the network surrounding the development site is already at, or close to capacity. While there are no such capacity issues at on the surrounding public roads of the development site, in line with the thresholds used to determine the significance of effects on severance, total traffic increase has been used to anticipate likely effects as a result of the Development's construction.

The IEMA Guidelines state that *"The Department for Transport has historically set out a range of indicators for determining the significance of severance. Changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' chances in severance respectively.'* These thresholds are used to determine the magnitude of change for the assessment of driver delay.

Table 14.5. Assessment of Driver Delay

Road Link	Receptor Sensitivity	Traffic Increase	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	12.6%	Negligible	Negligible
A85 West	Negligible	14.5%	Negligible	Negligible
A85 East	Negligible	16.5%	Negligible	Negligible
B840 Cladich	Medium	42.49%	Low	Minor
A819 Dalmally	Negligible	38.6%	Low	Negligible
A819 Site Access	Negligible	37.1%	Low	Negligible
A819 Inveraray	Negligible	36.9%	Low	Negligible
A83 Garron Bridge	Negligible	15.3%	Negligible	Negligible
A83 Rest and Be Thankful	Low	13.7%	Negligible	Negligible
A815 Strachur	Low	25.9%	Negligible	Negligible
A83 Lochgilphead	Negligible	18%	Negligible	Negligible
B840 Ford	Negligible	82.4%	Medium	Negligible

Classifying the significance of effects: prior to mitigation, the likely effect of construction traffic on driver delay is a direct, temporary, **Minor Adverse (Not Significant)** effect.

In terms of driver delay, the significance of effects for most road links would be negligible. One public road link is forecast to have minor significance of effects: B840 Cladich – this will not carry HGV construction traffic.

Traffic management will be introduced on the A83 Lochgilphead road link at the proposed jetty. The jetty will be used for the delivery of abnormal indivisible loads (AIL) and as such the traffic management will only be used when deliveries are taking place, and full AIL escort protocols will also be in place to reinforce the proposed traffic management on this road link.

14.8 Mitigation

This section describes the measures that will be implemented to mitigate any adverse environmental effects identified by the assessment.

14.8.1 HGV Construction Traffic

Mitigation relating to traffic movements associated with the Development would be focused primarily on HGV construction traffic, as the additional Car / LGV trips will have a negligible environmental effect on future traffic flows.

In accordance with IEMA Guidelines, the most efficient and effective way to address environmental impacts is to remove them entirely through the application of a mitigation hierarchy. Within this hierarchy, a priority is to avoid environmental impacts in the first instance before seeking to reduce, mitigate or compensate any adverse impacts. To avoid environmental impacts, the following is proposed:

- An HGV construction traffic bypass route between the A83 east of Inveraray and the A819 to the north of Inveraray. This utilises a combination of existing construction Access Track and new Access Tracks to the north of Inveraray Castle.
- An AIL route, utilising Upper Avenue, between the A83 south of Inveraray and the A819 north of Inveraray to facilitate the movement of AIL deliveries from the proposed jetty facility.
- HGV construction traffic will avoid the B840. It is unlikely that this route would be required for construction traffic as a route will be available directly from Access Tracks from the A819 at Craig nan Sassanach to the Development Site.

The proposed HGV construction traffic routes would avoid Inveraray Town Centre as well as the historic Aray Bridge on the A83.

A Construction Traffic Management Plan (CTMP) would operate throughout the duration of the construction programme. *Appendix 14.1 (Volume 5: Appendices)* contains a draft CTMP including the following. A detailed CTMP is expected to be conditioned and would be provided once a principal contractor is appointed.

- Site access and the entry/exit arrangements from public roads. Specifically, the A83 east of Inverary where construction traffic leaves the public road, and the A819 north of Inveraray where construction traffic joins the public road. Both these locations will have comprehensive traffic management schemes in accordance with DfT / Transport Scotland Traffic Signs Manual Chapter 8, Traffic Safety Measures and Signs for Road Works and Temporary Situations, 2009.
- Traffic routeing plans – defining the routes to be taken by HGVs to the Site. For example, prioritising the use of A and B-roads as far as possible and avoidance of sensitive locations;
- construction hours and delivery times;
- strategy for traffic management and measures for informing construction traffic of local access routes, road restrictions, timing restrictions and where access is prohibited;
- measures to protect the public highway (e.g. wheel wash facilities);
- measures for the monitoring of the CTMP to ensure compliance from drivers and appropriate actions in the event of non-compliance;
- mechanism for responding to traffic management issues arising during the works (including concerns raised from the public) including a joint consultation approach with relevant highways authorities;
- details of traffic management requirements; and
- strategy for traffic management and measures for informing construction traffic of local access routes, road restrictions (statutory limits: width, height, axle loading and gross weight), timing restrictions (if applicable) and where access is prohibited.

Mitigation provided by the CTMP will address the following potential environmental effects.

- Severance of communities – construction traffic will give particular attention to locations and environments where pedestrian traffic and road crossing points are present to ensure severance effects are minimised.
- Fear and Intimidation on and by Road Users – construction traffic will be mindful of vehicle speeds and manoeuvring in proximity to vulnerable road users (pedestrian and cycle traffic) in all locations and environments to ensure fear and intimidation effects are minimised.
- Road User and Pedestrian Safety – construction traffic will be mindful of vehicle speeds and manoeuvring in proximity to vulnerable road users (pedestrian and cycle traffic) in all locations and environments. Best

practice for construction traffic operators will be promoted to ensure accident and road safety effects are minimised.

- Non-motorised User Amenity – construction traffic will give particular attention to locations and environments where pedestrian and cycle traffic are present to ensure effects on pedestrian and cycle amenity are minimised.
- Non-motorised User Delay – construction traffic will give particular attention to locations and environments where pedestrian and cycle traffic are present to ensure effects on pedestrian and cycle delay are minimised.
- Driver Delay – AIL construction traffic will be escorted and may be scheduled to travel when Study Area roads are less busy. AIL escorts can enact rolling traffic management control to address any localised queuing and delay resulting from the presence of potentially slow-moving construction traffic. These mitigation measures are proposed to ensure effects on driver delay are minimised.

14.9 Residual Effects

Following the implementation of mitigation as described in *Section 14.8 Mitigation*, residual environmental effects are forecast as follows:

14.9.1.1. Severance of Communities

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation will reinforce the previously reported magnitude of change. Therefore, the effect on severance following mitigation will remain a direct temporary **Minor Adverse (Not Significant)** effect.

14.9.1.2. Fear and Intimidation on and by Road Users

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation will reinforce the previously reported magnitude of change. Therefore, the effect on fear and intimidation following mitigation will remain a direct temporary **Negligible (Not Significant)** effect.

14.9.1.3. Road User and Pedestrian Safety

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation will reinforce the previously reported magnitude of change. Therefore, the effect on road user and pedestrian safety following mitigation will remain a direct temporary **Minor Adverse (Not Significant)** effect.

14.9.1.4. Non-motorised User Amenity

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation will reinforce the previously reported magnitude of change. Therefore, the effect on non-motorised user amenity following mitigation will remain a direct temporary **Minor Adverse (Not Significant)** effect.

14.9.1.5. Non-motorised User Delay

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation will reinforce the previously reported magnitude of change. Therefore, the effect on non-motorised user delay following mitigation will remain a direct temporary **Minor Adverse (Not Significant)** effect.

14.9.1.6. Driver Delay

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation will reinforce the previously reported magnitude of change. Therefore, the effect on driver delay following mitigation will remain a direct temporary **Minor Adverse (Not Significant)** effect.

14.10 Cumulative Assessment

Chapter 4: Approach to EIA (Volume 2: Main Report) Table 4.8 Cumulative Developments lists the cumulative development sites to be considered for assessment.

Appendix 14.1 (Volume 5: Appendices) contains construction traffic forecasts for the cumulative development sites affecting Study Area roads.

Table 14.15 Cumulative Development Construction Traffic compares cumulative development traffic against baseline traffic to determine the Study Area roads to be assessed due either to Rule 1 or Rule 2 conditions being met.

Table 14.6. Cumulative Development Construction Traffic

Road Link	Vehicular Traffic (AWT)							
	2027 Baseline		Cumulative Development		Cumulative Development % Impact		Environmental Assessment Required	
	HGV	All Vehs	HGV	All Vehs	HGV	All Vehs	HGV	All Vehs
A85 Taynuilt	189	5,105	1,322	6,540	599%	28%	Y	Y
A85 West	187	4,442	1,420	6,021	659%	35%	Y	Y
A85 East	185	3,892	1,464	5,773	791%	148%	Y	Y
B840 Cladich	6	362	6	516	0%	42%	N	Y
A819 Dalmally	92	1,666	1,283	3,439	1395%	206%	Y	Y
Site Access Track	0	0	490	644	High	High	N	N
A819 Site Access	94	1,735	1,503	3,853	1599%	222%	Y	Y
A819 Inveraray	87	1,741	1,496	3,859	1720%	222%	Y	Y
A819 Inveraray Town Centre	88	1,917	1007	3,545	1144%	185%	Y	Y
Inveraray Bypass	0	0	490	490	High	High	N	N
A83 Aray Bridge	234	4,297	608	5,223	260%	122%	Y	Y
A83 Garron Bridge	217	4,196	1081	5,612	498%	134%	Y	Y
A83 Rest and Be Thankful	322	4,676	866	5,374	168%	14%	Y	Y
A815 Strachur	128	2,480	618	3,124	382%	25%	Y	Y
Upper Avenue AIL Route	0	0	100	100	High	High	N	N
A83 Inveraray Town Centre	229	4,283	550	4,886	140%	14%	Y	Y
A83 Lochgilphead	226	3,564	1,329	5,116	588%	144%	Y	Y
B840 Ford	2	187	2	341	0%	82%	N	Y

Table 14.15 shows that all public road links on Study Area roads must be included in the assessment.

Severance of Communities

Table 14.16 Severance Impacts of the Development plus Cumulative Development below presents the severance of communities assessment for the relevant road links which may experience effects as a result of Cumulative Development.

Table 14-7. Severance Impacts of the Development plus Cumulative Development

Road Link	Receptor Sensitivity	Traffic Increase	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	28%	Negligible	Negligible
A85 West	Negligible	35%	Low	Negligible
A85 East	Negligible	148%	High	Minor
B840 Cladich	Medium	42%	Low	Minor

Road Link	Receptor Sensitivity	Traffic Increase	Magnitude of Change	Significance of Effect
A819 Dalmally	Negligible	206%	High	Minor
A819 Site Access	Negligible	222%	High	Minor
A819 Inveraray	Negligible	222%	High	Minor
A819 Inveraray Town Centre	Very high	185%	High	Major
A83 Aray Bridge	Low	122%	High	Moderate
A83 Garron Bridge	Negligible	134%	High	Minor
A83 Rest and Be Thankful	Low	14%	Negligible	Negligible
A815 Strachur	Low	25%	Negligible	Negligible
A83 Inveraray Town Centre	Very High	14%	Negligible	Minor
A83 Lochgilphead	Negligible	144%	High	Minor
B840 Ford	Negligible	82%	Medium	Negligible

Classifying the significance of effects in terms of severance of communities: prior to mitigation, the A819 Inveraray Town Centre is forecast to experience a direct, temporary, **Major Adverse (Significant)** effect as a result of cumulative development traffic. The Development does not route HGV construction traffic on the A819 Inveraray Town Centre.

Classifying the significance of effects in terms of severance of communities: prior to mitigation, the A83 Aray Bridge is forecast to experience a direct, temporary, **Moderate Adverse (Significant)** effect as a result of cumulative development traffic. The Development does not route HGV construction traffic on the A83 Aray Bridge.

Classifying the significance of effects in terms of severance of communities: prior to mitigation, remaining road links are forecast to experience a **Negligible** or direct, temporary **Minor (Not Significant)** effect for cumulative development traffic.

Fear and Intimidation on and by Road Users

Table 14.17 Fear and Intimidation Impacts of the Cumulative Development below shows the anticipated effects on the relevant road links in terms of fear and intimidation on and by road users as result of Cumulative Development.

Table 14-8. Fear and Intimidation Impacts of the Development plus Cumulative Development

Road Link	Receptor Sensitivity	Level of Fear and Intimidation	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	Moderate	Medium	Minor
A85 West	Negligible	Moderate	Negligible	Negligible
A85 East	Negligible	Moderate	Negligible	Negligible
B840 Cladich	Medium	Small	Negligible	Negligible
A819 Dalmally	Negligible	Moderate	Negligible	Negligible
A819 Site Access	Negligible	Small	Negligible	Negligible

A819 Inveraray	Negligible	Moderate	Negligible	Negligible
A819 Inveraray Town Centre	Very high	Moderate	Low	Moderate
A83 Aray Bridge	Low	Moderate	Negligible	Negligible
A83 Garron Bridge	Negligible	Small	Negligible	Negligible
A83 Rest and Be Thankful	Low	Small	Negligible	Negligible
A815 Strachur	Low	Moderate	Negligible	Negligible
A83 Inveraray Town Centre	Very High	Moderate	Negligible	Minor
A83 Lochgilphead	Negligible	Small	Negligible	Negligible
B840 Ford	Negligible	Small	Negligible	Negligible

Classifying the significance of effects in terms of fear and intimidation: prior to mitigation, the A819 Inveraray Town Centre is forecast to experience a direct, temporary, **Moderate Adverse (Significant)** effect as a result of cumulative development traffic. The Development does not route HGV construction traffic on the A819 Inveraray Town Centre.

Classifying the significance of effects in terms of fear and intimidation: prior to mitigation, remaining road links are forecast to experience a **Negligible** or direct, temporary **Minor (Not Significant)** effect for cumulative development traffic.

Road User and Pedestrian Safety

Table 14.18 Forecast Annual Injury Accidents on Study Area Roads (Cumulative Development) shows the anticipated impact on road user and pedestrian safety as a result of Cumulative Development.

Table 14-9. Forecast Annual Injury Accidents on Study Area Roads (Cumulative Development)

Road Link	Forecast Annual Injury Accidents by Severity					
	Recorded 2018-2022			Cumulative Development (Annual)		
	Slight	Serious	Fatal	Slight	Serious	Fatal
A85 Taynuilt	7	8	1	0.2	0.3	0.0
A85 West	0	0	0	0.0	0.0	0.0
A85 East	0	0	0	0.0	0.0	0.0
B840 Cladich	0	0	0	0.0	0.0	0.0
A819 Dalmally	1	5	0	0.1	0.6	0.0
A819 Site Access	0	3	0	0.0	0.5	0.0
A819 Inveraray	1	1	0	0.1	0.1	0.0
A819 Inveraray Town Centre	0	0	0	0.0	0.0	0.0
A83 Aray Bridge	3	3	0	0.0	0.1	0.0
A83 Garron Bridge	3	3	0	0.1	0.1	0.0
A83 Rest and Be Thankful	4	7	0	0.0	0.1	0.0
A815 Strachur	3	3	2	0.1	0.1	0.0
A83 Inveraray Town Centre	0	0	0	0.0	0.0	0.0
A83 Lochgilphead	0	0	0	0.0	0.0	0.0
B840 Ford	0	0	0	0.0	0.0	0.0

Classifying the significance of effects: prior to mitigation, the likely effect of cumulative development on road user and pedestrian safety is a direct, temporary, **Minor Adverse (Not Significant)** effect.

In terms of road user and pedestrian safety, the magnitude of change for most road links is considered to be low as accidents for cumulative development are forecast to be substantially less than 1 'slight' injury accident and substantially less than 1 'serious' injury accident per annum on all Study Area roads.

The cumulative assessment forecasts the greatest increase in 'serious' injury accidents per annum on study area roads at the A819 Dalmally. This forecast remains significantly below 1 'serious' injury accident per annum resulting from cumulative development traffic.

Non-motorised User Amenity

Table 14.19 Non-Motorised User Amenity Effects of the Cumulative Development below shows the anticipated effects on Non-motorised User Amenity as a result of the Cumulative Development.

Table 14-10. Non-Motorised User Amenity Effects of the Cumulative Development

Road Link	Receptor Sensitivity	Traffic Increase	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	28%	Negligible	Negligible
A85 West	Negligible	35%	Low	Negligible
A85 East	Negligible	148%	High	Minor
B840 Cladich	Medium	42%	Low	Minor
A819 Dalmally	Negligible	206%	High	Minor
A819 Site Access	Negligible	222%	High	Minor
A819 Inveraray	Negligible	222%	High	Minor
A819 Inveraray Town Centre	Very high	185%	High	Major
A83 Aray Bridge	Low	122%	High	Moderate
A83 Garron Bridge	Negligible	134%	High	Minor
A83 Rest and Be Thankful	Low	14%	Negligible	Negligible
A815 Strachur	Low	25%	Negligible	Negligible
A83 Inveraray Town Centre	Very High	14%	Negligible	Minor
A83 Lochgilphead	Negligible	144%	High	Minor
B840 Ford	Negligible	82%	Medium	Negligible

Classifying the significance of effects in terms of non-motorised user amenity: prior to mitigation, the A819 Inveraray Town Centre is forecast to experience a direct, temporary, **Major Adverse (Significant)** effect as a result of cumulative development traffic. The Development does not route HGV construction traffic on the A819 Inveraray Town Centre.

Classifying the significance of effects in terms of non-motorised user amenity: prior to mitigation, the A83 Aray Bridge is forecast to experience a direct, temporary, **Moderate Adverse (Significant)** effect as a result of cumulative development traffic. The Development does not route HGV construction traffic on the A83 Aray Bridge.

Classifying the significance of effects in terms of non-motorised user amenity: prior to mitigation, remaining road links are forecast to experience a **Negligible** or direct, temporary **Minor (Not Significant)** effect for cumulative development traffic.

Non-motorised User Delay

Table 14.20 Non-motorised User Delay Effects of Cumulative Development below shows the anticipated effect on Non-motorised User Delay as a result of Cumulative Development.

Table 14-11. Non-motorised User Delay Effects of Cumulative Development

Road Link	Receptor Sensitivity	Traffic Increase	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	28%	Negligible	Negligible
A85 West	Negligible	35%	Low	Negligible
A85 East	Negligible	148%	High	Minor
B840 Cladich	Medium	42%	Low	Minor
A819 Dalmally	Negligible	206%	High	Minor
A819 Site Access	Negligible	222%	High	Minor
A819 Inveraray	Negligible	222%	High	Minor
A819 Inveraray Town Centre	Very high	185%	High	Major
A83 Aray Bridge	Low	122%	High	Moderate
A83 Garron Bridge	Negligible	134%	High	Minor
A83 Rest and Be Thankful	Low	14%	Negligible	Negligible
A815 Strachur	Low	25%	Negligible	Negligible
A83 Inveraray Town Centre	Very High	14%	Negligible	Minor
A83 Lochgilphead	Negligible	144%	High	Minor
B840 Ford	Negligible	82%	Medium	Negligible

Classifying the significance of effects in terms of non-motorised user delay: prior to mitigation, the A819 Inveraray Town Centre is forecast to experience a direct, temporary, **Major Adverse (Significant)** effect as a result of cumulative development traffic. The Development does not route HGV construction traffic on the A819 Inveraray Town Centre.

Classifying the significance of effects in terms of non-motorised user delay: prior to mitigation, the A83 Aray Bridge is forecast to experience a direct, temporary, **Moderate Adverse (Significant)** effect as a result of cumulative development traffic. The Development does not route HGV construction traffic on the A83 Aray Bridge.

Classifying the significance of effects in terms of non-motorised user delay: prior to mitigation, remaining road links are forecast to experience a **Negligible** or direct, temporary **Minor (Not Significant)** effect for cumulative development traffic.

Driver Delay

Table 14.21 Driver Delay Effects of Cumulative Development below shows the anticipated effects on Driver Delay as a result of Cumulative Development.

Table 14-12. Driver Delay Effects of Cumulative Development

Road Link	Receptor Sensitivity	Total Traffic Increase	Magnitude of Change	Significance of Effect
A85 Taynuilt	Low	28%	Negligible	Negligible
A85 West	Negligible	35%	Low	Negligible
A85 East	Negligible	148%	High	Minor
B840 Cladich	Medium	42%	Low	Minor
A819 Dalmally	Negligible	206%	High	Minor
A819 Site Access	Negligible	222%	High	Minor
A819 Inveraray	Negligible	222%	High	Minor
A819 Inveraray Town Centre	Very high	185%	High	Major
A83 Aray Bridge	Low	122%	High	Moderate
A83 Garron Bridge	Negligible	134%	High	Minor
A83 Rest and Be Thankful	Low	14%	Negligible	Negligible
A815 Strachur	Low	25%	Negligible	Negligible
A83 Inveraray Town Centre	Very High	14%	Negligible	Minor
A83 Lochgilphead	Negligible	144%	High	Minor
B840 Ford	Negligible	82%	Medium	Negligible

Classifying the significance of effects in terms of driver delay: prior to mitigation, the A819 Inveraray Town Centre is forecast to experience a direct, temporary, **Major Adverse (Significant)** effect as a result of cumulative development traffic. The Development does not route HGV construction traffic on the A819 Inveraray Town Centre.

Classifying the significance of effects in terms of driver delay: prior to mitigation, the A83 Aray Bridge is forecast to experience a direct, temporary, **Moderate Adverse (Significant)** effect as a result of cumulative development traffic. The Development does not route HGV construction traffic on the A83 Aray Bridge.

Classifying the significance of effects in terms of driver delay: prior to mitigation, remaining road links are forecast to experience a **Negligible** or direct, temporary **Minor (Not Significant)** effect for cumulative development traffic.

14.11 Cumulative Assessment Mitigation

Cumulative assessment mitigation measures will encompass the CTMP described in section 14.8 for the Development. In addition, it is expected that similar CTMP will be in place for other cumulative developments.

A key consideration for respective CTMP should be that cumulative development explores options for coordinating construction traffic on public roads.

Consideration should be given in particular to the A819 Inveraray Town Centre which is the only road link in the cumulative assessment forecast to potentially experience direct, temporary **Major Adverse (Significant)** effects. Cumulative development mitigation could potentially examine the use of construction traffic routes associated with the Development that avoid Inveraray town centre, or scheduling of cumulative development to avoid peak construction traffic periods coinciding.

Consideration should also be given to the A83 Aray Bridge which the cumulative assessment forecasts to potentially experience direct, temporary **Moderate Adverse (Significant)** effects. Cumulative development mitigation could potentially examine the use of construction traffic routes associated with the Development that avoid Inveraray town centre, or scheduling of cumulative development to avoid peak construction traffic periods coinciding.

14.12 Cumulative Assessment Residual Effects

Following the implementation of mitigation as described in *Section 14.8 Mitigation*, the residual environmental effects of cumulative development are forecast as follows:

Severance of Communities

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation for cumulative development will aim to reduce magnitude of change on Study Area roads by managing cumulative development construction traffic, particularly on the A819 Inveraray Town Centre. The likely effect on severance following mitigation will be a reduction to a direct, temporary **Minor Adverse (Not Significant)** effect.

Fear and Intimidation on and by Road Users

The sensitivity of receptors on study area roads will be unchanged. Mitigation for cumulative development will aim to reduce magnitude of change on Study Area roads by managing cumulative development construction traffic, particularly on the A819 Inveraray Town Centre. The likely effect on fear and intimidation following mitigation will remain a direct, temporary **Minor Adverse (Not Significant)** effect.

Road User and Pedestrian Safety

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation for cumulative development will aim to reduce magnitude of change on Study Area roads by managing cumulative development construction traffic. Therefore, the likely effect on road user and pedestrian safety following mitigation will remain a direct, temporary **Minor Adverse (Not Significant)** effect.

Non-motorised User Amenity

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation for cumulative development will aim to reduce magnitude of change on study area roads by managing cumulative development construction traffic, particularly on the A819 Inveraray Town Centre. The likely effect on non-motorised user amenity following mitigation will be a reduction to a direct, temporary **Minor Adverse (Not Significant)** effect.

Non-motorised User Delay

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation for cumulative development will aim to reduce magnitude of change on Study Area roads by managing cumulative development construction traffic, particularly on the A819 Inveraray Town Centre. The likely effect on non-motorised user delay following mitigation will be a reduction to a direct, temporary **Minor Adverse (Not Significant)** effect.

Driver Delay

The sensitivity of receptors on Study Area roads will be unchanged. Mitigation for cumulative development will aim to reduce magnitude of change on Study Area roads by managing cumulative development construction traffic, particularly on the A819 Inveraray Town Centre. The likely effect on driver delay following mitigation will be a reduction to a direct, temporary **Minor Adverse (Not Significant)** effect.

14.13 Summary of Effects

Table 14.22 Summary of Effects presents a summary of the environmental effects forecast in this assessment.

Table 14-13. Summary of Effects

Category	the Development			Cumulative Development		
	Significance of Effects	Mitigation	Residual Effects	Significance of Effects	Mitigation	Residual Effects
Severance of Communities	Direct, Temporary Minor Adverse (Not Significant)	CTMP + Construction Traffic Haul Routes	Direct, Temporary Minor Adverse (Not Significant)	Direct, Temporary Major Adverse (Significant)	CTMP + Construction Traffic Haul Routes + Co-ordination between Cumulative Schemes	Direct, Temporary Minor Adverse (Not Significant)
Fear and Intimidation on and by Road Users	Direct, Temporary Negligible Adverse (Not Significant)	CTMP + Construction Traffic Haul Routes	Direct, Temporary Negligible Adverse (Not Significant)	Direct, Temporary Moderate Adverse (Not Significant)	CTMP + Construction Traffic Haul Routes + Co-ordination between Cumulative Schemes	Direct, Temporary Minor Adverse (Not Significant)
Road User and Pedestrian Safety	Direct, Temporary Minor Adverse (Not Significant)	CTMP + Construction Traffic Haul Routes	Direct, Temporary Minor Adverse (Not Significant)	Direct, Temporary Minor Adverse (Not Significant)	CTMP + Construction Traffic Haul Routes + Co-ordination between Cumulative Schemes	Direct, Temporary Minor Adverse (Not Significant)
Non-motorised User Amenity	Direct, Temporary Minor Adverse (Not Significant)	CTMP + Construction Traffic Haul Routes	Direct, Temporary Minor Adverse (Not Significant)	Direct, Temporary Major Adverse (Significant)	CTMP + Construction Traffic Haul Routes + Co-ordination between Cumulative Schemes	Direct, Temporary Minor Adverse (Not Significant)
Non-motorised User Delay	Direct, Temporary Minor Adverse (Not Significant)	CTMP + Construction Traffic Haul Routes	Direct, Temporary Minor Adverse (Not Significant)	Direct, Temporary Major Adverse (Significant)	CTMP + Construction Traffic Haul Routes + Co-ordination between Cumulative Schemes	Direct, Temporary Minor Adverse (Not Significant)
Driver Delay	Direct, Temporary Minor Adverse (Not Significant)	CTMP + Construction Traffic Haul Routes	Direct, Temporary Minor Adverse (Not Significant)	Direct, Temporary Major Adverse (Significant)	CTMP + Construction Traffic Haul Routes + Co-ordination between Cumulative Schemes	Direct, Temporary Minor Adverse (Not Significant)

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 15: Noise and Vibration

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

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15. Noise and Vibration

15.1 Introduction

This chapter presents the assessment of potential noise and vibration effects during the construction, operational and decommissioning phases of the Development. The assessment has been undertaken following guidelines set out in the IEMA publication “Guidelines for Environmental Impact Assessment” (IEMA Guidelines), relevant British Standards, planning policy and guidance.

The Scoping Report identified the following potential effects may result from the construction and operation of the Development:

- Noise and vibration impacts during the construction phase which could affect existing nearby noise sensitive receptors (NSRs);
- Construction phase noise impacts from changes in road traffic noise levels at NSRs in proximity to routes used by construction traffic;
- Operational airborne noise impacts from openings to underground plant or from surface plant if required at NSRs; and
- Operational ground borne noise and vibration impacts from underground plant at nearby NSRs.

This chapter is supported by the following Figures (Volume 3) and Technical Appendices, which are located in Volume 5:

- Figure 15.1: Sensitive receptors considered as part of Noise and Vibration impact assessment
- Figure 15.2: Long and Short Term Sound Monitoring Locations
- Figure 15.3: Road Traffic Noise Study Links
- Appendix 15.1: Acoustic Terminology
- Appendix 15.2: Baseline Sound Monitoring Details
- Appendix 15.3: Acoustic Model Input Data
- Appendix 15.4: Uncertainty in Modelling

15.2 Legislation and Policy

15.2.1 Relevant Legislation

The provisions of Sections 60 and 61 of the Control of Pollution Act 1974 offer protection to those living in the vicinity of construction sites.

Section 60 enables a local authority to serve a notice specifying its noise control requirements which may include:

- Plant or machinery that is or is not to be used;
- Hours of working; and
- Levels of noise or vibration that can be emitted.

Section 61 relates to prior consent and is for situations where a contractor or developer takes the initiative and approaches the local authority before work starts, to obtain prior approval for the methods to be used and any noise and vibration control techniques that may be required.

The term 'Best Practicable Means' (BPM) is defined in Section 72 of the Control of Pollution Act 1974, where 'practicable' means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications.

15.2.2 National Planning Policy

15.2.2.1 National Planning Framework 4 (NPF4)

NPF4 is Scotland's national spatial strategy. It outlines spatial principles, regional priorities, national developments, and planning policies. NPF4 replaces NPF3 and Scottish Planning Policy. This comprehensive framework aims to create sustainable, liveable, and productive places, aligning with the United Nations Sustainable Development Goals and Scotland's national outcomes.

NPF4 Policy 11 states that:

> *"a) Development proposals for all forms of renewable, low-carbon and zero emissions technologies will be supported. These include:*
>
> *i. wind farms including repowering, extending, expanding and extending the life of existing wind farms;*
> *ii. enabling works, such as grid transmission and distribution infrastructure;*
> *iii. energy storage, such as battery storage and pumped storage hydro;*
> *iv. small scale renewable energy generation technology;*
> *v. solar arrays;*
> *vi. proposals associated with negative emissions technologies and carbon capture; and*
> *vii. proposals including co-location of these technologies.";*

It later states:

> "*e)* In addition, project design and mitigation will demonstrate how the following impacts are addressed:
>
> *i. impacts on communities and individual dwellings, including, residential amenity, visual impact, noise and shadow flicker;"*

15.2.2.2 Planning Advice Note 1/ 2011 Planning and Noise

Current national guidance on noise is contained in Planning Advice Note (PAN) 1/2011 Planning and Noise (The Scottish Government, 2011). In para 2 PAN 1/2011 states that it "*promotes the principles of good acoustic design and a sensitive approach to the location of new development. It promotes the appropriate location of new potentially noisy development, and a pragmatic approach to the location of new development within the vicinity of existing noise generating uses, to ensure that quality of life is not unreasonably affected and that new development continues to support sustainable economic growth."*

Part 3 of PAN 1/2011 states *"The Environmental Noise (Scotland) Regulations 2006 transposed the European Directive 2002/49/EC (the Environmental Noise Directive) into Scottish law. This requires Scottish Ministers and airport authorities to manage noise through a process of strategic noise mapping and noise action plans. In the areas affected by the Regulations, planning authorities have a role in helping to prevent and limit the adverse effects of environmental noise."*

There are no Noise Action Plans in proximity to the Development site.

A Technical Advice Note (TAN 2011) (The Scottish Government, 2011) accompanies PAN 1/2011 and provides technical guidance on noise assessment.

15.2.3 Local Planning Policy

The Argyll and Bute Council (ABC) Local Development Plan 2 (LDP2) was adopted on 28 February 2024, and replaces the Argyll and Bute Local Development Plan 2015 and its associated Supplementary Guidance (March 2016), and Supplementary Guidance 2 (December 2016). LDP2 is divided into the written statement and proposals maps. The written statement provides the general policy context against which planning applications for new development proposals should be assessed.

With respect to noise, LDP2 section 4.33 states:

> *"4.33 Uses that can result in negative impact upon neighbouring amenity are sometimes referred to as "bad neighbour uses". Such uses can include pubs or clubs, waste water treatment plants, scrap yards and various industrial processes. Their impact can be wide ranging with issues, including:*
>
> - *Noise disturbance from industrial or mechanical processes*
> - *Noise from high turnover of customers at unsocial hours*
> - *Odour pollution from cooking smells*

> *• Light pollution from outdoor lighting or flicker from moving apparatus*
>
> *4.34 Proposals that would have an unacceptable, detrimental impact upon neighbouring amenity will be resisted.*
>
> *4.35 The Council will operate a precautionary principle and it will be for the applicant to provide evidence to demonstrate that there would not be any unacceptable impacts upon neighbouring amenity. This could be provided through the commissioning of technical studies and reports which should be submitted, where relevant, with the planning application."*

15.2.4 Chapter Specific Guidance

The following documents have been referred to as part of this assessment. Further details about the documents can be found in the Guidance and Standards subsection below.

- BS 5228:2009+A1:2014 Noise and Vibration Control on Construction and Open Sites Parts 1 and 2 (with amendments, 2014);
- BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting;
- BS 6472-2: 2008 Guide to evaluation of human exposure to vibration in buildings. Blast-induced vibration;
- BS 4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound; and
- BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings.

15.3 Consultation

The assessment scope has also been considered following review of Scoping Opinion responses for the Development *(Appendix 4.2 (Volume 5: Appendices)).* Specifically, no amendments were made to the scope or methodology proposed in the Development Scoping Report, however it is noted that Argyle and Bute Council's noise and vibration scoping report response stated that:

- *"Mitigation measures to abate noise and vibration should be deployed during the construction and operational phase of the development. Predicted noise and vibration levels should be detailed within the CEMP and EIAR.*
- *As limited information is provided on the proposed impact piling works for the Marine Facility* [referred to as the Temporary Jetty in this chapter]*, the applicant/contractor is requested to submit a Noise Method Statement for the construction and operation that outlines timing, duration and expected noise levels* [as part of the CEMP]*. The Noise Method Statement should detail potential Likely Significant Effects (LSEs) and be agreed by the Planning Authority and NatureScot respectively prior to works being commenced."*

Further to this a private stakeholder at Loch Fyne has highlighted the potential for piling at the Temporary Jetty to affect their underwater measurements on "trial days" where noise sensitive equipment is being tested within the Loch. Avoiding piling on these days (up to 12 days per year) has been included as embedded mitigation; see *section 15.7.0*.

15.4 Study Area

The extent of the study area has been defined to include the closest NSRs/ communities in each direction from the Main Site, Temporary Jetty and Access Tracks and those that may be affected by changes in road traffic flows during the construction phase of the Development as described below:

- Construction Noise: The construction noise assessment study area is typically 300 m (based on BS 5228-1 guidance (BSI, 2014a)) from the works, however the construction noise study area has been extended to 1 km and includes the closest NSRs to the construction works from the Main Site and access various Access Tracks as a conservative approach due to the size of the working areas.
- Construction Vibration: NSRs within 100 m from the closest construction activity with the potential to generate vibration have been considered.

- Construction Traffic: The study area extent is based on the traffic links in the transport model (as discussed in Chapter 14: Traffic and Transport. See *Figure 15.3* for the links considered as part of this assessment.
- Operational Noise: The study area extends to the closest NSRs to the Main Site, in each direction.

15.5 Methods

This section discusses the specific guidance and assessment criteria, provides further detail on the scope of the assessment and outlines limitations and assumptions made in undertaking the assessment.

15.5.1 Assessment Scope

The assessment considers the effects during multiple phases of the Development lifespan as identified in *Chapter 2: Project and Site Description*. The phases include construction, operation and decommissioning.

The scope of this assessment is to identify the significance of the potential effects identified within the study area defined in 15.3. Based on this a structure for the assessment methodology for the Development is presented as follows:

- Construction Phase Impacts at NSRs from:
  - Airborne and ground borne noise and vibration from activities within the site boundary.
  - Changes in airborne traffic noise levels from the surrounding road network.
- Operational Phase Impacts at NSRs from:
  - Airborne and ground borne noise and ground borne vibration from activities within the site boundary.
- Decommissioning Phase Impacts at NSRs from:
  - Activities within the site boundary.
  - Changes in airborne traffic noise levels from the surrounding road network.

Changes in road traffic flows on surrounding roads during the operational phase of the Development are not included in the scope of this assessment as the number of vehicles would be negligible compared to existing flows on the surrounding road network; see paragraph 14.39 in *Chapter 14: Access, Traffic and Transport*. In addition, low frequency noise during operation has been scoped out, due to the large intervening distance between potential sources of low frequency noise and NSRs, and due to potential audible tonal components at NSRs on the surface being designed out during detailed design as required.

Decommissioning, if required, would involve the drainage of water from the Headpond, the removal of equipment, blocking of Waterways and tunnel entrances and the removal of above ground structures, as described in *Chapter 2: Project and Site Description*. No blasting, tunnelling or crushing will be required and it is considered that the effects will be negligible.

The temporal scope of this assessment therefore includes consideration of the construction and operational phases of the Development.

The spatial scope of the assessment is described in *Section 15.4.*

Potential airborne noise impacts on ecological receptors are considered within *Chapter 6: Terrestrial Ecology* and *Chapter 9: Ornithology*. Potential underwater noise and vibration impacts on ecological receptors are considered within *Chapter 7: Aquatic Ecology*.

15.5.2 Guidance and Standards

15.5.2.1 Construction Phase

BS 5228-1: 2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 1: Noise (with 2014 amendment)

Advice is provided by British Standard BS 5228-1:2009 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' with respect to noise assessment and mitigation (BS5228).

BS 5228 contains a noise emission database for individual construction plant, their associated activities, and methods of working. Unless noise level data is available from manufacturers, the BS 5228 database is used when predicting noise levels associated with various construction activities.

With regard to acceptable noise levels, BS 5228 provides guidance within Annex E including the 'ABC Method', which enables the identification of potentially significant effects at dwellings. This proposes Threshold Values, in terms of the $L_{Aeq,T}$, as a function of baseline sound levels at the receptors, as shown in *Table 15.1* below.

Table 15.1 Example Threshold of Potential Significant Effect at Dwellings

Assessment Category and Threshold Value Period	Threshold Value $L_{Aeq,T}$ dB(A) façade		
	Category A (a)	Category B (b)	Category C (c)
Night-time (23:00 – 07:00)	45	50	55
Evenings and Weekends (d)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.
NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.
NOTE 3: Applies to residential receptors only.
(a) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
(b) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values.
(c) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values.
(d) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.

For the appropriate period (night, evening / weekend, day), the baseline ambient sound level is determined at each NSR and rounded to the nearest 5 dB. The appropriate Threshold Value is then determined. The total construction noise level is then compared with this Threshold Value. If the total noise level exceeds the Threshold Value, then a potentially significant effect is deemed to occur.

Planning Advice Note PAN 50 'Controlling the Environmental Effects of Surface Mineral Workings'

Annex D: Control of Blasting at Surface Mineral Workings

PAN 50 includes Annex D relating specifically to the control of Blasting Surface Mineral Workings. The annex provides a framework for the consideration of blasting at surface mineral development proposals and for the monitoring and control of operations. Noise, vibration and air overpressure are amongst the considerations.

Annex D identifies that:

- airborne sound pressure levels in the audible range are not a concern and compares peak levels from blasting as being comparable to that experienced from a passing vehicle but of shorter duration.
- ground vibration levels at receptors from blasting should be specified in peak particle velocity (PPV) measured in millimetres per second. It states that vibration limit values, *"should be compatible with current guidance on this matter given within the relevant British Standards publications, namely, BS 6472, 1992 concerning perception and BS 7385, Part 2: 1993 concerning the likelihood of damage."*
- due to the unpredictable and uncontrollable effects of prevalent atmospheric conditions, the location at which the maximum air overpressure is expected cannot be determined with any degree of accuracy. Hence, demonstration of compliance with any specific air overpressure limit is not a practical possibility. Instead, annex D states, *"A scheme which details the intended methods to be employed in minimising air overpressure from blasting operations is recommended in preference to limit values"*. It also states that, *"Prior to the commencement of*

blasting operations details of the methods employed to minimise air overpressure from blasting operations shall be submitted to the planning authority for written approval."

Annex D references the guidance in BS 5228-2, BS 6272 and BS 7385 in relation to human perception and damage to buildings from blasting.

BS 5228 2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration (with 2014 amendments)

BS 5228-2:2009 addresses the need for the protection against vibration for persons living in the vicinity of construction sites and recommends procedures for vibration control. BS 5228-2:2009 recommends that:'.... *it is considered more appropriate to provide guidance in terms of the PPV (Peak Particle Velocity), since this parameter is likely to be more routinely measured based upon the more usual concern over potential building damage'*.

BS 5228-2:2009 provides empirical formulae relating resultant PPV for vibratory compaction, percussive and vibratory piling, dynamic compaction, the vibration of stone columns and tunnel boring operations.

Table 15.2 (adapted from Table B.1, BS 5228-2:2009) details PPV levels and their potential effect on humans, and provides a semantic scale for description of vibration impacts on human receptors.

Table 15.2 Guidance on Effects of Vibration Levels

Vibration Level (PPV mm/s)	Effect
0.14 to 0.3	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 to < 1	Vibration might be just perceptible in residential environments.
1.0 to <10	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
>= to 10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

BS 5228-2:2009 provides the following criteria which are the maximum vibration levels to which underground services should be subjected:

- Maximum PPV for intermittent or transient vibrations 30 mm/s;
- Maximum PPV for continuous vibrations 15 mm/s.

It goes on to state that "*even a PPV of 30 mm/s gives rise to a dynamic stress which is equivalent to approximately 5 % only of the allowable working stress in typical concrete and even less in iron or steel.*"

BS 6472-1: 2008. Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting

BS 6472-1: 2008 provides guidance on the effects of human exposure to whole body vibration inside buildings, from internal sources such as footsteps or machinery, or external sources such as road traffic or railways. It specifically excluded consideration of blasting which is covered in BS 6472-2:2008. This Standard provides guidance on the levels of vibration that are likely to give rise to varying degrees of 'adverse comment'.

The vibration criteria are given in terms of the vibration dose value (VDV) indicator. The VDV is given by the fourth root of the time integral of the fourth power of the acceleration after it has been frequency-weighted. BS 6472-1:2008 states that the VDV is the best indicator to use when assessing human response to whole body vibration inside buildings.

The criteria contained within BS 6472-1:2008 are provided in *Table 15.3*.

Table 15.3 VDV Criteria from BS 6472 1:2008

Place and time	Low probability of adverse comment $m/s^{1.75}$	Adverse comment possible $m/s^{1.75}$	Adverse comment probable $m/s^{1.75}$
Residential buildings 16 h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

For offices and workshops, multiplying factors of 2 and 4 respectively should be applied to the above vibration dose value ranges for a 16 h day.

Vibration dose values below the ranges in *Table 15.3* are rated as 'adverse comment not expected' and vibration above the ranges in *Table 15.3* are rated as 'adverse comment very likely'.

These criteria apply to both the vertical and horizontal axes of vibration, although the two directions use different frequency weighting in the calculation of the VDV. The vertical direction uses the W_b weighting, while the horizontal axes use the W_d weighting. The definitions of the frequency weightings are given in BS 6472-1:2008.

The Standard also states that if the direction of the vibration is dominated by a single axis, it is only necessary to assess the vibration response in respect to the dominant axis.

BS 6472-2: 2008. Guide to evaluation of human exposure to vibration in buildings. Part 2: Blast-induced vibration

BS 6472-2:2008 provides guidance on human exposure in buildings to blast-induced vibration and air overpressures. Like PAN 50 Annex D, it is primarily applicable to blasting associated with mineral extraction but can also be applicable to explosives used within civil engineering and demolition.

BS 6472-2:2008 advises that to predict the likely vibration magnitude from a controlled blast, a series of measurements at several locations should be taken from one or more trial blasts. Using the formula provided in BS 6472-2:2008 and extrapolation of the trial blast results, the likely vibration magnitudes at a given distance (for a given maximum instantaneous charge) can be predicted to a given confidence level.

The standard suggests that accredited blasting contractors will appropriately design blasts to minimise effects at Noise (and vibration) Sensitive Receptors (NSRs).

For blast vibration occurring up to three times per day the standard states that for residential premises the probability of adverse comment is low if the peak particle velocity (PPV) is below 6.0 to 10.0 mm/s during the day. At night this reduces to 2.0 mm/s. It goes on to state that "*Doubling the suggested vibration magnitudes could result in adverse comment and this will increase significantly if the magnitudes are quadrupled.*"

The standard acknowledges that "*blast-induced vibration is highly variable*" and it qualifies that the above limits "*should not be exceeded by more than 10% of the blasts*" and that no blast should result in vibration that exceeds the limit by more than 50%. It goes on to state that "*working to a 90% confidence limit value means, in practice, that blasts need to be designed to ensure that the average level of vibration is approximately half of the specified limit. For example, if the satisfactory limit is required to be 6.0 mm/s at 90% confidence then blasts will be designed to produce vibration levels of approximately 3.0 mm/s, and in practice most will be below this level*".

Should more than three blasts be required per day, BS 6472-2:2008 provides information on the acceptable vibration limits.

BS 6472-2:2008 states that "*Accurate prediction of air overpressure (from blasting) is almost impossible due to the variable effects of the prevailing weather conditions and the large distances often involved*."

Whilst not providing specific air overpressure limits, BS 6472-2:2008 provides the following information on acceptable overpressure levels: "*Windows are generally the weakest parts of a structure exposed to air overpressure. Research by the United States Bureau of Mines has shown that a poorly mounted window that is pre-stressed can crack at around 150 dB(lin), with most windows cracking at around 170 dB(lin). Structural damage would not be expected at air overpressure levels below 180 dB(lin).*"

The air overpressure levels measured at properties near quarries in the United Kingdom are generally around 120 dB(lin), which is 30 dB(lin) below, the limit for cracking pre-stressed poorly mounted windows (150 dB(lin)).

BS 7385: Part 2: 1993 Evaluation and measurement for vibration in buildings. Part 2 Guide to damage levels from groundborne vibration

BS 7385-2:1993 provides guidance on the levels of groundborne vibration above which building structures could be damaged. For the purposes of BS 7385-2:1993, damage is classified as cosmetic (formation of hairline cracks), minor (formation of large cracks) or major (damage to structural elements). Guide values given in BS 7385-2:1993 are associated with the threshold of cosmetic damage only, usually in wall and / or ceiling lining materials.

BS 7385-2:1993 provides a frequency-based vibration criterion for transient vibration induced cosmetic damage, which is reproduced in *Table 15.4*.

Table 15.4 Transient vibration guide values for cosmetic damage

Type of Structure	Peak Component Particle Velocity in Frequency Range of Predominant Pulse[1 and 2]	
	4 Hz to 15 Hz	**15 Hz and above**
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Un-reinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz3	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

1 Peak Component Particle Velocity is defined as the maximum value of any one of three orthogonal component particle velocities measured during a given time interval
2 - Values referred to are at the base of the building.
3 - At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

When considering continuous vibrations, even taking the precautionary approach of halving the guideline vibration values for transient vibration induced minor cosmetic damage to buildings (from BS 7385-2:1993), the resulting guidelines are still orders of magnitude above the threshold of perception and substantially higher than equivalent values likely to provoke complaint.

The guidance on acceptable vibration levels in structures provided in BS 5228-2:2009 recommends adopting the building damage vibration guidelines from BS 7385-2:1993.

Design Manual for Roads and Bridges LA111 Noise and Vibration (Revision 2), Transport Scotland, 2020 & Calculation of Road Traffic Noise (CRTN), Dept. for Transport, Welsh Office, 1998 & Noise Advisory Council (NAC), A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level L_{eq}

The Development will affect traffic flows on existing roads in the area within and surrounding the Development Site during construction - refer to *Chapter 14: Traffic and Transport*. This preliminary assessment focuses on the impact at existing residential properties located alongside the existing local road network.

Construction traffic noise has been assessed by considering the increase in traffic flows during the construction works, following the guidance of CRTN (DfT/ Welsh Office, 1998) and DMRB (Transport Scotland, 2020).

18-hour (06:00 - 24:00) Annual Average Weekday Traffic (AAWT) data have been provided for the construction years, indicating totals 'with' and 'without' construction traffic, on a monthly basis. Basic Noise Level (BNL) calculations have been undertaken to predict the change in noise level between the 'with' and 'without' scenarios where flows are greater than 1000, in order to determine if any existing roads are predicted to be subject to a potentially significant change in 18-hour traffic flows.

The Noise Advisory Council (NAC) prediction method detailed in the document *'A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level L_{eq}'* is applicable for prediction of noise level from low traffic flows. i.e. < 1000 vehicles per 18-hour where CRTN is not valid. This has been used as necessary to supplement the CRTN calculations.

15.5.2.2 Operational Phase

BS 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound'

BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The method compares the *rating level* of the sound source under consideration with the *background sound level* in the vicinity of residential locations. The relevant parameters are as follows:

- *ambient sound level*, L_a, $L_{Aeq,T}$ dB – defined in the standard as the 'equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far, at the assessment location over a given time interval, T. The *ambient sound* comprises the residual sound and the *specific sound* when present";
- *residual sound level*, L_r, $L_{Aeq,T}$ dB – defined in the standard as the 'equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T', where the residual sound is the '*ambient sound* remaining at the assessment location when the *specific sound source* is suppressed to such a degree that it does not contribute to the am*bient sound*";

- *background sound level* – $L_{A90,T}$ – defined in the Standard as the “A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels”;
- *specific sound level* – *L*s ($L_{Aeq,Tr}$) – the “equivalent continuous A-weighted sound pressure level produced by the *specific sound source* at the assessment location over a given reference time interval, Tr”; and
- *rating level* – $L_{Ar,Tr}$ – the “*specific sound level* plus any adjustment made for the characteristic features of the sound”, as follows:
  - Up to 6 dB for tonal characteristics, Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.
  - Up to 9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.
  - If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.
  - Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

When comparing the background and the rating sound levels, the standard states that:

a) “*Typically, the greater the difference, the greater the magnitude of impact.*

b) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.*

c) *A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.*

d) *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context.*”

Importantly, as indicated above, BS 4142 requires that the *rating level* of the sound source under assessment be considered in the context of the environment when defining the overall significance of the impact. The standard suggests that in assessing the context, all pertinent factors should be taken into consideration, including the following:

- “The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.”

BS 8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’

BS 8233:2014 provides guidance for the control of noise in and around buildings. It provides design guidance for noise generated inside or outside the building including noise level criteria and control measures, and a methodology for calculating internal noise levels depending on the performance of the building fabric.

Of relevance to this assessment, for “steady external noise sources” it provides guideline values for internal ambient noise levels within dwellings. These are reproduced in *Table 15.5*.

Table 15.5 Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining Room	40 dB $L_{Aeq,16hr}$	-

Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

15.5.3 Criteria for Sensitivity of Receptors

The adopted assessment of noise and vibration effects is based on the sensitivity of the receptor and the magnitude of the exceedance of the relevant noise and vibration criteria.

In accordance with TAN 1/2011 and the IEMA Guidelines, the sensitivity of receptors to noise or vibration is based on their usage as defined in *Table 15.6*. This classification deviates from that defined in *Chapter 4 Approach to EIA*. According to the criteria in Chapter 4, individual residential properties would be classified as of medium sensitivity to noise impacts which would make this assessment less stringent and would not be in accordance with the relevant guidance. Therefore, the below classification has been applied.

Table 15.6 Receptor Sensitivity

Sensitivity of Receptor	Description
Very high	Concert halls / theatres, specialist vibration sensitive equipment
High	Residential properties, educational buildings, medical facilities, care homes
Medium	Places of worship, community facilities, offices
Low	Other commercial / retail premises

The above criteria do not apply to underground services such as water mains or electricity cables, which are classified as sensitive to vibration but not noise. It is not considered necessary or appropriate to determine a specific sensitivity for this type of receptor.

15.5.4 Criteria for Impacts

15.5.4.1 Construction Noise

The magnitude of the impact of the construction noise is based on the difference between the likely construction noise level at the and the Threshold Value for potentially significant effects derived using the methodology in BS 5228-1:2009 in *Table 15.1*, as shown in *Table 15.7*.

Table 15.7 Construction noise magnitude of impact

Construction and Demolition Sound Level above Threshold Value (dB)	Magnitude of Impact
Exceedance of ABC Threshold Value by ≥ +5 dB	Major
Exceedance of ABC Threshold Value by up to +5 dB	Moderate
Equal to or below the ABC Threshold Value by up to -5dB	Minor
Below the ABC Threshold Value by ≥ -5dB	Negligible

15.5.4.2 Construction Noise Off-Site - Public Roads

The magnitude of the impact resulting from the construction traffic on public roads is based on the difference between predicted road noise levels in the peak construction period ‘with’ and ‘without’ construction traffic included. The mapping of the predicted level differences to a magnitude of impact descriptor for traffic noise changes arising from construction works have been taken from Table 3.17 of DMRB and are provided in *Table 15.8*.

Table 15.8 Construction Traffic Noise Criteria

Change in Traffic Noise Level, $L_{A10,18hr}$ dB	Magnitude of Impact
≥ 5	Major
≥3 to <5	Moderate
≥1 to <3	Minor
<1	Negligible

An increase in road traffic flows of 25% (where the traffic speed and composition remain consistent) equates to an approximate increase in road traffic noise of 1 dB L_A. A doubling of traffic flow would be required for an approximate increase in 3 dB L_A.

It is generally accepted that changes in noise levels of 1 dB L_A or less are imperceptible, and changes of 1 to 3 dB L_A are not widely perceptible. Consequently, at the selected road traffic noise receptors the magnitude of the predicted change in noise levels uses the scale shown in *Table 15.8* with respect to construction traffic. The criteria are based on the current guidance on short-term changes in traffic noise levels in DMRB.

15.5.4.3 Construction Vibration

For all activities except blasting, construction vibration impact criteria at the nearest NSRs have been taken from BS 5228-2:2009 for this assessment as shown in *Table 15.9*.

Table 15.9 Magnitude of impact for construction vibration (excluding blasting)

Magnitude of Impact	Vibration Level (PPV mm/s)	Effect
Negligible	0.14 to 0.3	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
Minor	0.3 to < 1	Vibration might be just perceptible in residential environments.
Moderate	1.0 to <10	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
Major	>= to 10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

For blasting activities the guidance in BS 6472-2:2008 has been used. Daytime PPVs of up to 6 mm/s are classified as minor impact, between 6 and 10 mm/s are classified as moderate, and exceedances of 10 mm/s are a major impact. Night-time PPVs below 2 mm/s are classified as minor impacts, between 2 and 4 mm/s are classified as moderate, and exceedances of 4 mm/s are a major impact. As per the requirements of BS 6472-2:2008 these limits should not be exceeded by more than 10% of blasts, and no blast should exceed them by more than 50%.

To avoid the potential for damage to occur to underground services, the criteria stated in BS 5228-2:2009 should not be exceeded. For continuous vibration the limit to the PPV is 15 mm/s and for transient vibration it is 30 mm/s.

15.5.4.4 Groundborne Noise

The proposed tunnelling and the operation of the turbines have the potential to generate groundborne noise at nearby receptors. There are no UK legislative standards or criteria that define when groundborne noise becomes significant. The most relevant guidance is in *'Measurement and assessment of groundborne noise and vibration'* (Association of Noise Consultants, 2020) which described a number of published guidelines for assessing impacts of groundborne noise. This includes the guidelines published by the American Public Transit Association which suggest criteria for acceptable maximum levels of groundborne noise affecting various building types, including a criterion of 35 dB L_{Amax} for groundborne noise affecting residential properties, during the day or night. This criterion is increasingly being adopted (as 35 dB L_{ASmax}) by Local Authorities in the UK when defining acceptable groundborne noise levels for new developments. These criteria are typically applied to permanent groundborne noise sources, such as new underground railway lines, however in the absence of suitable alternative criteria these have also been applied to the assessment of groundborne noise during construction. The criteria are detailed in *Table 15.10*.

Table 15.10 Magnitude of impact for groundborne noise

Magnitude of Impact	Groundborne noise (dB L_{ASmax})
Negligible	30
Minor	35
Moderate	40
Major	45

15.5.4.5 Operational Industrial Noise

With regard to operational airborne noise, the classification of magnitude of impacts is presented in *Table 15.11* which is based upon the advice of BS 4142:2014 (levels during the operational phase and then subtracting the measured *background sound level* from the *rating level*).

Table 15.11 Magnitude of impact for operational sound

Magnitude of Impact	BS4142 Descriptor	Difference Between Rating and Background Levels
Negligible (Very Low)	Indication of a low effect, depending upon context	≤ 0
Minor (Low)	Indication of a adverse impact, depending upon context	+5 dB approx.
Moderate (Medium)	Indication of a significant adverse impact, depending upon context	+10 dB approx.
Major (High)	No BS 4142 descriptor for this magnitude level	> +15

The above criteria do not include consideration of the context, which is a requirement of BS 4142:2014.

15.5.4.6 Operation – Groundborne Vibration

With regard to operational groundborne vibration, the classification of magnitude of impacts is presented in *Table 15.12* which is based upon the advice of BS 6472-1:2008 for the avoidance of adverse comment. Groundborne vibration is assessed separately for construction and operation because the source is effectively permanent and therefore has the potential to result in greater effects. The guidance in BS 6472-1:2008 relates to permanent sound sources as opposed to temporary sources which are covered in BS 5228:2009.

Table 15.12 Groundborne vibration magnitude of impact

Internal Vibration Level (VDV, $ms^{-1.75}$)		Magnitude of Impact
Day	Night	
< 0.2	< 0.1	Negligible
0.2 – 0.4	0.1 – 0.2	Minor
0.4 – 0.8	0.2 – 0.4	Moderate
> 0.8	>0.4	Major

The Power Cavern Complex is around 450 m below ground level. At this distance the vibration from the operation of the turbines will not exceed the limit of 15 mm/s at which damage to underground services may occur. Therefore the potential for damage to underground services by the operation of the Development is negligible and this has been excluded from the scope of the assessment.

15.5.4.7 Significance of Effects

Based on the derived magnitude of impact and the sensitivity of the receptor to noise and / or vibration, the significance of effects are as shown in *Table 15.13*.

Table 15.13 Significance Criteria

	Magnitude of Impact			
Sensitivity of Receptor	Major	Moderate	Minor	Negligible
Very High	Major	Major	Moderate	Minor
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible

Table 15.14 puts the levels of the magnitude of adverse impacts and effect significance in context. This is based on the IEMA Guidelines for Environmental Noise Impact Assessment and the UK Government's Planning Practice Guidance (PPG) web-based resource.

Table 15.14 Magnitude of Impact and Significance of Effect

Magnitude of Impact	Effect	Significance
Major	Disruptive, causes a material change in behaviour and / or attitude. Potential for sleep disturbance. Quality of life diminished due to change in character of the area.	More likely to be significant
Moderate	Intrusive, noise can be heard and causes small changes in behaviour and / or attitude. Potential for non-awakening sleep disturbance. Affects the character of an area such that there is a perceived change in the quality of life.	↕

Minor	Non-intrusive, can be heard but does not cause any change in behaviour or attitude. Can slightly affect the character of an area but not such that there is a perceived change in the quality of life.	Less likely to be significant
Negligible	No discernible effect on the receptor.	Not Significant

The above significance derivation does not apply to the assessment of potential for damage to underground services. BS 5228-2:2009 does not provide significance of effect criteria for assessing vibration impacts on building services in the context of Environmental Impact Assessment (EIA). The significance of effect is therefore applied based upon whether the predicted vibration levels meet the BS 5228-2:2009 limits. Where the limits are not exceeded, this has been classified as being Not Significant. Where they are exceeded, they are considered Significant.

15.5.5 Assessment Methodology Summary

The previous subsections have detailed the various methods and criteria relevant to the assessment of noise and vibration. *Table 15.15* summarises the assessment methodology relevant to each of the identified sources of noise and vibration impacts.

Table 15.15 Summary of Assessment Methodology and Criteria for Impacts

Phase	Potential Impact Origin	Assessment Method Reference	Criteria for Impacts Reference	Scope In/Out
Construction	Site Activity – Equipment Noise (Airborne)	BS 5228-1:2009	Table 15.7	Scoped In
	Site Activity – Equipment Vibration	BS 5228-2:2009	Table 15.9	Scoped In
	Site Activity – Equipment Noise (Groundborne)	Para. 15.4.4 Ground Bourne Noise Section	Table 15.10	Scoped In
	Site Activity – Blasting (Vibration & Air Overpressure)	BS 6472-2:2008	Para 15.4.4 Construction Vibration Section	Scoped In
	Site Activity – Haul Roads	BS 5228-1:2009	Table 15.7	Scoped In
	Off-Site Activity – Public Roads	DMRB & CRTN & NAC	Table 15.8	Scoped In
Operation	Site Activity – Equipment Noise	BS 4142:2014	Table 15.11	Scoped In
	Site Activity – Equipment Vibration	BS 6472-1:2008	Table 15.12	Scoped Out
	Site Activity – Low Frequency Noise	-	-	Scoped Out
	Off-Site Activity – Public Roads	-	-	Scoped Out

Note activities during the decommissioning phase are expected to be less intensive than activities during the construction phase as there will be no requirements for tunnelling, blasting and large scale earthworks. Impacts from the decommissioning will therefore be no worse than those predicted during the construction phase and consequently the construction phase is decommissioning phase has not been assessed further in this chapter.

15.5.6 Limitations And Assumptions

In order to ensure a robust assessment of the likely significance of the environmental effects of the Development, the assessment has been undertaken adopting reasonable worst-case assumptions, where necessary.

The following are the robust but reasonable worst-case scenario assumptions (maximum/minimum) parameters for the purposes of the noise assessment with regard to construction/operation of the Development:

- The quantitative assessment has been undertaken at the worst case NSRs, it is assumed that predicted noise levels at more distant NSRs would be less due to the additional propagation distance.
- Construction and operational noise level predictions in the assessment are based on a "flat ground" assumption as a worst case assumption. It is considered worst case on the basis that land topology will likely provide greater screening than that modelled for some NSRs.
- The upgrade of existing and construction of new Access Tracks has been assessed by assuming all construction plant associated with those activities would be located at the closest approach along the track to the receptor for the duration of the activity. In practice they will move passed the closest point over time.

- The assessment of construction road traffic on public roads is based on the assumption that all links will carry all development construction traffic. In practice this would not occur.
- The operational plant and equipment at the Upper Reservoir would be designed to not exceed more than 70 dBA at 5 m.
- Operation noise assessment has been undertaken on the basis that noise emissions from operational sound sources would be 24/7 in nature.

15.6 Baseline Environment

Existing sound levels in the vicinity of the Development are dominated by forestry activities within the area and road traffic on local roads. The existing sound climate is therefore typical of a rural area in the Scottish Highlands.

15.6.1 Noise Sensitive Receptors

The NSRs likely to be most exposed to the sound emissions from the Development have been identified, as shown in *Figure 15.1: Sensitive receptors considered as part of Noise and Vibration impact Assessment (Volume 3: Figures).*

The area potentially affected by noise during construction of the Development is a much larger area than that of its operation. The worst affected NSRs have therefore been identified differently for construction and operation as discussed in following subsections.

15.6.1.1 Construction Assessment NSRs

Almost 500 Ordnance Survey Data address points have been initially considered around the Development with the furthest approximately 4.7 km from related tracks or activities during construction (and 5 km from the red line boundary). Only a subset have been assessed quantitatively and were selected as follows:

The address point was less than 1 km from any construction Access Track, with the exception of receptors NSR229 NSR238, NSR244 which were retained as they represented receptors closest to the Headpond in the east and are situated between access to the north and south.

Of those that remain, many in the Inveraray area near the access closest to the jetty (known as Upper Avenue) are closely spaced and can be represented by single receptors closer to the Access Tracks along its route. The closest in this area is 17 m from the Upper Avenue Access Track (NSR278) whereas the furthest receptor is 524 m (NSR317).

The remaining subset of NSRs that have been assessed quantitatively are referred to as the *worst affected* NSRs. A figure showing the complete set of over 450 address points considered by this assessment along with those identified as worst affected NSRs highlighted is provided in *Figure 15.1: Sensitive receptors considered as part of Noise and Vibration impact Assessment (Volume 3: Figures).*

15.6.1.2 Operational Assessment NSRs

The following NSRs represent the properties closest to the Development's operational activities and will therefore be exposed to the highest noise levels of all NSRs. This means that the worst-case impacts are considered, impacts at other NSRs will be of lower magnitude than those identified at these locations.

Table 15.16 Identified Noise-Sensitive Receptors

Receptor	Description	Receptor Type	Sensitivity of Receptor	Distance to Nearest Operational Sound Source (m)
NSR059	North of Headpond and closest to substation	Residential	High	2537
NSR090	West of construction tunnel vent shaft	Residential	High	1370
NSR373	South-west of construction tunnel vent shafts	Residential	High	2470
NSR375	South-west of construction tunnel vent shafts	Residential	High	2573
NSR376	West of construction tunnel vent shaft	Residential	High	1460
NSR377	West of construction tunnel vent shaft	Residential	High	1520
NSR378	West of construction tunnel vent shaft	Residential	High	1422

15.6.2 Baseline Sound Level Monitoring

Long-term and short-term baseline sound monitoring has been completed at eight locations (L1 to L4 and S1 to S4) which were considered representative of the closest identified sensitive receptors. The monitoring locations are shown in *Figure 15.2 (Volume 3: Figures)*.

Measurements have been conducted in accordance with the principles of BS 7445-1:2003 'Description and Measurement of Environmental Noise Part 1: Guide to Quantities and Procedures' and BS 4142:2014. Details of instrumentation and meteorological conditions can be found in *Appendix 15.2* along with a plot of the time histories for the long-term survey locations and logged levels at both the long-term and short-term measurement locations.

A summary of the baseline monitoring results is provided in *Table 15.17*. All measurements are free-field. The equivalent sound levels in the Table have been derived from the logarithmic average of the measured $L_{Aeq,15min}$ values over the relevant time period. The L_{A90} levels are presented for both the mode and arithmetic mean of all L_{A90} measurements made during the time period referenced.

Table 15.17 Summary of Sound Monitoring Data (Short and Long-Term)

S1 (11:00 – 03/08/2023 : 10:45 – 04/08/2023)

Period	Start	End	L_{Aeq}	L_{AFmax}	L_{A90} Mode	L_{A90} Mean
Day	07:00	19:00	54	107	37	36
Evening	19:00	23:00	42	64	36	33
Day-Evening	07:00	23:00	54	107	37	37
Night	23:00	07:00	39	69	25	26

S2 (12:15 – 03/08/2023 : 12:00 – 04/08/2023)

Period	Start	End	L_{Aeq}	L_{AFmax}	L_{A90} Mode	L_{A90} Mean
Day	07:00	19:00	42	71	35	35
Evening	19:00	23:00	39	71	33	36
Day-Evening	07:00	23:00	42	71	33	33
Night	23:00	07:00	33	58	28	29

S3 (12:45 – 03/08/2023 : 12:30 – 04/08/2023)

Period	Start	End	L_{Aeq}	L_{AFmax}	L_{A90} Mode	L_{A90} Mean
Day	07:00	19:00	50	95	41	40
Evening	19:00	23:00	44	71	39	39
Day-Evening	07:00	23:00	50	95	42	41
Night	23:00	07:00	40	56	35	37

S4 (15:00 – 03/08/2023 : 16:00 – 03/08/2023)

Period	Start	End	L_{Aeq}	L_{AFmax}	L_{A90} Mode	L_{A90} Mean
Day	15:00	15:05	57	75	55	55
Day	15:15	15:20	56	69	55	55

Day	15:30	15:35	58	75	55	55
Day	15:45	16:50	56	70	55	55

L1 (19:00 – 27/07/2023 : 07:00 – 03/08/2023)

					L_{A90}	L_{A90}
Period	Start	End	L_{Aeq}	L_{AFmax}	Mode	Mean
Day	07:00	19:00	55	87	40	40
Evening	19:00	23:00	56	98	35	36
Day-Evening	07:00	23:00	55	98	41	39
Night	23:00	07:00	49	84	34	35

L2 (19:00 – 27/07/2023 : 07:00 – 03/07/2023)

					L_{A90}	L_{A90}
Period	Start	End	L_{Aeq}	L_{AFmax}	Mode	Mean
Day	07:00	19:00	65	104	36	36
Evening	19:00	23:00	60	99	38	38
Day-Evening	07:00	23:00	64	104	37	35
Night	23:00	07:00	55	89	39	39

L3 (19:00 – 27/07/2023 : 07:00 – 03/082023)

					L_{A90}	L_{A90}
Period	Start	End	L_{Aeq}	L_{AFmax}	Mode	Mean
Day	07:00	19:00	45	85	38	38
Evening	19:00	23:00	43	79	43	43
Day-Evening	07:00	23:00	44	85	38	38
Night	23:00	07:00	44	85	42	43

L4 (19:00 – 27/07/2023 : 07:00 – 03/08/2023)

					L_{A90}	L_{A90}
Period	Start	End	L_{Aeq}	L_{AFmax}	Mode	Mean
Day	07:00	19:00	44	75	39	39
Evening	19:00	23:00	43	68	44	44
Day-Evening	07:00	23:00	44	75	38	39
Night	23:00	07:00	42	65	42	42

Each measurement location is used to represent the prevailing baseline sound levels at one or more NSRs. The $L_{Aeq,T}$ is below 60 dB at all monitoring location with the exception L2 where is it 65 dB $L_{Aeq,12hr}$ and 64 dB $L_{Aeq,18hr}$.

15.6.3 Underground Services

These are not sensitive to noise but are sensitive to vibration due to the potential for damage to occur during construction of the Development.

15.6.4 Existing Vibration Levels

There are currently no known significant sources of vibration in the area. Consequently, ambient vibration monitoring has not been undertaken. It should be noted that annoyance due to vibration is not related to the comparison of pre and post-development vibration levels, and pre-development vibration levels are not usually necessary to assess the likelihood of vibration damage or annoyance from any new vibration sources likely to be introduced into the area. Therefore, consideration of existing vibration levels is excluded from the assessment.

15.7 Assessment of Effects

This section presents the findings of the assessment for the construction and operational phases. The assessments consider the potential causes of impacts quantitatively, the sensitivity of NSRs (and infrastructure) that could be affected, and the magnitude of impacts, in order to derive the classification of effects.

15.7.1 Construction Phase

Construction work of any type that involves heavy plant activity will generate noise, which may result in complaints if appropriate scheduling and control of works is not exercised. Noise levels generated by construction activities and experienced by NSRs, depends upon a number of variables, the most significant of which are:

- The level of noise generated by plant or equipment used on-site, generally expressed as the sound power level;
- The periods of operation of the plant on the Development Site, known as its ‘on-time’;
- The distance between the noise source and the NSR; and,
- The attenuation of sound due to ground absorption, air absorption and barrier effects.

To evaluate noise effects during the construction phases it is necessary to have knowledge of the variables listed above. Construction Contractors may use different working methods and plant to achieve the same ends. An accurate construction noise and vibration effect assessment is not possible until after the appointment of an approved Construction Contractor with knowledge of the exact working routine and plant schedule to be implemented.

Nevertheless, in order to present a quantitative assessment, assumptions regarding the plant required for different activities have been made. The assessment has adopted a worst-case approach by assuming all plant will operate simultaneously. In practice the actual levels at receptors are likely to be lower than calculated. It must be emphasised that the information used within the assessment is unlikely to be adopted exactly by any contractor and therefore the outcomes of the construction assessment should be viewed in this context.

The use of construction plant and the likely noise effect from its use is determined using the guidance detailed in BS 5228. Where necessary, mitigation methods may be required to attenuate noise to acceptable levels at NSRs. Should complaints be received from local residents, ABC would determine whether BPM is being applied. Should this not be the case, action under the Control of Pollution Act 1974 may be taken.

The anticipated activities with the potential to generate significant levels of noise at receptors are as follows:

- Enabling Works:
  - Existing access improvements.
- Mobilisation, including the following activities:
  - Construction of new Access Tracks to borrow pits;
  - Construction Compound setup (temporary and permanent); and
  - Test audit and confirmatory site investigation.

- Headpond construction, including the following activities:
  - Form access including bridges / culverts, site clearance;
  - Preparatory works: construction diversion, foundation improvements and stabilisation works;
  - Borrow pit opening and operation including Embankment works; and
  - Concrete works: core cutoff, inlet / outlet gate shafts and concrete spillway.
- Tailpond construction, including the following activities:
  - Temporary works in Loch Awe;
  - Temporary B840 realignment;
  - Site clearance;
  - Concrete works: inlet / outlet shaft and gate shaft construction;
  - Rock excavation in Loch Awe and Installation of rock armour; and
  - Disassembly of temporary works.
- Tunnelling works, including the following activities:
  - Form access to portal sites; and
  - Construction of tunnel portals.
- Switchyard activities;
  - Site clearance;
  - Superstructure; and
  - AIS Switchyard construction
- Temporary Marine Facility with jetty construction activities:
  - Form access;
  - Site clearance and compound setup;
  - Jetty piling;
  - Lifting and placing of jetty deck; and
  - Removal of jetty deck post AIL delivery.

Sections 15.6.0 to *15.6.6* together present an assessment of all significant noise and vibration generating activities required to be undertaken as listed above.

15.7.1.1 Construction Noise – Surface Plant All Works

Predictions have only included equipment anticipated to be located above ground or within a tunnel portal. The airborne sound of equipment working within the tunnels should not generate noise levels at NSRs to the same level.

The following activities listed in *Table 15.18* have been identified from the Construction Programme (*Insert 2.1* in *Chapter 2: Project and Site Description*) and the duration of each activity is also provided.

Construction activities have been grouped into phases though phases are not strictly chronological (i.e. an activity in Phase 3 can start before an activity in Phase 2). Predictions have been performed of the sound emissions from the different construction activities at the identified worst case NSRs on a monthly basis using the start and end dates provided. Activities that start or end mid-month have received an on-time correction applied for that month based on the number of daytime construction hours available in the month and the amount potentially utilised. Predicted noise levels for each month represent the worst-case day for that month.

Table 15.18. Construction noise activity programme

Construction Areas	Task ID	Major Construction Activities	Start Date	End Date
		Phase 1		
Enabling works	P1-A1-T1	Existing access improvements	19/01/2027	05/07/2027
		Phase 2		
General Mobilisation	P2-A1-T1	Construction of new Access Tracks – road construction	06/07/2027	13/03/2028
	P2-A1-T2	Construction Compound setup (temporary and permanent)	06/07/2027	20/12/2027
	P2-A1-T3	Temporary jetty construction	06/07/2027	05/06/2028
	P2-A1-T4	General HGV movements within RLB	14/03/2028	30/12/2031
Headpond	P2-A2-T1	Construction of access including bridges and culverts	06/07/2027	13/03/2028
	P2-A2-T2	Site clearance	14/03/2028	08/05/2028
	P2-A2-T3	Construction diversion	14/03/2028	08/05/2028
	P2-A2-T4	Stabilisation works	09/05/2028	28/08/2028
Tailpond	P2-A3-T1	Temporary B840 Realignment Works	06/07/2027	10/04/2028
	P2-A3-T2	Inlet / outlet area	11/04/2028	31/07/2028
	P2-A3-T3	Site clearance	11/04/2028	08/05/2028
	P2-A3-T4	Trench construction for gatehouse and tailrace	09/05/2028	15/01/2029
Tunnelling works	P2-A4-T1	Form access to portal sites	06/07/2027	30/08/2027
	P2-A4-T2	Tunnel portal – construction	31/08/2027	20/12/2027
	P2-A4-T3	Tunnel portal – PT	06/07/2027	25/10/2027
	P2-A4-T4	Tunnel excavation material transport	20/12/2027	30/10/2029
Switchyard	P2-A5-T1	Groundworks	06/07/2027	20/12/2027
	P2-A5-T2	Superstructure construction	21/12/2027	20/11/2028
		Phase 3		
Headpond	P3-A1-T2	Opening and operation of borrow pit	06/07/2027	13/03/2028
	P3-A1-T3	Construction of Embankments	10/04/2029	10/02/2031
	P3-A1-T4	Construction of spillway	22/10/2028	28/06/2029
	P3-A1-T5	Construction of inlet / outlet and gate shafts	14/03/2028	30/07/2029
Tailpond	P3-A2-T1	Temporary works in Loch Awe	06/07/2027	05/06/2028
	P3-A2-T2	Construction of inlet / outlet and gate shafts	16/01/2029	03/06/2030
	P3-A2-T3	Construction of inlet / outlet structure	16/01/2029	03/06/2030
Switchyard	P3-A3-T1	Superstructure construction	21/12/2027	20/11/2028
	P3-A3-T2	AIS Switchyard	21/11/2028	22/10/2029
		Phase 4		
Lower Reservoir	P4-A1-T1	Rock excavation in front of inlet and armouring works	04/06/2030	26/08/2030

Note that this table is the construction noise activity programme. Some of the activities are part of more than one phase, but are not a second noise activity and so only appear above under a single phase, these are:

- Upper Reservoir – Site clearance which is also Phase 3
- Lower Reservoir – Trench construction for gatehouse and bifurcation which is also Phase 3
- Upper Reservoir – Opening and operation of borrow pit which is also Phase 4
- Upper Reservoir – Embankment construction Works which is also Phase 4
- Lower Reservoir – Construction of inlet and gate shafts which is also Phase 4
- Lower Reservoir – Construction of inlet/outlet structure which is also Phase 4
- Switch room building and HV Switchyard – AIS Switchyard which is also Phase 4

Whilst the actual phasing of the works may change depending on final construction proposals, it is considered unlikely that more activities will be undertaken. Therefore, the modelling considers a worst-case scenario.

The ground heights at the Headpond will change as the works progress and the excavation deepens, which will introduce barrier effects to receptors. Flat ground height has been used in the modelling of different phases, which is a worst-case assumption.

Sound power levels for each item of equipment for each construction activity have been sourced from BS 5228-1, which gives measured noise levels for various items of construction plant. The source data input into the noise model are given in *Appendix 15.3 (Volume 5: Appendices)*.

The inherent uncertainty in the modelling procedures and the processes implemented to minimise the uncertainty are discussed in *Appendix 15.4 (Volume 5: Appendices)*.

Where the construction equipment required for an activity will be located within a specific area, the sound power levels of the equipment have been summed and the overall level has been assigned to an area source. Where significant mobile plant movements are required to transport spoil between tunnel portal and other areas for moving spoil, these have been modelled as moving point sources at a maximum speed of 20 km/h. However, it is worth noting that the speed entirely depends on the design speed of the construction track that and could be less than 20 km/h.

In addition, following the completion of the construction Access Tracks we have assumed that all tracks will observe average of 3.25 HGV movements per hour at 20 km/h (based on 59 movements in a 12 hour day) relating to general site logistics.

Construction noise levels have been predicted using the noise modelling software package CadnaA 2023, which implements the standard noise prediction methodology given in BS 5228-1+A1:2014. The model includes the assumes a flat ground topography of the Development Site and surrounding area as a worst case assumption, as well as soft ground absorption properties. The modelling approach assumes that all receptors are downwind of all contributing noise sources.

During construction, it is expected that the noisiest activities will be the drilling and, blasting during the construction works for the Headpond and tunnelling. The noise from blasting has been assessed separately below.

At close proximity to the tunnel excavation, airborne noise from this equipment is likely to be high. However, for the majority of this tunnelling activity (i.e. the excavation by drill and blast methods) will be underground and will therefore be further screened from NSRs.

The measured baseline sound levels at all monitoring locations, rounded to the nearest 5 dB, are 5 dB or more below the Category A Threshold Values within BS 5228-1 shown in *Table 16.1* with the exception of L2, which is 65 dB $L_{\mathrm{Aeq,12hr}}$. L2 is located at a property less than 5 metres from the A819, it is located 200 m from the nearest Access Track and is potentially affected by only HGV movements on the A819 rather than construction site work noise. Construction traffic noise affecting noise sensitive receptors along public roads is not assessed against BS5228-1, therefore on this basis the applicable Threshold Values for the construction noise assessment at all NSRs are from Category A; 65 dBA, 55 dBA and 45 dBA during the day, evening and night-time respectively. This is the most stringent assessment category.

Construction noise levels have been predicted at the receptors identified as the worst affected NSRs using a 12 hour construction working day, based on 07:00 – 19:00. For assessment purposes, it is assumed that all the equipment listed in *Appendix 15.3 (Volume 5: Appendices)* for each construction activities listed in Table 15.18 would be operating simultaneously throughout the months they are scheduled for. Therefore, they are based upon the proposed working hours and the monthly schedule in *Table 15.18*, the $L_{\mathrm{Aeq,1h}}$ noise levels have been predicted for a theoretical 'worst-case day'.

Construction noise levels have been predicted "without" and "with" contribution from tasks relating to the upgrade or preparation of new Access Tracks, namely Task ID's:

- P1-A1-T1 – Existing access improvements
- P2-A1-T1 – Construction of new Access Tracks – road construction; and
- P2-A3-T1 – Temporary B840 Realignment works

When determining the construction noise levels "with" the contribution from these tasks, the tasks have been assumed to be located at the closest approach to an NSR from the nearest Access Track. Each NSR is only considered to receive the noise contribution from tasks being undertaken at the closest point to the closest Access Track. The tasks are assumed to be located at these locations for the full duration of the task as stated in *Table 15.18*. This is a conservative approach as in practice the Access Track tasks are linear in nature and will therefore only be at their worst location as they pass the NSR, furthermore the assumption that all equipment required for the task compounds the worst-case assumption. The “without” contribution from the Access Track construction scenario allows the typical levels experienced by receptors during a typical day in a given a month to provide context of what the significance the Access Track might have when works are at their closest point to the NSRs.

These conservative assumptions have been used when establishing the predicted levels from the construction activities as it is too early to identify the precise timing of each task, i.e. where crews will be along each Access Track on a given day.

Table 15.19 and *Table 15.20* show the predicted free-field construction noise levels at each receptor for each month of the construction programme *without* contribution from the Access Track construction activities for the first and second 30-month periods. The results are without the benefit of embedded mitigation discussed in *Section 15.7.*

Table 15.21 and *Table 15.22* show the predicted free-field construction noise levels at each receptor for each month of the construction programme *with* contribution from the Access Track construction activities for the first and second 30 month periods. The results are without the benefit of embedded mitigation discussed in *Section 15.7.*

The following paragraphs discuss the worst affected NSRs in some detail to provide context to the levels presented in the result tables.

NSR090 – This receptor is located approximately 43 m from the planned Temporary B840 Realignment road and it can be seen that a potential exceedance of 8 dB over the threshold value 65 dB $L_{\mathrm{Aeq,T}}$ is only predicted during the period corresponding to the construction of the new road between Jul-27 to Apr-28, see task P2-A3-T1. Therefore, while activity will be noticeable during this time it will not be occurring at a distance of 43 m for the total duration as has been assessed and will gradually move over time, meaning adverse effects will be reduced.

NSR220, NSR424 & NSR216 – The Access Track near Inveraray castle may require upgrades in some places to accommodate the construction traffic as part of task P1-A1-T1. These receptors are located approximately 45 m, 83 m and 106 m from the existing Access Track at Inveraray castle respectively. It is predicted that exceedances at these receptors only occur during track upgrade task Jan-27 to Jul-27, the exceedances at NSR220, NSR424 & NSR216 are 11 dB, 3 dB and 1 dB respectively. As above these works will move gradually in practice and will not be located at the closest approach for the duration of the task as assessed here.

NSR278 – As this receptor is located 17 m from the existing Access Track (Upper Avenue) near the jetty designated for upgrade an exceedance of 20 dB over the 65 dB $L_{\mathrm{Aeq,T}}$ threshold value is predicted over most of Jan-27 to Jul-27. It is important to note that in practice the upgrade of the Access Track will be localised and undertaken where needed and will be in the vicinity of NSR for a much shorter duration than that assumed for the quantitative predictions.

The calculations for the receptors above have assumed that the Access Track/road work will be undertaken by all equipment at the same time for the total duration of the relevant task. In practice the equipment will only be in the vicinity of the NSR for a much shorter duration than that assumed for the quantitative predictions. Therefore, due to the relative short duration of the Access Track / road works it is expected that the potential adverse effects can be managed by minimising the amount of time in proximity to the receptor, observing the good practices to reduce noise as well as communicating plans/progress and changes with residents. The application of these general mitigation measures are also referenced in *Section 15.8 Mitigation and Monitoring*.

NSR376 – This receptor is located approximately 35 m from the boundary of the northernmost temporary compound at the Lower Reservoir (Loch Awe). Predicted levels exceed the 65 dB $L_{\mathrm{Aeq,T}}$ threshold value by no more the 3 dB during the period the compound will be established Apr-27 to Dec-27. The predicted levels have assumed the setup task will occur throughout this period however there are more than 15 compounds (temporary or permanent) that require setup over this period. Therefore, actual levels are likely to be lower than the threshold value, and in addition the application of good practice to reduce construction noise levels will also support this.

NSR378 – This receptor is located approximately 81 m from the Temporary B840 Realignment, therefore for explanation of these exceedances from Jul-27 to Apr-28 see NSR090 above. In addition, the exceedances are also contributed by task P2-A1-T2 during the setup of the main Tailpond temporary Construction Compound which may occur until Dec-27. This task relates to all permanent and temporary compounds and therefore a single compound will not likely require the entire Jun-27 to Dec-27 duration to complete. The receptor is approximately 40 m from the main temporary compound and is typically closest to activities listed under Lower Reservoir, see *Appendix 15.3 (Volume 5: Appendices)*. Exceedances beyond Apr-28 when the Temporary B840 Realignment work is complete is due to any task labelled under Lower Reservoir. The predicted exceedances are no more than 7 dB over the 65 dB $L_{Aeq,T}$ threshold value. It is worth noting that for each task at the Tailpond (and everywhere else) we have assumed that all equipment is in use simultaneously whereas in practice its use will be staggered and potentially used less than the on-times used in this assessment suggest.

NSR041 & NSR440 – These receptors are approximately 120 and 260 m from the closest part of the temporary jetty respectively. During task P2-A1-T3 (the temporary jetty construction), the piling is assumed in continuous operation over 60% of the reference period (i.e. 12 hour weekday) and it is the dominating noise source for that task under this assumption as it is at least 20 dB higher than any other piece of equipment used in the task (see *Appendix 15.3 (Volume 5: Appendices)*). The associated sound power level has been selected based on historic data provided in BS5228-1 Table D.4, namely Ref 21 and 62 both are diesel piling hammer types applied to tubular casings (as opposed to sheet piles) and both have associated sound power level of 132 dB(A). These have been selected as the basis for the piling noise predictions from the temporary jetty construction because they match the expected piling method and represent the most conservative option for the assessment i.e. Table D.4 Ref 62 is identical to Ref 61 which is 10 dB $L_{Aeq,T}$ lower as it has a lower power rating. Furthermore, the closest approach of the temporary jetty to the closest receptor (NSR440) is 120 m – the receptor is also adjacent to the red line boundary. At NSR440 it can be seen that for 11 of the 12 months it is potentially operational it exceeds the lower Category A weekday daytime and Saturday AM limit of 65 dB $L_{Aeq,T}$ by 10 dB at most, at NSR041 this is 3 dB exceedance at most.

Further to this it can also be observed that when contribution of track access works is included the exceedance at NSR440 increase to 11 dB $L_{Aeq,T}$ from 10 dB $L_{Aeq,T}$ at worst. Suggesting that staggering the track access preparation with the piling activities would help to reduce overall noise levels across a given day/week/month.

As piling is the dominating noise source any noise reduction strategy would need to address the piling first. Piling noise reduction mitigation is considered for this task later in the chapter.

Table 15.19 Predicted Construction Noise Levels Jan-27 to Jun-29 (without Access Track Construction contributions and without Embedded Mitigation benefit), dB $L_{Aeq,T}$

	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	Feb-28	Mar-28	Apr-28	May-28	Jun-28	Jul-28	Aug-28	Sep-28	Oct-28	Nov-28	Dec-28	Jan-29	Feb-29	Mar-29	Apr-29	May-29	Jun-29
NSR023							40	41	41	41	41	41	40	40	41	42	42	38	37	37	37	37	37	37	37	37	37	37	37	37
NSR027							39	40	40	40	40	40	39	39	40	41	41	37	35	35	35	35	35	35	35	35	35	35	35	35
NSR030							41	41	41	41	41	41	40	40	41	42	42	39	38	38	38	38	38	38	38	38	38	38	38	38
NSR040							62	63	63	63	63	63	62	62	62	62	62	54	38	38	38	38	38	38	38	38	38	38	38	38
NSR041							67	68	68	68	68	68	68	68	68	68	68	59	42	42	42	42	42	42	42	42	42	42	42	42
NSR057							57	57	57	57	57	57	57	57	57	57	57	49	34	34	34	34	34	34	34	34	34	34	34	34
NSR059							46	47	47	47	46	46	45	45	42	36	36	36	36	36	36	36	36	35	35	35	35	39	40	40
NSR060							45	46	46	46	46	46	44	44	45	46	46	42	41	41	41	41	41	41	41	41	41	41	41	41
NSR066							57	57	57	57	57	57	57	57	57	57	57	49	33	33	33	33	33	33	33	33	33	33	33	33
NSR087							56	56	56	56	56	56	56	56	56	56	56	48	41	41	41	41	41	41	41	41	41	41	41	41
NSR090							63	63	63	63	63	62	57	57	55	57	59	58	57	55	55	55	55	55	58	60	60	60	60	60
NSR127							26	27	27	27	27	25			43	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
NSR147							26	27	27	27	27	25			48	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
NSR207							43	44	44	44	44	43	43	43	46	47	47	46	45	45	45	45	45	45	45	45	45	45	45	45
NSR209							43	44	44	44	44	43	43	43	46	48	48	46	46	46	46	46	46	46	46	46	46	46	46	46
NSR210							43	44	44	44	44	43	43	43	45	47	47	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR211							43	44	44	44	44	43	43	43	46	47	47	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR216							39	40	40	40	40	40	39	39	43	45	45	44	44	44	44	44	44	44	44	44	44	44	44	44
NSR220							44	44	44	44	44	44	43	43	49	51	51	51	50	50	50	50	50	50	50	50	50	50	50	50
NSR221							43	44	44	44	44	43	43	43	46	47	47	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR225							43	44	44	44	44	43	43	43	44	45	45	42	41	41	41	41	41	41	41	41	41	41	41	41
NSR229							43	44	44	44	44	43	43	43	40	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
NSR247							36	37	37	37	37	37	37	37	39	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
NSR273							29	29	29	29	29	27			33	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
NSR278							51	52	52	52	52	51	47	47	53	55	55	54	54	54	54	54	54	54	54	54	54	54	54	54
NSR298							40	41	41	41	41	41	40	40	41	42	42	38	37	37	37	37	37	37	37	37	37	37	37	37
NSR301							54	55	55	55	55	54	52	52	53	53	53	46	42	42	42	42	42	42	42	42	42	42	42	42
NSR317							59	60	60	60	60	60	59	59	59	59	59	51	40	40	40	40	40	40	40	40	40	40	40	40
NSR348							51	52	52	52	52	50	48	48	49	49	49	44	43	43	43	43	43	43	43	43	43	43	43	43
NSR366							26	27	27	27	27	25			43	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
NSR373							53	54	54	54	54	53	52	52	49	44	45	44	44	42	42	42	42	42	45	46	46	46	46	46
NSR375							53	54	54	54	54	53	52	52	49	44	45	44	44	42	42	42	42	42	44	46	46	46	46	46
NSR376							67	68	68	68	68	66	54	54	52	52	54	52	52	49	49	49	49	49	53	55	55	55	55	55
NSR377							63	63	63	63	63	61	53	53	51	52	53	52	51	48	48	48	48	48	52	54	54	54	54	54
NSR378							62	62	62	62	62	62	61	61	60	64	67	66	66	65	65	65	65	65	68	69	69	69	69	69
NSR381															35	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR382							41	42	42	42	42	41	40	40	42	42	42	39	37	37	37	37	37	37	37	37	37	37	37	37
NSR395							28	29	29	29	29	27			40	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR397							28	29	29	29	29	27			40	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR398							26	27	27	27	27	25			43	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR399							41	42	42	42	42	41	41	41	42	43	43	40	39	39	39	39	39	39	39	39	39	39	39	39
NSR424							41	41	41	41	41	41	41	41	47	49	49	48	48	48	48	48	48	48	48	48	48	48	48	48
NSR440							74	75	75	75	75	74	73	73	73	73	73	65	43	43	43	43	43	43	43	43	43	43	43	43
NSR457							47	47	47	47	47	47	45	45	46	46	46	42	41	41	41	41	41	41	41	41	41	41	41	41
NSR466							55	55	55	55	55	55	54	54	54	54	54	47	41	41	41	41	41	41	41	41	41	41	41	41
NSR476							54	55	55	55	55	54	53	53	53	54	54	47	41	41	41	41	41	41	41	41	41	41	41	41

Table 15.20 Predicted Construction Noise Levels Jul-29 to Dec-31 (without Access Track Construction contributions and without Embedded Mitigation benefit) dB $L_{Aeq,T}$

	Jul-29	Aug-29	Sep-29	Oct-29	Nov-29	Dec-29	Jan-30	Feb-30	Mar-30	Apr-30	May-30	Jun-30	Jul-30	Aug-30	Sep-30	Oct-30	Nov-30	Dec-30	Jan-31	Feb-31	Mar-31	Apr-31	May-31	Jun-31	Jul-31	Aug-31	Sep-31	Oct-31	Nov-31	Dec-31
NSR023	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR027	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
NSR030	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
NSR040	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
NSR041	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR057	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	33
NSR059	40	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	36	33	33	33	33	33	33	33	33	33	33
NSR060	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR066	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
NSR087	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR090	60	60	60	60	60	60	60	60	60	60	60	55	54	53	41	41	41	41	41	39	38	38	38	38	38	38	38	38	38	38
NSR127	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	45
NSR147	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
NSR207	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR209	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
NSR210	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	44
NSR211	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR216	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
NSR220	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
NSR221	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR225	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR229	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
NSR247	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
NSR273	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	35
NSR278	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
NSR298	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR301	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	41
NSR317	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
NSR348	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	42
NSR366	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	45
NSR373	46	46	46	46	46	46	46	46	46	46	46	42	42	41	38	38	38	38	38	37	37	37	37	37	37	37	37	37	37	37
NSR375	46	46	46	46	46	46	46	46	46	46	46	42	42	41	38	38	38	38	38	37	37	37	37	37	37	37	37	37	37	37
NSR376	55	55	55	55	55	55	55	55	55	55	55	50	49	49	40	40	40	40	40	38	37	37	37	37	37	37	37	37	37	37
NSR377	54	54	54	54	54	54	54	54	54	54	54	49	49	48	40	40	40	40	40	38	37	37	37	37	37	37	37	37	37	37
NSR378	69	69	69	69	69	69	69	69	69	69	69	62	61	60	41	41	41	41	41	40	39	39	39	39	39	39	39	39	39	39
NSR381	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR382	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR395	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR397	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR398	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR399	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
NSR424	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
NSR440	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	42
NSR457	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR466	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR476	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41

Table 15.21 Predicted Construction Noise Levels Jan-27 to Jun-29 (with Access Track Construction contributions and without Embedded Mitigation benefit) dB $L_{Aeq,T}$

	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	Feb-28	Mar-28	Apr-28	May-28	Jun-28	Jul-28	Aug-28	Sep-28	Oct-28	Nov-28	Dec-28	Jan-29	Feb-29	Mar-29	Apr-29	May-29	Jun-29
NSR023	39	43	43	43	43	43	41	41	41	41	41	41	40	40	41	42	42	38	37	37	37	37	37	37	37	37	37	37	37	37
NSR027	43	46	46	46	46	46	42	40	40	40	40	40	39	39	40	41	41	37	35	35	35	35	35	35	35	35	35	35	35	35
NSR030	43	46	46	46	46	46	42	41	41	41	41	41	40	40	41	42	42	39	38	38	38	38	38	38	38	38	38	38	38	38
NSR040							63	64	64	64	64	64	64	64	63	62	62	54	38	38	38	38	38	38	38	38	38	38	38	38
NSR041							68	69	69	69	69	69	69	69	68	68	68	59	42	42	42	42	42	42	42	42	42	42	42	42
NSR057							58	58	58	58	58	58	58	58	58	57	57	49	34	34	34	34	34	34	34	34	34	34	34	34
NSR059							47	47	47	47	47	47	46	46	43	36	36	36	36	36	36	36	36	35	35	35	35	39	40	40
NSR060	47	51	51	51	51	51	47	46	46	46	46	46	44	44	45	46	46	42	41	41	41	41	41	41	41	41	41	41	41	41
NSR066							57	58	58	58	58	58	58	58	57	57	57	49	33	33	33	33	33	33	33	33	33	33	33	33
NSR087	47	51	51	51	51	51	56	56	56	56	56	56	56	56	56	56	56	48	41	41	41	41	41	41	41	41	41	41	41	41
NSR090							72	73	73	73	73	73	72	72	72	68	59	58	57	55	55	55	55	55	58	60	60	60	60	60
NSR127							26	27	27	27	27	25			43	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
NSR147							26	27	27	27	27	25			48	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
NSR207	57	61	61	61	61	61	53	44	44	44	44	43	43	43	46	47	47	46	45	45	45	45	45	45	45	45	45	45	45	45
NSR209	60	64	64	64	64	64	56	44	44	44	44	43	43	43	46	48	48	46	46	46	46	46	46	46	46	46	46	46	46	46
NSR210	57	60	60	60	60	60	53	44	44	44	44	43	43	43	45	47	47	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR211	57	60	60	60	60	60	52	44	44	44	44	43	43	43	46	47	47	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR216	62	66	66	66	66	66	58	40	40	40	40	40	39	39	43	45	45	44	44	44	44	44	44	44	44	44	44	44	44	44
NSR220	72	76	76	76	76	76	67	44	44	44	44	44	43	43	49	51	51	51	50	50	50	50	50	50	50	50	50	50	50	50
NSR221	56	60	60	60	60	60	52	44	44	44	44	43	43	43	46	47	47	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR225	56	60	60	60	60	60	52	44	44	44	44	43	43	43	44	45	45	42	41	41	41	41	41	41	41	41	41	41	41	41
NSR229							43	44	44	44	44	44	44	44	40	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
NSR247							36	37	37	37	37	37	37	37	39	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
NSR273	45	49	49	49	49	49	40	29	29	29	29	27			33	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
NSR278	81	85	85	85	85	85	77	52	52	52	52	51	47	47	53	55	55	54	54	54	54	54	54	54	54	54	54	54	54	54
NSR298	39	43	43	43	43	43	41	41	41	41	41	41	40	40	41	42	42	38	37	37	37	37	37	37	37	37	37	37	37	37
NSR301	48	52	52	52	52	52	54	55	55	55	55	54	52	52	53	53	53	46	42	42	42	42	42	42	42	42	42	42	42	42
NSR317	45	49	49	49	49	49	59	60	60	60	60	60	59	59	59	59	59	51	40	40	40	40	40	40	40	40	40	40	40	40
NSR348	54	58	58	58	58	58	53	52	52	52	52	50	48	48	49	49	49	44	43	43	43	43	43	43	43	43	43	43	43	43
NSR366							26	27	27	27	27	25			43	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
NSR373							54	54	54	54	54	54	53	53	51	46	45	44	44	42	42	42	42	42	45	46	46	46	46	46
NSR375							54	54	54	54	54	54	53	53	50	45	45	44	44	42	42	42	42	42	44	46	46	46	46	46
NSR376							67	68	68	68	68	66	58	58	58	55	54	52	52	49	49	49	49	49	53	55	55	55	55	55
NSR377							63	64	64	64	64	62	56	56	55	53	53	52	51	48	48	48	48	48	52	54	54	54	54	54
NSR378							67	67	67	67	67	67	67	67	66	66	67	66	66	65	65	65	65	65	68	69	69	69	69	69
NSR381															35	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR382	41	45	45	45	45	45	42	42	42	42	42	41	40	40	42	42	42	39	37	37	37	37	37	37	37	37	37	37	37	37
NSR395							28	29	29	29	29	27			40	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR397							28	29	29	29	29	27			40	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR398							26	27	27	27	27	25			43	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR399	46	50	50	50	50	50	44	42	42	42	42	41	41	41	42	43	43	40	39	39	39	39	39	39	39	39	39	39	39	39
NSR424	65	69	69	69	69	69	60	41	41	41	41	41	41	41	47	49	49	48	48	48	48	48	48	48	48	48	48	48	48	48
NSR440							75	76	76	76	76	75	75	75	74	73	73	65	43	43	43	43	43	43	43	43	43	43	43	43
NSR457	47	51	51	51	51	51	48	47	47	47	47	47	45	45	46	46	46	42	41	41	41	41	41	41	41	41	41	41	41	41
NSR466	47	51	51	51	51	51	55	55	55	55	55	55	54	54	54	54	54	47	41	41	41	41	41	41	41	41	41	41	41	41
NSR476	48	52	52	52	52	52	55	55	55	55	55	54	53	53	53	54	54	47	41	41	41	41	41	41	41	41	41	41	41	41

Table 15.22 Predicted Construction Noise Levels Jul-29 to Dec-31 (with Access Track Construction contributions and without Embedded Mitigation benefit) dB $L_{Aeq,T}$

	Jul-29	Aug-29	Sep-29	Oct-29	Nov-29	Dec-29	Jan-30	Feb-30	Mar-30	Apr-30	May-30	Jun-30	Jul-30	Aug-30	Sep-30	Oct-30	Nov-30	Dec-30	Jan-31	Feb-31	Mar-31	Apr-31	May-31	Jun-31	Jul-31	Aug-31	Sep-31	Oct-31	Nov-31	Dec-31
NSR023	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR027	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
NSR030	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
NSR040	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
NSR041	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR057	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	33
NSR059	40	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	36	33	33	33	33	33	33	33	33	33	33
NSR060	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR066	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
NSR087	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR090	60	60	60	60	60	60	60	60	60	60	60	55	54	53	41	41	41	41	41	39	38	38	38	38	38	38	38	38	38	38
NSR127	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	45
NSR147	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
NSR207	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR209	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
NSR210	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	44
NSR211	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR216	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
NSR220	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
NSR221	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR225	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR229	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
NSR247	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
NSR273	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	35
NSR278	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
NSR298	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR301	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	41
NSR317	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
NSR348	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	42
NSR366	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	45
NSR373	46	46	46	46	46	46	46	46	46	46	46	42	42	41	38	38	38	38	38	37	37	37	37	37	37	37	37	37	37	37
NSR375	46	46	46	46	46	46	46	46	46	46	46	42	42	41	38	38	38	38	38	37	37	37	37	37	37	37	37	37	37	37
NSR376	55	55	55	55	55	55	55	55	55	55	55	50	49	49	40	40	40	40	40	38	37	37	37	37	37	37	37	37	37	37
NSR377	54	54	54	54	54	54	54	54	54	54	54	49	49	48	40	40	40	40	40	38	37	37	37	37	37	37	37	37	37	37
NSR378	69	69	69	69	69	69	69	69	69	69	69	62	61	60	41	41	41	41	41	40	39	39	39	39	39	39	39	39	39	39
NSR381	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR382	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
NSR395	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR397	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
NSR398	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
NSR399	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
NSR424	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
NSR440	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	42
NSR457	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR466	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
NSR476	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41

The worst-case noise impacts and resultant effects are summarised in *Table 15.23* both without and with the Access Track construction activities P1-A1-T1, P2-A1-T1 and P2-A3-T1 and without and with the benefit of embedded mitigation and based on comparison with the Threshold Value (65 dB $L_{Aeq,1h}$), the magnitude of impact scale in *Table 15.7* and significance of effect matrix in *Table 15.13*. The receptor sensitivity of all NSRs has been classified as high.

The construction noise level reduction provided by embedded mitigation is discussed later in *Section 15.7.0*.

Table 15.23 Predicted worst-case construction noise effects

Receptor	Area	Without Access Track Construction		With Access Track Construction	
		Magnitude of Impact	**Significance of Effect**	**Magnitude of Impact**	**Significance of Effect**
(a) <u>Without</u> Embedded Mitigation (and Without other Specific Mitigation)					
NSR090	Lower Reservoir	Minor	Minor	Major	Major
NSR220	Inveraray Castle	Negligible	Negligible	Major	Major
NSR424	Inveraray Castle	Negligible	Negligible	Moderate	Moderate
NSR216	Inveraary Castle	Negligible	Negligible	Moderate	Moderate
NSR278	Upper Avenue/A819	Negligible	Negligible	Major	Major
NSR376	Lower Reservoir	Moderate	Moderate	Moderate	Moderate
NSR378	Lower Reservoir	Moderate	Moderate	Major	Major
NSR041	Temporary Jetty	Moderate	Moderate	Moderate	Moderate
NSR440	Temporary Jetty	Major	Major	Major	Major
(b) **<u>With</u> Embedded Mitigation (but Without other Specific Mitigation)**					
NSR090	Lower Reservoir	Minor	Minor	Moderate	Moderate
NSR220	Inveraray Castle	Negligible	Negligible	Moderate	Moderate
NSR424	Inveraray Castle	Negligible	Negligible	Minor	Minor
NSR216	Inveraray Castle	Negligible	Negligible	Minor	Minor
NSR278	Upper Avenue/A819	Negligible	Negligible	Moderate	Moderate
NSR376	Lower Reservoir	Minor	Minor	Minor	Minor
NSR378	Lower Reservoir	Minor	Minor	Moderate	Moderate
NSR041	Temporary Jetty	Moderate	Moderate	Moderate	Moderate
NSR440	Temporary Jetty	Major	Major	Major	Major

At all other NSRs in *Figure 15.1*, the significance of effects is predicted to be temporary and either negligible or minor adverse at worst, and therefore Not Significant.

15.7.1.2 Construction Vibration – Surface Plant Impacts

Research by the Transport and Road Research Laboratory (TRL, 1977) found that the levels of ground-borne vibration from tracked earth moving equipment (such as a bulldozer or excavator) are imperceptible to humans at a distance of approximately 20 metres, and those generated by vehicles with rubber tyres (e.g. a heavy lorry or dump truck) would be imperceptible at more than 10 metres from the haul road. Mobile plant may occasionally come within 20 metres of a sensitive receptor, such as during the track upgrade task (P1-A1-T1) at Upper Avenue; hence vibration may be perceptible but is unlikely to be of a magnitude that could cause complaint. It is concluded that the magnitude of vibration impacts for surface plant would be no worse than Minor at NSRs closer than 20 m and Negligible beyond. Accordingly, the predicted worst-case significance of effects is a localised, temporary, minor adverse for all high sensitivity NSRs, which is considered to be Not Significant.

Hydraulic hammers and breakers that are mounted on excavators will cause ground-borne vibration from their impulsive percussive action. Typical safe working distances from this type of equipment are shown in *Table 15.24.*

BS 5228-2 does not provide case history data for hydraulic hammer vibration specifically and therefore this table has been taken from the Australian document "*Construction Noise Strategy (Rail Projects)*" (NSW Transport Construction Authority) as indicative advice for safe working distance to comply with the vibration criterion levels published within BS 6472-1:2008 (relating to annoyance) and BS 7385-1:1993 (relating to damage).

Table 15.24 Recommended safe working distances for Hydraulic Hammers

Plant	Rating / Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Small Hydraulic Hammer	300 kg / 5-12 t excavator	2 m	7 m
Medium Hydraulic Hammer	900 kg / 12-18 t excavator	7 m	23 m
Large Hydraulic Hammer	1,600 kg / 18-34 t excavator	22 m	73 m

Hydraulic Hammer equipment is expected to be in use at the Upper (Headpond) and Lower Reservoirs with reference to the detailed equipment list *Appendix 15.3 (Volume 5: Appendices)*. NSR378 is located approximately 45 m from a temporary compound boundary at the Lower Reservoir and is the closest receptor to this activity.

As such the values provided within *Table 15.24* demonstrate that all identified high sensitivity NSRs are unlikely to perceive the vibration from hydraulic hammer rock breaking. Accordingly, the magnitude of impact on humans is predicted to be negligible and therefore the significance of effect is negligible, which is considered to be Not Significant.

Furthermore, the distance to the nearest building is around double the distance quoted for causing cosmetic damage from the largest hydraulic hammer in *Table 15.24*. Therefore the magnitude of impact on buildings for the potential to cause cosmetic damage is predicted to be negligible resulting in significant of effects that are negligible based on a high sensitivity receptor. Overall the effect of surface plant vibration on building is Not Significant.

15.7.1.3 Construction Vibration – Piling Impacts

The planned piling activities are as follows:

- A diesel impact piling hammer would be required for the construction of the temporary jetty.
- Vibratory sheet piling would be required during the construction of the cofferdam at the Tailpond at Loch Awe and may be required at the Upper Reservoir as well for stabilising the excavated slopes.

Airborne piling noise has been included in the predictions of construction noise. Predictions of the groundborne vibration generated by the piling have been performed using the methodology in BS 5228-2:2009+A1:2014.

Temporary Jetty – Impact Piling

It is assumed that that all jetty piles will be driven to refusal and that the maximum pile driver hammer energy is likely to be approximately 200 kJ. This is greater than the stated range of hammer energy in the prediction method, which is 1 to 85 kJ. BS 5228-2:2009+A1:2014 does not state an applicable distance range for the prediction methodology, however the research on which it is based (Groundborne vibration caused by mechanised construction works, Hiller and Crabb, 2000) validated the equation with measured levels at distances of up to 120 m.

The closest NSR to the jetty hammer piling location is NSR440, which is between 130 m to 230 m from the jetty footprint. At this range the predicted PPV vibration level is 2.0 mm/s down to 1.0 mm/s, assuming the piles are driven to refusal and using an nominal hammer energy (W) of 200 kJ. While the valid range of W for the calculation method is 1.5 ≤ W ≤ 85 kJ, the method has been used in the absence of an alternative.

On this basis, the magnitude of impact at the closest NSR is predicted to be up to moderate and therefore the significance of effect is considered to be localised, temporary, moderate adverse, which is potentially Significant. It should be noted that the predicted vibration levels are at the lower end of the moderate PPV range 1.0 to < 10 mm/s and specifically *Table 15.5* states that the effect is likely to cause complaint but, "can be tolerated if prior warning and explanation has been given to residents".

Regarding potential cosmetic damage to buildings, by comparing the PPV levels at which annoyance and cosmetic damage might occur, see *Table 15.2* and *Table 15.4* it can be observed the humans are more sensitive than buildings to vibration. As PPV level from impact piling at the temporary jetty are less than 10 mm/s the magnitude of impact and the significance of effect on the building would be no worse than minor which is Not Significant.

Lower Reservoir – Cofferdam Vibratory Sheet Piling

The closest receptor to the vibratory sheet piling at the Lower/Upper Reservoir is NSR378 which is approximately 105 m from the closest place piling would take place. At this distance the predicted PPV is 0.5 mm/s.

Accordingly, the magnitude of impact is predicted to be no worse than minor and therefore the significance of effect is expected to be localised, temporary, minor adverse for all high sensitivity NSRs and buildings, which is considered to be Not Significant.

15.7.1.4 Construction Vibration – Piling Impacts on Underground Services

No underground services have been identified in the vicinity of construction equipment with potential to create significant vibration levels. Therefore, with reference to the prediction method in BS 5228-2:2009, the vibration levels at the closest underground services are likely to be below the limit of 30 mm/s for transient vibration. Hence the effect on the underground services is considered to be Not Significant.

15.7.1.5 Construction Blasting – Air Overpressure and Vibration

It is proposed to use the blast and drill method to excavate the tunnel entrances and portals, powerhouse cavern, surge shafts and construction and Access Tunnels. Areas of hard rock are anticipated to be encountered during the excavation of the Headpond which will require blasting.

Open air blasting activities (i.e. excavation of the tunnel entrances and the foundation preparation at the reservoir area would be scheduled for daytime hours of 07:00 – 19:00, Monday to Friday. However, underground blasting (at the powerhouse cavern, surge shafts and construction and Access Tunnels) may be a 24-hour operation, with 2 cycles per 24 hours. As explained in PAN 50 Annex D, blasting generates both air overpressure and vibration simultaneously. At this stage of the Development design, the detail of blasting (such as mass of charge, site location, hole spacing, detonation delay) is not determined and would be established in the detailed design phase.

PAN 50 Annex D states that, *"Variations in instantaneous charge weights at any specific site relate closely to variations in vibration magnitude. It is this parameter, together with distance from the blast, that forms the basis of vibration prediction."*

Australian Standard AS2187.2-2006 'Explosives-Storage and Use, Part 2: Use of explosives' provides guidance on calculating first estimates of potential vibration levels from blasting. Using the distances to the closest NSRs to the blasting works, a maximum instantaneous charge (MIC) can be calculated for a mean PPV limit. Indicative first estimates of the MIC are shown in *Table 15.25* on the basis of not exceeding the PPV 6 mm/s threshold and therefore remaining Not Significant.

Table 15.25 Indicative first estimates of the MIC to not exceed applicable threshold for different blasting locations

Location	Most Sensitive Period of Works	Applicable threshold from BS 6472-2 (PPV, mm/s)	Closest Receptor	Approximate Distance to Closest Receptor (m)	Indicative first estimates of the MIC to not exceed applicable threshold (kg)
Access Tunnel Portal	Daytime	6	NSR378	860	1048
Construction Tunnel Portal			NSR378	530	398
Power Tunnel Portal			NSRs	> 2000	5670
Headpond			NSR090	> 2000	5670
Powerhouse cavern and surge shafts	Night-time	2	NSR090	> 2000	1436
Access Tunnel			NSR378	860	266
Construction Tunnel			NSR378	530	101
Power Tunnel			NSRs	1500	808

Night-time blasting on the surface is not planned, however the allowable MIC information is provided for night-time to give some context to the daytime values. It is recognised that some of the quoted indicative first estimates of the MIC not to be exceeded are much greater than the size of the blast charge typically required and provided for context only.

If the Construction Contractor requires the flexibility, it is possible to identify different allowable MICs for the day and night-time periods for those works planned to be undertaken 24 hours a day. Furthermore, *Table 15.22* is a first estimate of possible maximum instantaneous charges to demonstrate that through appropriate design, blasting can achieve imposed limits. However, the above prediction method does not allow for the specific rock conditions at the Development Site and explosive packing by the Construction Contractor. BS 6472-2:2008 states *"In order to predict the likely vibration magnitude, a series of measurements at several locations should be taken from one or more trial blasts*". It also provides a method for determining likely site-specific vibration levels with a 90 % confidence limit at receptors using a scaled distance graph, based on measurements of trial blasts at that location.

Note that BS 5228-2:2009+A1:2014 provides the following guidance regarding air overpressure from blasting operations and the effects of screening and weather conditions:

- "*The attenuation effects due to the topography, either natural or manufactured, between the blast and the receiver are much greater on the audible component of the pressure wave, whereas the effects are relatively slight on the lower frequency concussive component. The energy transmitted in the audible part of the pressure wave is much smaller than that in the concussive part and therefore baffle mounds or other acoustic screening techniques do not significantly reduce the overall air overpressure intensity*."
- "*Meteorological conditions, over which an operator has no control, such as temperature, cloud cover, humidity, wind speed, turbulence and direction, all affect the intensity of air overpressure at any location and cannot be reliably predicted. These conditions vary in time and position and therefore the reduction in air overpressure values as the distance from the blast increases might be greater in some directions than others*."

As such it is very difficult to provide a quantitative prediction of absolute levels of air overpressure from blasting works. In lieu of this, it is preferential to carry out blasting operations using the BPM available to ensure that the resultant noise, vibration and air overpressure are minimised.

With appropriate design by suitably qualified blasting contractors, the worst-case magnitude of impacts due to blasting is predicted to be minor and the significance of effects is predicted to be localised, temporary and minor adverse for all high sensitivity NSRs, which is considered to be Not Significant.

15.7.1.6 Construction Traffic Noise

The potential changes in road traffic noise as a result of the Development have been considered for each road link in the Traffic and Transport Chapter defined study area. These links are shown in *Figure 15.3*.

Construction traffic data parameters have been provided by the applicant for the following parameters for each road link for the baseline and construction year (2023 and 2027 respectively):

- Annual Average Weekday Traffic (AAWT) between 06:00 – 00:00 (18hr):
- Percentage HGV; and
- Vehicle speed (kph).

The assessment has considered three different scenarios in order to contextualise predicted changes in road traffic noise levels as a result of Development construction activities, these are the 18hr weekday average in the:

A. Worst month – November 2027

B. High Intensity Period – (Oct 29 - Nov 31)

C. Average period (Jan 27 - Apr 34)

The CRTN or NAC method has been used to calculate the 'Basic Noise Level' (BNL), i.e., the traffic noise level at 10 m from the kerb, taking into account of the flow, percentage HGV and speed. The BNL is calculated for scenarios with and without the construction works and is used to determine a change in road traffic noise levels. The different methodologies predict different metrics; CRTN predictions are based on $L_{A10,18hr}$ results whereas the NAC predictions are based on $L_{Aeq,16hr}$ results. This difference is not important however, given that it is the change in traffic noise level that is relevant.

The results for each scenario A, B and C are presented in *Table 15.26*, *Table 15.27* and *Table 15.28* respectively. The magnitude of impact and significance of effect has been determined using *Table 15.8* and *Table 15.13* for high sensitivity NSRs. It is also important to note that the traffic flows quoted for each link are based on the assumption that all construction traffic will use all links at the same time as a conservative approach. The allows the sensitivity of each link to noise to be analysed, but in practice the number of construction related vehicles using a given link may be less.

Table 15.26 Predicted change in 18hr weekday average BNL for Scenario A - Worst Month

#	Link Name	Scenario A: Baseline				Scenario A: Baseline & Balliemeanoch Construction				Calc. Method	Change in BNL, dB	Magnitude of Impact & Significance of Effect
		AAWT	% HGV	SPEED (km/h)	Predicted Level (dBA)	AAWT	% HGV	SPEED (km/h)	Predicted Level (dBA)			
1	A85 Taynuilt	166	4974	3	52	656	5618	12	52	CRTN	2.6	MINOR
2	A85 West	160	4332	4	75	650	4976	13	75	CRTN	2.4	MINOR
3	A85 East	160	3790	4	70	650	4434	15	70	CRTN	2.7	MINOR
4	B840	7	358	2	38	7	358	2	38	NA	NA	NO CHANGE
5	A819 Dalmally	83	1630	5	80	573	2274	25	80	CRTN	4.9	MODERATE
6	Site Access North (Two-way)	0	0	0	0	490	644	76	32	NAC	59.1	MAJOR
7	Site Access North (Entry Only)	0	0	0	0	245	322	76	32	NAC	56.1	MAJOR
8	Site Access South (Exit Only)	0	0	0	0	245	322	76	32	NAC	56.1	MAJOR
9	A819 Site Access	85	1699	5	84	575	2343	25	84	CRTN	4.7	MODERATE
10	A819 Inveraray (N)	82	1703	5	89	572	2347	24	89	CRTN	4.6	MODERATE
11	A819 Inveraray (S)	81	1877	4	64	81	2031	4	64	CRTN	0.4	NEGLIGIBLE
12	Inveraray Bypass	0	0	0	0	490	490	100	32	NAC	59.0	MAJOR
13	A83 Aray Bridge	211	4183	5	54	701	4827	15	54	CRTN	2.7	MINOR
14	A83 Garron Bridge	197	4077	5	79	687	4721	15	79	CRTN	2.3	MINOR
15	A83 Rest and Be Thankful	296	4525	7	65	786	5169	15	65	CRTN	2.2	MINOR
16	A815 Strachur	119	2418	5	62	609	3062	20	62	CRTN	3.9	MODERATE
17	A83 Inveraray	210	4187	5	40	210	4341	5	40	CRTN	0.1	NEGLIGIBLE
18	A83 Pier	210	3477	6	74	700	4121	17	74	CRTN	2.6	MINOR
19	B840 Ford	4	186	2	41	4	186	2	41	NA	NA	NO CHANGE

Table 15.27 Predicted change in 18hr weekday average BNL for Scenario B - High Intensity Period

#	Link Name	Scenario B: Baseline				Scenario B: Baseline & Balliemeanoch Construction				Calc. Method	Change in BNL, dB	Magnitude of Impact & Significance of Effect
		AAWT	% HGV	SPEED (km/h)	Predicted Level (dBA)	AAWT	% HGV	SPEED (km/h)	Predicted Level (dBA)			
1	A85 Taynuilt	166	4974	3	52	594	5556	11	52	CRTN	2.3	MINOR
2	A85 West	160	4332	4	75	588	4914	12	75	CRTN	2.1	MINOR
3	A85 East	160	3790	4	70	588	4372	13	70	CRTN	2.4	MINOR
4	B840	7	358	2	38	7	358	2	38	NA	NA	NO CHANGE
5	A819 Dalmally	83	1630	5	80	511	2212	23	80	CRTN	4.5	MODERATE
6	Site Access North (Two-way)	0	0	0	0	428	582	74	32	NAC	58.6	MAJOR
7	Site Access North (Entry Only)	0	0	0	0	214	291	74	32	NAC	55.6	MAJOR
8	Site Access South (Exit Only)	0	0	0	0	214	291	74	32	NAC	55.6	MAJOR
9	A819 Site Access	85	1699	5	84	513	2281	22	84	CRTN	4.3	MODERATE
10	A819 Inveraray (N)	82	1703	5	89	510	2285	22	89	CRTN	4.2	MODERATE
11	A819 Inveraray (S)	81	1877	4	64	81	2031	4	64	CRTN	0.4	NEGLIGIBLE
12	Inveraray Bypass	0	0	0	0	428	428	100	32	NAC	58.4	MAJOR
13	A83 Aray Bridge	211	4183	5	54	639	4765	13	54	CRTN	2.4	MINOR
14	A83 Garron Bridge	197	4077	5	79	625	4659	13	79	CRTN	2.1	MINOR
15	A83 Rest and Be Thankful	296	4525	7	65	724	5107	14	65	CRTN	2.0	MINOR
16	A815 Strachur	119	2418	5	62	547	3000	18	62	CRTN	3.6	MODERATE
17	A83 Inveraray	210	4187	5	40	210	4341	5	40	CRTN	0.1	NEGLIGIBLE
18	A83 Pier	210	3477	6	74	638	4059	16	74	CRTN	2.4	MINOR
19	B840 Ford	4	186	2	41	4	186	2	41	NA	NA	NO CHANGE

Table 15.28 Predicted change in 18hr weekday average BNL for Scenario C - Average Period

#	Link Name	Scenario C: Baseline				Scenario C: Baseline & Balliemeanoch Construction				Calc. Method	Change in BNL, dB	Magnitude of Impact & Significance of Effect
		AAWT	% HGV	SPEED (km/h)	Predicted Level (dBA)	AAWT	% HGV	SPEED (km/h)	Predicted Level (dBA)			
1	A85 Taynuilt	166	4974	3	52	354	5556	6	52	CRTN	1.3	MINOR
2	A85 West	160	4332	4	75	348	4914	7	75	CRTN	1.3	MINOR
3	A85 East	160	3790	4	70	348	4372	8	70	CRTN	1.4	MINOR
4	B840	7	358	2	38	7	358	2	38	NA	NA	NO CHANGE
5	A819 Dalmally	83	1630	5	80	271	2212	12	80	CRTN	3.1	MODERATE
6	Site Access North (Two-way)	0	0	0	0	188	582	32	32	NAC	55.6	MAJOR
7	Site Access North (Entry Only)	0	0	0	0	94	291	32	32	NAC	52.6	MAJOR
8	Site Access South (Exit Only)	0	0	0	0	94	291	32	32	NAC	52.6	MAJOR
9	A819 Site Access	85	1699	5	84	273	2281	12	84	CRTN	2.9	MINOR
10	A819 Inveraray (N)	82	1703	5	89	270	2285	12	89	CRTN	2.9	MINOR
11	A819 Inveraray (S)	81	1877	4	64	81	2031	4	64	CRTN	0.4	NEGLIGIBLE
12	Inveraray Bypass	0	0	0	0	188	428	44	32	NAC	55.3	MAJOR
13	A83 Aray Bridge	211	4183	5	54	399	4765	8	54	CRTN	1.4	MINOR
14	A83 Garron Bridge	197	4077	5	79	385	4659	8	79	CRTN	1.2	MINOR
15	A83 Rest and Be Thankful	296	4525	7	65	484	5107	9	65	CRTN	1.1	MINOR
16	A815 Strachur	119	2418	5	62	307	3000	10	62	CRTN	2.3	MINOR
17	A83 Inveraray	210	4187	5	40	210	4341	5	40	CRTN	0.1	NEGLIGIBLE
18	A83 Pier	210	3477	6	74	398	4059	10	74	CRTN	1.4	MINOR
19	B840 Ford	4	186	2	41	4	186	2	41	NA	NA	NO CHANGE

With reference to the presented results:

- Link 6 and Link 7 represent the northern site access route utilised in different ways; as a two-way and one-way route to Site. There are no NSRs in the vicinity of the road, the closest is ~1.2 km and therefore the magnitude of impact and significance of effect is downgraded from major adverse for these links and is considered negligible at NSRs regardless of the period considered, which is considered Not Significant.
- The southern access route (one way) Link 8 is 45 m the closest and 200 m from the second closest NSR. The closest NSR is also a similar distance from the A819 (specifically Link 10) as it is at the junction of Link 8 and Link 10. Existing ambient levels at this location are represented by monitoring location L2 which was directly adjacent to the A819. The option to utilise Link 8 may not arise however, as it is dependent on it being established by the adjacent proposed Wind Farm development.
- In the worst month (Scenario A) and high intensity period (Scenario B) only, it can be seen that for Links 9, 10 and 16 are predicted to experience moderate effects at worst. Otherwise outside these periods, which is the majority of the time, they are predicted to experience minor adverse effects at worst.
- In all scenarios moderate effects are predicted at receptors in proximity to Link 5, however it should be noted that for average activity period (Scenario C) the relative change only just exceeds the boundary between minor and moderate magnitude of impact.
- Link 12 is the Inveraray Bypass Access Track through Inveraray Castle grounds, this track allows construction traffic to avoid passing through the town in order minimise adverse effects. However some dwellings, that are not close to other Links, may experience a change based on the predicted levels at 10 m from carriageway edge of 59 dB, 58 dB and 55 dB LAeq,16hr in Scenario A, B and C respectively when compared to ambient levels observed in that area at S3 of 50 dB LAeq,16hr, see *Table 15.18*. Therefore additional conservative calculations have been performed to predict the level at the potentially affected receptors using a continuous line source propagation assumption and the closest approach to Link 12.

Table 15.29 Predicted Road Traffic Noise Levels at Receptors near Link 12 (Inveraray Bypass)

NSR	Distance to Link 12 (m)	Reduction due to distance (based on line source) (dB)	Scenario A $L_{Aeq,16hr}$ dB	Scenario B $L_{Aeq,16hr}$ dB	Scenario C $L_{Aeq,16hr}$ dB
Reference	13.5	0	59.0	58.4	55.3
NSR220	45	-5	53.8	53.2	50.1
NSR209	130	-10	49.2	48.6	45.5
NSR207	178	-11	47.8	47.2	44.1
NSR210	182	-11	47.7	47.1	44.0
NSR211	184	-11	47.7	47.1	44.0
NSR221	187	-11	47.6	47.0	43.9

- At 130 m and beyond it can be seen that all NSRs are predicted to experience construction traffic noise levels from Link 12 that are comparable to or lower than the existing ambient sound levels. When summing the ambient sound level of 50 dB $L_{Aeq,16hr}$ to the highest predicted level of 49.2 dB $L_{Aeq,16hr}$ at NSR209, this would result in less than a 3 dB increase due to road traffic noise and would be classified as minor in accordance with *Table 15.8* and *Table 15.13*, and Not Significant. The exception is NSR220 (45 m from the link) is 3 dB above the measured ambient level of 50 dB $L_{Aeq,16hr}$ for Scenario A and B and equal to the ambient level of 50 dB $L_{Aeq,16hr}$ for Scenario C. On this basis effects at receptors in proximity to Link 12 are potentially Significant.
- No change is predicted on the B840 (Link 4 & 19), as the access to the site has been designed such that HGV movements to/from site will not utilise the B840 and instead use either the northern and possibly southern Access Tracks.
- On Links 1-4, Link 11, Link 13-15 and Links 17-19 the significant of effect is minor adverse, negligible or no change (Not Significant) regardless of the scenario considered.

Finally, it is important to remember that the assumptions under which the significance of effect for each scenario have been predicted in the above tables are on the basis all construction vehicles will utilise every road link simultaneously in the transportation of materials to/from site. This is a conservative approach but does allow the sensitivity of each link to be compared. In practice the magnitude of impacts will be less or at least no worse than those presented.

Mitigation measures to reduce construction road traffic noise, particularly where effects of moderate adverse or greater are predicted, are presented in the *Section 15.8 Mitigation and Monitoring*.

15.7.2 Operational Phase

Depending on the proximity of noise sensitive receptors to above ground operational infrastructure and the intrinsic sound power level of the operational activities, there is potential for adverse impacts during the operation of the Development.

The sound power levels of the turbines, generators, emergency generators and associated equipment in the powerhouse cavern are not yet known. Modern gas insulated switchgear equipment emits very low noise levels during operation. At this stage, no detailed information is available regarding the sound power level or acoustic character of sound from the proposed transformers; however, these commonly produce a strong tonality at levels of 50 and / or 100 Hz due to the frequency of mains electricity. However, given the depth of the cavern and the distance to the nearest NSRs in approximately 2.5 km, it is highly unlikely that there will be any perceivable operational noise or vibration from the below ground equipment at the surface level.

At this distance, the level at which minor adverse impacts might occur (0.1 mm/s) for night-time groundborne vibration and 35 dB L_{ASmax} for groundborne noise (see *Table 15.10* and *Table 15.12* respectively) are highly unlikely to be exceeded. As such, operational noise and vibration affecting NSRs at the surface is not considered further for the powerhouse cavern activities.

However, the following ancillary equipment and operations have been considered as potential source of operational sound on the surface:

- Upper Reservoir – Switching Station (nearest NSR > 2 km)
- Upper Reservoir – Ventilation Shafts (nearest NSR to a ventilation shaft is ~1.4 km)

Note there are no operational sound sources attributed to the Lower Reservoir area.

The equipment at the Upper Reservoir would be designed to not exceed more than 70 dBA at 5 m.

Operational sound modelling has been undertaken using the same 3D noise model used for the construction assessment which included, global soft-ground assumption and flat ground assumpotion but instead using ISO 9613-2 as the method of sound propagation prediction. The operational sound sources have been represented by hemispherical point sources for the “Switchgear Building and Switchyard” and each ventilation shaft as indicated on *Figure 1.4*. Each source has been assigned a sound power level of 92 dB L_{WA} (based on meeting 70 dBA at 5 m meters). The free-field specific sound level at NSRs has been calculated based on continuous operation, day and night, at 1.5 m and 4 m height respectively, as presented in *Table 15.30*.

Table 15.30 Predicted Operational Sound Levels

Receptor	Predicted operational specific sound Level and $L_{Aeq,15min}$, dB	
	Day $L_{Aeq,1h}$, dB	Night $L_{Aeq,15min}$, dB
NSR059	<15 dBA	<15 dBA
NSR090		
NSR373		
NSR375		
NSR376		
NSR377		
NSR378		

15.7.2.1 BS4142:2014 Assessment

The predicted free-field operational *specific sound levels* at the NSRs around the Development are presented in Table *15.30*. Assuming continual 24-hr operation, the predicted sound levels could apply to 1-hour daytime or 15-minute night-time BS 4142 assessment periods.

The daytime and night-time BS 4142 assessments are presented in *Table 15.31*. In addition, the magnitude of impact and effect classification has been included based upon the BS4142 assessment outcomes, with reference to the semantic scales in *Table 15.6*, *Table 15.11* and *Table 15.13*. As the predicted *specific sound levels* are below 15 dBA at the closest NSRs, the assessments have been grouped based on the *background sound level* used in the assessment. This results in two NSR groups, corresponding to monitoring locations L4 and S4. However as there is no night-time measured background sound level at S4 due to the presence of a flowing water in the area, making daytime levels unlikely to be different to night-time, the night-time level at L4 is used as a conservative approach at NSR373 and NSR375. This may also better represent dryer months.

Table 15.31 BS 4142 Assessment

Receptor	NSR059, NSR090, NSR376, NSR377 and NSR378		NSR373 and NSR375	
TIME PERIOD	DAYTIME	NIGHT-TIME	DAYTIME	NIGHT-TIME
Specific sound level Ls ($L_{Aeq,Tr}$), dB	15	15	15	15
Acoustic feature correction, dB	+0	+0	+0	+0

Rating level ($L_{Ar,Tr}$), dB	15	15	15	15
Representative *background sound level* ($L_{A90,T}$), dB	42 (L4)	39 (L4)	55 (S4)	39 (L4)
Excess of *rating level* over *background sound level* ($L_{Ar,Tr} – L_{A90,T}$), dB	-27	-24	-40	-24
BS 4142:2014 assessment outcome	Low impact, depending on context	Low impact, depending on context	Low impact, depending on context	Low impact, depending on context
Magnitude of impact (from **Error! Reference source not found.**11)	Very low	Very low	Very low	Very low
Receptor Sensitivity (from **Error! Reference source not found.**6)	High	High	High	High
Classification of effect (from **Error! Reference source not found.**13)	Negligible	Negligible	Negligible	Negligible

For all NSRs, the BS 4142 *rating level* is well below the *background sound level*. Predicted effects are therefore categorised as negligible (Not Significant) without the need for additional specifically designed sound mitigation to be in place.

15.8 Mitigation and Monitoring

15.8.1 Embedded Mitigation

15.8.1.1 Construction Phase

During the construction phase a commitment has been made by the Applicant to not utilise the B840 for the purpose of delivering materials to/from the Site, resulting in no change of traffic noise impact at NSRs close to the B840 in relation to the movement of Development construction vehicle on local roads.

To achieve Best Practical Means (BPM) as required by the Control of Pollution Act 1974 during the construction phase, good practice measures have been embedded into the project. These measures are particularly important during construction works being undertaken in the vicinity of the Lower Reservoir, temporary jetty and during the upgrade of existing tracks or establishment of new Access Track passing in the vicinity of NSRs, namely Upper Avenue Access Track, the Inveraray Castle Access Track and the Temporary B840 Realignment. The good practice embedded measures include:

__Construction Works__

- Establishing and maintaining good community relations throughout the construction process to keep residents and stakeholders informed on progress and the measures put in place to minimise noise impacts;
  - One stakeholder has highlighted the potential for the diesel impact piling at the temporary jetty to affect their underwater measurements on “trial days” where noise sensitive equipment is being tested within Loch Fyne. The trial days are understood to be up to 12 days per year and would be undertaken in blocks of 2 to 4 days at a time from 2025 onwards. diesel impact piling will therefore cease on these days, to avoid any adverse impacts.
- Adherence to standard construction working hours, i.e. 0700 hours – 1900 hours weekdays and 0800 hours – 1300 hours Saturdays, with no working on Sundays or Bank Holidays (including site deliveries) unless agreed in advance with the local planning authority.
- Selection of quiet and low vibration equipment and methodologies in accordance with the principles of BPM;
- Locating of fixed and semi-fixed ancillary plant such as generators, compressors and pumps away from NSR locations wherever possible;
- Provision of electrical power to the appointed Contractor for the construction phase which minimises the requirement for diesel generators at the Site;

- Regular maintenance of all plant used on site, paying attention to the integrity of silencers and acoustic enclosures;
- Fitting of compressors with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Shutting down of all noise generating construction plant when not in use.
- Loading and unloading of materials away from residential properties, ideally in locations which are acoustically screened from nearby NSRs;
- Handling of materials with care and placement rather than dropping where possible. Drop heights of materials from lorries and other plant shall be kept to a minimum;
- Selection of modern plant shall which complies with the latest European Commission noise emission requirements. Electrical plant items (as opposed to diesel powered plant items) shall be used wherever practicable. All major compressors shall be low noise models fitted with properly lined and sealed acoustic covers. All ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Organisation of site operations and vehicle routes to minimise the need for reversing movements, and to take advantage of any natural acoustic screening present in the surrounding topography;
- No employees, subcontractors and persons employed on the Site will cause unnecessary noise from their activities, e.g., excessive ‘revving’ of vehicle engines, music from radios, shouting and general behaviour etc. All staff inductions at the Site shall include information on minimising noise and reminding them to be considerate of the nearby residents; and
- As far as practicable, planning of noisier activities to take place during periods of the day which are generally considered to be less noise sensitive, i.e., not particularly early or late in the day.

Blasting Air Overpressure and Vibration

- Reduction of the air overpressure and vibration effects of blasting through good blast design, although this may come at the expense of higher drilling and detonator costs. Smaller, more frequent blasts lead to smaller but more frequent effects, and the balance between these factors will need to be discussed with ABC.
- Agreement of the methods employed to control air overpressure and vibration from blasting operations agreed with ABC prior to any blasting, as well as the frequency of blasting and a 90% confidence limit for blast PPV values at NSRs. The PPV blasting vibration limit should follow the guidance provided within BS 6472-2:2008 of between 6.0 and 10.0 mm/s during the daytime and 2.0 mm/s at night.
- Avoidance of ground blasting in the early morning, late afternoon or evening. The local community will be given advance notice prior to any blasting.
- An air overpressure limit at NSRs should follow the guidance provided within BS 6472-2:2008 (120 – 150 dB(lin)) and be agreed with ABC.
- Implementation of a blast monitoring scheme for air overpressure and vibration. Any scheme should include details on the location of monitoring points and vibration sensitive properties, and the equipment to be used. This should include a series of representative initial trial blasts at the start of the blasting to accurately identify allowable MICs to prevent exceedance of the identified limits at nearby receptors.
- Monitoring of all blasts at the Development Site and maintenance of records so that the historical peak particle velocity from blasts can be produced as required.
- Maintenance of a close working relationship between the construction / blasting operator and the local planning authority to facilitate the exchange of information regarding blasting events.
- Carrying out of all blasting using BPM where available, to ensure that the resultant noise, vibration and air overpressure are minimised in accordance with current British Standards and guidelines.
- Development of blast designs with the aid of regression lines determined from a logarithmic plot of Peak Particle Velocity against scaled distances. The regression lines should be regularly updated using the blasting monitoring information. The regression lines should be made available for inspection upon request.
- Control of fly rock requirements through Health and Safety legislation.

Appropriate noise and vibration mitigation measures will be incorporated into the template Construction Environmental Management Plan (CEMP) *(Appendix 3.1 (Volume 5: Appendices*), which will form the basis of the Contractor CEMP. The Contractor CEMP will be implemented by the E&C contractor, who is yet to be appointed.

15.8.1.2 Operational Phase

The operational embedded measures are as follows:

- Employment of the principles of best practice to minimise noise and vibration from the Development.
- 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.

15.8.2 Additional Mitigation, Compensation and Enhancement

15.8.2.1 Construction Phase

Construction Noise – Surface Plant Noise

Without including noise reduction provided by embedded mitigation the potential exceedance of the 65 dB $L_{Aeq,12hr}$ threshold value from construction site noise at:

- NSR090 is no worse than 8 dB for a short duration during Access Track works.
- NSR220 is no worse than 11 dB for a short duration during Access Track works.
- NSR278 is no worse than 20 dB for a short duration during Access Track works.
- NSR376 is no worse than 3 dB during the construction of the northern most Construction Compound at the Lower Reservoir.
- NSR378 is no worse than 7 dB without including the noise reduction provided by embedded mitigation. It is affected initially by Temporary B840 Realignment works and then by surface plant noise from the Tailpond compound area.

Furthermore, predicted levels are conservative and will likely be lower in practice and the previously listed embedded mitigation will further help to reduce noise levels and minimise annoyance. Nevertheless, BS5228-1 Table B.1 provides a list of specific construction noise sources, and typical noise mitigation measures that can achieve between 5 dB to 10 dB and higher in addition to the embedded mitigation, which will be applied as appropriate to reduce levels at these NSRs to within the threshold value.

Construction Noise - Piling at Temporary Jetty

Activity P2-A1-T3 (temporary jetty construction) has been shown to have the potential to cause an exceedance of the 65 dB $\mathrm{L}_{Aeq,12hr}$ threshold value by up to 10 dB at NSR440 and no more than 3 dB at NSR041. This activity is dominated by the Diesel Hammer Piling which has been as the most conservative assumption. With reference to BS 5228-1 it has been noted that 10 dB reduction could be achieved by selecting a quieter diesel hammer piling rig. Noise level reducing mitigation measures specific to a piling rig can also be utilised providing up to 5 to 10 dB of attenuation. These measures are outlined in BS 5228-1 Table B.1 i.e. enclosure of hammer head with acoustic screen, use a resilient pad between pile and hammer head, use of sound reduction equipment, exhausts or screens on power units and base machine where possible. Finally, the assessment has assumed that piling rig would be operational 60% of the work period on each day (Mon-Sat) for almost 12 months, this is a conservative assumption and would be less in practice.

Using one or a combination of these measures it is feasible that the activity P2-A1-T3 (temporary jetty construction) would be compliant with 65 dB $L_{Aeq,12hr}$ threshold value at NSR440 and NSR041 on the basis that following the appointment of a construction contractor a specific mitigation plan for P2-A-T3 would be implemented as part of the CEMP.

Construction Vibration - Piling at Temporary Jetty

Section 15.6 identified that the magnitude of impact associated with unmitigated impact piling at the temporary jetty is predicted to up to Moderate adverse with reference to *Table 15.9* and therefore the significance of effects is considered as a localised, temporary, moderate adverse effect for this high sensitivity NSR, which is considered Significant.

The predicted vibration levels are at the lower end of the Moderate PPV range 1.0 to < 10 mm/s and as noted in *Table 15.9* whilst such levels are likely to cause complaint they "can be tolerated if prior warning and explanation has been given to residents".

Therefore specific mitigation is included in the form of a suitable plan of communication between the contractor and the resident at NSR440.

Construction Blasting – Air Overpressure and Vibration

The assessment has identified that:

- the indicative first estimates of the allowable MIC values in the daytime to avoid significant effects during blasting at the nearest NSR; and
- the prediction method does not allow for the influence of specific rock conditions at the Development Site and explosive packing by the Construction Contractor on the vibration levels observed at receptors.

However, BS 6472-2:2008 states "In order to predict the likely vibration magnitude, a series of measurements at several locations should be taken from one or more trial blasts". It also provides a method for determining likely site-specific vibration levels with a 90 % confidence limit at receptors using a scaled distance graph, based on measurements of trial blasts at that location.

The final design of the blasting requirements will be undertaken by specialist blasting contractor to avoid vibration and air overpressure impacts that are greater than minor adverse at NSRs.

Construction Traffic Noise

NSRs in the vicinity of Link 8 southern site Access Track (NSR127, NSR366, NSR398) are predicted to potentially experience major adverse effects due to the introduction of a new road traffic noise source ~200 m at its closest point. Therefore, as the northern access has no receptors in the immediate vicinity, specific mitigation in the form of utilising the northern access (Link 6) for two-way access to the Site is proposed to avoid the use of the southern site Access Track wherever possible and therefore avoid significant construction road traffic noise impacts at these NSRs.

NSRs in the vicinity of Links 5, 9, 10 and 16 are predicted to potentially experience moderate adverse effects at worst on the basis that all links carry all construction traffic at the same time. In practice the moderate adverse impacts can be reduced to Minor, by applying specific mitigation in the form of splitting construction traffic over the north and south routes to the site entrance. This would provide a reduction of the with construction traffic noise levels on each link which would reduce the effect to minor adverse at worst.

NSRs in the vicinity of Link 12 have been determined to be far enough away from the link to experience minor adverse effects at worst, with the exception of NSR220 which is located approximately 45 m from Link 12. The 16 hour road traffic noise level from construction traffic movements was predicted at the receptor in *Table 15.29* and was shown to be just less than 4 dB over the measured ambient in the area of 50 dB $L_{Aeq,16hr.}$ Therefore a potentially effective mitigation measure would be a road side acoustic barrier with height and length determined to provide at least 5 dB attenuation at NSR220 from passing construction vehicles. With the barrier installed the increase in ambient level at the NSR would be reduced to less than 3 dB which would be classified as minor adverse effect and Not Significant. Other measures to reduce effects road traffic noise would also be valid, i.e. diverting the route. According to BS 5228-1 Table B.1 upto 10 dB can be observed generally from an acoustic screen. The location and parameters of a suitable barrier would be included in the final Contractor CEMP by the E&C contractor.

15.8.2.2 Operational Phase

No adverse effects are predicted during the operational phase and therefore no additional mitigation has been required.

15.9 Residual Effects

A summary table is presented below for construction and operational phases that indicates whether the residual effects, after the implementation of all mitigation, are significant or not significant or a given receptor or group of receptors.

Table 15.32 Summary of Effects: Construction

Receptor	Description of Effect	Effect with Embedded Mit.	Additional Mitigation	Residual Effects	Significance
NSR376/ NSR378	Surface Plant Noise	Minor/Moderate	Specific construction site activity mitigation measures to achieve the 65 dB $L_{Aeq,12hr}$ threshold, see BS 5228-1 Table B.1	Minor	Not Significant
NSR216, NSR424	Access Track Upgrade/ Construction	Minor	None	Minor at worst	Not Significant
NSR090 NSR220	Access Track Upgrade/ Construction	Moderate	Specific construction site activity mitigation measures to achieve the 65 dB $L_{Aeq,12hr}$ threshold, see BS 5228-1 Table B.1	Minor at worst	Not Significant
NSR278	Access Track Upgrade/ Construction	Moderate/Major	Specific construction site activity mitigation measures to achieve the 65 dB $L_{Aeq,12hr}$ threshold, see BS 5228-1 Table B.1	Moderate at worst for short temporary period, but Minor at worst for the majority of the time.	Not Significant
NSR041 and NSR440	Temporary Jetty Impact Piling Noise	Moderate to Major	Specific construction site activity mitigation measures to achieve the 65 dB $L_{Aeq,12hr}$ threshold, see BS 5228-1 Table B.1	Negligible to Minor	Not Significant
All NSRs	Surface Plant Vib.	Negligible	None	Negligible	Not Significant
NSR440	Temporary Jetty Impact Piling Vibration	Moderate	Communication – prior warning and explanation as per BS5228-2, see *Table 15.9*	Minor	Not Significant
All NSRs	Cofferdam Piling	Minor	None	Minor	Not Significant
All NSRs	Blasting	Minor/Moderate	Design of the blasting requirements undertaken by specialist blasting contractor.	Minor	Not Significant
NSRs near Links 1-3, 11, 13-15,17,18	Road Traffic Noise	Negligible to Minor	None	Negligible to Minor	Not Significant
NSRs near Link 4 & 19 (B840)	Road Traffic Noise	No Change	None	No Change	Not Significant
NSRs near Link 5, 9, 10 and 16	Road Traffic Noise on northern and southern routes to site	Moderate	Divide traffic over north and south routes to site.	Minor	Not Significant

Receptor	Description of Effect	Effect with Embedded Mit.	Additional Mitigation	Residual Effects	Significance
Link 6 and 7	Haul road traffic noise at northern track “two way” and “entry” respectively	Negligible (due to large distance to nearest receptor)	None	Negligible	Not Significant
NSRs near Link 8	Haul road traffic noise using southern track “exit” only	Major	Use the northern track two-way (Link 6) primarily.	Negligible to Minor	Not Significant
NSRs near Link 12 (except NSR220)	Haul road traffic noise on Link 12	Minor (reduced from Major based on NSR level comparison to ambient level)	None	Minor	Not Significant
NSR220	Haul road traffic noise on Link 12	Major	Roadside acoustic screen, location, height and length to be determined as part of CEMP preparation to provide minimum of 5 dB attenuation at 45 m.	Minor	Not Significant

Table 15.33 Summary of Effects: Operation

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
All NSRs	Turbine hall Groundborne Noise and Vibration	Negligible	None	Negligible	Not Significant
All NSRs	Surface plant airborne noise at Upper Reservoir	Negligible	None	Negligible	Not Significant
All NSRs	Operational road traffic noise	Negligible	None	Negligible	Not Significant

15.10 Cumulative Effects

The assessment of likely cumulative effects set out below is based on the cumulative schemes identified in Chapter 4: Approach to EIA. Cumulative schemes identified are those that are reasonably foreseeable - i.e. in the public domain e.g. at scoping stage, or have been consented but not yet under construction / constructed at the point of writing the assessment / at submission.

15.10.1 Inter-Cumulative Effects

The inter-cumulative effects have been considered for both the construction and operational phases in combination with other schemes.

15.10.1.1 Construction

The inter-cumulative effects with noise and vibration have been considered at NSRs following a high-level review of other developments. On the basis that the intervening distance to construction works is long (>2 km) and duration is short, the contribution of noise and vibration from on-site works at all other developments is considered to have a negligible effect on predicted construction noise and vibration levels at NSRs in the vicinity of the Development.

However, other developments in the wider area will potentially utilise the same public roads during construction as the Development. Therefore a cumulative assessment of construction traffic on local roads has been carried out in relation to the following developments:

- Cruachan Expansion Hydro

- Blarghour Wind Farm
- Upper Sonachan Wind Farm
- Ladyfield Wind Farm

The worst-case period (Scenario A – Worst Month, see *Section 15.6.0.5*) has been considered in the following cumulative assessment as a conservative assumption of the combined effect:

- The traffic flows on all road links (see *Figure 15.3*) including the contribution from the Development;
- The traffic flows on all road links (see *Figure 15.3*) including the contribution from the Development and the contribution from the other key developments identified.

Table 15.34 Predicted change in 18hr weekday average BNL for Scenario A - Worst Month (Nov 2027)

#	Link Name	Scenario A: Baseline				Scenario A: Baseline & Balliemeanoch Construction				Calc. Method	Change in BNL, dB	Magnitude of Impact & Significance of Effect
		AAWT	% HGV	SPEED (km/h)	Predicted Level (dBA)	AAWT	% HGV	SPEED (km/h)	Predicted Level (dBA)			
1	A85 Taynuilt	656	5618	12	52	1299	6409	20	52	CRTN	2.0	MINOR
2	A85 West	650	4976	13	75	1393	5911	24	75	CRTN	2.1	MINOR
3	A85 East	650	4434	15	70	1293	5225	25	70	CRTN	2.0	MINOR
4	B840	7	358	2	38	7	358	2	38	NO CHANGE		
5	A819 Dalmally	573	2274	25	80	1128	2957	38	80	CRTN	2.6	MINOR
6	Site Access North (Two-way)	490	644	76	32	490	644	76	32	NO CHANGE		
7	Site Access North (Entry Only)	245	322	76	32	245	322	76	32	NO CHANGE		
8	Site Access South (Exit Only)	245	322	76	32	245	322	76	32	NO CHANGE		
9	A819 Site Access	575	2343	25	84	1130	3026	37	84	CRTN	2.5	MINOR
10	A819 Inveraray (N)	572	2347	24	89	1127	3030	37	89	CRTN	2.5	MINOR
11	A819 Inveraray (S)	81	2031	4	64	636	2714	23	64	CRTN	4.9	MODERATE
12	Inveraray Bypass	490	490	100	32	490	490	100	32	NO CHANGE		
13	A83 Aray Bridge	701	4827	15	54	755	4881	15	54	CRTN	0.2	NEGLIGIBLE
14	A83 Garron Bridge	687	4721	15	79	741	4775	16	79	CRTN	0.2	NEGLIGIBLE
15	A83 Rest and Be Thankful	786	5169	15	65	840	5223	16	65	CRTN	0.2	NEGLIGIBLE
16	A815 Strachur	609	3062	20	62	609	3062	20	62	NO CHANGE		
17	A83 Inveraray	210	4341	5	40	531	4790	11	40	CRTN	2.1	MINOR
18	A83 Pier	700	4121	17	74	1021	4570	22	74	CRTN	1.1	MINOR
19	B840 Ford	4	186	2	41	4	186	2	41	NO CHANGE		

It can be observed that the combined effects at road links are no worse than minor adverse (Not Significant) with the exception of Link 11 which is moderate adverse (Significant). However, it should be noted that without the contribution of other developments the Development has Negligible effect on the Magnitude of Impact outcome at Link 11; in other words the effect of construction traffic noise associated with the other developments is moderate adverse without the contribution of Development. Therefore, the overall effect of the Development on the cumulative effect of construction road traffic on all considered road links is Negligible (Not Significant).

15.10.1.2 Operational

The predicted operational noise levels from the Development are much lower than the prevailing *background sound level* and *residual sound levels* at the NSRs. Therefore, the contribution of the Development to that of any other development in the area would be negligible and not significant and inter cumulative operational effects have been considered in no further detail.

15.10.2 Intra-Cumulative Effects

The intra-relationship effects of noise and vibration with other potential environmental effects have been considered at NSRs. Generally, the effects from the following sources have the potential to lead to significant effects when considered in combination:

- Noise and Vibration
- Visual Impact
- Dust
- Construction Traffic on Public Roads

The intra-cumulative effects are most likely to lead to significant effects when the receptor is in close proximity to the source of noise and vibration and the levels experienced are already leading to Minor or worse effects. However, it is difficult to quantify the intra-cumulative effects of noise and vibration with other potential effects. Nevertheless, given that only negligible effects of noise and vibration have been identified for the operational phase of the Development, any significant intra-cumulative effects that could occur would only be short term and temporary, during construction.

Vibration is unlikely to contribute significantly to any intra-cumulative effects at receptors considered in the chapter, due to the nature and distance of the groundborne vibration induced activities i.e. piling and blasting from the receptors.

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 16: Socio-Economic, Recreation and Tourism

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

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Tables

16. Socio-Economic, Recreation and Tourism

16.1 Introduction

This chapter assesses the potential socio-economic, recreation and tourism impacts resulting from the construction and operation of the Development, as it is described in *Chapter 2: Project and Site Description*. The assessment considers each receptor within the 5 km study area and, where appropriate, details the mitigation measures which should be implemented to minimise any adverse impacts arising as a result of the Development.

The chapter should be read in conjunction with *Chapter 5: Landscape and Visual*, *Appendix 5.5 Forestry* (Volume 5 Appendices), *Chapter 7: Aquatic Ecology*, *Chapter 11: Water Environment*, *Chapter 13: Cultural Heritage*, *Chapter 14: Access, Traffic and Transport, Chapter 15: Noise and Vibration* and *Chapter 20: Commercial Fisheries*.

This chapter is supported by the following figures within Volume 3 Figures:

- Figure 16.1a: Socio-economic, Recreation and Tourism Receptors
- Figure 16.1b Socio-economic, Recreation and Tourism (Table)
- Figure 16.2 Outline Access Management Plan Recreational Routes and Paths

This chapter is also supported by the following Appendices within Volume 5 Appendices:

- Appendix 16.1: Outline Access Management Plan;
- Appendix 16.2: Preliminary Draft Workers Housing Strategy.

16.2 Legislation, Policy and Guidance

16.2.1 Legislation

This section identifies the legislation, policy and guidance of relevance to the assessment of the potential socio-economic, recreation and tourism impacts associated with the construction and operation of the proposed Development. Key documents relevant to the economy, housing and tourism at a national and local level have also been identified.

16.2.1.1 Legislation

Legislation relevant to this chapter includes The Land Reform (Scotland) Act 2003, which is hereafter referred to as the Land Reform Act.

16.2.2 National Policy

The following national policy is considered to be relevant:

- National Planning Framework 4 (NPF4) (2023).

National Planning Framework 4 (NPF4) identifies eighteen National Developments which are significant developments of national importance. Bailliemeanoch PSH falls under National Development 3 'Strategic Renewable Generation and Transmission infrastructure' and is considered to have in principle support under NPF4 as a national priority. Of particular relevance are NPF4 policies 11 and 25.

The intent of Policy 11 Energy is '*to encourage, promote and facilitate all forms of renewable energy development onshore and offshore'*. Part C is considered to be particularly relevant as it outlines that:

'Development proposals will only be supported where they maximise net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities'.

The intent of Policy 25 is '*to encourage, promote and facilitate a new strategic approach to economic development that also provides a practical model for building a wellbeing economy at local, regional and national levels*'. Part A of the policy outlines that proposals that contribute to local or regional community building strategies and consistent with local economic priorities will be supported.

16.2.3 Local Policy

The Argyll and Bute Local Development Plan 2 (ABLDP) was formally adopted on 28th February 2024 replacing the previous LDP published in 2015. The following ABLDP2 policies are considered to be most relevant to this chapter:

- Policy 4 – Sustainable Development;
- Policy 8 – Sustainable Siting;
- Policy 15 – Supporting the Protection, Conservation and Enhancement of Our Historic Built Environment;
- Policy 20 – Gardens and Designed Landscapes;
- Policy 22 – Economic Development;
- Policy 23 – Tourist Development, Accommodation, Infrastructure and Facilities;
- Policy 24 – Existing Tourism Uses;
- Policy 25 – Tourism Development Opportunities;
- Policy 26 – Informal Public Outdoor Recreation and Leisure Related Development;
- Policy 30 – The Sustainable Growth of Renewables;
- Policy 32 – Active Travel;
- Policy 49 – Sport, Recreation and Community Facilities; and
- Policy 67 – Provision of Housing to Meet Local Needs including Affordable Housing.

In addition to the LDP, the following publications by Argyll and Bute Council present the local policy position and strategies for development within the region.

- Argyll and Bute Council Local Housing Strategy 2022 – 2027;
- Argyll and Bute Indicative Regional Spatial Strategy (2021);
- Argyll and Bute Council's Economic Strategy Refresh: 2024 – 2034 (2024); and
- Declaring an Argyll and Bute Housing Emergency, Environment, Development and Infrastructure Committee Paper (1 June 2023).

16.2.4 Other Documents

The following national publications are also considered relevant to this chapter:

- The Scottish Outdoor Access Code (NatureScot, 2020).
- Our Strategic Framework (VisitScotland, 2021).
- Scotland Outlook 2030: Responsible Tourism For A Sustainable Future (Scottish Tourism Alliance, 2020).
- Tourism in Scotland: the economic contribution of the sector (Scottish Government, 2018).

The following local publications are also considered relevant to this chapter:

- Argyll & the Isles Strategic Tourism Partnership Visitor Economy Recovery and Growth Strategy 2022 – 2025.

16.3 Consultation

The following table provides detail on the consultation comments received relevant to this socio-economic, recreation and tourism chapter. The key issues and actions taken to address these points have been set out within*Table 16.1 Summary of Consultation*, below.

Table 16.1 Summary of Consultation

Consultee	Summary of Response	Key Issue	Action Taken
Argyll and Bute Council	Discussion over the water levels at Loch Awe, the Inventory Garden and Designed Landscape at Inveraray, the pier improvement project being pursued by ABC, the materials and material waste of the Headpond and connections points, and jobs and Temporary Workers Accommodation.	• Change in water levels of Loch Awe • Job creation associated with the Development • Required Temporary Workers Accommodation. • Potential for community benefits e.g. additional housing	Change in the water levels of Loch Awe will not be discernible by recreational users. A Workers Housing Strategy (Appendix 16.2 Volume 5 Appendices) has been prepared detailing accommodation expectations associated with the construction phase of the proposed Development. ILI has engaged with Argyll Estate on their masterplan and identified an opportunity to construct 12 permanent houses on Argyll Estate land. Refer to Appendix B: Preliminary Draft Workers Housing Startegy for further details.
Historic Environment Scotland	HES identified a potential for significant adverse impacts on the Inventory Garden and Designed Landscape around Inveraray Castle. The proposed new access, improved access from the proposed pier and the proposed temporary Construction Compound would affect the Upper Avenue of Inveraray Castle.	Impact upon the Upper Avenue as a result of proposed new and improved access from the proposed pier and around Inveraray Castle.	Chapter 13: Cultural Heritage, has assessed the likely cultural heritage impacts and are not repeated within this chapter, and Chapter 3: Evolution of Design and Alternatives, sets out the alternatives that have been assessed. Comments from HES focus on potential impacts related to construction works in the smaller development sites north and south of Inveraray. Use of the jetty and associated access routes is expected a maximum of ten times over the course of the seven year construction period. This will limit the extent of impact upon users of the Upper Avenue and visitors to the Garden and Designed Landscape around Inveraray Castle. The temporary Construction Compound will be sited to ensure access along the Upper Avenue is maintained throughout the construction period.
Marine Scotland Science	There is an important recreational fishery for Atlantic salmon, brown trout and pike on Loch Awe, the River Orchy (flows into Loch Awe) and the River Awe (flows out of Loch Awe).	Presence of recreational fishery on Loch Awe, River Orchy and the River Awe.	Chapter 8: Marine Ecology has assessed the likely impacts of the proposed Development upon marine ecology with Chapter 11: Water Environment assessing impacts from silt and sedimentation in Loch Awe, concluding that impacts upon species of salmon, brown trout and pike in the loch are expected to be managed through good practice mitigation.
Royal Yachting Association Scotland (RYA)	A new or upgraded pier could benefit recreational boaters and the local community. As it is unclear what the impact on recreational boating will be during the construction phase then the impact on recreational boating should be scoped in. However mitigation measures should ensure that there are no adverse effects. It will be important to consult Inspire Inveraray which wishes to buy the old pier. RYA conclude that the area of the loch is great enough to ensure that short-term water level changes associated with the scheme are likely to be trivial to small recreational boats.	Potential impact upon recreational boaters and local community following construction of pier at Inveraray.	Engagement with Inspire Inveraray concluded that a second permanent pier was not desired as funding has been secured to upgrade the old existing pier within the north of Inveraray. The Marine Facility associated with the Development is temporary. RYA agree that any changes to the water level of Loch Awe, as a result of the proposed Development, would be trivial to small recreational boats on account of the loch's size. RYA Scotland is a non-statutory consultee of Marine Scotland so will be consulted when the marine licence is applied for.
Scotways	The public right of way SA128 is recorded in the National Catalogue of Rights of Way (CROW) as crossing close to the application site. Outline the information relating to other forms of public access to land and recreational amenity should be considered. The Applicant should take	Proposed access route's interference with Public Right of Way SA128 within the Development Site boundary.	Engagement with Argyll and Bute Council's Access Manager concluded that an Outline Access Management Plan should be prepared detailing the measures proposed to minimise any impacts on access to local paths. The Outline Access Management Plan is set out in Appendix 16.1 within Volume 5 Appendices.

Consultee	Summary of Response	Key Issue	Action Taken
	into account both recreational amenity and landscape impacts. Comments on the legal duties to uphold access rights deriving from the Land Reform Act (Section 3 and Section 14). Scotways suggests approaching the relevant authority's access team for their input when drawing up their Access Management Plan.		
MoD	Concerns over piling activities and additional noise or vessel traffic within Loch Fyne impacting upon high speed runs and development activities.	Confliction of trial days with works in Loch Fyne generating noise in the water	It has been agreed with the MoD that piling activities within Loch Fyne will cease on trial days for circa 12 days per year with dates to be agreed with the appointed Construction contractor who will maintain in contact with the MoD throughout construction as required, and therefore their availability for the range of uses will continue largely as normal.

In addition, public consultation was undertaken as part of the Development design process. The consultation received feedback which can be categorised by the following themes:

- Changes to Loch Awe water levels;
- Increased traffic flows for residential receptors; and
- The potential for negative wellbeing impacts as a result of the proposed Development, including the potential for the Development to have both short and long term negative commercial impacts for specific residential receptors located near the loch side

A questionnaire was available at the consultation events which was intended to gain further insight into recreational uses in the area. Responses indicated that the local area is used regularly for walking and highlighted a general concern amongst local residents of the potential impact of the proposed Development upon local Walking Routes and access along the A85 and B840. This consultation response proved beneficial in understanding local concerns and helped inform the Development design and mitigation. Further detail on the consultation events and outcomes has been included within the accompanying Pre-Application Consultation report.

16.4 Methods

16.4.1 Guidance and Standards

The following national level guidelines apply to this chapter:

- Institute Environmental Management and Assessment (IEMA): *Environmental Impact Assessment Guide to: Delivering Quality Development* (IEMA, 2016).

16.4.1.1 Socio-economics

The method for the socio-economic assessment has been broadly derived from the Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment methodology for the Assessment of Pedestrians, Cyclists and Community Effects (Volume 11, Section 3 Part 8, Ref 2, LA112 Population and Human Health (Standards for Highways, 2020)). This guidance has since been replaced by DMRB Sustainability and Environment Appraisal: LA 112 'Population and Human Health' (Highways England, et al., 2020). The updated LA 112 however does not include consideration of certain socio-economic elements which were contained within Part 8 guidance; those elements of the Part 8 guidance therefore have continued to influence this assessment.

Together, this guidance promotes:

- a consideration of job creation, local expenditure, and potential effects on community facilities.

16.4.1.2 Tourism and Recreation

The guidance concerning effects on tourism and recreation broadly follows the guidance contained within DMRB, Volume 11 Environmental Assessment methodology for the Assessment of Pedestrians, Cyclists and Community Effects (Volume 11, Section 3 Part 8, Ref 2). The DMRB guidance recommends consideration of the following:

- Changes to amenity by users of core paths, footpaths, cycleways and other less formal routes including local paths which may not be designated; and
- Severance or disturbance of core paths, footpaths, cycleways and local paths during both construction and operation; and
- Changes to the amenity value experienced by visitors.

16.4.2 Approach to Assessment

The methodology adopted involves undertaking desktop research to determine the existing conditions and receptors within the study area. This desktop exercise draws on a range of publicly available statistics and information alongside feedback from consultation events.

Sources used to determine the baseline include:

- For socio-economic elements:
  - Scottish Government statistics publications;
  - Databases and reports from the Office for National Statistics (ONS); and
  - National Records for Scotland.
- For tourism and recreation elements:
  - VisitScotland research and statistics reports;
  - Consultation with Scotways and Argyll and Bute Council's Access Manager;
  - Core Paths Plan Review; and
  - Historic Environment Scotland databases.

16.4.2.1 Study Area

The Development Site is shown on *Figure 1.1 Location Plan*, and *Figure 2.3 Above Ground Infrastructure (Sheets 1 & 2)* within *Volume 3: Figures* and comprises the core Development Site, lying to the east of Balliemeanoch, and subsidiary development site areas including access track locations to the north and south of Inveraray. The Development Site in its entirety falls within the red line boundary and comprises an area of 3115 ha.

The study area for the socio-economic, recreation and tourism assessment is shown in *Figure 16.1a: Socio-economic, Recreation and Tourism Receptors (Volume 3: Figures)*. The study area extends to 5 km, as agreed in the scoping report, from the red line boundary in order to ensure consideration of receptors in the wider area around the Development Site.

16.4.3 Assessment Scope

The assessment considers the effects during the three phases of the Development lifespan as identified in *Section 2.15: Construction Programme* of *Chapter 2: Project and Site Description*. The phases include: pre-construction, construction and operation. Decommissioning has been scoped out as per *Section 2.19 Decommissioning* within *Chapter 2 Project and Site Description*. The assessment considers:

- Socio-economics – the local communities and associated economies in the vicinity of the Development; and
- Tourism and Recreation – tourist / visitor attractions as well as recreational land uses or resources such as visitor centres and walking or cycling routes.

The assessment will consider the effects of the construction and operation of the Development on the local communities and associated economies in the vicinity of the proposed Development. Additionally, tourist and visitor attractions and recreational land uses such as walking or cycling routes will also be assessed. The study area will extend to 5 km from the proposed Development Site in order to ensure consideration of the local area not just the immediate Development location.

The assessment process follows the following approach:

- Scoping, comments received from the scoping opinion and through individual consultation helped to develop the scope of the assessment;

- Description of the baseline conditions, against which the effects of the Development will be assessed;
- Determination of the receptors likely to be affected and their sensitivity or importance;
- Prediction of the degree of change from the baseline as a result of an effect and the likelihood that it may occur (i.e. the magnitude of change); and
- An assessment of whether a likely significant effect will occur on a receptor by considering the predicted magnitude of change with the sensitivity of the receptor and also taking into account any mitigation measures.

16.4.4 Assessment Methodology

The assessment methodology employed throughout this chapter to determine the impact of the proposed Development upon local socio-economic, recreation and tourism receptors reflects that of the magnitude of change and significance criteria set out in *Chapter 4: Approach to EIA*.

16.4.4.1 Sensitivity of Receptors

The sensitivity of the receptor takes into account the receptor's value or quality in terms of the socio-economic or tourism activities it supports and the ability to absorb an effect without perceptible change. The sensitivity criteria have been derived taking into account relevant legislation, statutory designations or classifications.

16.4.4.2 Magnitude of Change

The magnitude of change criteria consider the scale of the predicted changes to existing conditions, taking into account its duration, the reversibility of the effect and whether the effect is direct or indirect.

16.4.4.3 Significance of Effects

The approach to the assessment of effects and determination of significance is as per *Table 4.7: Approach to the Assessment of Significance* in *Chapter 4: Approach to EIA*. The approach is also informed by professional judgement. The significance of effect is based on a combination of the sensitivity or importance of the receptor and the magnitude of change from a potential effect. As in Chapter 4, this general approach has been treated as a framework during the assessment and had not been used as a matrix.

16.4.5 Limitations and Assumptions

It should be noted that the following features have been assessed separately within the relevant EIA chapters and therefore do not fall within the scope of this assessment:

- Effects on visual amenity of tourism and recreation receptors are considered in *Chapter 5: Landscape and Visual Assessment.*
- Impacts on the operation of hydropower schemes within the area, such as Beochlich, will be addressed within *Chapter 12: Flood Risk and Water Resources*.
- Impacts on the heritage values of heritage assets will be addressed within *Chapter 13: Cultural Heritage*.
- Effects on increases in traffic volumes on the local road network and severance for motorists, cyclists and pedestrians will be assessed within *Chapter 14: Access, Traffic and Transport*.
- Effects on fish, including commercial fisheries are included within *Chapter 7: Aquatic Ecology*, *Chapter 11: Water Environment* and *Chapter 20: Commercial Fisheries*.

16.5 Baseline Environment

In order to assess the potential impacts of the Development, it is necessary to determine the environmental conditions, resources and receptors that currently exist within the Development Site and in the surrounding area.

Baseline information has been collated from a variety of publicly available sources as well as through consultation with Argyll and Bute Council. Some information has also been obtained through the collection of survey data as set out in *Section 16.4.2: Approach to Assessment*, above.

16.5.1 Existing Land Use

The core Development Site is located within mid Argyll, between Loch Awe and Loch Fyne, and lies approximately 9.5 km to the north-west of Inveraray and approximately 4.5 km to the south of Portsonachan (*Figure 1.1: Site Location Plan)(Volume 3: Figures))*. The land within the Headpond area of the Development Site comprises an upland plateau moorland with craggy outcrops, used mainly for sheep grazing.

The highest point on the site is approximately 400 m above sea level. With the exception of Public Right of Way SA128, there are no public rights of way, cycle routes or formal recreation receptors within the core Development Site. The Development's Tailpond will be Loch Awe, an area used for recreational activities such as boating, water sports and angling. The development components located around Inveraray include the Marine Facility, pier and upgraded access tracks. These tracks intersect with existing tracks at Inveraray Castle Garden and Designed Landscape (the visual amenity of which is assessed in *Chapter 5: Landscape and Visual Assessment*) and certain core paths.

The Headpond location at Lochan Airigh sits at approximately 360 m above ordnance datum and 3 km to the east of the village of Balliemeanoch. The Marine Facility is located south of Inveraray off the A83.

There is no woodland within the main area of the Development Site, with woodland pockets restricted to those located along the proposed access tracks. These woodlands include plantation woodland along the existing access track off the A819; along the proposed new and upgraded existing tracks proposed to the west of Inveraray; and along the upgraded access to the north of Inveraray Castle.

The Development is predominantly located within the catchment of the Allt Beochlich watercourse. The catchment consists of a number of small streams which ultimately flow into Loch Awe, these originate from smaller Lochs (Airigh, Dubh and Romach). A recreational fishery for Atlantic salmon, brown trout and pike on Loch Awe, the River Orchy and the River Awe is present within the study area. Additionally, a fish farm is located on Loch Awe outside of the study area.

16.5.2 Socio-Economics

16.5.2.1 Population

The core Development Site is located in a rural area. Isolated static caravans are situated at the west of the site on the banks of Loch Awe in proximity to the proposed Tailpond inlet / outlet. There are also two houses in this area close to the proposed western access track linking the Headpond and Tailpond; a single detached bungalow and Balliemeanoch farm itself.

In June 2021 Scotland's population was estimated at 5,479,900. At the same point, the total population of the Argyll and Bute local authority area was estimated to be 86,220 which equates to approximately 1.57% of the total population of Scotland.

The Development Site lies within Argyll and Bute Council where it is noted that 47.2% of the area's population live in areas classified by the Scottish Government as 'rural' (Argyll and Bute Council (2020). Surrounding the Development Site lie the settlements of Ardchonnell, Ballimeanoch, Drimfern, Ladyfield, Portsonachan and Taynafead. Inveraray is the largest nearby settlement to the Development Site with an estimated population of 560 (Argyll and Bute Council, 2020). In 2022, the total population of the study area was determined to be 1066 (Office for National Statistics, 2023).

Table 16.2. Populations

Age Group	Total Populations of Argyll and Bute	% of Total Population of Argyll and Bute	Scotland % of population
0 – 15	12,441	14.4	16.6
16 – 24	8,232	9.5	10.2
25 – 44	17,085	19.8	26.4
45 – 64	25,685	29.8	27.2
65 – 74	12,521	14.5	10.9
75 +	10,256	11.9	8.7
All Ages	86,220	100.0	100.0

Age Group	Total Populations of Argyll and Bute	% of Total Population of Argyll and Bute	Scotland % of population

Source: National Records of Scotland, 2022

16.5.2.2 Housing

Argyll and Bute Council declared a Housing Emergency in June 2023 due to a stressed local housing system giving rise to increased homelessness and a lack of housing choice for key workers (Argyll and Bute Council, 2023).

The Argyll and Bute Local Housing Strategy Annual Report for 2023[1] outlines that there was a total of 48,971 dwellings in April 2023 of all tenures in Argyll and Bute. Within the housing areas closest to Balliemeanoch there are 8,899 houses within the Lorn area (including Oban) and 5,714 in mid-Argyll (including Inveraray).

The housing stock is predominantly owner-occupied with 29,133 dwellings, 8,799 dwellings are social rented housing and 5,697 dwellings are privately rented. There are a further 5,225 dwellings that are defined as ineffective stock, i.e., not utilised as a households main dwelling. These include second/holiday homes, empty homes and job-related homes. The ineffective stock rate for Lorn is 8% and Mid-Argyll 13% which is over three times the national average (4%)[2].

16.5.2.3 Employment

Employment rates within Argyll and Bute are identified in *Table 16.3. Employment Rates June 2023*, below. The percentage of people in employment in the Argyll and Bute region is 0.5% higher than across Scotland. By comparison, the employment rate of the region is 0.4% lower than the average for Great Britain, as shown in the table below.

Table 16.3. Employment Rates June 2023

Argyll and Bute (%)	Scotland (%)	Great Britain (%)
75.3	74.8	75.7

Source: Office for National Statistics, 2023

Table 16.4 Employee Jobs by Sector, provides a breakdown of employment by industry. The four largest employment sectors in Argyll and Bute are *Human Health and Social Work Activities* (12.5%), *Accommodation and Food Service Activities* (13.9%), *Wholesale and Retail Trade; Repair of Vehicles* (11.1%) and *Public Administration and Defence* (11.1%). Data on the *Agriculture, Forestry and Fishing* sector and *Activities of Households as Employers* is not available at the local authority level; however, it is noted that the ABC Economy Key Facts[3] states that agriculture and fishing has relatively high levels of employment in Argyll and Bute.

In 2022, 3.5% of jobs in the Argyll and Bute Council area were in the *Arts, Entertainment and Recreation* sector with a further 13.9% in the *Accommodation and Food Service Activities* sector, as shown in *Table 16.4 Employee Jobs by Sector*, below.

VisitScotland (2023) notes that within the region, employment in sustainable tourism accounts for 5,700 jobs, with the tourism sector providing approximately 15% of employment in Argyll and Bute. By comparison, in 2022, the tourism sector accounted for 8.5% of total employment in Scotland, providing approximately 229,000 jobs throughout the country (VisitScotland, 2023).

Table 16.4 Employee Jobs by Sector

	Argyll and Bute		Scotland
Sector	**Employee Jobs**	**%**	**%**
Mining and Quarrying	200	0.6	1.0
Manufacturing	1,750	4.9	6.9
Electricity, Gas, Steam and Air Conditioning	400	1.1	0.8
Water Supply; Sewerage, Waste Management	150	0.4	0.7

[1] The Argyll and Bute Local Housing Strategy Annual Report for 2023
[2] INTRODUCTION (argyll-bute.gov.uk)
[3] https://www.argyll-bute.gov.uk/my-community/economy

	Argyll and Bute		Scotland
Construction	2,000	5.6	5.7
Wholesale and Retail Trade; Repair of Vehicles	4,000	11.1	12.9
Transportation and Storage	1,500	4.2	4.1
Accommodation and Food Service Activities	5,000	13.9	8.4
Information and Communication	600	1.7	3.2
Financial and Insurance Activities	175	0.5	3.3
Real Estate Activities	500	1.4	1.3
Professional, Scientific and Technical Activities	1,750	4.9	7.4
Administrative and Support Service Activities	3,000	8.3	8.1
Public Administration and Defence	4,000	11.1	6.5
Education	3,000	8.3	8.8
Human Health and Social Work Activities	4,500	12.5	15.7
Arts, Entertainment and Recreation	1,250	3.5	3.0
Other Service Activities	450	1.2	1.6

Source: Nomis, 2023

The businesses which exist in the vicinity of the Development and within the 5 km study area have been identified through a desk-top exercise which also identified various categories of businesses. These include farming/agriculture, leisure and tourism, including hotels and self-catering accommodation sites on the banks of Loch Awe. Numerous guest houses, hotels and self-catering accommodation businesses are located within Inveraray and the wider study area.

16.5.3 Tourism and Recreation

A review of national and regional tourism strategies (VisitScotland, 2023; Wild About Argyll, 2022), together with publicly available information, including statistics for the area has been undertaken. This review identifies key tourism receptors within 5 km of the Development Site. Features were considered tourism receptors if they promoted tourist visits, and include:

- Visitor Attractions – features that attract visitors out of interest or pleasure (such as boat tours, gift shops, local lochs, Scenic Areas and Nature Reserves)
- Tourist Services – features that cater to tourists e.g. restaurants and pubs; and
- Recreation – features that support outdoor recreational activities (such as core paths, long distance routes and lochs).

A variety of online sources were visited to gather publicly available information on tourist attractions, resources, services and other tourist features. This includes but is not limited to:

- VisitScotland;
- Scottish Government;
- Scotways; and
- Wild About Argyll.

Tourism receptors identified as part of the review have been set out in *Table 16.7 Recreation and Tourism Features within 5 km of Development Site*below. A complete list of the tourism receptors within the study area has been included as part of this assessment in *Figure 16.2: Socio-economic, Recreation and Tourism Receptors* (Volume 3 Figures).

A review of Scotland's Environment Map (2024) and NatureScot's Sites of Scientific Interest (2024) database identified that there are no statutory environmental designations within the core area of the Development Site. Inveraray Castle Garden and Designed Landscape falls within the red line boundaries to the north and south of Inveraray. The proposed Marine Facility would be situated within the Upper Loch Fyne and Loch Goil Marine Protected Area (MPA), located to the west of Inveraray.

16.5.3.1 Tourism Industry

Tourism is an important contributor to the local economy. VisitScotland compiles annual tourism statistics for Scotland. The statistics provide a range of details including an estimate of the contribution of the tourism sector to the economy, numbers of visits to the region, and popular attractions.

Key points to note from the data on 2019 (VisitScotland, 2023) include:

- UK residents took approximately 846,000 trips to Argyll & the Isles, staying on average 4.0 nights and spending £199 million;
- Visitors from overseas made 147,000 trips to Argyll & the Isles, staying on average 3.7 nights and spending approximately £62 million;
- Argyll Forest Park, the most visited attraction in Argyll and Bute, is outside the study area, over 5 km from the Development Site boundary; and
- Occupancy rates in the area vary according to the type of accommodation but are typically highest between May and August.

16.5.3.2 Tourism Receptors

The tourist attractions identified in the study area can be loosely split into the following two categories:

- Scenic areas and nature reserves which includes lochs, forestry and mountains; and
- Visitor and historic attractions, which includes museums, galleries, outdoor activities and archaeological features that are promoted for tourists.

Scenic Areas and Nature Reserves

Areas designated for their landscape and nature value are not necessarily marketed for tourism but could contribute to tourists' preference for an area. This is especially true in Scotland as VisitScotland's surveys confirm that landscape is the most important factor that attracts visitors to Scotland (VisitScotland, 2021). Scenic areas and nature reserves often provide educational and / or recreational infrastructure and facilities. Those designated areas identified within the study area are listed in *Table 16.7 Recreation and Tourism Features within 5 km of Development Site,* below.

Several lochs fall within the study area and contribute to the area's appeal for tourist. These lochs also offer the potential for various recreational uses including bathing water, water sports, fishing and loch cruises. Whilst Loch Awe falls closest to the core Development Site, the delivery of large abnormal loads to the Site will occur via the Marine Facility and pier constructed on Loch Fyne. Pressure on the local road network is therefore expected to be reduced.

To the north of Inveraray Castle, non-statutory long established woodland, of plantation origin, is located along the northern and southern stretches of the proposed access route. This woodland contributes to the area's local setting.

Table 16.5 Top Five Free and Paid Visitor Attractions presents the most visited tourist attractions within the Argyll and Bute region in 2019. The results demonstrate the importance of scenic areas and nature reserves with Argyll Forest Park representing the top tourist destination in terms of visitor numbers (VisitScotland, 2023).

Table 16.5 Top Five Free and Paid Visitor Attractions in Argyll and Bute region

	Visitor Attraction	Visitor Numbers 2019
Free Attractions	Argyll Forest Park	151,538
	Staffa National Nature Reserve	107,725
	Oban War and Peace Museum	33,310
	Iona	29,808
	Aros Park	19,710
Paid Attractions	Inveraray Castle	125,462
	Iona Abbey & St Columba Centre (Mull)	63,884
	Oban Distillery Visitor Centre	57,031
	Benmore Botanic Garden	53,318

Visitor Attraction	Visitor Numbers 2019
Mount Stuart	42,809

Source: VisitScotland (2023)

Visitor Attractions

The Argyll and Bute region has a high density of well-preserved archaeological features. Some of these features are promoted as historic attractions for tourists, including scheduled monuments, conservation areas and listed buildings. The review of tourism receptors identified several historic tourist attractions falling within the study area. These features are set out in *Table 16.7 Recreation and Tourism Features within 5 km of Development Site*, below.

One scheduled monument is present within the core Development Site: Balliemeanoch Chapel and Burial Ground, which is located approximately 500 m north of the proposed tailrace tunnel. Further information on the historic attractions as archaeological features is contained within *Chapter 13: Cultural Heritage* of this EIA.

The visitor attractions identified within the study area are set out in *Table 16.7 Recreation and Tourism Features within 5 km of Development Site,* below and shown in *Figure 16.1: Socio-economic, Recreation and Tourism Receptors*, included within Volume 3 Figures.

Recreation Routes

Access to the outdoors is important for recreation and tourism in Argyll and Bute. The Land Reform Act established access rights to most land and inland water for everyone in Scotland. The rights only exist if they are exercised responsibly by respecting people's privacy, safety and livelihoods, and the environment.

Recreation routes support outdoor pursuits and activities. Recreation routes within the study area are core paths, long distance routes and local paths. A review of Scotways' Catalogue of Rights of Way indicated Public Right of Way SA128 to be located within the Development Site (Scotways, 2024). Although this route does not appear within Historic Environment Records or the Canmore database, consultee feedback provided by Scotways indicated that the route has been informally promoted and remains important for public access to the countryside.

The core paths closest to the proposed Development are the C173 (Ford – Annat), located approximately 0.8 km to the west of the Development Site, and the C200 (Coille Bhraghad – Queens Drive), located to the northwest of Inveraray. Moreover, numerous tracks are present within the commercial forest to the north of the Development Site. Although these routes are not formally promoted trails or cycle routes, they provide local amenity access to the outdoors. Opportunities for walking, cycling and horse riding also exists in the wider study area through various waymarked core paths and recreation routes including:

- The Loch Lomond and Cowal Way; a long-distance footpath linking Portavadie in the south of Cowal with Inveruglas at Loch Lomond, approximately 16.5 km to the southeast of the Headpond;
- Argyll and Bute Core Path network; the proposed access routes at Inveraray cross the following Core Paths:
  - C200: Coille Bhraghad-Queens Drive;
  - C201: Dun Na Cuaiche; and
  - C203: Bealach an Fhuarain.
- National Cycle Network Route 78 to the west of Loch Awe; and
- A number of core paths located on the west side of Loch Awe including C173 (a, b, c, d, e), C490, C305; and
- Long-distance walks including the summit of Ben Cruachan.
- The wider area is also used for hill walking in the various nearby Munro, Corbett and Graham hills.

An Outline Access Management Plan has been prepared (*Appendix16.1 Outline Access Management Plan (Volume 5: Appendices))* which sets out the access arrangements for walkers, cyclists and horse riders during construction and operation of the Development. The plan also details the mitigation measures which should be implemented to maintain access during these phases.

Tourist Services

In addition to visitor attractions and resources there are a range of services which cater to tourists and visitors such as hotels, B&Bs and self-catering accommodation.Table 16.6 % Net Rooms Occupancy by Area and Accommodation Type, provides information on accommodation services. The table compares occupancy within the Argyll and Bute region to Scotland as a whole, considering a range of accommodation types.

The results indicate that maximum occupancy occurs in summer months with the highest percentages recorded as 87% for hotels in June and August, 86% for guest houses and B&Bs in August and 71% for self-catering units in August. Occupancy within Argyll and Bute generally surpasses that of Scotland. Whilst every effort has been made to capture the most recent accommodation data for the region, it should be noted that the following statistics have been gathered during the Covid-19 pandemic and therefore the overall results of Table 16.6 may not be representative of previous or current years.

Table 16.6 % Net Rooms Occupancy by Area and Accommodation Type

	Hotels (%)		Guest Houses and B&Bs (%)		Self-catering (%)	
	Argyll and Bute Region, 2019	**Scotland, 2021/2022**	**Argyll and Bute Region, 2019**	**Scotland, 2021/2022**	**Argyll and Bute Region, 2019**	**Scotland, 2021/2022**
January	62	40	37	19	43	20
February	64	55	48	33	50	30
March	67	44	34	36	54	30
April	76	67	45	60	55	42
May	83	65	72	66	63	41
June	87	72	70	73	63	51
July	83	84	74	75	67	60
August	87	84	86	71	71	55
September	82	47	69	60	59	54
October	77	63	46	36	53	45
November	62	50	38	28	35	28
December	61	45	17	37	40	32
Annual average	**74.3**	**59.6**	**53**	**49.6**	**54.4**	**40.6**

Source: VisitScotland, 2023

Tourist services other than accommodation are also found within the study area, including shops, restaurants and pubs. Tourist services prove more relevant to this socio-economic assessment than tourist accommodation and it is therefore the former which have been included *Table 16.7 Recreation and Tourism Features within 5 km of Development Site* Additional detail on the specific tourist and recreation receptors within the study area can be found in *Figure 16.1b: Socio-economic, Recreation and Tourism Receptors Table (Volume 3: Figures)*.

Table 16.7 Recreation and Tourism Features within 5 km of Development Site

Attraction / Amenity	Description	Distance to Development	Sensitivity
Scenic Areas and Nature Reserves			
Knapdale National Scenic Area	National Scenic Area characterised by Knapdale Forest and partially surrounded by the Crinan Canal, Sound of Jura and Loch Sween.	Approximately 27km southwest of Development Site.	Medium
Trails and Cycle Routes			
The Loch Lomond and Cowal Way	Long-distance footpath linking Portavadie in the south of Cowal with Inveruglas at Loch Lomond.	Approximately 16.5 km to the southeast of the Headpond.	Medium

Attraction / Amenity	Description	Distance to Development	Sensitivity
National Cycle Network Route 78	National Cycle Network Route running to the west of Loch Awe.	NCN route 78 lies approximately 0.8 km to the west, on the opposite side of Loch Awe from the Development Site.	High
Summit of Ben Cruachan	Walking route to the summit of Ben Cruachan.	Ben Cruachan lies approximately 12 km to the north of the core Development Site.	Medium
C200: Coille Bhraghad-Queens Drive	Part of the Argyll and Bute Core Path network.	The proposed access route at Inveraray crosses this Core Path.	Medium
C201: Dun Na Cuaiche	Part of the Argyll and Bute Core Path network.	The proposed access route at Inveraray crosses this Core Path.	Medium
C203: Bealach an Fhuarain	Part of the Argyll and Bute Core Path network.	The proposed access route at Inveraray crosses this Core Path.	Medium
C171: Kilmore – Loch Nan-Kilchrenan	Part of the Argyll and Bute Core Path network.	This Core Path lies approximately 5 km to the north of the core Development Site, on the opposite side of Loch Awe.	Medium
C173 (a, b, c, d, e)	Part of the Argyll and Bute Core Path network.	This Core Path lies approximately 0.8 km to the west of the core Development Site, on the opposite side of Loch Awe from the Development Site.	Medium
C175: Kilmelford to Loch Avich	Part of the Argyll and Bute Core Path network.	This Core Path lies approximately 5.5 km southwest of the core Development Site on the opposite side of Loch Awe.	Medium
C176: Loch Avich South (Two Lochs Trail)	Part of the Argyll and Bute Core Path network.	This Core Path lies approximately 5.5 km southwest of the core Development Site on the opposite side of Loch Awe.	Medium
C199: Furnace to Inveraray via Kenmore	Part of the Argyll and Bute Core Path network.	This Core Path follows the western bank of Loch Fyne, south of Inveraray and approximately 1km from the Development Site boundary south of Inveraray.	Medium
C300: Kilchrenan to Taynuilt	Part of the Argyll and Bute Core Path network.	This Core Path is located approximately 5 km north of the core Development Site on the opposite side of Loch Awe.	Medium
C305: Dalavich to Barnaline Lodge	Part of the Argyll and Bute Core Path network.	This Core Path lies approximately 4 km to the southwest of the core Development Site, on the opposite side of Loch Awe.	Medium
C323: Drissaig to Inverinan via Gleann Meisean	Part of the Argyll and Bute Core Path network.	This Core Path is located approximately 4.6 km from the core Development Site, on the opposite side of Loch Awe.	Medium
C324: Inverinan circular, Loch Aweside	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe.	This Core Path lies approximately 1 km to the west of the core Development Site, on the opposite side of Loch Awe.	Medium
C490: Dalavich, Loch Awe	Part of the Argyll and Bute Core Path network.	This Core Path lies approximately 4.3 km southwest of the core Development Site on the opposite side of Loch Awe.	Medium
C523: Loch Nant, Loch Aweside	Part of the Argyll and Bute Core Path network.	This Core Path lies approximately 1.5 km to the west of the core Development Site, on the opposite side of Loch Awe.	Medium
Old Road to Inverinan	1.1km rural path, designated Heritage Path located west of Loch Awe.	This path lies approximately 1 km to the west of the core Development Site, on the opposite side of Loch Awe.	Low
Public Right of Way SA128	Recorded National Catalogue Rights of Way which crosses the Development Site, intersecting the proposed access route to the north of the Site.	The proposed access route to the north of the Development Site crosses this Public Right of Way.	Low
Historic & Visitor Attractions			

Attraction / Amenity	Description	Distance to Development	Sensitivity
Kilchurn Castle	15th century castle located on a rocky peninsula at the northeastern end of Loch Awe.	Approximately 14.5 km to the northeast of the Headpond.	Low
Inveraray	Town in Argyll and Bute located on the western shore of Loch Fyne.	The proposed works at Inveraray are located directly north and south of the town.	Low
Inveraray Castle	Country house near Inveraray on the shore of Loch Fyne.	Approximately 0.5 km south of the proposed Development Site at Inveraray.	Medium
Inveraray Old Jail	Former prison and court house on Church Square, Inveraray.	Approximately 0.7 km east of the proposed Development Site at Inveraray.	Low
Innes Chonnel Castle	Ruined 13th century castle on Innis Chonnel, an island on Loch Awe.	Approximately 4.3 km southwest of the proposed Development Site.	Low
Dunderave Castle	16th century castle on the shore of Loch Fyne.	Approximately 4.3 km west of the proposed Development Site around Inveraray.	Low
The Inverary Bell Tower	38 m bell tower on the shore of Loch Fyne.	Approximately 0.5 km west of the proposed Development Site at Inveraray.	Low
Inveraray Maritime Museum	Maritime Museum located at the Pier, Inveraray.	Approximately 0.75 km from the Development Site at Inveraray.	Low
Dunderave Castle	16th century castle on the shore of Loch Fyne,	Approximately 5km northeast of the proposed Development Site at Inveraray.	Low
Fraoch Eilean Castle	13th century castle located on Fraoch Eilean island in Loch Awe.	Approximately 7 km northeast of the core Development Site.	Low
Innis Chonnel Castle	13th century located on Innis Chonnel island in Loch Awe	Approximately 6.3 km southwest of the core Development Site.	Low
Nant Power Station, Dam	Hydroelectric power plant, first commissioned in 1963 at Coillaig.	Approximately 1.8 km northwest of the core Development Site, on the opposite side of Loch Awe.	Low
Hayfield House	Walled garden and gardener's house at Hayfield in Argyll.	Approximately 5.5 km northeast of the core Development Site on the opposite side of Loch Awe.	Low
Visitor Services			
Various restaurants	Various restaurants including Loch View Restaurant; Cottage Restaurant; Ocho Inveraray.	Located within study area.	Low
Various gift shops	Various gift shops including The Courtyard; The Pier Shop; Bonnie Argyll.	Located in Inveraray.	Low
Various retail	Various supermarkets including The Furnace Village Store; Co-op Food; Costcutter.	Located in Inveraray.	Low
Various clothing stores	Various clothing stores including Inveraray Woollen Mill; MacIntyres; Dewar Store.	Located in Inveraray.	Low

Source: VisitScotland (2023)

16.6 Assessment of Effects

The Development has the potential to result in both adverse and beneficial impacts on a wide range of recreational infrastructure, tourism assets and socio-economic activities. In order to assess the overall significance of an effect it is necessary to establish the magnitude of the effect occurring i.e. the change to the existing baseline conditions as a result of the development and the sensitivity or importance of the receiving environment or receptor. The following sections assess the potential impacts upon different receptors during the construction and operational phases.

16.6.1 Receptors Scoped out of Assessment

The inclusion of impacts to housing supply and the supply of visitor accommodation in proximity to the Development Site have been scoped out of this assessment as a Workers Housing Strategy sets out potential options for housing workers during construction (*Appendix 16.2 Housing Strategy (Volume 5: Appendices))*. The Development is therefore not expected to have an adverse impact upon the availability of tourist accommodation for visitors or the local housing market.

In addition, the proposed Development is not expected to have an effect upon population demographics, or local businesses within the Development Site. These features have therefore been scoped out of the assessment.

Moreover, the decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of these facilities. The impact of decommissioning has therefore been scoped out of this assessment.

16.6.2 Pre-construction

Whilst economic impacts upon local businesses pre-construction are unlikely, the local community may experience feelings of uncertainty during this phase on account of the unknown potential impacts associated with the construction of such a Development. To address this, the Applicant has published a project website and held consultation events on the project. A Community Liaison Group (CLG) will also be established prior to the commencement of works. This group will consist of representatives from the local community, including businesses, tourist and recreational operators. The CLG will provide an opportunity for local residents and stakeholders to share their views and feelings about the Development directly with the Applicant. As such, it is expected that any potential negative social impacts during the pre-construction phase will be negligible.

16.6.3 Construction

16.6.3.1 Socio-economics

Access

During the construction phase, access will be limited in all areas with construction works for health and safety reasons. This includes the Headpond, Tailpond inlet / outlet structure, the compounds, and the access tracks (temporary and ancillary). Site clearance will be phased and will not include the whole area at one time.

The construction works are not expected to require diversions to any existing recreational routes on site. However, where this requirement changes and diversions are deemed necessary, these diversions will be determined post consent once the contractor has been appointed. Access is considered to have a significance of Medium as it is regionally important to the Argyll and Bute region for recreation and tourism. The magnitude of change is considered Medium given the length of the construction period. The Significance is therefore considered to be **Minor Adverse** which is considered to be **Not Significant**.

During construction, there will likely be localised disruption to public access along the B840, A819 and A83 as a result of the increased vehicle movements. Impacts to road users has been assessed within *Chapter 14: Access, Traffic and Transport*. A temporary realignment of the B840 will be necessary during construction works with potential effects assessed to be **Minor Adverse** and **Not Significant** upon the local community on account of the traffic disruption.

Potential Effects on the Local Economy and Tourism

The Development is likely to have a beneficial effect on the local economy during the seven year construction phase, as a result of job creation and local expenditure by the developer and contractors, alongside supply chain benefits. During the construction phase, workers involved in the project would use local services and spend in local restaurants and shops which would be especially beneficial outside of the high tourist season. Local businesses are predicted to have Medium sensitivity and will be impacted for up to seven years which would be a Medium magnitude of change. The significance of effect on the local economy is assessed to be **Moderate Beneficial** and is therefore considered to be **Significant**.

Potential Effects on the Local Job Market

The job market is considered to have a medium sensitivity to change, being regionally important, but robust due to existing employment numbers. The applicant anticipates that up to 1000 personnel will be employed on site during the seven year construction phase at its peak. The average number of personnel working on the Development Site will be an average of 600 to 800 workers on-site, although reduced numbers will be required during the mobilisation period and as the project nears completion.

The relatively small local population will result in a need to attract workers from outside of the study area and local job market; however, it is considered that the construction of the Development will create local jobs, which will have a beneficial effect on the local job market. Additional benefits will arise as the Applicant is committed to establishing a training programme which will be available for all individuals employed on site and will help to upskill the local workforce.

As the number of local jobs available during construction is unknown at this stage, the limited local population and the duration will be temporary, therefore the magnitude of change of job creation is considered to be Low. The significance of effect on the local job market is therefore likely to be **Minor Beneficial**, which is **Not Significant**.

Potential Effects on the Local Community

Although certain individual properties and farmsteads exist within the study area, there are no community receptors within the Development Site. The communities of Inveraray, Portsonachan and Ardchonnell are all located outside of the Development Site Boundary but within the study area.

The proposed access route on site does not pass through any of the communities identified within the study area. *Chapter 14: Access, Traffic and Transportation* provides detail on the access route from the proposed pier to the core Development Site and assesses the potential effects of construction traffic upon the local area. Abnormal loads utilising this route are not expected to pass any sensitive community receptors such as schools, churches or community halls in order to arrive at the Development Site. New and upgraded routes that will be constructed as part of the proposal have been designed to ensure construction traffic avoids the town of Inveraray. An outline Construction Traffic Management Plan (CTMP) has been prepared for the Development, setting out the measures to be implemented which will reduce traffic disruption in the local area (*Appendix 14.1 Transport Assessment Report)(Volume 5: Appendices)*. The CTMP will be refined and detailed by the appointed construction contractor.

Construction works will require a workforce of up to 1000 people at peak construction periods. A Workers Housing Strategy has been developed to guide the location of worker housing (*Appendix 16.2 Housing Strategy*)*(Volume 5: Appendices)*. A key objective is to sensitively locate the housing, which will avoid workers and the associated housing changing the character of the small settlements found within the study area.

Communities and the community receptors are considered to have a Low sensitivity given they are locally important. The magnitude of change is considered to be Low as there will not be any direct impacts. Although some construction activities may be visible from community receptors and there may be some nuisance as a result of certain construction activities, they will not prohibit the daily operations of the various receptors. As a result, the significance of effects to community receptors is considered to be **Negligible**, which is therefore **Not Significant**. Visual impacts of the Development upon the local community are assessed in *Chapter 5: Landscape and Visual Assessment.*

16.6.3.2 Tourism

Potential Effects on Tourism

There will be some land use change from current grazing land to developed ground for the compounds, access tracks and Headpond, although this is not expected to detract from tourists' enjoyment of the area.

In general, visitor attractions are not predicted to be directly impacted as a result of construction activities. Visitor attractions located within the study area are outside of the Development Site boundary and while there may be views of construction activity from Inveraray and the opposite side of Loch Awe towards the Development, construction effects will be temporary. There are many hotels, B&Bs and self-catering units located within the study area and while views of construction could impact amenity and deter visitors, the views on construction works would be dependent on the location of these receptors. *Chapter 5: Landscape and Visual Assessment* considers the expected impact of the Development's construction from various viewpoints within the study area. The viewpoints and assessment of impact can be found in *Chapter 5: Landscape and Visual Assessment*. Although the Development may be visible from certain tourist receptors, the quality of the visitor experience in the local area is expected to be maintained throughout the construction phase. Tourist receptors are considered to be of Medium sensitivity given their importance for supporting the regional tourism economy. The magnitude of change is considered Low given the change will be temporary. The potential effects are predicted to be **Minor Adverse** which is **Not Significant**.

The potential exists for the Development's construction to impact upon the setting of certain nearby historic visitor attractions as noted in *Table 16.7 Recreation and Tourism Features within 5 km of Development Site,* above. Visitors may be deterred by construction activities where these impact upon the setting, the surrounding landscape or cause traffic nuisance on the local road network required to access the features. Visitor attractions are considered to be of Medium sensitivity given that the attractions are regionally important. The magnitude of change is considered Low given the change will be temporary. The potential effects are predicted to be **Minor Adverse** which is **Not Significant**.

An outline Housing Strategy has been drafted as part of the s36 application (*Appendix 16.2 Housing Strategy (Volume 5: Appendices)*), setting out how workers will be accommodated without having an adverse impact on visitor accommodation capacity, and in turn the wider tourism sector. Local properties and accommodation will therefore remain available for tourists. As such, both the magnitude of change and sensitivity of tourist services in the area are considered to be Low. The potential effects are predicted to be **Negligible**, which is considered **Not Significant**.

Potential Effects on Recreational Routes

The majority of recreation routes identified in *Table 16.8 Assessment of Recreation Routes During Construction,* will be open as normal during the construction phase. However, to ensure the safety of recreation route users during construction, diversions may be necessary for specific routes to facilitate construction activities. The impacted routes fall predominantly within the Development Site boundary within the commercial forest to the north of the Site and are detailed in *Table 16.8 Assessment of Recreation Routes During Construction*. Localised disruption may be experienced by users navigating diversions, however it is expected that diversions will be in place for a limited period of time, thus minimising the impact of construction activities upon recreational route users. The specific detail of each necessary diversion will be determined post consent and will be set out within a finalised Access Management Plan once the contractor has been appointed.

The potential sensitivity, magnitude of change and significance of individual recreation routes during construction has been assessed and set out *Table 16.8 Assessment of Recreation Routes During Construction*, below.

Table 16.8 Assessment of Recreation Routes During Construction

Recreation Route	Description	Sensitivity	Magnitude of Change	Significance	Impact
The Loch Lomond and Cowal Way	Long-distance footpath linking Portavadie in the south of Cowal with Inveruglas at Loch Lomond. Located approximately 16.5km to the southeast of the Headpond, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
National Cycle Network Route 78 (The Caledonia Way)	Cycle route running 235 miles from Campbeltown to Inverness, falls within study area. Located to the west of Loch Awe, outwith the Development Site boundary.	High	Low	Not Significant	Minor Adverse
C200: Coille Bhraghad-Queens Drive	4.7km walk to the northwest of Inveraray. Part of the Argyll and Bute Core Path network. The access route at Inveraray crosses this Core Path.	Medium	Low	Not Significant	Minor Adverse

Recreation Route	Description	Sensitivity	Magnitude of Change	Significance	Impact
C201: Dun Na Cuaiche	Part of the Argyll and Bute Core Path network. The access route at Inveraray crosses this Core Path.	Medium	Low	Not Significant	Minor Adverse
C203: Bealach an Fhuarain	Part of the Argyll and Bute Core Path network. The access route at Inveraray crosses this Core Path.	Medium	Low	Not Significant	Minor Adverse
C171: Kilmore – Loch Nan-Kilchrenan	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
C173 (a, b, c, d, e)	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
C175: Kilmelford to Loch Avich	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
C176: Loch Avich South (Two Lochs Trail)	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
C199: Furnace to Inveraray via Kenmore	Part of the Argyll and Bute Core Path network. Located on the banks of Loch Fyne, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
C300: Kilchrenan to Taynuilt	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
C305: Dalavich to Barnaline Lodge	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
C323: Drissaig to Inverinan	Part of the Argyll and Bute Core Path network. Located on the west of Loch Awe, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
C324: Inverinan circular, Loch Aweside	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
C490: Dalavich, Loch Awe	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe, outwith the proposed Development Site boundary.	Medium	Low	Not Significant	Negligible
C523: Loch Nant, Loch Aweside	Part of the Argyll and Bute Core Path network. Located on the west side of Loch Awe, outwith the Development Site boundary.	Medium	Low	Not Significant	Negligible
Old Road to Inverinan	1.1km rural path, designated Heritage Path located west of Loch Awe, outwith the Development Site boundary.	Low	Low	Not Significant	Negligible
Public Right of Way SA128	Recorded National Catalogue Rights of Way which crosses the Development Site, intersecting the access route to the north of the site.	Low	Medium	Not Significant	Minor Adverse

Given that there are several core paths, long distance routes and regional cycle ways within the study area, several of the recreation routes have been allocated a sensitivity of 'Medium'. The National Cycle Network Route 78 has been allocated a 'High' sensitivity as it is nationally important. The local paths and unmarked cycle ways are considered to have a 'Low' sensitivity. The majority of paths within the study area are located to the west of Loch Awe and therefore fall outwith the Development Site boundary. Impacts of the Development's construction upon these routes have been assessed as Negligible on account of their distance from the Development Site and physical separation from construction traffic routes.

Where disruption for recreation route users is likely on Core Paths around Inveraray, this is expected to be temporary, occurring only during construction works. The magnitude of change for the construction works is expected to be Low as the works will be short term and any disruption to recreational routes will be temporary. Given the recreational routes listed in *Table 16.8 Assessment of Recreation Routes During Construction* above, all have a Medium or Low sensitivity, any potential effects are predicted to be **Minor Adverse** and **Not Significant**.

Potential Effects on Lochs

Several lochs are located within the study area, as listed in *Table 16.7 Recreation and Tourism Features within 5 km of Development Site.* These lochs are used for various recreational activities including swimming, fishing and boating and commercial uses such as fishing. It is understood that the MoD also carry out trials and testing on Loch Fyne. During the construction phase, it has been agreed through consultation with the MoD that piling activities will cease on trial days for circa 12 days per year with dates to be agreed with the appointed Construction contractor who will maintain in contact with the MoD throughout construction as required, and therefore their availability for the range of uses will continue largely as normal.

The only exception will be around the Tailpond works at Loch Awe where limited restricted access for water pursuits will be necessary in the interest of public safety within the immediate area of the cofferdam whilst the inlet / outlet structure is constructed. There will also be amenity effects on recreational loch users in proximity to the works. Visual amenity effects are assessed in *Chapter 5: Landscape and Visual Assessment*. The installation of a cofferdam in Loch Awe will be required when building the inlet / outlet, however this is expected to have a minimal impact upon recreational users given the loch size and area required for construction activities. Moreover, a difference in flow rates and water levels as a result of the Development will not be noticeable to recreational users on account of the size of the loch. Those using the loch for water sports and swimming are not expected to be disrupted. In addition, fish farming activities present on Loch Awe are not expected to be impacted by changes in flow rates and water levels as a result of the Development, on account of the scale of the loch.

The Development will involve the construction of a Marine Facility jetty in Loch Fyne. This construction will occur within the Argyll and Bute Council's LDP designated Upper Loch Fyne Marine Consultation Area. The Marine Facility will be temporary and small scale, consisting of a temporary pier constructed into the loch. Approximately 10 boats are expected to use the pier throughout the seven year construction period in order to service the pumped storage hydro scheme. As such, any disturbance to recreational loch users will be infrequent and impacts on recreational fishing in Loch Fyne are expected to be minimal.

The sensitivity of lochs within the study area is considered to be Medium as these are regionally important features contributing to the area's landscape character. However, as only a small area of Loch Awe and Loch Fyne will be unavailable during construction of the Tailpond and Marine Facility, the magnitude of change is considered to be Low. The potential effects on lochs within the study area are therefore predicted to be **Minor Adverse** which is **Not Significant**.

16.6.4 Operation

16.6.5 Socio-economics

Potential Effects on the Local Job Market

The operational phase of a PSH scheme is typically considered to be around 100 years, although it can be longer. General maintenance will be ongoing for the duration of operation including regular inspection of the Headpond. The electrical plant will require refurbishment or overhaul approximately every 25 years. During operation it is expected that there will be 10 permanent full time jobs created on site. There is also likely to be additional jobs created in a remote control centre, and local procurement will support jobs in local businesses. The magnitude of change on the local job market is considered to be Low. The job market has been given a Medium sensitivity, meaning the significance of effect on operational job creation is considered to be **Minor Beneficial** and **Not Significant**.

16.6.6 Tourism

Potential Effects on Tourism, Access and Recreation Routes

During the operational phase, much of the land used during the construction period will be reinstated and will be available to the public again. Access will be limited only in the area of the Headpond, the immediate vicinity of the Tailpond inlet / outlet and the permanent compounds. Access to the Headpond waterbody and the Tailpond inlet / outlet structure will be prohibited to the public for health and safety reasons. The permanent compounds will house facilities for the operation and maintenance of the Development including access to the tunnels. Although access to the Headpond will be prohibited, access to all lochs in the study area will be available as normal during operation. Access is considered to have a Medium sensitivity as it is regionally important to the Argyll and Bute region for recreation and tourism. The magnitude of change is considered Low as most access within the Development Site will be reinstated for the operational phase. The significance is therefore considered to be **Minor Adverse** and **Not Significant**.

It is not expected that diversions to recreation routes within the study area will be required during operation. The finalised Access Management Plan will set out measures proposed to ensure the safety of walkers, cyclists and horse riders within the Development Site during operation and if diversions are deemed necessary at a later stage in the development process. The potential effects to the individual recreation routes during operation have been assessed. Given that these recreational routes are regionally important, the sensitivity is assessed to be Medium. The magnitude of change on tourism and recreation routes is considered to be Low on account of the limited extent of impacts upon these routes. The impact of the Development during operation is therefore expected to be **Minor Adverse** and **Not Significant**.

Following construction, areas of land around the Headpond will be repurposed, facilitating the installation of benches and information boards. This infrastructure aims to cater to visitors, enhancing the visitor experience at Balliemeanoch Pumped Storage Hydro and leading to a **Minor Beneficial** impact of the Development during operation.

The potential exists for visitors to be deterred from visiting the Inveraray Castle Gardens and Designed Landscape, or the quality of the visitors' experience to these features to be reduced as a result of the construction of the Marine Facility and access tracks. The landscape and visual amenity and heritage impacts of the Development upon this, and other tourism receptors, is addressed in *Chapter 5: Landscape and Visual Assessment*, and *Chapter 13: Cultural Heritage*, respectively. In addition, *Chapter 15: Noise and Vibration* assesses the noise of the Development upon local receptors including tourism during the operational phase. Noise and vibration impacts associated with the Development are not expected to disrupt the local community's sense of wellbeing nor visitors' enjoyment of recreational activities within the local area with operational noise limited to the area of above ground plant at the Headpond. Moreover, no detrimental impact upon the operation of businesses within the local area is expected as a result of operational noise and vibration. No operational noise is anticipated at Loch Awe. The visitor attractions noted in *Table 16.7 Recreation and Tourism Features within 5 km of Development Site*, above, are considered to be of Medium sensitivity given the sites' regional importance. The operation of the Development is not expected to have any impact upon local attractions nor deter visitor from the area. The magnitude of change is therefore considered to be Low with the impact of the Development's operation assessed as **Negligible** and **Not Significant**.

There are many hotels, B&Bs and self-catering units located within the study area and while views of the Development could impact amenity and deter visitors, *Chapter 5: Landscape and Visual Assessment* sets out the proposed Development's zone of theoretical visibility (ZTV) and assesses the receptors where significant visual impacts are likely. It is expected that the majority of tourist accommodation receptors included within this socio-economic assessment fall outwith the ZTV. As outlined above, noise from the Development is not anticipated to disrupt the use of visitor accommodation. Tourist accommodation receptors are considered to be of Medium sensitivity given their importance for supporting the regional tourism economy. The magnitude of change is considered Low given the distance of the accommodation receptors from the Development Site. The potential effects are predicted to be **Negligible** which is **Not Significant**.

Potential Effects on Lochs

Impacts on nearby lochs and on loch users during operation of the Development are expected to be minimal. During this phase, only the piles will remain of the temporary pier constructed in Loch Fyne as part of the proposal will likely be minimal. The operation of the Development is therefore not expected to cause any disturbance upon Loch Fyne.

During operation, impacts upon recreational fishing may occur as a result of the piles left in-situ from the Marine Facility installed as part of this proposal. This facility's installation would lead to the overall loss of 20.4 m^2 of benthic habitat and the potential displacement of fishing activities on account of obstructed access to approximately 1,800 m^2 fishing grounds. However, considering the relatively small area of impact, overall the magnitude of the impact is deemed to be Negligible and the sensitivity of the receptor is considered to be Medium. The effect will therefore be **Minor Adverse** and **Not Significant**. Greater detail on the impacts of the Development upon benthic habitat loss and commercial fishing on Loch Fyne has been included in *Chapter 8: Marine Ecology* and *Chapter 20: Commercial Fisheries*, respectively.

16.7 Cumulative Effects

16.7.1 Inter-Cumulative Effects

The assessment of likely cumulative effects is based on the cumulative schemes identified in *Chapter 4: Approach to EIA.* Best practice guidance states that a socio-economic, recreation and tourism assessment should focus on the most significant cumulative effects and conclude with a clear assessment of those which are likely to influence decision making. Therefore, only the relevant cumulative schemes have been considered within this assessment.

The following cumulative schemes, as set out in *Chapter 4: Approach to EIA*, have been identified within the Argyll and Bute region.

- Inverawe Hydro Scheme;
- Lochan Shira Reservoir;
- Clachan Flats Wind Farm;
- Coille Bhraghad Mineral Exploitation Drilling;
- Corr Chnoc Wind Farm;
- Cruach Mhor Wind Farm;
- Cruachan Power Station;
- Crarae Substation; and
- Crarae Substation OHL Connection

Inter-project effects were considered for the cumulative developments listed in *Table 4.8 of Chapter 4*: *Approach to EIA.* The potential emerges for the range of cumulative developments proposed within the region to collectively support the diversification of the economy and upskill the local workforce.

Potential indirect combined effects were identified from material management on the transport network, and on human receptors from nuisance such as reduced amenity, dust and noise. If excavated material were transported off-site, this would increase the required number of vehicle journeys to and from the Development Site and create a combined adverse effect of greater significance with the likelihood of traffic congestion on the local road network. *The Outline Construction Environment Management Plan (Appendix 3.1, Volume 5: Appendices)* provides mitigation in relation to the generation of dust, noise and other emissions. The project's CTMP sets out the measures which will be implemented to reduce traffic congestion and minimise delays on the local road network. Following the implementation of these measures, no direct combined detrimental effects on the socio-economic, recreation and tourism receptors are excepted as a result of the Development and the cumulative developments.

16.7.2 Intra-Cumulative Effects

The potential emerges for combined effects to be experienced by recreational users of the designated routes and core paths and visitors to the tourism and recreational features present within the study area. The potential for intra-relationship effects emerges through the following chapters:

Chapter 5: Landscape and Visual Assessment – combined effects would be experienced by recreational users of the designated routes and core paths within the study area, where there would be intervisibility of the Development and where diversions are proposed.

Chapter 13: Cultural Heritage – there would be combined effects on the visual amenity experienced at various cultural heritage sites within the study area which may impact upon the visitors' enjoyment of these features and the local area.

Chapter 14: Access, Traffic and Transport – combined effects would be experienced by visitors to the area and users of the road network during the construction phase with increased construction traffic upon the local road network.

Chapter 15: Noise and Vibration – combined effects would be experienced by visitors to the local area, particularly in close proximity to the construction area where the sense of activity would increase during the construction phase.

16.8 Mitigation and Monitoring

This section details the proposed mitigation measures for socio-economic effects which could be implemented to reduce the potential adverse impacts of the Development upon the local socio-economic, recreation and tourism receptors identified above. Mitigation outlined in this section is additional to the embedded mitigation outlined in *Section 3.6 Embedded Mitigation* in Chapter 3: Evolution of Design and Alternatives and mitigation identified in other EIA chapters.

16.8.1 Construction

16.8.1.1 The Local Community, Access and Traffic

The 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. This channel of communication will enable the Applicant to consult with operators of nearby restaurants, hotels and B&Bs, ensuring that nearby businesses do not experience any interruption to their daily operations as a result of the Development. The Applicant will seek to proactively address any issues communicated through this channel to prevent any adverse impacts of the Development's construction upon the amenity of local tourist services. As such, it is anticipated that there will be no significant effects to any socio-economic resources.

A Minor Adverse impact upon local access is expected as a result of the Development's construction. In the interest of public health and safety, access may be restricted around the Development Site, however this is expected to be short-term and temporary. Any diversions deemed necessary will be in place to maintain access through the Site, providing alternative routes for active travel users. Such alternatives minimise the impact of the Development's construction resulting in no adverse impact.

The construction of the Development is anticipated to take up to seven years. The associated traffic flows will vary over the course of the construction period as various elements of the Development are constructed. In order to mitigate against delays and amenity loss associated with peak or abnormal construction traffic, a Construction Traffic Management Plan (CTMP) will be implemented for the construction period. A framework CTMP is contained within *Appendix 14.1 Transport Assessment Report* of *Chapter 14: Access, Traffic and Transport*. The CTMP will aim to minimise traffic congestion on the local road network during construction of the Development. The CTMP will be employed to ensure that deliveries and plant movement occur at set times, avoiding peak periods. This will maintain road safety and ensure the users of local amenities are minimally impacted during construction. The final CTMP will be finalised following consultation with Police Scotland, ABC and Transport Scotland.

An outline Housing Strategy has been drafted (*Appendix 16.2 Workers Housing Strategy*)*(Volume 5: Appendices)* 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.

Tourism and Recreational Routes

The potential for minor adverse impacts on the Inventory Garden and Designed Landscape around Inveraray Castle emerges as a result of the Development's construction. *Chapter 5: Landscape and Visual Assessment*, and *Chapter 13: Cultural Heritage* 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. These mitigation measures aim to avoid and minimise alterations to important features of the landscape which attribute meaning and value to the Inveraray Castle Gardens and Designed Landscape. Where appropriate, similar mitigation measures have also been proposed to screen the construction activities from those tourist attractions set out in *Table 16.7 Recreation and Tourism Features within 5 km of Development Site*, above. Offsite planting will screen the construction activities, helping to minimise the impact of visual, noise and dust disturbance upon nearby residents, businesses and attractions thus reducing any negative impacts which may deter visitors. Together, these measures are expected to protect the character and setting of the area, ensuring that visitors' enjoyment of local tourism and recreational features is not minimised on account of the Development.

The majority of recreational routes will remain accessible throughout the construction phase. In the interest of public safety, it is expected that signage will be erected on certain forestry paths falling within the Development Site warning users where construction vehicles are likely to cross the given path. The accompanying Outline Access Management Plan (*Appendix 16.1: Outline Access Management Plan* (Volume 5 Appendices)) provides detail on the measures which will be implemented to maintain public access throughout construction and operation of the Development. A finalised Access Management Plan will be prepared post consent once the contractor has been appointed.

Lochs

The impact upon recreational boating is expected to be Minor Adverse, however through early engagement with recreational loch users this is expected to be minimised. Consultation with local stakeholders, such as Inspire Inveraray who represent the local community, will be undertaken prior to construction. Moreover, engagement with Clydeport at least two months prior to construction will ensure that information is shared widely amongst recreational loch users, informing them of works commencing within Loch Awe. Clyde Cruising Club and other local boat clubs will also be informed of the intended construction start date by the appointed contractor two months prior to construction commencing. A notice will be issued in the local Notices to Mariners which ensures that details of the upcoming works are communicated to all local clubs. In addition, it has been agreed with the MoD that piling activities within Loch Fyne will cease on trial days for circa 12 days per year with dates to be agreed with the appointed Construction contractor who will maintain in contact with the MoD throughout construction as required, and therefore their availability for the range of uses will continue largely as normal.

A small area of Loch Awe, around the Tailpond inlet / outlet, will have restricted access for water pursuits during construction. Although there will be amenity effects on recreational loch users, these will be short-term and temporary in nature. In addition, the area expected to be impacted represents only a small portion of the entire loch and therefore impacts are expected to be minimal. Through early engagement and communication with recreational users, no adverse effects are anticipated from the Development's construction.

16.8.2 Operation

16.8.2.1 Access, Tourism and Recreational Routes

Although there are many shops, hotels and restaurants located within the study area, a minimal impact upon these local tourist services is expected. As detailed in *Chapter 5: Landscape and Visual Assessment*, the Development may be visible from certain receptors, however this is not expected to have an adverse impact upon visitors' experience of such amenities. Local services and tourist accommodation receptors are considered to be of Medium sensitivity given their importance for supporting the regional tourism economy. The magnitude of change is considered Low given distance of the accommodation from the Development Site. The potential effects are predicted to be **Minor Adverse** which is **Not Significant**.

During operation of the Development, a Minor Adverse impact upon certain local recreation routes is expected. The majority of the affected routes are understood to be forestry paths with only one Public Right of Way (SA128) directly impacted by the Development. Where routes are impacted, diversions are not anticipated to be necessary, due to the short timeframe and limited extent of the impact. Any diversions will have due regard to use by walkers. The recommendations from British Standard 5709:2006 "Gaps, Gates and Stiles" will be considered in consultation with the Argyll and Bute Council Access Officer and other parties.

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 area is expected to be maintained. Details of the proposed upgrades will be provided when a construction contractor has been appointed. Consultation on the type and requirement for upgrades will be undertaken. It is expected that such improvements to Walking Routes and local accessibility post-construction will minimise any adverse impacts of the Development.

The Site's proposed access track is expected to cross Public Right of Way (ProW) SA128, within the commercial forest to the north of the core Development Site. Although noted on Scotways' Catalogue of Rights of Way, it is understood that this path is no longer an extant feature on the ground and is not in frequent use. Any physical change to the path would occur over an area of less than 5 m, thus minimising the impact. Moreover, access to route SA128 will be maintained throughout operation of the Development. Appropriate signage warning walkers of construction traffic will also be introduced where the PRoW intersects the Development's internal access track. As such, it is understood that any adverse impacts will be negated.

16.9 Residual Effects

Embedded mitigation and the proposed diversions described above account for much of the mitigation proposed in this chapter. As a result, the significance of residual effects is largely the same as the potential effects identified. *Table 16.9 Summary of Effects: Construction* and *Table 16.10 Summary of Effects: Operation*, below, provide a summary of all effects before and after mitigation. In summary, there are no adverse residual significant effects on socio-economics, recreation and tourism, with one significant beneficial effect on the local economy resulting from job creation and local expenditure by the developer and contractors within the study area throughout construction period.

16.9.1 Pre-construction and Construction

Engagement with the Community Liaison Group prior to the commencement of works will reduce any negative impacts arising during the pre-construction phase on the local community and therefore are **Not Significant**.

Significant beneficial effect on the local economy resulting from job creation and local expenditure by the developer and contractors within the study area throughout construction period.

Creation of jobs within study area during construction phase will result in a **Not Significant** impact on the local job market.

Construction activities causing changes to setting of certain visitor attractions and local amenity impacts will result in a **Not Significant** impact on tourism and tourist services.

Tourist accommodation will not be significantly adversely impacted during construction through implementation of the Housing Strategy and therefore is **Not Significant**.

Impacts to drivers on the local road network within the study area are reduced from Minor Adverse to Negligible through the preparation and implementation of a CTMP and therefore **Not Significant**.

Recreational users of Loch Awe and Loch Fyne will not be significantly affected by construction due to the limited land take required and engagement of the CLG with Inspire Inveraray, Clydeport and local community, and therefore impacts are **Not Significant**.

National Cycle Route 78 has been given a sensitivity of high as it is national important. The magnitude of change is the same as the other long distance routes and core paths within the area and is rated as Low. Following the assessment framework set out in *Chapter 4: Approach to EIA*, this would be a significant effect. However, using professional judgment it is not considered that the effects during construction will be significant on account of the limited extent of the impacted area on Route 78. As a result, it is predicted that the impact will be reduced to Minor and therefore **Not Significant**.

Core paths and forestry paths within the study area will largely remain open and accessible to all users during construction. To maintain public health and safety, diversions to certain forestry paths, such as the SA128, may be necessary. Through the implementation of signage, active travel users will be informed of any diversions currently in place and, where necessary, alternative routes will be suggested. The residual impact upon recreational route users is therefore **Not Significant**.

16.9.2 Operation

An Outline Access Management Plan has been included in *Appendix 16.1 (Volume 5: Appendices)* and sets out where access will be restricted and general mitigation measures, such as diversions, which will be in place during operation of the Development. The implementation of this plan is expected to reduce any adverse impacts associated with the operation of the Development. A finalised Access Management Plan will be prepared post consent, providing greater detail on the specific diversions which will be in place. The residual effect is therefore understood to be **Not Significant**

Core paths and forestry paths within the study area are expected to remain open and accessible to all users during operation. Through the implementation of signage, active travel users will be informed of any diversions currently in place and where necessary, alternative routes will be suggested. The residual impact upon recreational route users is therefore **Not Significant**.

Without mitigation, there would be a minor adverse impact upon tourist services within the study area during operation. However as set out in *Chapter 5: Landscape and Visual Assessment*, embedded mitigation measures have been considered and will effectively reduce the impact of any adverse visual amenity impacts over time. In addition, measures such as offsite planting will be implemented, screening the development from view from nearby receptors. As such, the quality of the visitor experience in the local area is expected to be maintained throughout the operational phase. Any residual effects are thus considered to be **Not Significant**.

Access to Loch Fyne and Loch Awe will be maintained during operation. The Marine Facility will be removed with only the piles remaining in-situ. However, for health and safety reasons, access to the Tailpond inlet / outlet will be restricted during operation. Although this accounts for only a small area of the loch, an Outline Access Management Plan has been prepared (*Appendix 16.1 Outline Access Management Plan (Volume 5: Appendices)).* This plan sets out where restrictions may be necessary, the mitigation measures which will be implemented to reduce any impacts and the preferred approach for informing loch users of such access restrictions. A finalised Access Management Plan will be prepared post consent providing greater detail on the access arrangements in Loch Awe. As a result, a **Not Significant** residual effect is expected on loch users during operation of the Development.

Table 16.9 Summary of Effects: Construction

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Local Community	Limited access around and within construction works areas for health and safety reasons. The core Development Site is situated away from the local transport network, limiting the potential for effects.	Minor Adverse Not Significant	An Outline Access Management Plan has been prepared which sets out the measures which will be implemented to minimise the impact of the proposed Development's construction upon local access and ensure public health and safety during construction works. A finalised Access Management Plan will be prepared post consent.	Negligible	**Not Significant**
Local Economy	Job creation and local expenditure by the developer and contractors within the study area throughout construction period.	Moderate Beneficial Significant	No additional mitigation required.	Moderate Beneficial	**Significant**
Local Job Market	Creation of jobs within study area during construction phase.	Minor Beneficial Not Significant	No additional mitigation required.	Minor Beneficial	**Not Significant**
Local Community	Potential for construction activities to cause nuisance to certain community receptors.	Negligible Not Significant	The community will be able to provide feedback on construction works via the CLG, allowing the construction team to respond where practicable.	Negligible	**Not Significant**
Local Community	Localised disruption to public access along B840, A819 and A83 as a result of the increased vehicle movements.	Minor Adverse Not Significant	A CTMP to be prepared and implemented to mitigate against delays and amenity loss associated with peak or abnormal construction traffic. A TMP will also be prepared to minimise traffic congestion on the local road network and maintain road safety.	Negligible	**Not Significant**
Tourism	Construction activities causing changes to setting	Minor Adverse	LVIA sets out mitigation measures, such as offsite screen planting,	Negligible	**Not Significant**

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
	of certain visitor attractions.	Not Significant	which should be implemented to avoid and minimise any impacts on the setting and character of nearby visitor attractions which could deter visitors.		
Tourist Accommodation	An outline Housing Strategy has been prepared (Appendix 16.2. Volume 5 Appendices) setting out how workers could be accommodated and through the use of park and ride services. Local properties and accommodation will therefore remain available for tourists.	Negligible Not Significant	No additional mitigation required.	Negligible	**Not Significant**
Recreational Routes	Diversions to certain recreational routes and forestry paths falling within the Development Site boundary.	Minor Adverse Not Significant	Diversions to certain forestry paths may be necessary to maintain public health and safety during construction works. Diversions will be determined post consent once the contractor has been appointed and detailed within the finalised Access Management Plan.	Negligible	**Not Significant**
Tourist Services	Local amenity impacts e.g. views from nearby tourist accommodation, shops and restaurants.	Negligible Not Significant	Community Liaison Group to be established enabling Applicant to consult operators of nearby restaurants, hotels and B&Bs throughout construction phase and address any issues which emerge.	Negligible	**Not Significant**
Lochs	Marine facility and Tailpond inlet / outlet construction at Loch Fyne and Loch Awe respectively, restricting access to and recreational use of these areas of the lochs.	Minor Adverse Not Significant	Consultation with local stakeholders (e.g. Inspire Inveraray, Clydeport, MoD) and CLG at least two months prior to construction start date to inform community of upcoming works on the loch.	Negligible	**Not Significant**

Table 16.10 Summary of Effects: Operation

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Access	Access to areas around Headpond and Tailpond will be restricted to general public.	Minor Adverse Not Significant	Signage to be implemented within vicinity of Headpond and Tailpond inlet / outlet warning visitors that access to the waterbody is unsafe and therefore forbidden. Lochs within the wider study area will remain accessible to the public during operation and therefore additional mitigation is not considered to be required.	Negligible	**Not Significant**
Visitor Services	Potential for setting of historic attractions to be altered by proposed Development.	Minor Adverse Not Significant	Where necessary, mitigation measures have been set out within the LVIA which, upon implementation, would avoid and minimise impacts on the setting and character of nearby visitor attractions. Benches and information boards to be installed informing visitors of the pumped storage hydro scheme purpose and benefits.	Minor Beneficial	**Not Significant**

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Recreational Routes	Diversions may be required for certain informal recreational routes and forestry paths within Development Site during operation.	Minor Adverse Not Significant	A finalised Access Management Plan will be prepared post consent and will set out where temporary and permanent diversions of certain forestry paths are necessary to maintain health and safety of users. Additional forestry paths to be provided as part of Development, improving accessibility of the area for active travel users.	Minor Beneficial	**Not Significant**
Lochs	Marine facility may displace fishing activities by obstructing access to fishing grounds.	Minor Adverse Not Significant	Mitigation measures set out within the accompanying *Chapter 8: Marine Ecology* aim to minimise any detrimental impact upon fishing activities as a result of the Marine Facility's construction in Loch Fyne.	Negligible	**Not Significant**

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Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 17: Climate

ILI (Borders PSH) Ltd

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17. Climate

17.1 Introduction

This chapter of the EIAR identifies the potential impacts and effects of the Development on the climate, as well as the impacts and effects of climate change on the Development, that are to be considered as part of the EIA. A comprehensive description of the Development is contained in *Chapter 2: Project and Site Description.*

This chapter has been informed by an overview of the environmental baseline conditions, along with the anticipated key issues likely to be associated with the Development.

In order to comply with the requirements of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (Ref. 17-1) and the Institute of Environmental Management and Assessment (IEMA) Guidance for assessing climate mitigation (Ref. 17-2) and adaptation (Ref. 17-3) in EIAs, consideration has been given within this chapter to the following three aspects of climate change assessment:

- Lifecycle Greenhouse Gas (GHG) Impact Assessment – the impact of GHG emissions arising from the Development on the climate over its life-time;
- In-Combination Climate Change Impact (ICCI) Assessment – the combined impact of the Development and future climate change on the receiving environment; and
- Climate Change Resilience (CCR) Assessment – the resilience of the Development to the potential impacts of climate change.

This chapter should be read in conjunction with:

- *Chapter 2: Project and Site Description*;
- *Chapter 4: Approach to EIA*;
- *Appendix 17.1 Climate Change Risk Register (Volume 5 Appendices);*
- *Appendix 17.2 In-combination Climate Change Impact (ICCI) Assessment (Volume 5 Appendices).*

17.2 Legislation and Policy

The Legislation, Policy and Guidance section of this chapter provides an overview of the relevant legislation, planning policy and technical guidance relevant to the climate assessments.

17.2.1 Legislation

Legislation relevant to the climate change assessments have been summarised in *Table 17-1 Legislation Relevant to Climate Change,* below.

Table 17-1: Legislation Relevant to Climate Change

Policy Reference	Policy Context
International	
United Nations Framework Convention on Climate Change Paris Agreement (Ref. 17-4)	The Paris Agreement requires all signatories to strengthen their climate change mitigation efforts to keep global warming to below 2°C this century and to pursue efforts to limit global warming to 1.5°C.
National	
UK Nationally Determined Contribution (Ref. 17-5)	In 2020, the UK communicated its updated Nationally Determined Contribution to the United Nations Framework Convention on Climate Change (UNFCCC). Within this, the UK has committed to reducing GHG emissions by at least 68% by 2030 compared to 1990 levels.
The Climate Change (Scotland) Act 2009 (Ref. 17-6)	The Climate Change (Scotland) Act 2009 originally set a legally binding target for Scotland to reduce its greenhouse gas (GHG) emissions from 1990 levels by at least 80% by 2050 to help ensure the delivery of these targets. This part of the 2009 Act also requires that the Scottish Ministers set annual targets, in secondary legislation, for Scottish GHG emissions from 2010 to 2050.

Climate Change (Emissions Reduction Targets) (Scotland) Act (Ref. 17-7)	In 2019, The Climate Change (Scotland) Act 2009 was amended by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, increasing the ambition of Scotland's emissions reduction targets to Net Zero by 2045 and revising interim and annual emissions reduction targets. The amendments also update arrangements for Climate Change Plans to meet the targets.
Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (Ref. 17-1)	The EIA Regulations state that an EIA (where relevant) must include: *"the impact of the development on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the development to climate change".*

17.2.2 National Planning Policy

National Planning Policy relevant to climate change is detailed in *Table 17-2 National Planning Policies Relevant to Climate Change,* below.

Table 17-2: National Planning Policies Relevant to Climate Change

Policy Reference	Policy Context
Update to the Climate Change Plan 2018 – 2032: Securing a Green Recovery on a Path to Net Zero Securing a green recovery on a path to net zero: climate change plan 2018-2032 (Ref. 17-10)	This document updates the 2018 Climate Change Plan to reflect the setting of new ambitious targets to end Scotland's contribution to climate change by 2045. It also reflects on how Scotland emerges from COVID-19, recognising that there is a chance to rebuild the economy to deliver a greener, fairer and more equal society. In line with the 2018 plan, the focus is on the period up to 2032.
Infrastructure Investment Plan (Ref. 17-11)	The 2021 Infrastructure Investment Plan (IIP) covers 2021-22 to 2025-26 and delivers the National Infrastructure Mission commitment to boost economic growth. It notes a shift in the definition of infrastructure with the Scottish Government defining infrastructure more widely than all other parts of the UK, including digital and social infrastructure and, for the first time, including 'natural infrastructure'. The IIP recognises the new challenges Scotland faces since the 2015 IIP, including economic, health and social harm from COVID-19, the UK's exit from the European Union and a number of other long-term trends, including climate change and technological and demographic change. The IIP adopts a single vision for infrastructure investment choices: "*Our infrastructure supports Scotland's resilience and enables inclusive, net zero, and sustainable growth*" (page 21). In supporting this vision, the Plan focuses on three key themes. The three themes in the IIP for guiding investment decisions are directly linked to Scotland's National Performance Framework, which sets out the Government's overall purpose, they are: "*Enabling the transition to net zero emissions and environmental sustainability: Public infrastructure investment has a critical role to play in tackling the twin crises of climate change and biodiversity loss. We will increase spending on low-carbon measures, climate resilience, and nature-based solutions.* *Driving inclusive economic growth: We can boost productivity and competitiveness and create good jobs and green jobs by enhancing our transport and digital connectivity and capacity in all areas of Scotland and by stimulating innovation. We will embed fairness and inclusion, seeking to ensure no one is left behind.* *Building resilient and sustainable places: Delivering on our ambition for a fairer Scotland starts at the local community level. We will invest in housing and improve local service delivery. With our partners, we will meet the diverse economic, social, and environmental needs of urban, rural, and island areas*" (page 21). Climate change is recognised as a long-term trend which impacts on the provision of infrastructure. In response, it is noted that there is a need to adapt current infrastructure and design future assets to be more resilient to the effects of climate change, alongside investing in nature infrastructure and nature-based solutions which help tackle biodiversity and create wider socioeconomic benefits.
National Planning Framework 4 (NPF4) (Ref. 17-12)	The National Planning Framework 4 (NPF4) was published by the Scottish Ministers on 13 February 2023. NPF4 sets out how the Scottish Governments' approach to planning and development will help to achieve a net zero, sustainable Scotland by 2045. With regards to climate change, NPF4 aims to deliver 'Sustainable Places' where we "reduce emissions, restore and better connect to biodiversity" (page 4). One of the six overarching principles set out in NPF4 to support the delivery of our future places is 'Just Transition,' which states that "*we will empower people to shape their places and ensure the transition to net zero is fair and inclusive*". Sustainable Places Policy 1 'Tackling the Climate and Nature Crises' encourages, promotes and facilitates "*development that addresses the global climate emergency and nature crisis"* (page 37). Sustainable Places Policy 2 'Climate Mitigation and Adaption' aims to "*encourage, promote and facilitate development that minimises emissions and adapts to the current and future impacts of climate change*". NPF4 goes on to state that "*development proposals will be sited and designed to adapt to current and future risks from climate change*" (page 37). NPF4 also identifies PSH as a "national" development and provides policy support for PSH projects, recognising that they can make a significant contribution to achieving net zero.

Policy Reference	Policy Context
National Policy Statement for Energy Infrastructure (Ref. 17-8)	The National Policy Statement (NPS) sets out the national policy for energy infrastructure required to ensure a secure, reliable, and affordable energy supply. Although the NPS is only applicable in England, it can be relevant in planning applications in Scotland.
Draft Energy Strategy and Just Transition Plan (Ref. 17-9)	Scotland's draft Energy Strategy and Just Transition Plan aims to achieve a zero-carbon energy system by 2045. The plan includes goals including the addition of 20 GW of renewable electricity by 2030, accelerated decarbonisation of industry, transport, and heat, and the establishment of a national public energy agency. The plan also focuses on ensuring a just transition by maximising employment, manufacturing, and export opportunities in the energy sector.

17.2.3 Local Planning Policies

Local Planning Policies relevant to climate change are detailed in *Table 17-3 Local Planning Policy and Considerations Relevant to Climate Change*, below.

Table 17-3: Local Planning Policy and Considerations Relevant to Climate Change

Policy Reference	Policy Context
Argyll and Bute Local Development Plan 2024 (Ref. 17-13)	The Argyll and Bute Local Development Plan (LDP) sets out the overarching vision statement, spatial strategy and general planning policies for the whole of Argyll and Bute council area. The LDP includes the following policies relevant to climate: • Policy 06 'Green Infrastructure' • Policy 04 'Sustainable Development' • Policy 09 'Sustainable Design' • Policy 30 'The Sustainable Growth of Renewables'
Argyll and Bute – Climate Emergency Declaration (Ref. 17-14)	Argyll and Bute Council declared a climate emergency in September 2019 and pledged to take various actions to improve environmental sustainability across the Council area. This includes a commitment to make the council area carbon-neutral by 2045.

17.2.4 Guidance

The climate change assessment has been carried out in accordance with the following:

- IEMA: Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022) (Ref. 17-2);
- IEMA: Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2020) (Ref. 17-3);
- Scottish Government Wind Farm Carbon Calculation Tool (Ref. 17-35);
- The GHG Protocol (World Resources Institute and World Business Council for Sustainable Development (WRI & WBCSD) (Ref. 17-16); and.
- PAS 2080: 2023 Carbon management in buildings and infrastructure (Ref. 17-15).

17.3 Consultation

A scoping exercise was undertaken to establish the content of the assessment and the approach and methodology to be followed.

The Scoping Report was issued on 28th September 2021 and records the findings of the scoping exercise. It also details the technical guidance, standards, best practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Development on climate change.

The Scoping Opinion was received on 3rd March 2023. The feedback received from stakeholders at scoping and the Applicant's responses in relation to climate are presented below in *Table 17-4 Summary of Consultation*, below.

Table 17-4 Summary of Consultation

Consultee	Key Issue	Summary of Response	Action Taken
NatureScot	Section 17. Climate does not appear to consider the GHG emissions associated with the change or damage to soil/ peat	As part of the s36 application, peat bog probing has been undertaken at the Development's Site to measure the carbon sink potential. The	Soil/peat damage has been considered and reported in *Table 17-17* as part of the land use change GHG Assessment. The Scottish Government

Consultee	Key Issue	Summary of Response	Action Taken
	and the carbon sequestration potential of peatland habitats.	study's outputs have been considered for the Land Use Change GHG Assessment.	Windfarm Carbon Assessment Tool was used to determine the GHG emissions from potential peat land loss, and the assumptions applied are reported in the Assumptions, Limitations and Uncertainties Section. In addition, a peat management plan has been developed and will be submitted as part of the EIAR.

17.4 Study Area

17.4.1 Lifecycle GHG Impact Assessment

The Study Area for the GHG impact assessment covers all direct GHG emissions arising from activities undertaken at the Development Site during pre-construction, construction and operation (including maintenance). It also includes indirect emissions outside of the site boundary, including emissions embedded within the construction products and materials arising as a result of the energy used for their production, and emissions arising from the transportation of products and materials, waste and construction workers.

The environmental impact associated with GHG emissions is a national and global issue. Consequently, the significance of the Development's lifecycle GHG emissions will be assessed by comparing the estimated GHG emissions from the Development against the reduction targets defined in the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 (Ref. 17-6), associated 2030 and 2040 legally binding carbon reduction targets (Ref. 17-19), and the Scotland's forecast trajectory towards Net Zero by 2045.

17.4.2 Climate Change Risk Assessment

The Study Area for the CCRA is the area within the Development Site, i.e., it covers the construction and operation (including maintenance) of all assets and infrastructure which constitute the Development.

17.4.3 In-combination Climate Change Impact Assessment

The Study Area for the ICCI assessment is as identified by each environmental discipline for their individual assessments.

The methodology used by the environmental disciplines to identify ICCIs is described below, and the ICCIs themselves are summarised in *Appendix 17.2 In-combination Climate Change Impact (ICCI) Assessment (Volume 5 Appendices).*

17.5 Assessment Methodology

17.5.1 Assumptions, Limitations and Uncertainties

The climate assessment has been based on the parameters outlined in *Chapter 2: Project and Site Description*.

This chapter forms an assessment based on available information at the time of preparing the EIAR. The technology for hydro schemes continues to evolve to maintain commercial flexibility and meet the changing demands of the UK market. It is assumed that the Development has a maximum generation capacity of 1.5GW (Gigawatts), and this is the basis of the Application.

At the time the GHG Assessment was undertaken the full cycle frequency was not known as this will be dictated by the energy markets. Therefore, based on advice from the design team, it was assumed that the Development will operate on 100 full cycles per year; this is a conservative estimate.

The carbon intensity of the electricity used for pumping was assumed to be the same as the UK Grid. The UK Government Greenbook (Ref. 17-31) on grid decarbonisation data was used to forecast grid decarbonisation into the GHG Assessment.

The largest single source of GHG emissions from the Development is likely to result from construction activities and the manufacture of materials necessary to construct the Development. The GHG assessment is based on a high-level materials assessment undertaken by the Design Team. It was assumed that all materials would be sourced within 100 km of the Development and transported by Heavy Goods Vehicle (HGV). The number of vehicle trips was based on a transport assessment. The methodology and assumptions used in this assessment are detailed in *Chapter 14: Access, Traffic and Transport***.**

The Institute for Environmental Management and Assessment's (IEMA) 'Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance' (Ref. 17-2) states that a comparable baseline must be used as a reference point against which the impact of a new project can be assessed, which may be "*GHG emissions arising from an alternative project design for a project of this type*". Currently, marginal load-following generation capacity is generally provided by gas-fired Open Cycle Gas Turbine (OCGT) (Ref. 17-28). The benefit of any renewable electricity scheme is to displace fossil-fuelled power sources. It is reasonable to assume that as additional renewable energy generation capacity becomes available, such as from the Development, it will reduce demand for the marginal generator, i.e., directly displace the use of OCGT. On this basis, the GHG assessment has used the operational emissions of an OCGT as the future baseline.

As described in *Chapter 2: Project and Site Description*, construction is due to take place over a 7-year period, commencing in 2027, and it is due to be commissioned in 2034. The Development is anticipated to operate for a 100-year period.

The GHG emissions expected from peatland excavations to make way for the Development were calculated using the Scottish Government Windfarm Carbon Assessment Tool (Ref. 17-35). It was assumed that no peat would be restored> This is a worst-case scenario as a Peat Management Plan containing mitigation measures to manage peatland damage has been developed for the Section 36 Application.

As stated at the scoping stage, it is extremely rare for a large-scale pumped storage hydro project to be decommissioned due to the long operational lifespan of the facility. Therefore, decommissioning was not considered as part of the climate change assessment.

17.6 Methodology

The methodologies described in the following section have been developed in line with the relevant planning policy (see Legislation, Policy & Guidance Section) and IEMA guidance on assessing GHG emissions in EIA (Ref. 17-2) and considering climate change resilience and adaptation measures (Ref. 17-3) in EIA.

17.6.1 Lifecycle GHG Impact Assessment

Greenhouse gas emissions arising during construction are calculated in line with PAS2080:2023 Guidance (Ref. 17-15) and GHG Protocol (Ref. 17-16), and the GHG 'hot spots' (i.e. materials and activities likely to generate the largest amount of GHG emissions) have been identified. This has enabled priority areas for mitigation to be identified. This approach is consistent with the principles set out in IEMA's guidance for assessing GHGs in EIA (Ref. 17-2).

The lifecycle approach considers emissions from the following lifecycle stages of the Development: pre-construction, construction and operation (including maintenance). The decommissioning phase has been scoped out of this assessment due to the long operational lifespan of the facility. Subsequent refurbishment or decommissioning plans would be prepared as required at that time for planning applications.

Where activity data has allowed, expected GHG emissions arising from the pre-construction, construction and operational activities, and embodied carbon in materials used in the Development, have been quantified using a calculation-based methodology as per the following equation in line with the GHG Protocol (Ref. 17-16), accompanied with the conversion factors for company reporting published by the UK Government (Ref. 17-19):

Activity data x GHG emissions factor = GHG emissions value

To inform the GHG Assessment, conversion factors for company reporting published by the UK Government were used to determine the GHG emission for fuel use and construction waste. In addition to this, emissions factors from ICE V3.0 (Ref. 17-34) were used to determine the GHG emissions for the construction materials (concrete and steel etc.) and emission rates from the CESSM 4 Price Book (Ref. 17-33) were used to determine the GHG emissions from excavation work required to construct the underground Power Cavern Complex.

The Scottish Government Windfarm Carbon Assessment Tool (Ref. 17-35) was used to determine the GHG emissions that were anticipated to arise from peat excavation. UK Government Greenbook (Ref. 17-31) decarbonisation figures were applied to the GHG Assessment for operational energy usage required for pumping activities. This was applied to factor in UK Grid decarbonisation as, during the operation of the Development, fossil fuels will continue to be phased out in line with UK and Scottish Government policy.

In line with the GHG Protocol (Ref. 17-16), when defining potential impacts (or 'hot spots'), the seven Kyoto Protocol GHGs have been considered, namely:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Sulphur hexafluoride (SF_6);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Nitrogen trifluoride (NF_3).

These GHGs are broadly referred to in this chapter under an encompassing definition of 'GHG emissions', with the unit of tCO_2e (tonnes of CO_2 equivalent) or $MtCO_2e$ (Mega tonnes of CO_2 equivalent).

Where data is not available, a qualitative approach to addressing GHG impacts has been followed, in line with the IEMA guidance for assessing GHG emissions in EIA (Ref. 17-2).

Table 17-5 Potential Sources of GHG Emissions, below, summarises the key anticipated GHG emissions sources associated with the Development, in line with the '*Publicly Available Standard (PAS) 2080 – carbon management in infrastructure*' (Ref. 17-15).

Table 17-5: Potential Sources of GHG Emissions

Lifecycle stage	Activity	Primary emission sources
Pre-construction Stage	Any enabling works, land clearance, and disposal of waste generated during the enabling works.	Material GHG emissions are expected from fuel use, electricity use, loss of carbon sink and waste disposal.
Construction Stage	Raw material extraction, product manufacture of construction materials, electricity use, on-site fuel use, waste disposal, and transport.	Material GHG emissions are expected from embodied carbon of materials, electricity use, fuel use, and waste disposal.
Operation Stage	Raw material extraction, product manufacture for operational materials, electricity use, fuel use onsite, waste disposal, landscaping or other offsets.	Material GHG emissions are expected from embodied carbon of materials, electricity use, fuel use, waste disposal, gain of carbon sinks.

17.6.2 Climate Change Resilience Assessment

The EIA Regulations (Ref. 17-1) require the inclusion of information on the vulnerability of the Development to climate change. Consequently, an assessment of climate change resilience for the Development has been undertaken, identifying potential climate change impacts per the IEMA Environmental Impact Assessment Guide to Climate Change Resilience & Adaptation (Ref. 17-3).

The assessment has included all infrastructure and assets associated with the Development. It covers resilience against both gradual climate change, and the risks associated with an increased frequency of extreme weather events as per the UK Climate Projections 2018 (UKCP18) (Ref. 17-20).

The review of potential impacts and the Development's vulnerability considers the embedded mitigation measures that have been designed into the Development, discussed in the Embedded Mitigation Section.

The assessment has considered climate projections over a 100-year period from the Development's completion, assuming a construction start date of 2027.

The following key terms and definitions relating to the CCRA have been used:

- Climate hazard – a weather or climate related event, which has potential to do harm to environmental or community receptors or assets, such as increased winter precipitation;
- Climate change risk – risks associated with climatic variables, such as increased winter precipitation leading to flooding;

- Climate change impact – an impact from a climate hazard which affects the ability of the receptor or asset to maintain its function or purpose; and
- Consequence – any effect on the receptor or asset resulting from the climate hazard having an impact.

A stepped approach is used to assess the impacts of climate change on the Development:

Step 1: Identify Potential Climate Hazards and Subsequent Risks

Potential climate change hazards relevant to the location of the Development have been identified using projections from UKCP18.

Climate parameters considered in the CCRA during the pre-construction, construction and operation of the Development include the following:

- Extreme weather events;
- Flood risk;
- Forest Fire;
- Temperature change; and
- Precipitation change.

Step 2: Identify the Likelihood of a Climate Impact Occurring

Once potential climate hazards have been identified in Step 1, the criteria presented in *Table 17-6 Likelihood of a Climate Impact Occurring*, below, is used to determine the likelihood of a climate impact occurring on the Development site.

Table 17-6. Likelihood of a Climate Impact Occurring

Likelihood of event	Qualitative description	Quantitative description (probability of occurrence)
Very likely	Likely that the impact will occur many times (reoccurs frequently).	90-100% probability that the impact will occur.
Likely	Likely that the impact will occur sometimes (reoccurs infrequently).	66-90% probability that the impact will occur.
Possible, about as likely as not	Possible that the impact will occur (has occurred rarely).	33-66% probability that the impact will occur.
Unlikely	Unlikely that the impact will occur (not known to have occurred).	10-33% probability that the impact will occur.
Very unlikely	Almost inconceivable that the impact will occur.	0-10% probability that the impact will occur.

Step 3. Identify the Consequence of the Impact on the Development

Following identification of climate impacts, the consequences of climate impacts have been assessed according to *Table 17-7 Level of Consequence of a Climate Change Risk Occurring*, below. For example, permanent damage to electrical equipment from heatwaves causing complete loss of operation. The categories and descriptions provided below are based on IEMA's '*Climate Change Resilience and Adaptation guidance'* (Ref. 17-2).

Table 17-7. Level of Consequence of a Climate Change Risk Occurring

Consequence of impact	Description
High	• Permanent damage to structures/assets; • Complete loss of operation/service; • Complete/partial renewal of infrastructure; Exceptional environmental damage; and/or • Extreme financial impact.
Moderate	• Partial infrastructure damage and some loss of service; • Some infrastructure renewal; • Adverse impact on the environment; and/or • Moderate financial impact.
Low	• Localised infrastructure disruption and minor loss of service;

Consequence of impact	Description
	• No permanent damage, minor restoration work required; • Slight adverse environmental effects; and/or • Small financial losses.
Negligible	• No damage to infrastructure; • No impacts on the environment; and/or • No adverse financial impact.

Step 4. Identify the Significance of Impact (likelihood of impact occurring x consequence of impact)

This assessment was informed by the risk framework and the descriptors of likelihood and consequence adopted from the European Commission's Technical guidance on the climate proofing of infrastructure in the period 2021 – 2027 (Ref. 17-17).

The likelihood and consequence descriptors and the risk matrix are provided in *Table 17-6 Likelihood of a Climate Impact Occurring*, and *Table 17-7 Level of Consequence of a Climate Change Risk Occurring.*

The CCRA has assessed the significance of effects by evaluating the combination of the likelihood of the climate-related impact occurring, and the consequence, as per the risk assessment matrix in *Table 17-8 Risk Matrix as per the EU Technical Guidance (2021).* As evident in *Table 17-8,* any Low or Medium risks are deemed to be Not Significant to the Development, whilst any High and Extreme risks are deemed to have a Significant impact on the Development. The assessment has taken into account design and mitigation measures. Once the likelihood and consequence of an impact has been identified, this is used to determine the level of significance.

Table 17-8: Risk Matrix as per the EU Technical Guidance (2021)

		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Rare	Low (NS)	Low (NS)	Medium (NS)	High (S)	Extreme (S)
	Unlikely	Low (NS)	Low (NS)	Medium (NS)	High (S)	Extreme (S)
	Moderate	Low (NS)	Medium (NS)	High (S)	Extreme (S)	Extreme (S)
	Likely	Medium (NS)	High (S)	High (S)	Extreme (S)	Extreme (S)
	Almost certain	High (S)	High (S)	Extreme (S)	Extreme (S)	Extreme (S)

NS – Not significant; S - Significant

17.6.3 In-combination Climate Change Impact Assessment

The ICCI assessment has considered the ways in which projected climate change will influence the significance of the impact of the Development on receptors in the surrounding environment.

The ICCI assessment has considered the existing and projected future climate conditions for the geographical location and assessment timeframe to identify climate hazards. It then identifies the extent to which receptors in the surrounding environment are potentially vulnerable to, and affected by, these climate impacts. Identification of impacts has been assessed in liaison with the technical specialists responsible for preparing the applicable technical chapters listed below:

- *Chapter 13: Cultural Heritage*; and
- *Chapter 10: Geology & Ground Conditions*.

Potential climate hazards impacting receptors in the surrounding environment have been assessed using the criteria presented in *Table 17-9 Level of Likelihood of the Climate-Related Hazard Occurring.*

Table 17-9. Level of Likelihood of the Climate-Related Hazard Occurring

Level of likelihood of climate hazard	Qualitative description	Quantitative description
Very likely	Likely that the event will occur many times (reoccurs frequently).	90-100% probability that the hazard will occur during the life of the project.
Likely	Likely that the event will occur sometimes (reoccurs infrequently).	66-90% probability that the hazard will occur during the life of the project.
Possible, about as likely as not	Possible that the event will occur (has occurred rarely).	33-66% probability that the hazard will occur during the life of the project.
Unlikely	Unlikely that the event will occur (not known to have occurred).	10-33% probability that the hazard will occur during the life of the project.
Very unlikely	Almost inconceivable that the event will occur.	0-10% probability that the hazard will occur during the life of the project.

Once the likelihood of a climate hazard occurring has been identified the likelihood of the hazard impacting receptors is assessed using the criteria presented in *Table 17-10 Level of Likelihood of the Climate-Related Impact Occurring.*

Table 17-10. Level of Likelihood of the Climate-Related Impact Occurring

Level of likelihood of climate impact occurring	Definition of likelihood
High	Likelihood of climate hazard occurring is high and impact is always/ almost always going to occur.
Moderate	Likelihood of climate hazard occurring is high and impact occurs often or the likelihood of climate hazard occurring is moderate and impact is likely to occur always/almost always.
Low	Likelihood of climate hazard occurring is high, but impact rarely occurs or the likelihood of climate hazard occurring is moderate and impact sometimes occurs or the likelihood of climate hazard occurring is low and impact is likely to occur always/almost always.
Negligible	All other eventualities – highly unlikely but theoretically possible.

Once the likelihood of an impact occurring has been identified, the consequence of the impact on the receptor is assessed using the criteria set out in *Table 17-10.* The ICCI consequence criteria are defined in *Table 17-11 Consequence Criteria for ICCI Assessment,* and consider the change to the significance of the impact already identified by the environmental discipline. To assess the consequence of an ICCI each discipline has assigned a level of consequence to an impact based on the criteria description and their discipline assessment methodology.

Table 17-11: Consequence Criteria for ICCI Assessment

Consequence	Consequence Criteria
High	The climate change parameter in-combination with the effect of the Development causes the significance of the impact of the Development on the resource/receptor, as defined by the topic, to increase from negligible, low, or moderate to major.
Moderate	The climate change parameter in-combination with the effect of the Development causes the effect defined by the topic to increase from negligible or low, to moderate.
Low	The climate change parameter in-combination with the effect of the Development, causes the significance of effect defined by the topic, to increase from negligible to low.
Negligible	The climate change parameter in-combination with the effect of the Development does not alter the significance of the effect defined by the topic.

17.7 Data Sources

In preparation of this chapter, the following sources of published information have been used to inform the climate change assessment:

- Historic climate data obtained from the Met Office website at the closest meteorological station to the Development (Lephinmore, approximately 16 miles south of the Development) (Ref. 17-25) to determine the existing baseline conditions;
- UKCP18 (Ref. 17-20) to determine the future baseline conditions;

- Think Hazard (Ref. 17-26) were also used for other projected trends/impacts, and the UK Climate Change Risk Assessment (Ref. 17-27) analysed for the current state of nationwide climate change risks;
- Civil Engineering Standard of Measurement 4 (CESMM 4) Price Book (Ref. 17-33) emissions factors to determine the GHG emissions for the underground excavations;
- Bath Inventory of Carbon and Energy (ICE V3) (Ref. 17-34) emission factors to determine the carbon emissions from building materials;
- Department of Energy Security & Net Zero (DESNZ) 2023 (Ref. 17-19) emission factors to determine the GHG emissions from fuel usage and waste;
- Scottish Government Windfarm Carbon Assessment Tool (Ref. 17-35) to determine the GHG emissions associated with the excavation of peat; and
- UK Government Green Book (Ref. 17-31) for projections of future grid decarbonisation.

17.8 Baseline Conditions

17.8.1 Lifecycle GHG Impact Assessment

Existing Baseline

For the GHG assessment, the existing baseline is the current position at the Development Site. The existing baseline comprises the carbon stock and sources of GHG emissions within the boundary of the existing activities on-site.

The current land use within the Site and the local area consists predominantly of woodland, grassland, peatlands, and farm access tracks. The abundance of vegetation within the Development Site suggests carbon sink potential.

Future Baseline

The future baseline provides an estimate of the GHG emissions that would occur at the Development Site in the future if the Development does not proceed.

17.8.2 CCRA and ICCI Assessments

Existing Baseline

The existing baseline for the CCRA and ICCI assessments is based on historic observational climate data recorded by the closest meteorological station to the Development (Lephinmore, located approximately 16 miles south of the Development) for the 30-year period of 1981-2010. This has been obtained from the Met Office website (Ref. 17-25), and is summarised in *Table 17-12.*

Past Extreme Events

The following events are examples of extreme climatic conditions experienced at the site location in the past:

- Highest recorded temperature recorded was 34.8°C on the 19th July 2022 (Ref. 17-29);
- Lowest recorded temperature recorded was -15.9°C on the 29th December 1995 (Ref. 17-29);
- Highest 24-hour rainfall total for a rainfall day was 238 mm and was recorded on 17th January 1974 (Ref. 17-29);
- The highest gust speed recorded was 142 mph and was recorded on 13th February 1989 (Ref. 17-29); and
- In October 2023, torrential rainfall, up to a month's rainfall accumulating within a 24-hour period, led to significant flooding and landslips across the west coast of Scotland, affecting the region's road network (Ref. 17-30).

Future Baseline

The future baseline is expected to differ from the existing baseline described above. UKCP18 (Ref. 17-20) provides probabilistic climate change projections for pre-defined 30-year periods for annual, seasonal, and monthly changes to mean and extreme climatic conditions over land areas. For the purposes of the assessments, UKCP18 probabilistic projections for the following average climate variables have been obtained:

- Mean annual temperature;
- Mean summer temperature;

- Mean winter temperature;
- Maximum summer temperature;
- Minimum winter temperature;
- Mean annual precipitation;
- Mean summer precipitation;
- Mean winter precipitation; and
- Extreme weather events (e.g. heat waves & storm events).

Projected temperature and precipitation variables are presented in *Table 17-12 Climate Data Projections for Balliemeanoch.* UKCP18 probabilistic projections have been analysed for the 25 km^2 (square kilometres) grid square within which the Development is located. These figures are expressed as temperature/precipitation anomalies in relation to the 1981-2010 baseline.

UKCP18 uses a wide range of possible scenarios, classified as Representative Concentration Pathways (RCP), to inform differing future emission trends. These RCPs *"… specify the concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to preindustrial levels*". RCP8.5 has been used for the purposes of this assessment as a worst-case as this predicts a high-emissions or 'business-as-usual' scenario.

As the design life of the Development is at least 100 years, the CCRA has considered a scenario that reflects a high level of GHG emissions at the 10%, 50% and 90% probability levels up to 2099 to assess the impact of climate change over the assessed lifetime of the Development.

Construction risks are assessed against the 2020-2049 projection data, while operation risks are assessed against 2020-2049, 2040-2069 and 2070-2099 projection data as a conservative worst-case scenario.

The following data are proposed to be used to inform the climate change assessment and are detailed in the Data Sources section.

Table 17-12: Climate Data Projections for Balliemeanoch

Climate Variable	Baseline (1981–2010)	Climate change projection RCP 8.5				Projected Trend	Climate Projection Source
		2020–2049	2040–2069	2070–2099	Beyond 2100		
Temperature							
Mean annual maximum daily temperature (°C)	12.42°C	+0.82°C (+0.22°C to + 1.42°C)	+1.44°C (+0.54°C to +2.34°C)	+2.81°C (+1.36°C to +4.32°C)	No projection data is available, trend towards increasing temperatures is expected to continue	↑	*UKCP18 RCP8.5*
Mean summer maximum daily temperature (°C)	17.76°C	+0.86°C (+0.10°C to + 1.64°C)	+1.63°C (+0.42°C to +2.89°C)	+3.53°C (+1.42°C to + 5.76°C)		↑	*UKCP18 RCP8.5*
Mean winter minimum daily temperature (°C)	1.89°C	+0.81°C (-0.05°C to + 1.73°C)	+1.38°C (+0.18°C to + 2.65°C)	+2.39°C (0.41°C to +4.47°C)		↑	*UKCP18 RCP8.5*
Maximum summer air temperature (°C)	18.64°C (July)	+0.82°C (-0.40°C to + 1.75°C)	+1.65°C (0.14°C to + 3.18°C)	+3.72°C (1.06°C to + 6.41°C)		↑	*UKCP18 RCP8.5*
Minimum winter air temperature (°C)	1.82°C (January)	+0.98°C (-0.05°C to +2.03°C)	+1.56°C (+0.14°C to + 3.10°C)	+2.58°C (0.29°C to + 5.15°C)		↑	*UKCP18 RCP8.5*
Rainfall							
Mean annual rainfall (mm)	1957.45	+3.32% (–2.63% to +9.68%)	+5.86% (–2.76% to +15.37%)	+7.03% (–5.57% to +21.27%)	No projection data available, but there is potential for the overall trend in increased rainfall to continue.	↑	*UKCP18 RCP8.5*
		2020–2049	2040–2069	2070–2099	Beyond 2100		
Mean summer rainfall (mm)	119.65	-8.11% (–22.18% to +7.32%)	–11.88% (–31.73% to +10.93%)	–25.77% (–49.91% to +5.41%)	No projection data is available. It is possible for the decrease in summer rainfall trend to continue.	↓	*UKCP18 RCP8.5*
Mean winter rainfall (mm)	207.97	+9.00% (–3.40% to +23.72%)	+15.18% (–1.33% to +35.73%)	+25.61% (–0.07% to +58.29%)	No projection data is available, an increase in winter rainfall is possible.	↑	*UKCP18 RCP8.5*

Climate Variable	Baseline (1981–2010)	Climate change projection RCP 8.5				Projected Trend	Climate Projection Source
Wettest month on average (mm)	242.84 (January)	+9.3% (-9.5% to 29.8%)	+17.9% (-9.1% to +48.1%)	+32.4% (-6.6% to +78.0%)	No projection data is available.	↑	*UKCP18 RCP8.5*
Driest Month on average (mm)	93.65 (May)	+8.2% (-8.7% to +24.5%)	+10.8% (-13.5% to +33.7%)	+6.6% (-27.6% to +39.6)	No projection data is available.	↑	*UKCP18 RCP8.5*
Other							
Droughts	The Met Office has projected a trend towards drier summers on average, with the trend being stronger under a high GHG emission scenario compared to a low one. However, it is the distribution of rainfall throughout the seasons that will determine UK drought risk.					↑	Met Office
Storms	Climate change is expected to lead to more frequent and intense winter storms across the UK, with higher wind speeds and wetter winters, while summers may become drier.					↑	Met Office
Wildfires	The wildfire hazard is classified as medium according to the information that is currently available to the Think Hazard tool. This means there is between a 10% and 50% chance of experiencing weather that could support a hazardous wildfire that may pose some risk of life and property loss in any given year.					↑	Think Hazard

17.9 Significance Criteria

17.9.1 Lifecycle GHG impact assessment

For the lifecycle GHG impact assessment, the magnitude of impact considers the output of the GHG quantification process, i.e. the Development's GHG lifecycle footprint, in the context of its contribution to Scotland's annual percentage reduction targets and the possible impact of the Development on Scotland meeting its Net Zero target. Emissions from the Development will be presented as a percentage of the carbon reduction period under which they fall.

According to the IEMA guidance on assessing GHG emissions in EIA (Ref. 17-2), "*GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant*".

The IEMA guidance describes five distinct levels of significance which are not solely based on whether a project emits GHG emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards Net Zero.

Table 17-13 Definition of Levels of Significance presents the different significance levels as per the latest version of the IEMA guidance, which emphasises that *"…a project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the UK's net zero trajectory, or accepted aligned practice or area-based transition targets, results in a significant adverse effect. It is down to the practitioner to differentiate between the 'level' of significant adverse effects e.g. 'moderate' or 'major' adverse effects*."

Table 17-13: Definition of Levels of Significance

Effect	Significance Level	Description in the IEMA guidance	Example in the IEMA guidance
Major adverse	Significant	A project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the UK's Net Zero trajectory or accepted aligned practice or area-based transition targets, results in a significant adverse effect. It is down to the practitioner to differentiate between the 'level' of significant adverse effects; e.g., 'moderate' or 'major' adverse effects.	The project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards Net Zero.
Moderate adverse			The project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to Scotland's trajectory towards Net Zero.
Minor adverse	Not significant	A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve a minor adverse effect that is not significant. It may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the Scotland on track towards Net Zero by 2045.	The project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the Scotland's trajectory towards Net Zero.
Negligible		A project that achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory, and has minimal residual emissions, is assessed as having a negligible effect that is not significant. This project is playing a part in achieving the rate of transition required by nationally set policy commitments.	The project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or Net Zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards Net Zero and has minimal residual emissions.
Beneficial	Significant	A project that causes GHG emissions to be avoided or removed from the atmosphere. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a beneficial effect.	The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds Net Zero requirements with a positive climate impact.

Moderate and major adverse impacts and beneficial impacts are considered to be 'significant', while minor adverse and negligible significance levels are deemed to be 'not significant'.

A minor adverse or negligible non-significant effect conclusion does not necessarily refer to the magnitude of GHG emissions being carbon neutral (i.e. zero on balance); but refers to the likelihood of avoiding severe climate change, aligning project emissions with a science-based 1.5°C compatible trajectory and achieving Net Zero by 2045.

A project's impact can shift from significant adverse to non-significant effects by incorporating mitigation measures that substantially improve on business-as-usual and meet or exceed the science-based emissions trajectory of ongoing but declining emissions towards Net Zero.

The IEMA guidance also states it is down to the professional judgement of the practitioner to determine how best to contextualise a project's GHG impact and assign the level of significance. It is suggested that sectoral, local, or national carbon budgets can be used, as available and appropriate, to contextualise a project's GHG impact and determine the level of significance. The approach adopted for the purposes of this assessment is outlined below.

Where available, Scotland's carbon reduction targets have been used for the purposes of this assessment to represent future emissions inventory scenarios for Scotland (Ref. 17-22). These legally-binding targets outline the total amount of GHGs that Scotland can emit on a yearly basis.

To identify and assess the magnitude of impact of GHG emissions arising from the Development, these are first calculated and put into the context of Scotland's carbon reduction targets. The IEMA guidance and criteria (Ref. 17-2) is then used to test the significance of the magnitude.

Table 17-14 Scotland's Annual Carbon Reduction Targets outlines Scotland's annual carbon reduction targets that are used to contextualise the Development's GHG emissions. These targets are derived from annual percentage reductions relative to Scotland's 1990 emissions baseline (Ref. 17-23).

Table 17-14: Scotland's Annual Carbon Reduction Targets

Year	Percentage reduction from 1990 baseline	Scotland Government Annual Targets (Mt CO_2e)
2021	51.1%	35.84
2022	53.8%	34.23
2023	56.4%	32.61
2024	59.1%	30.99
2025	61.7%	29.37
2026	64.4%	27.76
2027	67.0%	26.14
2028	69.7%	24.52
2029	72.3%	22.90
2030 (Interim target)	75.0%	21.28
2031	76.5%	20.01
2032	76.5%	18.73
2033	78.0%	17.45
2034	79.5%	16.18
2035	81.0%	14.90
2036	82.5%	13.62
2037	84.0%	12.35
2038	85.5%	11.07
2039	87.0%	9.79
2040 (Interim Target)	88.5%	8.51
2041	92.0	6.81

Year	Percentage reduction from 1990 baseline	Scotland Government Annual Targets (Mt CO_2e)
2042	94.0%	5.11
2043	96.0%	3.41
2044	98.0%	1.70
2045 (net-zero emissions)	100%	0.0

In April 2024, the Scottish Government (Ref. 17-37) announced that it intended to remove the statutory 2030 target for emissions reductions, and to replace the existing annual percentage reduction targets with a series of multi-year carbon budgets. These changes would require an amendment to primary legislation which, at the time of drafting this chapter, has not yet been implemented. The Scottish Government reiterated its commitment to reach net zero by 2045.

In addition to using Scotland's emission reduction targets to test the significance of the Development, the Climate Change Committee (CCC) also provides sector-specific decarbonisation pathways (Ref. 17-24). *Table 17-15 Sector-Specific Electricity Generation Carbon Budgets Based Upon the CCC's Balanced Net Zero Pathway* presents the electricity generation sector specific carbon budgets as further context to the GHG emissions; however, it should be noted that these are not contained in legislation unlike the national-level budgets. The sector-specific carbon budget periods begin in 2020.

Table 17-15: Sector-Specific Electricity Generation Carbon Budgets Based Upon the CCC's Balanced Net Zero Pathway

Carbon budget period	Recommended Carbon Budget ($MtCO_2e$)
2023–2027	189.16
2028–2032	92.56
2033–2037	35.74
2038–2042	23.22
2043–2047	12.36
2048–2050	4.03

17.10 Climate Change Risk Assessment

17.10.1 CCR Assessment

The significance of impacts in the CCR Assessment is determined as a function of the likelihood of a climate change impact occurring and the consequence to the receptor if the impact occurs. The significance is detailed in *Table 17-8 Risk Matrix as per the EU Technical Guidance (2021)* . The assessment takes into account confirmed design and mitigation measures (referred to the Embedded Mitigation section).

17.10.2 ICCI Assessment

The significance of potential effects is determined using the matrix in *Table 17-16 ICCI Significance Criteria.* Where an effect has been identified as moderate or high, against the matrix in *Table 17-16*, these will be classed as a significant ICCI effect. If significant ICCI effects are assessed, then appropriate additional mitigation measures (secondary mitigation) are identified.

Table 17-16. ICCI Significance Criteria

		Likelihood of climate-related impact occurring			
		Negligible	**Low**	**Moderate**	**High**
Level of consequence of climate impact occurring	**Negligible**	NS	NS	NS	NS
	Low	NS	NS	NS	S
	Moderate	NS	NS	S	S
	High	NS	S	S	S

Note: S = significant; and NS = not significant

17.11 Embedded Mitigation

Where possible, mitigation measures have been incorporated into the Development design and construction. Through iterative assessment, potential impacts have been predicted and opportunities to mitigate them identified with the aim of preventing or reducing impacts as much as possible. This approach provides the opportunity to prevent or reduce potential adverse impacts from the outset. This embedded mitigation approach has been taken into account when evaluating the significance of the potential impacts.

Once these measures are incorporated into the design, they are termed ‘embedded measures’. Embedded measures relevant to the construction phase are described within each technical chapter of this EIAR. For the operational phase, such embedded measures will be represented primarily in the design, e.g. the choice of infrastructure components. Embedded measures are therefore either incorporated into the design from the outset or identified through the assessment process.

Along with any measures required for legislative compliance, the Development will also incorporate industry standard control measures, which are common practice on construction sites, into the embedded measures. These are described in each technical chapter of this EIAR. Embedded measures include (but are not limited to) the monitoring of weather forecasts and receipt of Scottish Environmental Protection Agency (SEPA) flood alerts by contractors to allow works to be planned and carried out accordingly to manage extreme weather conditions, such as storms and flooding, infrastructure design, and flood resilience measures.

17.11.1 GHG Mitigation Measures

An Outline construction environmental management plan (CEMP) is included within the Section 36 Application. This identifies various mitigation measures to be embedded within the Development to reduce the GHG impact, including:

- Adopting the Considerate Constructors Scheme (CCS) to assist in reducing pollution, including GHG emissions, from the Development by employing good industry practice measures which go beyond statutory compliance;
- Implementing a Construction Traffic Management Plan (CTMP) to reduce the volume of construction trips to the Site;
- Liaising with construction personnel on the potential to implement staff minibuses and car-sharing options;
- Switching vehicles and plant off when not in use and ensuring construction vehicles conform to European Union (EU) vehicle emissions standards for the types of plant and vehicles to be used;
- Conducting regular planned maintenance of the plant and machinery to optimise efficiency;
- Increasing recyclability by segregating construction waste to be re-used and recycled where reasonably practicable;
- Designing, constructing and implementing the Development in such a way as to minimise the creation of waste;
- Where practicable, maximise the use of alternative materials with lower embodied carbon, such as locally sourced products and materials with a higher recycled content; and
- A Peat Management Plan has been developed for the Development. This contains measures to reduce the impact of damaged peat lands as a result of the Development. Measures include reusing excavated peat for Access Tracks.

17.11.2 CCRA Adaptation Measures

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 *Chapter 11: Water Environment* and *Chapter 12: Water Resources and Flood Risk***.**

The following adaption measures are included within the Outline CEMP;

- 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 in order 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 Toolbox Talks to educate workers on the dangers of extreme weather conditions should be included.

17.12 Assessment of Likely Impacts and Effects

17.12.1 Lifecycle Greenhouse Gas Assessment

Within this section, GHG emissions arising as a result of the Development are identified and assessed for each lifecycle stage individually (construction and operation).

It is important to understand the GHG impacts at each individual lifecycle stage, as well as to understand the net lifecycle GHG impact of the Development due to the long-term, cumulative nature of GHG emissions over their lifetime.

Therefore, the net impact of the Development is also identified and assessed, taking into account the renewable energy generation and the benefit of this in the context of the wider energy generation sector and the National Grid average GHG intensity. The overall assessment, which will account for all GHG emissions over the lifetime of the Development, has also compared the GHG intensity of the Development with the GHG intensity of other likely grid energy generation sources.

17.12.2 Pre-construction and Construction Effects

The GHG emissions emitted during the pre-construction and construction phase are detailed below in *Table 17-17 GHG Emissions Resulting from the Pre-Construction and Construction Phase.*

The greatest GHG impacts occur during the pre-construction and construction phase (2027 - 2034) as a result of land use change through the excavation of peat to make way for the Development. Land use change emissions were calculated using bespoke peatland emission factors within the Scottish Government Windfarm Carbon Assessment Tool (Ref. 17-35). The reported GHG impacts for land use change are a worst-case scenario as it was assumed in the GHG Assessment that no measures are taken to reduce peatland loss. The Peat Management Plan includes measures that are likely going to significantly reduce the GHG impact of peatland loss due to the Development.

The other significant GHG impacts are from the manufacture of the materials and components required and the enabling work (underground excavations) required to construct the necessary infrastructure. Construction material quantities were provided by the design team and the GHG emissions were derived using emission factors from ICE V3 (Ref. 17-34) and the CESSM 4 Pricebook (Ref. 17-33).

The construction phase is estimated to account for 1,795,023 tCO_2e. *Table 17-17* summarises the emissions resulting from the pre-construction and construction phase of the Development.

Table 17-17. GHG Emissions Resulting from the Pre-Construction and Construction Phase

Emissions source	Construction and pre-construction emissions (tCO_2e)	Proportion of total construction and pre-construction emissions
Land use change (Peat Excavations)	619,943	35%
Materials	578,447	32%
Enabling Work	449,711	25%
Construction Activities (includes fuel use)	25,183	6%
Transport of materials	39,227	2%
Commuting	5,588	<1%
Waste	3,138	<1%
Preconstruction and Construction total	**1,795,023**	

The annual emissions of each phase have been compared to the relevant Scottish Net Zero Carbon Targets and are detailed in *Table 17-18 Scottish Net-Zero Targets Relevant to the Construction Period.*

Table 17-18. Scottish Net-Zero Targets Relevant to the Construction Period

Relevant Carbon Reduction Period	Carbon Reduction Allowance (tCO_2e)	Estimated total (tCO_2e) over carbon reduction period	% of carbon reduction period
2021-2030	285,641,192	1,025,727	0.35910%
2031-2040	142,607,749	769,295	0.53945%
2041-2044[1]	17,027,791	0	0.0%

The overall significance of GHG emissions in the context of the Scottish Carbon Reduction Targets and the national policy environment has been assessed in the Overall GHG Impact and Significance Section.

17.12.3 Operational Effects

The operational phase of the Development is assumed to cover the period from 2034 to 2133 (i.e. 100 years). The Development is estimated to have a storage capacity of 45 GWh based on a 1.5 GW capacity and a 30-hour maximum run time. It was assumed that the Development has a round-trip efficiency of 80%.

This round-trip efficiency value means that in order to generate 45 GWh of electricity, 56.25 GWh of electricity would be required to pump water from the lower reservoir to the upper reservoir during periods of low electricity demand (e.g. at night) or when there is a surplus electricity generation from renewable sources like wind or solar. Pumping water from the lower to the upper reservoir at periods of high renewable generation means that the carbon intensity of this phase of the operation is very likely to be lower than the grid average.

It is not, however, possible to accurately determine the carbon intensity of the electricity used for pumping activities due to the exact source of the surplus electricity not being known. Future projections of grid carbon intensity from the UK Government Greenbook (Ref. 17-31) were therefore used; these carbon factors represent the average carbon intensity for all electricity supplied via the UK grid for a given year, and can be taken to be a worst-case for the carbon impact of pumping operations.

GHG emissions sources within the scope of the operational emissions include energy use (for pumping of water from the lower to upper reservoir and auxiliary services) and fuel use for the transportation of workers to the Development and maintenance activities.

As presented in *Table 17-19 Emissions Resulting from the Operational Phase* the operational emissions over the design life of the Development are estimated at 3,269,787 tCO_2e. A total of 99% of this figure results from the pumping activities to move water from the lower to the upper reservoir between cycles. To calculate the greenhouse gas emissions for the Development's operation over its lifetime, it was assumed that there will be 100 cycles each year. The total electricity consumption value (GWh) for each cycle was multiplied by the total number of cycles and the Greenbook Grid Decarbonisation Values for each corresponding year, from 2034 to 2133. The result of this calculation was an emissions value for the operation of the Development each year, which were added together to get the total emissions for the Development's operation over its lifetime. The remaining GHG emissions result from operational worker commuting and maintenance activities.

Table 17-19. Emissions Resulting from the Operational Phase

Emissions source	Operational emissions (tCO_2e)	Proportion of total construction emissions
Electricity Usage (Pumping)	3,231,738	99%
Maintenance	22,770	1%
Vehicle Journeys	15,279	<1%
Operation design life total	**3,269,787**	
Annual total	**32,698**	

The annual emissions of each phase have been compared to the relevant Scottish Carbon reduction targets as detailed in *Table 17-20 Scottish Carbon Reduction Targets Relevant to the Operational Period.* To improve the robustness of the assessment and allow for temporal flexibility, the annual operational emissions have also been compared to the sector specific carbon budgets for electricity generation based on the CCC's Balanced Net Zero Pathway, these are detailed in *Table 17-21 Sector Specific Electricity Generation Carbon Budgets Relevant to the Operational Period.*

Table 17-20. Scottish Carbon Reduction Targets Relevant to the Operational Period

Relevant carbon reduction Period	Carbon reduction Allowance (tCO_2e)	Estimated total (tCO_2e) over carbon reduction period	% of carbon reduction period
2021-2030	285,641,192	0	0%
2031-2040	142,607,749	228,885	0.16050%
2041-2044[1]	17,027,791	130,791	0.76810%

Table 17-21: Sector Specific Electricity Generation Carbon Budgets Relevant to the Operational Period

Relevant UK Carbon Budget	Annualised UK Carbon Budget (tCO_2e)	Estimated total (tCO_2e) over the carbon budget period	% of Sectoral Budget for Electricity Generation.
2033-2037	35,740,000	89,919	0.25159%
2038-2042	23,330,000	163,489	0.70077%
2043-2047	12,360,000	163,489	1.32273%
2048-2050	4,030,000	65,396	1.62272%

The overall significance of GHG emissions in the context of the Scotland's carbon reduction targets and the national policy environment has been assessed in the Overall GHG Impact and Significance Section.

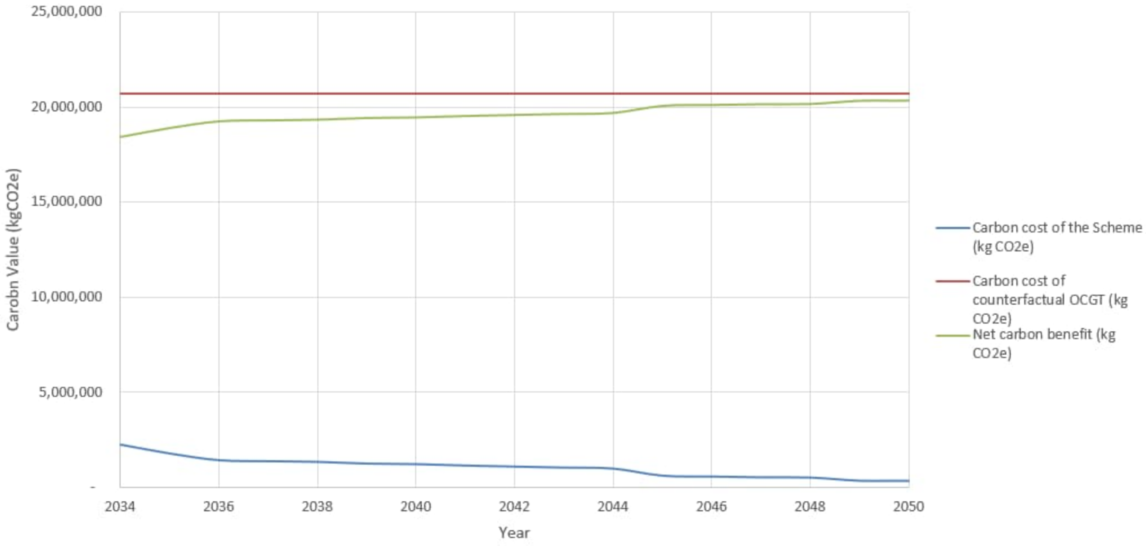
17.12.4 Carbon Intensity of the Development

The UK grid carbon intensity in 2023 is 0.207 $kgCO_2e/kWh$ (Ref. 17-19), however, these figures cannot be directly compared to the Development as the published UK grid carbon intensity figure only takes into account operational GHG emissions from the generation of electricity, overwhelmingly from the fossil fuels used to power gas-fired and occasionally coal-fired power stations (Ref. 17-28). For a meaningful comparison to be made between the Development and the UK grid, the operational carbon intensity of the Development must only include emissions from the operations of the Development and exclude emissions from construction.

The carbon intensity of the Development varies during the anticipated operational lifespan of the Development due to the Development's reliance on electricity from the UK Electricity Grid to pump water from the lower to the upper reservoir. In 2034, the first year of operation, the carbon intensity of the Development was calculated to be 0.04 $kgCO_2e/kWh$ for the GHG Assessment for the Development. In 2045, the year Scotland is due to reach Net Zero, the carbon intensity is anticipated to be 0.01 $kgCO_2e/kWh$. Therefore, comparing the Development against a counterfactual gas-fired Open Cycle Gas Turbine (OCGT) generating facility, a representative figure for the carbon intensity of an OCGT is 0.46 kgCO2e/kWh has been applied (Ref. 17-25). It can be determined that considerable GHG savings can be achieved from implementing the Development over the continued use of a counterfactual OCGT as shown in Figure 17-1 below.

[1] Excludes 2045 as no GHG emissions can be emitted from 2045 onwards.

Figure 17-1: GHG Savings of Development in comparison to the Counterfactual OCGT



The estimated operational GHG emissions from the Development, based on the DESNZ UK Grid Decarbonisation trajectory (Ref. 17-30), indicate a potential GHG saving of 203,768,262 tCO_2e across the anticipated 100-year operational period. This is in comparison to the counterfactual OCGT with identical energy generation capacity to the Development. It is important to note that this figure probably overestimates the GHG savings of the Development. This is because it is likely that energy generation from OCGT plants without carbon capture technology will be phased out before Scotland reaches Net Zero in 2045. The overall savings assume that the OCGT plant would continue to operate throughout the entire anticipated 100-year operational period.

17.12.5 Overall GHG Impact and Significance

Accounting for Scotland's climate objective to achieve net-zero carbon by 2045, and in line with IEMA guidance for assessing GHGs (Ref. 17-2), Scotland's 2030, 2040 and 2045 Carbon reduction targets have been used to contextualise emissions from the Development.

Pre-construction & Construction

Annual emissions from the pre-construction and construction phases of the Development (and their magnitude) are compared to the significance definitions outlined in *Table 17-20 Scottish Carbon Reduction Targets Relevant to the Operational Period* and *Table 17-21 Sector Specific Electricity Generation Carbon Budgets Relevant to the Operational Period*. In line with IEMA criteria for assessing the significance of GHG impacts (Ref. 17-2), construction of the Development can be assumed to be consistent with applicable existing and emerging policy requirements. GHG emissions from construction are therefore determined to be **minor adverse** and **not significant**.

Operation

The Development results in some operational emissions associated with electricity storage, maintenance and worker travel. However, the benefits of generating renewable energy from the Development far outweigh the associated emissions as demonstrated in the Carbon Intensity of the Development section. Annual emissions from the operation of the Development (and their magnitude) are compared to the significance definitions outlined in *Table 17-13 Definition of Levels of Significance.*

As stated in the IEMA guidance on assessing GHG emissions (Ref. 17-2), "…*the crux of significance, therefore, is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050".*

The Development's operational phase results in a reduction of GHG emissions compared to the without-project baseline. Operational emissions also align with Scotland's trajectory towards Net Zero. The GHG impact of the operational phase is therefore considered to be **Beneficial** and **Significant** when compared to the future baseline 'business-as-usual' scenario as described in *Table 17-13 Definition of Levels of Significance.*

Summary

The Development directly supports the Scottish Government's ambition to decarbonise electricity generation in line with Scotland's 2045 net-zero Target. Therefore, it is considered to be consistent with achieving Scotland's overall trajectory to Net Zero. It is also required by National Grid as part of their strategy to decarbonise electricity generation (Ref. 17-36).

17.13 Climate Change Resilience Assessment

The CCRA identified 21 risks, 11 related to pre-construction and construction, and 10 related to operation. The complete list of climate change risks can be found in the register presented in *Appendix 17.1 Climate Change Risk Register (Volume 5 Appendices);.*

Future climate projections have been reviewed, and the sensitivity of assets has been examined before commenting on the adequacy of the embedded climate change adaption measures built into the Development.

17.13.1 Pre-Construction and Construction Effects

The risks assessed in the CCRA at the pre-construction and construction phase of the Development predominantly cover workforce exposure to dangerous working conditions and damage to physical structures/asset damage.

Major climatic variables contributing to these risks include, but are not limited to, increased temperatures, flooding, and storms.

As a result of the embedded climate change mitigation measures (as presented in Embedded Mitigation Section), it is concluded that all climate change risks during the construction phase have been identified to be **low to medium** and **not significant**.

17.13.2 Operation Effects

The risks assessed in the CCRA at the operational phase of the Development predominantly encapsulate asset damage from extreme weather conditions and changes in annual precipitation and temperatures, as well as workforce exposure to dangerous working conditions.

Major climatic variables contributing to these risks are temperatures, precipitation, and extreme weather events.

As a result of the embedded climate change mitigation measures, it has been concluded that all climate change risks during the operation phase have been identified to be **low** to **medium** and **not significant**.

17.14 ICCI Assessment

The significance of potential ICCIs, are detailed in *Appendix 17.2 In-combination Climate Change Impact (ICCI) Assessment (Volume 5 Appendices).*

The ICCI Assessment has been considered by all other technical disciplines within the EIAR. The following disciplines did not identify any ICCIs as part of their assessment:

- Chapter 5: Landscape & Visual
- Chapter 6: Terrestrial Ecology
- Chapter 7: Aquatic Ecology
- Chapter 8: Marine Ecology
- Chapter 9: Ornithology
- Chapter 11: Water Environment
- Chapter 12: Water Resources and Flood Risk
- Chapter 14: Access, Traffic & Transport
- Chapter 15: Noise and Vibration
- Chapter 16: Social Economics, Recreation & Tourism
- Chapter 18: Marine Physical Environment & Coastal Processes
- Chapter 19: Shipping & Navigation

- Chapter 20: Commercial Fisheries

Future climate projections have been reviewed and the sensitivity of receptors to both climate change and the Development have been examined before commenting on the adequacy of the climate change resilience measures built into the Development.

As a result of the embedded mitigation and good practice measures (as presented in the Embedded Mitigation and the respective sections in the technical chapters) it is concluded that all ICCIs during the preconstruction, construction and operation phase have been identified to be **not significant**.

17.15 Additional Mitigation Measures and Monitoring

Additional mitigation measures are only required where significant effects are identified following the application of embedded mitigation measures. No significant adverse effects have been identified in this assessment therefore no additional mitigation or enhancement measures are proposed.

As no potential significant effects have been identified for climate change, no monitoring of significant effects is required and/or proposed.

17.16 Residual Effects

Table 17-22 Summary of Effects: Pre-Construction & Construction and *Table 17-23 Summary of Effects: Operation* provide a summary of the residual effects for pre-construction, construction and operation.

Table 17-22 Summary of Effects: Pre-Construction & Construction

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Global atmosphere	Impact of GHG emissions arising during construction of the Development on the climate.	Minor adverse	Not required	During the pre-construction and construction of the Development, there will be unavoidable GHG emissions due to the use of materials, energy, fuel, and transportation. However, additional GHG savings are expected to be achieved by implementing the GHG Mitigation Measures listed in the Embedded Mitigation Section.	Minor adverse – Not Significant
The Development	Impact of projected future climate change on the Development.	Low to Medium	Not required	During the pre-construction and construction of the Development, the impact of climate change will be unavoidable. The mitigation measures detailed in the embedded mitigation Section could reduce the impact of climate change on the Development.	Low to medium - Not Significant
Various - identified by each discipline in their assessment	Combined impact of future climate conditions and the Development.	Negligible to Low	Not required	The impact of climate change during the Development's pre-construction and construction will be unavoidable. The mitigation measures detailed within the technical chapters that identified ICCIs could reduce this impact.	Negligible to Low - Not Significant

Table 17-23 Summary of Effects: Operation

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Global atmosphere	Impact of GHG emissions arising during the operation of the Development on the climate	Beneficial	Not required	During the operation of the Development, there will be unavoidable GHG emissions due to the use of materials, energy, fuel, and transportation. However, additional GHG savings are expected to be achieved by implementing the GHG Mitigation Measures listed in the Embedded Mitigation Section.	Beneficial – Significant

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
The Development	Impact of projected future climate change on the Development	Low to Medium	Not required	During the operation of the Development, the impact of climate change will be unavoidable. The mitigation measures detailed in the embedded mitigation Section could reduce the impact of climate change on the Development.	Low to medium - Not Significant
Various identified by each discipline in their assessment	Combined impact of future climate conditions and the Development	Negligible to Low	Not required	During the operation of the Development, the impact of climate change will be unavoidable. The mitigation measures detailed within the technical chapters that identified ICCIs could reduce the impact of climate change on the Development.	Negligible to Low - Not Significant

17.17 Cumulative Effects

According to IEMA Guidance on assessing GHG emissions in EIA (Ref. 17-2), the concentration of GHGs in the atmosphere and their impact on climate change are influenced by all sources and sinks globally, whether they are human-caused or not. Unlike many topics in EIA that only focus on projects within a specific geographical area, GHG emissions and their effects are global in nature. For example, air pollutant emissions primarily affect nearby areas, but GHGs disperse globally due to their persistence in the atmosphere. Therefore, when assessing the cumulative effects of GHGs, it's essential to consider all global sources rather than just focusing on individual projects. This is because a specific local impact of GHG emissions does not have a greater local climate change effect. When considering GHG emissions, it is crucial to account for the cumulative contributions of all GHG sources that contribute to the overall context. If the assessment is limited to a specific geographic or sectoral boundary, then the consideration of cumulative contributions will also be within that boundary.

The GHG assessment provided within this chapter is considered inherently cumulative as it presents the impact of the Development in the context of Scotland's GHG reduction targets, used to represent the key sensitive receptor (i.e. the global atmosphere). This includes the provision of legally binding limits of GHG emissions that can be emitted by Scotland if it is to meet its net-zero targets by 2045. This assessment is considered comprehensive and includes a worst case within the defined assessment parameters.

The ICCI assessment, by nature, should be considered cumulatively in line with each discipline's assessment. The identified effects are detailed in *Appendix 17.2 In-combination Climate Change Impact (ICCI) Assessment (Volume 5 Appendices).*

As the CCRA is only concerned with the assets of the Development and a broader consideration of existing interdependent infrastructure, a cumulative assessment is not required.

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Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 18: Marine Physical Environment and Coastal Processes

ILI (Borders PSH) Ltd

July 2024

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Quality information

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18. Marine Physical Environment and Coastal Processes

18.1 Introduction

This chapter of the EIA Report provides an assessment of the potential effects of the Marine Facility, which forms part of the Development. The Project and Site Description *Chapter 2: Project and Site Description (Volume 2: Main Report)* provides a detailed description of the Marine Facility, a key component of the Development, consisting of a jetty to the south of Inveraray at the northern end of an extended embayment along the northern shore of Loch Fyne. The jetty will consist of a 10 m wide elevated deck supported by an open-piled structure 7 m above the local Mean High Water Springs (MHWS) level. The jetty will extend up to 180 m into Loch Fyne from the shoreline.

Potential effects, as identified in the Scoping Report, include consideration of hydrodynamic conditions and the sedimentary character across Loch Fyne and the wider area. Based on the *Source > Pathway > Receptor* model, it is noted that the physical processes topic is often concerned with pathways that have the potential to affect a specific receptor, rather than being identified as a receptor itself. For example, impacts on physical processes can result in effects on pathways that subsequently impact a receptor, as assessed separately for Aquatic Ecology *Chapter 7: Aquatic Ecology (Volume 2: Main Report)*.

This chapter is supported by *Appendix 18.1 Tidal Model Calibration (Volume 5: Appendices)*.

18.2 Legislation and Policy

A brief outline of relevant legislation and national and local planning policies relevant to the specific topic area. It will not be necessary to provide a commentary or analysis of the planning policy; this will be done within the Planning Statement which accompanies the Section 36 Application.

18.2.1 Legislation

The following national and devolved legislation is relevant to the planning and execution of projects in UK waters, including the Marine Facility:

- Marine and Coastal Access Act (MCAA) 2009 (HM Government, 2009);
- Marine (Scotland) Act 2010 (Scottish Government, 2010);
- Water Environment and Water Services (Scotland) Act 2003 (HMSO, 2003);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Scottish Statutory Instrument 2011 No. 209 (HMSO, 2009), as amended;
- The Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019; and,
- The Environment (EU Exit) (Miscellaneous Amendments) (Scotland) Regulations 2019.

18.2.2 National Planning Policy

The following national and devolved policies are relevant to the planning and execution of projects in UK waters, such as the Marine Facility:

- UK Marine Policy Statement (MPS) (HM Government, 2011).
- Scottish National Marine Plan (2015) (Scottish Government, 2015).

18.2.3 Local Planning Policy

Local planning is covered by the Argyll & Bute Local Development Plan 2 (2024). It sets out a long-term vision for Argyll and Bute which aims to promote an economically diverse and successful area based on sustainable and low carbon development. The following policies within the Local Development Plan are relevant to the EIA:

- Policy 04 – Sustainable Development
- Policy 06 – Green and Blue Infrastructure

- Policy 28 – Supporting Sustainable Aquatic and Coastal Development.
- Policy 30 – The Sustainable Growth of Renewables.
- Policy 55 – Flooding
- Policy 56 – Land Erosion
- Policy 57 – Risk Appraisals
- Policy 59 – Water Quality and the Environment.
- Policy 72 – Development Impact on Areas of Wild Land
- Policy 73 – Development Impact on Habitats, Species and Biodiversity
- Policy 74 – Development Impact on sites of international importance
- Policy 75 – Development Impact on Sites of Special Scientific Interest (SSSIs) and National Nature Reserves
- Policy 76 – Development Impact on Local Nature Conservation Sites (LNCS)

18.3 Consultation

The summary of consultation comments provided in *Table 18.1 Summary of Consultation* has been prepared from responses provided from consultees on the Marine Physical Environment and Coastal Processes section of the Scoping Report (AECOM, 2022).

Table 18.1 Summary of Consultation

Consultee	Key Issue	Summary of Response	Action Taken
Argyll & Bute Council	- Suspended sediment - Siltation - Coastal morphology and sediment transport	Potential for reduced water quality from suspended sediment during dredging. Obstruction of existing and proposed sea outfalls in vicinity of proposed development due to siltation. Requirement to fully understand local processes and potential impact of the Marine Facility.	Hydrodynamic model established to simulate hydrodynamic processes and sediment dispersion, as required. Available data reviewed to understand nature and extent of potential impacts.
Marine Scotland	- Hydrodynamics - Sedimentation	Need to consider potential impacts during construction and operation taking construction methods and dredging requirements into consideration.	Hydrodynamic model established to simulate hydrodynamic processes and sediment dispersion, as required.
NatureScot	- Suspended sediment - Siltation	Need to assess and change in water quality from suspended sediment during dredging and siltation.	Hydrodynamic model established to simulate hydrodynamic processes and sediment dispersion, as required.
SEPA	- Pollution of marine waters	Pollution prevention required during all phase of the project: construction, operation, maintenance, demolition and restoration	Hydrodynamic model established to simulate hydrodynamic processes and sediment dispersion, as required.

18.4 Study Area

The extent of the study area is defined as the area of Loch Fyne below the elevation of Mean High Water Springs (MHWS) extending for a minimum distance equivalent to the flood and ebb tidal excursion on a spring tide from the location of the proposed Marine Facility.

A hydrodynamic tidal model will be used to provide a description of baseline conditions across the entire model domain which extends into the Irish Sea. The potential Zone of Influence (ZoI) for fine suspended sediments could potentially extend beyond the defined study area but will be fully contained within the defined model domain.

18.5 Methods

18.5.1 Guidance and Standards

Industry guidelines relating to the impact of marine projects on the physical environment have been taken into consideration. The following existing guidance has been used to inform this appraisal of potential effects on the physical environment, as applicable to the natures of the works associated with the proposed Marine Facility:

- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland (SNH, 2018);
- Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to Inform EIA of Major Development Projects. (NRW, 2018);
- Marine Licensing: Sediment Analysis and Sample Plans. Marine Management Organisation. (2014);
- High Level Review of Current UK Action Level Guidance: MMO Project No. 1053 (MMO, 2025);
- Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment, 1999).

18.5.2 Assessment Scope

The assessment considers the effects during the three phases of the Development lifespan, as identified in *Sections 2.16 – 2.18 of Chapter 2: Project and Site Description*. The phases include pre-construction / construction, operation and decommissioning; however, since the steel piles of the Marine Facility will be a permanent structure remaining in-situ remaining beyond the design life of the Development, the decommissioning phase has not been assessed in detail.

The assessment considers the following potential effects associated with the Marine Facility:

Pre-Construction / Construction

- Direct habitat loss from the Marine Facility deck support structures
- Fine sediment dispersion due to seabed disturbance from pile installation

Operation

- Changes to coastal morphology
- Changes to hydrodynamic conditions and sedimentary regime

18.5.3 Baseline Data

Sources of data used to establish baseline conditions for the assessment of effects on the marine physical environment include:

- A new site-specific Multi-Beam Echo-Sounder (MBES) bathymetric survey covering an area of Loch Fyne approximately 1000 m by 500 m for the location of the proposed Marine Facility;
- LiDAR topographic survey data from the Scottish Remote Sensing Portal (Scottish Government)
- Numerical hydro-dynamic (HD) model of Loch Fyne and Approaches;
- C-Map digital bathymetry;
- Measured currents from the British Oceanographic Data Centre (BODC);
- Predicted tidal water levels and currents from the Admiralty's TotalTide software;
- Extreme water levels for the Environment Agency's Coastal Flood Boundary (CFB) for the UK database;
- Wind data from ERA5's global reanalysis atmospheric model; and
- Regional mapping of seabed geology (BGS, 1988).

Following the collation and analysis of baseline data, the potential effects of the Marine Facility have been assessed using a bespoke numerical model. The modelling studies are described in detail in a separate technical appendix covering hydro-dynamic modelling of water surface elevations and current flows across the study area (*Appendix 18.1 Tidal Model Calibration (Volume 5: Appendices)*.

18.5.4 Assessment Methodology

The predicted effects arising from the construction and operation phases of the proposed Marine Facility have been assessed using the impact assessment methodology, as set out within *Chapter 4: Approach to EIA*, of this report.

The approach to the EIA studies relating to the Marine Physical Environment follows an evidence-based approach. Firstly, the (existing) baseline physical characteristics are described, through collation and analysis of a range of datasets and reports. The description of the baseline character allows any predicted effects, arising from the Development, to be placed into the context of the existing conditions, along with any natural variability evident in the physical environment.

Subsequent sections of this chapter describe the baseline Marine Physical Environment, and the predicted effects arising from the construction and operation phases of the Marine Facility. The cumulative effects arising from other relevant schemes are also outlined, as previously identified within the planning system (see *Chapter 4: Approach to EIA, Section 4.5.8.5 Cumulative Effects*).

18.5.5 Limitations And Assumptions

There is no existing source of river flow data for any of the tributaries discharging into the Loch Fyne upstream from Inveraray which includes the rivers Aray, Shira and Fyne and Kinglas Water with no gauging station at any point along these watercourses. Long-term measurements would be required to confirm the significance of flows from these sources but, given the scale of the channels relative to the Loch Fyne itself, it is assumed that these freshwater flows do not provide the dominant forcing condition driving flows within the loch.

The assessment of wind conditions makes use of hindcast wind data from the ERA5 (ECMWF Re-Analysis Version 5) global climate model where ECMWF is the European Centre for Medium-Range Weather Forecasts. This approach was used in the absence of local wind measurements since no such long-term dataset is available. It is assumed that the use of offshore hindcast wind data provides a reasonable representation of local winds given that any increase in wind speed due to landforms will be offset by the increased frictional drag of the land surface.

18.6 Baseline Environment

The description of the baseline environment covers a range of marine and coastal parameters, most of which are considered as pathways although some also behave as receptors. As an example, tidal currents have the potential to act as a pathway due to their influence on sediment transport but can also be considered as a receptor.

18.6.1 Overview

The Marine Facility, as shown in *Figure 1. Location Of Marine Facility (Red) And Key Datasets In Loch Fyne And Firth Of Clyde*. Source: Google Earth below, is located within the Upper Loch Fyne and Lock Goil Marine Protected Area and is identified as a *Local Landscape Area* and *Garden & Designed Landscape* within the recently adopted Local Development Plan 2 (Argyll & Bute Council, 2024). Appropriate consideration therefore needs to be given due to the sensitive nature of the local and wider study area. Also presented in this figure are the datasets used to calibrate/validate the hydro-dynamic (HD) model. The location of tide gauge stations where predicted tides can be obtained using the Admiralty's TotalTide software are shown in pink, with archived current measurements from the British Oceanographic Data Centre (BODC) shown in green.

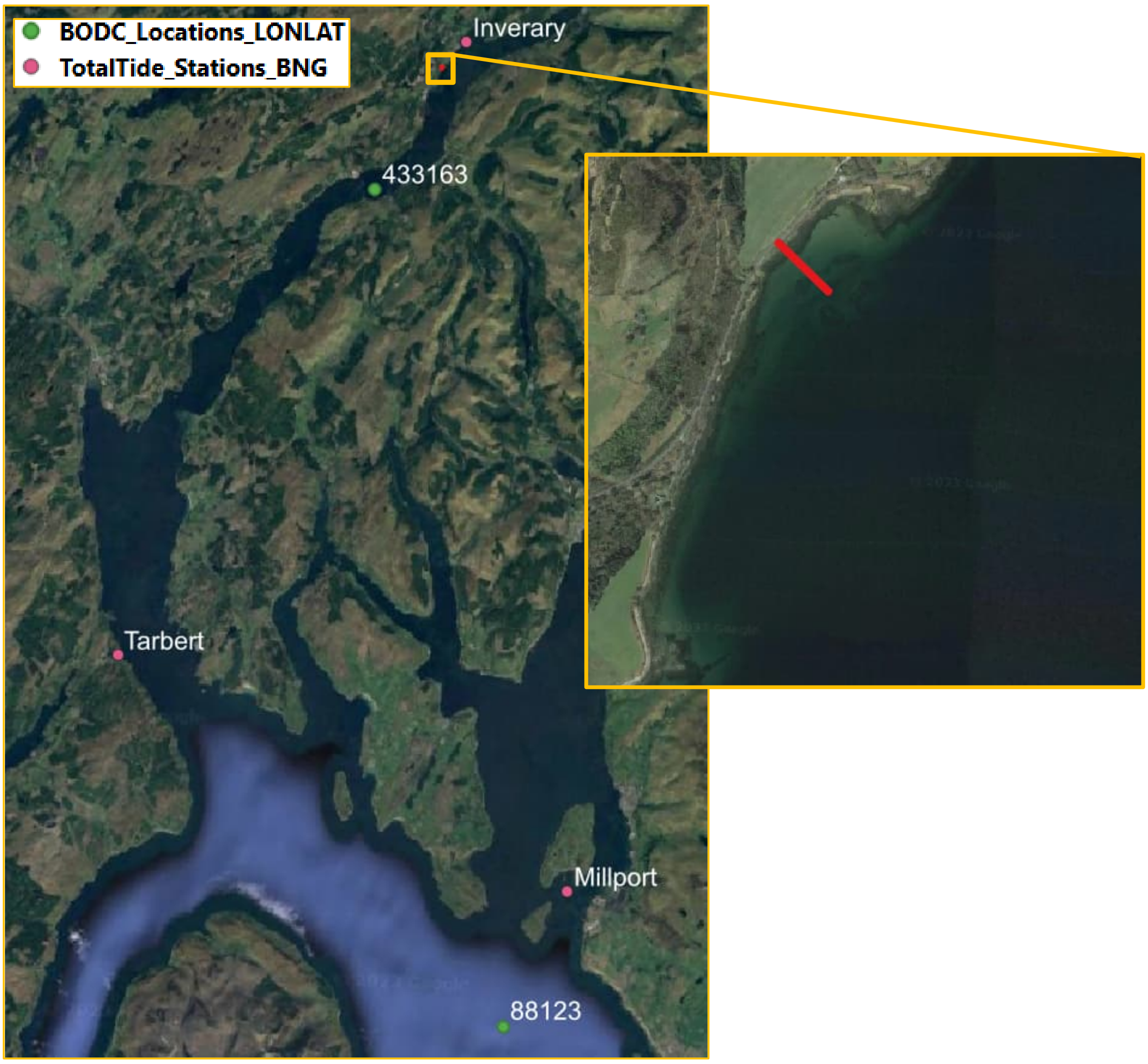

Figure 1. Location Of Marine Facility (Red) And Key Datasets In Loch Fyne And Firth Of Clyde. Source: Google Earth

18.6.2 Coastal Characterisation

The proposed Marine Facility is located on the northern shore of Loch Fyne within a small embayment to the south of Inveraray. Loch Fyne is a largely enclosed waterbody characterised by a relatively narrow water channel having a uniform width between 1.5 to 2 km along its 30 km length. Loch Fyne is connected to the open sea which is approximately 50 km from Inveraray and is therefore subject to the influence of tidal conditions. The immediate foreshore is largely made up of shingle and small pebble beaches.

The coastal character is one of a relatively developed and busy shoreline, with a focus on residential and recreation use. The section of Loch Fyne to the south of Inveraray is also an MoD exercise area used by submarines and other military vessels.

The majority of coastline, with the exception of land adjacent to Inveraray and Newton, is classified as 'Undeveloped Coast' (a coastal area of Sensitive Countryside) whilst land adjacent to Inveraray and Newton is classified as 'Developed Coast' (a coastal area of Countryside Around Settlement). Loch Shira is the inlet located approx. 3 km to the north of Inveraray.

On the land side, the majority of Inveraray is a Conservation Area and the surrounding countryside of Inveraray and Loch Shira is classified as an 'Area of Panoramic Quality'.

In view of the above, the coastline as a receptor is considered to have a 'High' value and an associated 'Medium' sensitivity.

18.6.3 Geology & Sediments

Based on mapping of the superficial geology (*Figure 10.3 Superficial Geology (Volume 3: Figures))*, the coastal and nearshore areas around Inveraray consist of raised marine deposits comprising sand and gravel. These can be expected to extend southwards as far as the location of the proposed Marine Facility which is consistent with the description of "shingle foreshore and stony beaches for the northern shoreline of Loch Fyne", as provided for Policy Zone J in the Local Development Plan (Argyll & Bute Council, 2015).

Based on currently available information, scouring of sediment around piles is considered unlikely to be a significant issue since shingle-type material will be resistant to erosion and even if it is mobilised, is unlikely to transported more than a few metres. Also, if the piles required to support the deck structures are in relatively deep water (i.e. >20 m), the risk of scour with the relatively weak currents at this depth will be significantly reduced.

A numerical model has been developed using the MIKE21 software package. This has the intention to provide a better understanding of the hydrodynamic regime within the local study area and to assess the potential for sediment mobilisation and dispersion.

Alluvium consisting of clay, silt and sand is identified in the lower reaches of the River Shira which has the potential to be transported further downstream towards the location of the proposed Marine Facility during high flow conditions. A proportion of this fine material can therefore be expected to be found mixed together with the predominant sand and shingle type material in the vicinity of the Marine Facility.

A review of available geotechnical information indicates that fine materials (i.e. clays and silts) are present within the natural shoreline sediments. However, due to the extremely low tidal current speeds at the Marine Facility (i.e. less than 0.1 m/s), this confirms that any disturbed sediment would not be widely dispersed and modelling of sediment dispersion processes is not therefore necessary.

18.6.4 Bathymetry

A bathymetric survey of the local study area was undertaken to provide detailed information on potential constraints at the site, in particular relating to vessel access. This information has been merged with C-Map digital chart data database to provide an initial assessment of water depths close to the study area. In the central section of Loch Fyne, adjacent to the proposed Marine Facility, depths are in excess of 100 m CD (i.e. below Chart Datum) reducing to 2 m CD close to the shore.

Characteristics of vessels and barges using the Marine Facility and access requirements, in terms of required under-keel clearance, have been evaluated to assess the need for dredging. This confirms that no dredging will be required in order to provide access for work boats and barges to the Marine Facility.

18.6.5 Tides

Water level variations at the site will be dominated by tidal influences but may also be subject to surge effects due to variations in atmospheric pressure and local wind effects. Mean tidal ranges at Inveraray are approximately 2.4 m on neap and 3.2 m on spring tides, respectively, and the regime can therefore be classified as 'meso-tidal'. Fluctuations due to positive and negative surge effects are likely to be in the range ±0.75 m. Standard tidal heights for Inveraray are provided in *Table 18.2 Tidal Heights And Levels For Inveraray (Source: UKHO, 2021)*.

Table 18.2 Tidal Heights And Levels For Inveraray (Source: UKHO, 2021)

Description	Tidal Height (m CD)	Level[1] (m ODN)
Highest Astronomical Tide (HAT)	3.6	1.98
Mean High Water Springs (MHWS)	3.3	1.68
Mean High Water Neaps (MHWN)	2.9	1.28
Mean Sea Level[2] (MSL)	1.8	0.18
Mean Low Water Neaps (MHWN)	0.5	-1.12
Mean Low Water Springs (MLWS)	0.1	-1.52
Lowest Astronomical Tide[2] (LAT)	0.0	-1.62

1. Based on -1.62m CD to ODN correction (UKHO, 2021).
2. Estimated values.

18.6.6 Extreme Water Levels

Information on extreme water levels is also required as a key design parameter taking meteorological effects and elevated surge levels into consideration. A detailed study of extreme water levels was undertaken for the Environment Agency to provide a consistent dataset for use in flood studies and design referred to as the Coastal Flood Boundary (CFB) for the UK, data. AECOM has therefore extracted extreme water level data for a representative point within the study area, as provided in *Table 18.3 Extreme Sea-Levels At Entrance To Loch Fyne (Source: EA (2018))*

Table 18.3 Extreme Sea-Levels At Entrance To Loch Fyne (Source: EA (2018))

Return Period (years)	Level (m ODN)	Equivalent Surge Level[1] (m)
1	2.67	0.77
10	3.09	1.19
25	3.27	1.37
50	3.40	1.50
100	3.53	1.63

1. Relative to MHWS.

The CFB database also provides MHWS and HAT levels given as +1.90 m ODN and +2.55 m ODN, respectively, for a point close to the entrance of Loch Fyne which are consistently higher than the corresponding values for Inveraray of 1.68 m ODN and 1.98 m ODN. This suggests that the amplitude of the tidal wave is attenuated rather than amplified as it propagates into Loch Fyne as a result of energy losses and the near constant width of the channel rather than a more typical, funnel-shaped estuary.

18.6.7 Tidal Currents

Measured tidal current data (Location 443163) has been obtained from the British Oceanographic Data Centre (BODC) for a location within Loch Fyne close to the proposed Marine Facility near Inveraray (see *Figure 2. Location Of The BODC Dataset (443163) Relative To Inveraray*, below). The data covers the period from 20/11/1994 to 25/2/1995 with measurements made at a level 11 m below the surface in a water depth of approximately 35 m at the location shown in *Figure 3. Measured Current Speeds Near Inveraray* and *Figure 4. Measured Current Directions Near Inveraray*, below. Although the measured data was collected almost 30 years ago, there have been no major developments within the loch and the channel morphology is very stable therefore this information is still representative of present-day conditions. The measured current speed and direction values are provided in Figure 3. and Figure 4. respectively.

This measured dataset was processed using harmonic analysis to identify the tidal constituents, also enabling tidal currents to be predicted for any timeframe. The M2 and S2 constituents derived from the analysis were used to calculate the tidal excursion distance resulting from tidal processes. Specifically, the tidal excursion has been calculated for a mean spring tide associated with stronger than average tidal currents to provide an indication of the maximum tidal excursion. At the BODC location (see *Figure 2. Location Of The BODC Dataset (443163) Relative To Inveraray*, below), the water depths allow for faster current speeds when compared to the location of the Marine Facility due to the reduced influence of bottom friction. Here the peak mean spring tidal currents provide a tidal excursion distance of 700 m on the flood or ebb tide thus the major axis of the tidal ellipse is 1.4 km for this mean spring tide. For the weaker currents near the Marine Facility, the tidal excursion distance is estimated to be approximately 300 m for the flood or ebb tide resulting in a dimension of 600 m for the major axis of the tidal ellipse.

Figure 2. Location Of The BODC Dataset (443163) Relative To Inveraray

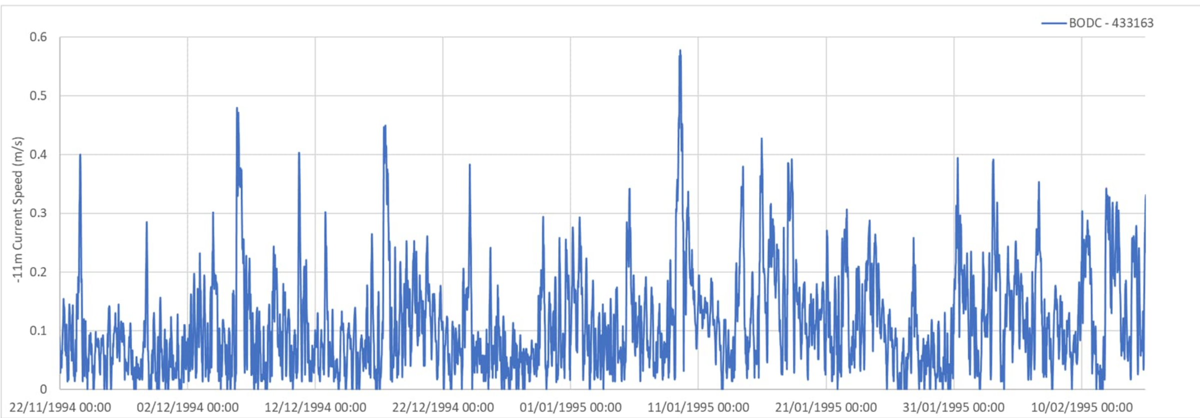

Figure 3. Measured Current Speeds Near Inveraray

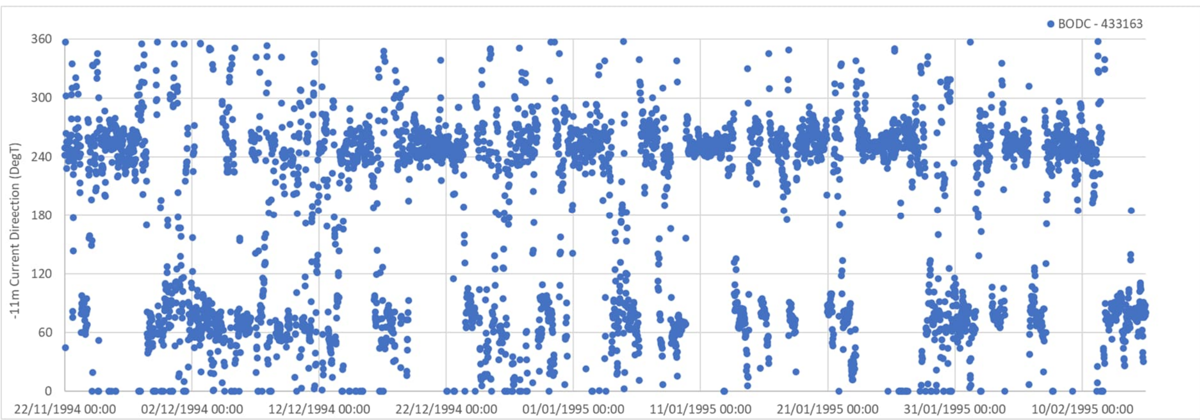

Figure 4. Measured Current Directions Near Inveraray

At this location near the centre of the loch, tidal currents are weak with speeds generally less than 0.2 m/s, close to the lower limit that can be measured using an impeller type current meter. During storm conditions surface currents will be enhanced by the action of strong winds acting on the water surface, particularly when the wind is blowing in the same direction as the ambient currents. Surface water flows will also have an influence on local currents, mainly at the surface due to the lower density of freshwater relative to the saline water in the loch.

The high density of data points around directions in the range 50-90°N and 230-270°N correspond to the alignment of the channel which in turn dictates the direction of flood and ebb tidal currents. However, there are also periods when the current direction does not reverse but instead remains constant. During these periods currents are therefore dominated by non-tidal processes, primarily winds that are funnelled along the axis of Loch Fyne driving currents towards the north-east or south-west.

Further detail of tidal current patterns is provided in *Figure 5. Modelled Hydrodynamics For A Mean Spring Tide At The Proposed Marine Facility*, below which shows output from the HD model for peak flood and ebb flow conditions during a mean spring tide at the proposed Marine Facility location. At this location, close to the head of the loch, both the ebb and flood current speeds are shown to be very low reaching peak values of approximately 0.025 m/s.

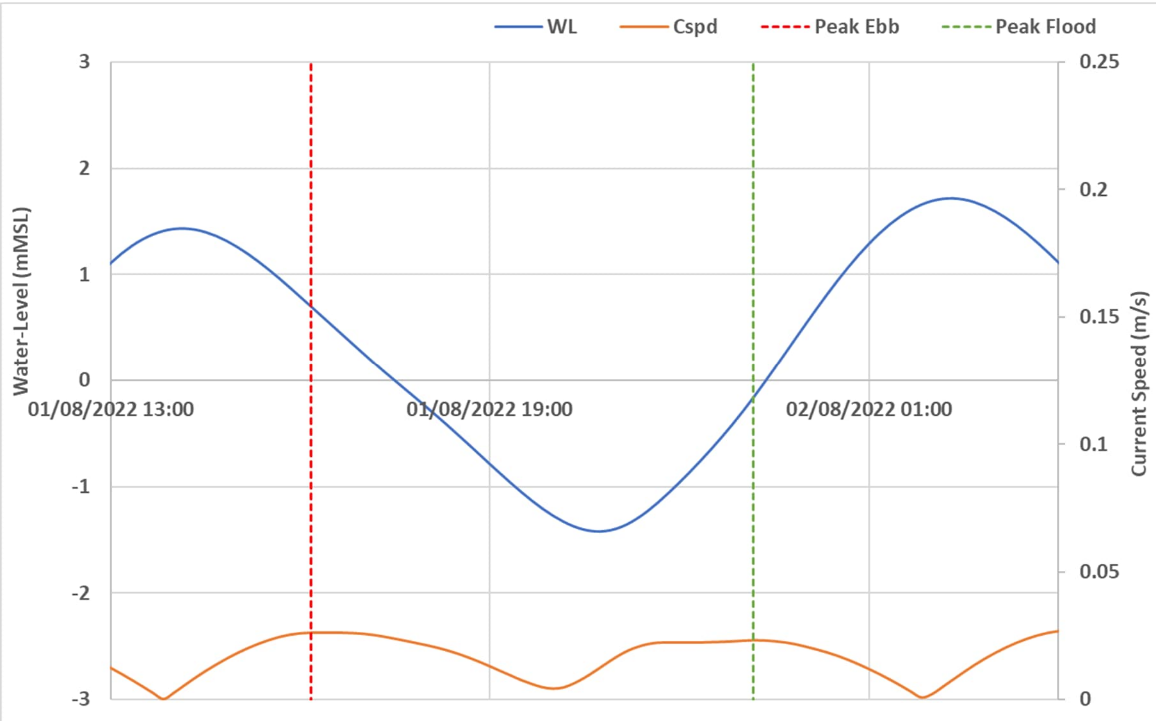

Figure 5. Modelled Hydrodynamics For A Mean Spring Tide At The Proposed Marine Facility

Sensitivity tests were undertaken to assess the influence of wind on the flow field, with winds applied from both the SSW and NE directional sectors, as shown in *Figure 6. Tidal Currents Over A Tidal Cycle For A 1 In 1 Year Wind Condition From SSW* and *Figure 7. Tidal Currents Over A Tidal Cycle For A 1-In-1 Year Wind Condition From NE,* below, respectively. These results show that for a 1 in 1 year return period, the wind causes an increase in current speeds, with the SSW direction resulting in the largest increase. This is due to an overall faster wind speed and a longer stretch of open water over which the wind can be influential on the waterbody. Despite this magnification under 'extreme' conditions, peak spring tide currents are still below 0.15 m/s and can therefore be classified as very weak, with limited potential to affect sediment transport since the near-bed currents will be less affected by surface wind effects. It is noted that the inclusion of wind effects also causes a slight phase shift in the tidal signal and consequently the timing of the peak ebb and flood current is also modified although this is of no consequence in terms of sediment transport.

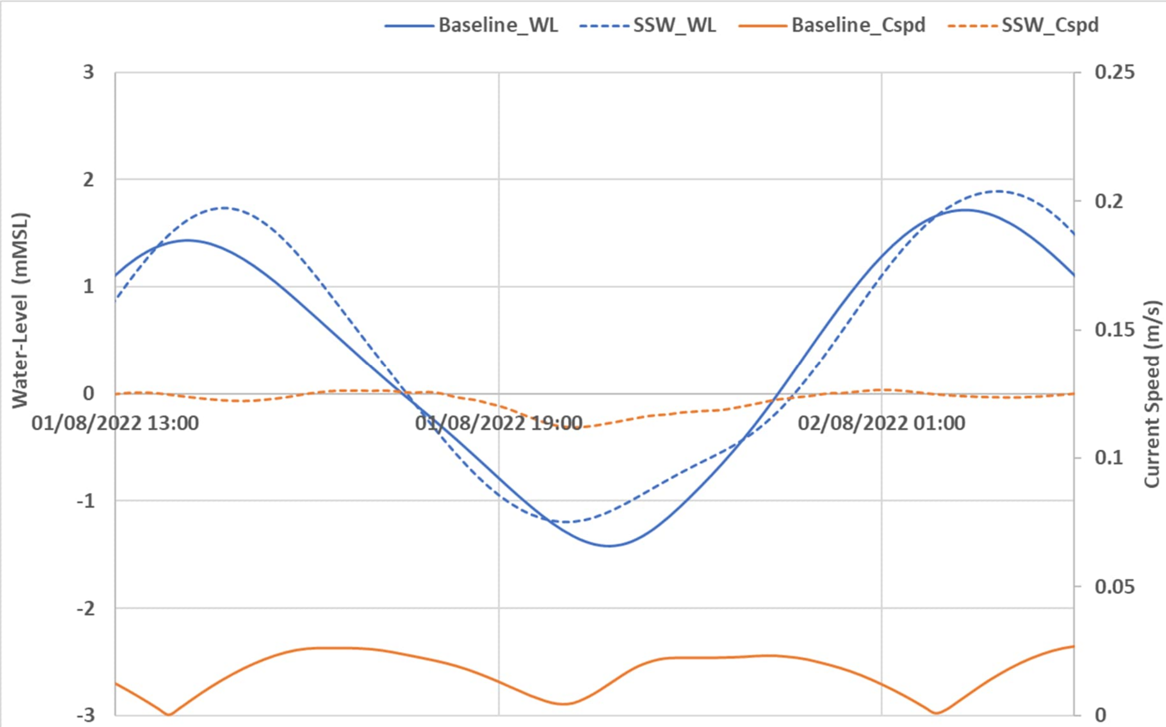

Figure 6. Tidal Currents Over A Tidal Cycle For A 1 In 1 Year Wind Condition From SSW

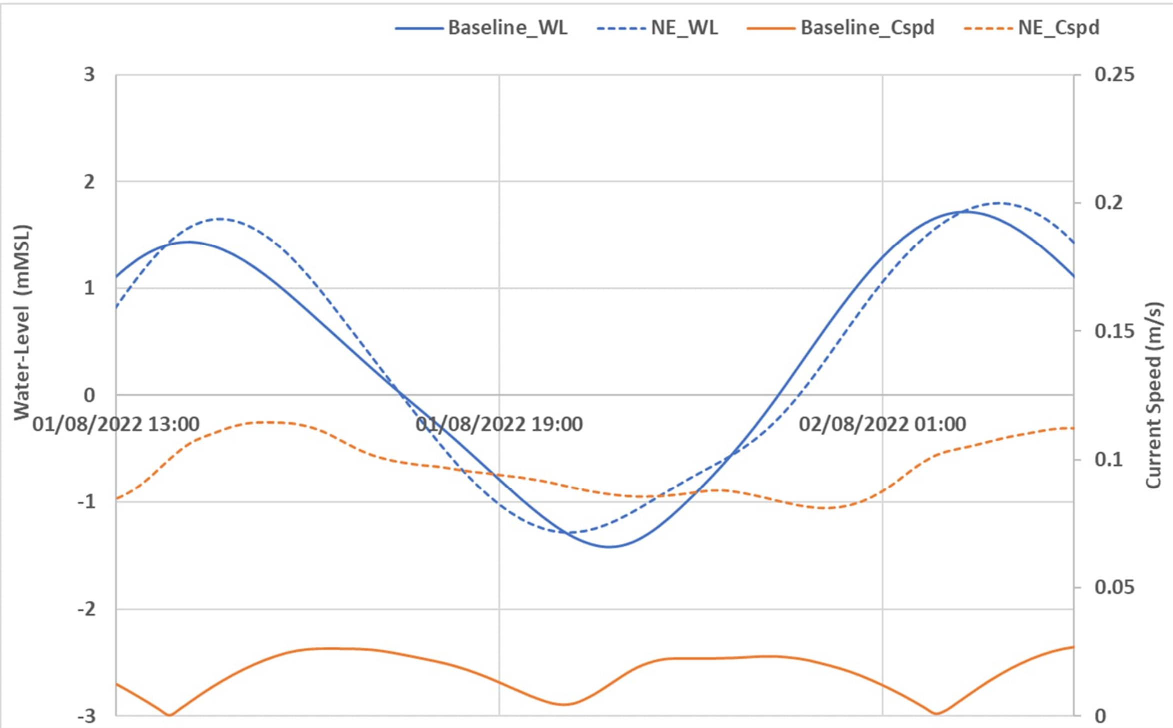

Figure 7. Tidal Currents Over A Tidal Cycle For A 1-In-1 Year Wind Condition From NE

Further details of results from this and other model sensitivity tests can be found in *Appendix 18.1 Tidal Model Calibration (Volume 5: Appendices)*.

18.6.8 Waves

In terms of local wave conditions, Inveraray is approximately 50 km from the open sea and therefore beyond the limit of offshore swell wave penetration. Only locally generated wind waves reach the location of the proposed Marine Facility and are limited by the available fetch lengths within Loch Fyne which are less than 10 km. However, Loch Fyne has a south-west to north-east alignment which coincides with the strongest winds from the predominant south-westerly direction. Using a fetch-based approach to estimate wave conditions from the SSW (which provides the largest magnification in current speeds out of the directions assessed), the 1 in 1 year return period wind speed of 11.6 m/s and fetch length of 10 km can result in a significant wave height in the range 1-2 m, which would have a relatively short period of less than 5s. Under such conditions, loading/unloading operations at the Marine Facility would most likely need to be restricted until the storm has abated.

18.6.9 Wind

No record of measured wind data near Inveraray was identified and therefore wind data was obtained for the closest location (-5.0973' W, 56.19332' N) from the ERA5 (2024) global re-analysis atmospheric model at 10 m elevation, see *Figure 8. ERA5 Wind Data Extraction Location. Source: Google Earth*. The model data is assumed to be representative of conditions along Loch Fyne.

Tidal modelling undertaken for the project has demonstrated that at Inveraray, whilst water levels vary in response to tidal forcing, the local currents are still very weak, typically less than 0.15 m/s. This has been shown to be due to the position of Inveraray within Loch Fyne and the shape of the channel. Local currents within Loch Fyne near the proposed Marine Facility are therefore likely to be dominated by the influence of surface winds during storms and, to a lesser extent, by surface run-off during periods of heavy rainfall.

Figure 8. ERA5 Wind Data Extraction Location. Source: Google Earth

18.6.10 Coastal Processes

The shoreline adjacent to the proposed Marine Facility is considered as a receptor that could be affected by changes in tidal and/or wave conditions during the operational phase. It is therefore important to establish baseline conditions in terms of coastal processes from the inspection of beach materials and indicators of active sediment transport along the shoreline.

The predominant sediments identified along the shoreline were found to be a mixture of gravel, sand and mud, with the majority classified as a sand-mud mixture with a median grain size ($D_{50)}$ in the range 0.041 – 0.59 mm as a result of the varying proportion of sand and mud. The three sampling locations closest to the proposed Marine Facility give a mean sediment grain size of 0.35 mm. As previously established, currents in the main channel of Loch Fyne are very weak (approximately 0.2 m/s) and would be even weaker along the margins of the Loch due to frictional effects. Waves are therefore expected to provide the primary mechanism for mobilising sediment which is subsequently transported by the ambient currents. Wakes from larger vessels navigating within the loch could also contribute to the suspension of sediment but will not influence sediment pathways.

The main channel is relatively narrow (approximately 2 km), thus the most severe waves will propagate along the channel either from the north-east or south-west where the maximum fetch length is approximately 10 km with any corresponding transport of sediment directed along the shoreline. To evaluate the level of transport, inspection of foreshore levels either side of obstacles, such as slipways, was undertaken to identify any differential levels that would indicate the direction of net transport. It was concluded that there is no evidence to suggest there are significant levels of transport in either direction along the coastline adjacent to the proposed Marine Facility. The expectation is therefore that the modelling studies would support this conclusion.

A review of coastal monitoring data (Dynamic Coast, 2022) also confirmed that the coastal frontage along the northern shore of Loch Fyne is predicted to be generally stable up to the year 2100, even under a high emissions scenario (i.e. RCP8.5 95th percentile), with negligible landward retreat. The only exception is a 100 m section of the south-facing coastline, as shown on *Figure 9. Predicted Future Shoreline Position For The Study Area (Source: Dynamic Coast, 2022)*, below, which is predicted to advance inland a distance of 60 m by 2100, based on a sea level rise of 0.91 m over this period.

Figure 9. Predicted Future Shoreline Position For The Study Area (Source: Dynamic Coast, 2022)

The progressive landward movement of the shoreline is not due to coastal erosion but is instead due to the predicted future rise in local sea levels leading to a landward migration of the shoreline based on the existing topography.

The predicted response to future sea level rise shows that the sensitivity of this particular location as a receptor is High and the value is Very High on the basis that permanent inundation of the coastal road with the associated loss of access would be a major issue.

Raising land levels or providing defences to mitigate the predicted future realignment of the coastline in this area is therefore likely to be required in the future to maintain access along the A83 road to Inveraray.

18.6.11 Existing Outfalls

Four sea outfalls have been identified adjacent to the location of the proposed Marine Facility with two commercial outfalls at Lùib lomaire Mhóir, a consented SEPA discharge south of Creagan nan Caorach and a local authority-maintained outfall at Newton which discharges from the Inveraray sewage works.

Concerns regarding the outfalls were highlighted by Argyll & Bute Council during the scoping stage which it is assumed relates to the adjacent Shellfish Protected Area referred to as the Loch Fyne Coastal Strip by the Scottish Government which is currently classified as ‘Not Achieving Guideline Standards’. Any additional adverse impact can therefore be expected to exacerbate this issue.

On the basis of the above, the sensitivity and value of the outfalls as a receptor are assessed to be High.

18.7 Future Baseline

It is important to recognise that present-day baseline conditions are not stationary and will change over the lifetime of the proposed Marine Facility.

18.7.1 Water Levels

Table 18.4 Sea Level Rise Allowances provides sea level rise (SLR) allowances for 2023 and 2053 relative to a base year of 2017 and therefore the difference between these values represents the SLR allowance for the two defined percentiles and thus represents the likely range in variability.

Table 18.4 Sea Level Rise Allowances

Year	SLR relative to base year		Comment
Year	*50th percentile*	*95th percentile*	
2023	*0.068*	*0.103*	Present day
2053	*0.208*	*0.322*	End of Marine Facility Design Life[1]
-	***0.140***	***0.219***	Increase in MSL 2023 to 2053

Note. 1. Estimated values.

18.7.2 Currents

As previously noted, surface water run-off into local watercourses will influence near-surface currents within Loch Fyne which are associated with periods of heavy rainfall. Current guidance[1] suggests an allowance for peak river flows of 59% to the year 2100 for the Argyll region. However, the effect of any increased river discharge into Loch Fyne will be highly localised and at the location of the Marine Facility such increases will be less than 10% of the peak tidal currents and unlikely to be measurable and of no consequence in terms of potential sediment transport.

18.7.3 Wind

Coastal flood studies typically apply a 5% uplift to wind speeds to allow for future climate change within the epoch 2023 to 2053 (GOV.UK, 2023). This increased wind speed would have a direct influence on surface currents, particularly for winds from south-westerly directions that are aligned with the axis of the loch. Increased wind speeds are unlikely to result in increased extreme wave conditions within Loch Fyne due to the limited length of fetch available over which waves are generated.

18.8 Assessment of Effects

This section presents the findings of the assessment for the pre-construction / construction and operational phases. Given that the Marine Facility is intended to be a permanent structure with the steel piles remaining in-situ, decommissioning effects do not need to be considered. If decommissioning were required, these effects would be very similar to those described in here which relate to construction effects.

18.8.1 Construction Effects

18.8.1.1 Direct Loss of Intertidal and Subtidal Habitats

There is a direct impact of the installed piles due to the plan area of seabed that these structures occupy. Based on the project design information provided, the Marine Facility will require the installation of 15 piles in the intertidal zone (i.e. below MHWS and above MLWS) with 57 piles in the subtidal zone (i.e. below MLWS). For a pile diameter of 600 mm, the loss of habitat in the intertidal zone would be approx. 4.2 m^2 and 16.1 m^2 in the subtidal which is considered to be negligible relative to the corresponding total areas for Loch Fyne. The loss of intertidal area is approximately 0.0002% of the equivalent total area available within Loch Fyne, which is negligible, and the area of subtidal loss is even smaller in percentage terms.

The sensitivity of both intertidal and subtidal habitats is considered to **High** although the magnitude of the effect is considered to be **Negligible** and consequently the overall effect is assessed as being **Minor**.

[1] SEPA (2023) Climate change allowances for flood risk assessment in land use planning (Version 3).

18.8.1.2 Sediment Scouring

During installation of the piles there is potential for disturbance of the local seabed due to the local acceleration of tidal flows as they are diverted around the physical obstruction created by each pile. This potential acceleration could be up to an increase of 0.005 m/s as highlighted in *,Figure 10. Difference In Tidal Current Speed With The Marine Facility Included In The Model During Mean Spring Peak Ebb Flow* and *Figure 11. Difference In Tidal Current Speed With The Marine Facility Included In The Model During Mean Spring Peak Flood Flow*, below. This effect will be most noticeable in the intertidal zone due to the presence of potentially mobile sediments. This local scour process cannot be assessed using standard modelling techniques and has therefore been assessed using expert judgement to determine the likely response. A localised lowering of the seabed adjacent to the pile is expected to occur soon after installation reaching an equilibrium state following exposure to the strongest spring tide currents. The depth will reduce linearly to the natural seabed level at a distance of half the pile diameter from the outer face of the pile. The maximum depth of scour at the pile face would have a similar dimension of approx. 350 mm. In reality the extent of scour is expected to be much less due to the presence of coarser, gravel-sized material on the seabed surface which will have an armouring effect.

18.8.1.3 Coarse Suspended Sediment

Sediment samples obtained at two of the three locations closest to the proposed Marine Facility show that the bed material can be classified as coarse sand with the third location in deeper water as fine sand. The coarse sand will therefore rapidly settle back onto the seabed within a few metres of the pile location whereas the fine sand has the potential to travel further due to it having a much lower settling velocity of approx. 2 mm/s. Even with this low settling velocity, the sediment is unlikely to fall more than 1 m before reaching the bed suggesting a travel distance of less than 100 m from the pile location in the direction of the flood or ebb currents under peak flow conditions.

18.8.1.4 Fine Suspended Sediment

The proportion of fine sediment (i.e. mud, clay and silt with a D_{50} of less than 63 µm) within the two sediment samples closest to the shore is less than 10% with this material being mobilised by natural tide and wave processes. However, in the deeper water the proportion of mud in the sample was found to be nearly 40%. If any of this material is brought into suspension during pile installation, or soon after, it has the potential to travel further since it will remain in suspension for longer. Based on the estimated dimension of the tidal excursion ellipse, this fine material could result in elevated suspended sediment concentrations over a distance 300 m from the Marine Facility although this effect will gradually reduce due to the finite supply which will cease as soon as the developed scour hole has reached an equilibrium state. Any sediment in suspension will be rapidly diluted with distance from the Marine Facility and elevated concentrations along the shoreline (i.e. where there are existing outfalls) will be negligible.

Taking Water Quality as the primary receptor affected by coarse and fine suspended sediment concentrations, with the sensitivity of this parameter considered to be **High** and the magnitude of the effect considered to be **Negligible** (due to the temporary, localised and transient nature of this effect), the overall sensitivity is assessed as **Minor**.

18.8.2 Operational Effects

18.8.2.1 Hydrodynamic Conditions and Sedimentary Regime

The analysis of tidal currents described above demonstrates that the presence of the Marine Facility will result in highly localised and undetectable changes in terms of tidal hydrodynamic conditions. A similar, but even lesser magnitude effect can be expected with respect to near-bed, wave-induced currents during storm conditions. Consequently, during the operational phase of the development, there will be negligible change related to sediment transport processes, both locally around individual pile structures and further afield, along adjacent sections of the coast.

A series of model simulations were carried out to address how the operational Marine Facility can be expected to modify baseline hydrodynamic conditions. The piles supporting the deck of the Marine Facility structure will impede tidal currents as the tide floods and ebbs, and to a lesser extent the propagation of waves. This is anticipated to impact the velocity of the near-bed currents, which in turn has the potential to impact the Bed Shear-Stress (BSS) within the water column and potentially interfere with local sedimentary processes.

The magnitude of this impact has been assessed by creating difference maps by comparing the present-day (**Baseline**) model output against and the model run with inclusion of the Marine Facility (**Development**). *Figure 10.* and *Figure 11. Difference In Tidal Current Speed With The Marine Facility Included In The Model During Mean Spring Peak Flood Flow* represent the changes in current speed and demonstrate the model's ability to capture minor changes that the presence of the Marine Facility induces (note the very small magnitude of values applied to the colour-scale of the figures). The changes presented in these plots present very insignificant to the flow regime that will only be detectable by the accuracy of a numerical model, with maximum offsets in the region of 0.001 m/s, with areas of both deceleration (blue) and acceleration (red). This is coupled with the differences presented to the BSS (*Figure 12. Difference In BSS With The Marine Facility Included In The Model During Mean Spring Peak Ebb Flow* and *Figure 13.*), which indicate even smaller changes to levels of BSS.

Time-series of both parameters have been extracted in the centre of the modelled differences (see *Figure 10*). This quantifies how marginal the maximum expected changes are during a mean spring tide within the highlighted areas. These are presented in *Figure 14. Peak Flood Extraction Differences In Cspd (Top) And Bss (Bottom) With The Inclusion Of The Marine Facility (Development)* and *Figure 15. Peak Ebb Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development).*

A threshold BSS value of 0.205 (N/m^2) is also presented (red line) in the plots presented. This value has been calculated using established methods (Soulsby, 1994) using a representative sediment size (0.35 mm) for the seabed close to the proposed Marine Facility. This represents the BSS required to mobilise sediment on the seabed at this location.

Peak offsets in current speeds at the flood and ebb extraction locations and equally almost indistinguishable within the time-series for both parameters. With no significant changes shown to occur during the flood and ebb phases in both current speed and BSS following the installation of the Marine Facility, with both the Baseline and Development model runs indicating BSS levels well below the site sediment threshold. This illudes to the conclusion that the Marine Facility will not alter local hydrodynamics or the sediment pathways under normal circumstances.

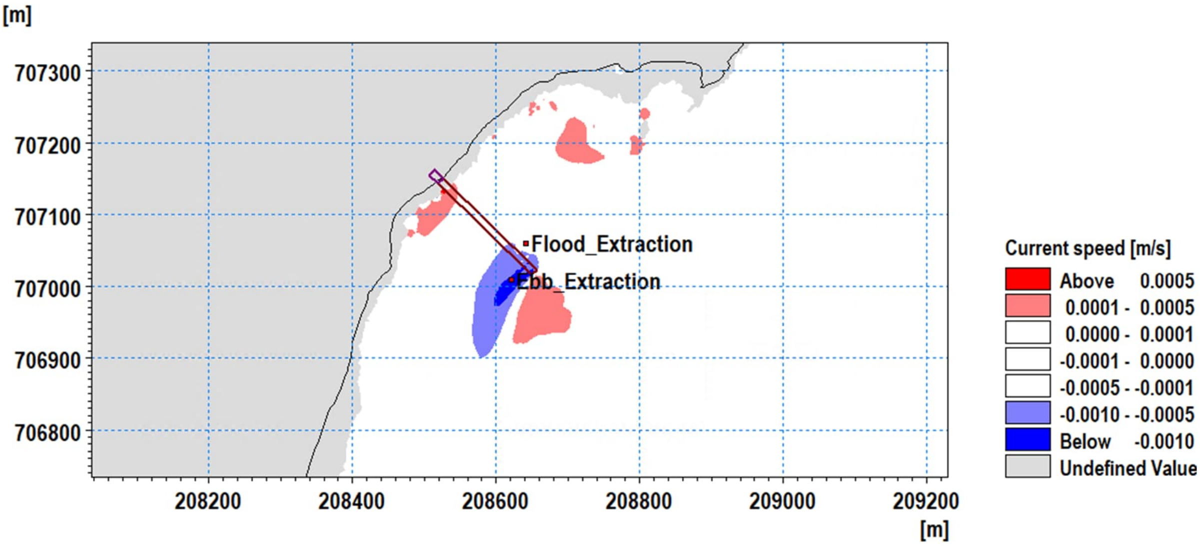

Figure 10. Difference In Tidal Current Speed With The Marine Facility Included In The Model During Mean Spring Peak Ebb Flow

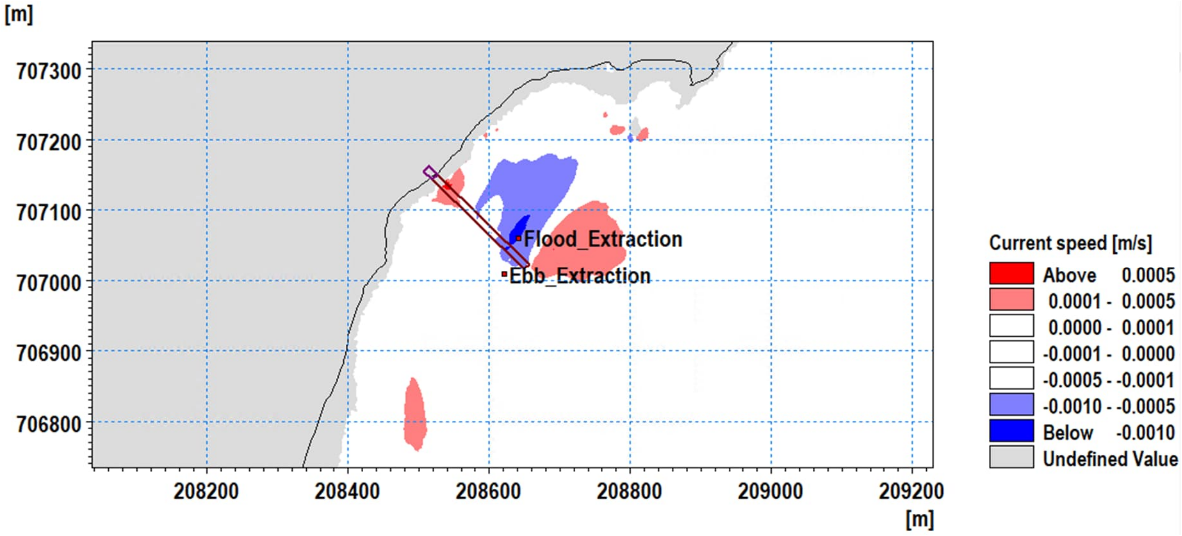

Figure 11. Difference In Tidal Current Speed With The Marine Facility Included In The Model During Mean Spring Peak Flood Flow

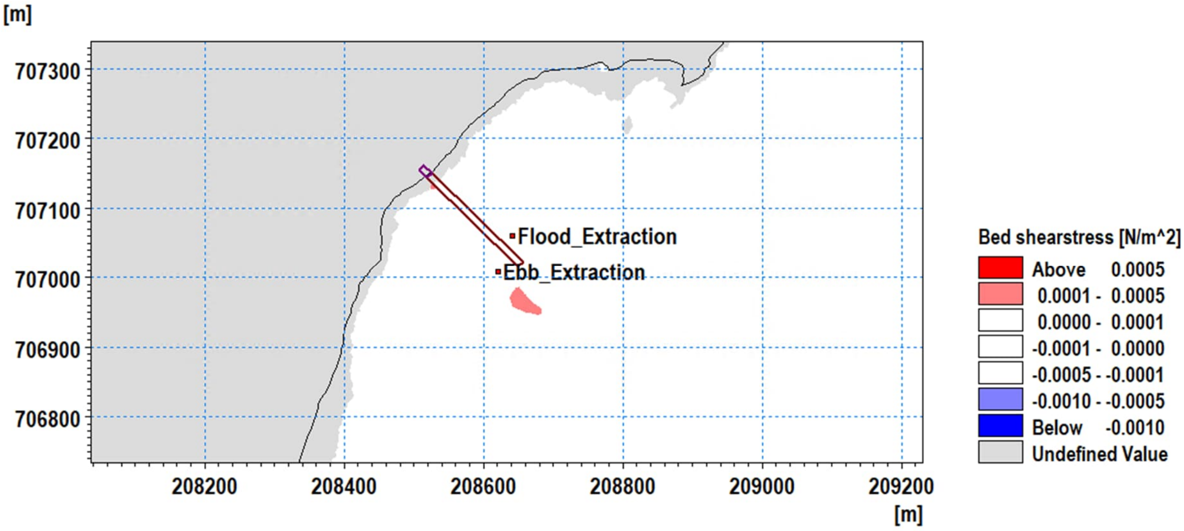

Figure 12. Difference In BSS With The Marine Facility Included In The Model During Mean Spring Peak Ebb Flow

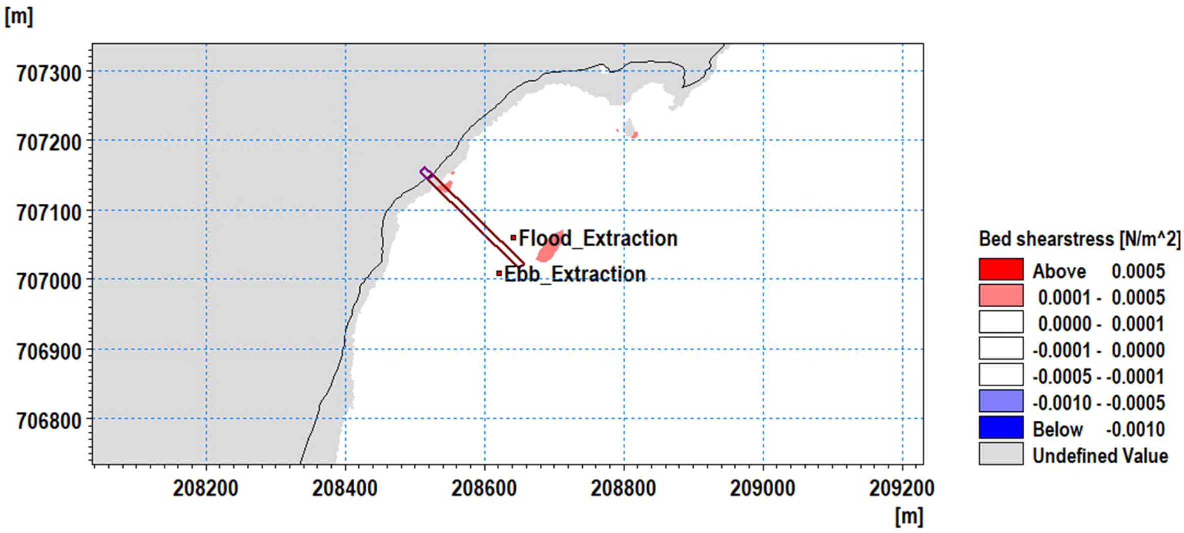

Figure 13. Difference In BSS With The Marine Facility Included In The Model During Mean Spring Peak Flood Flow

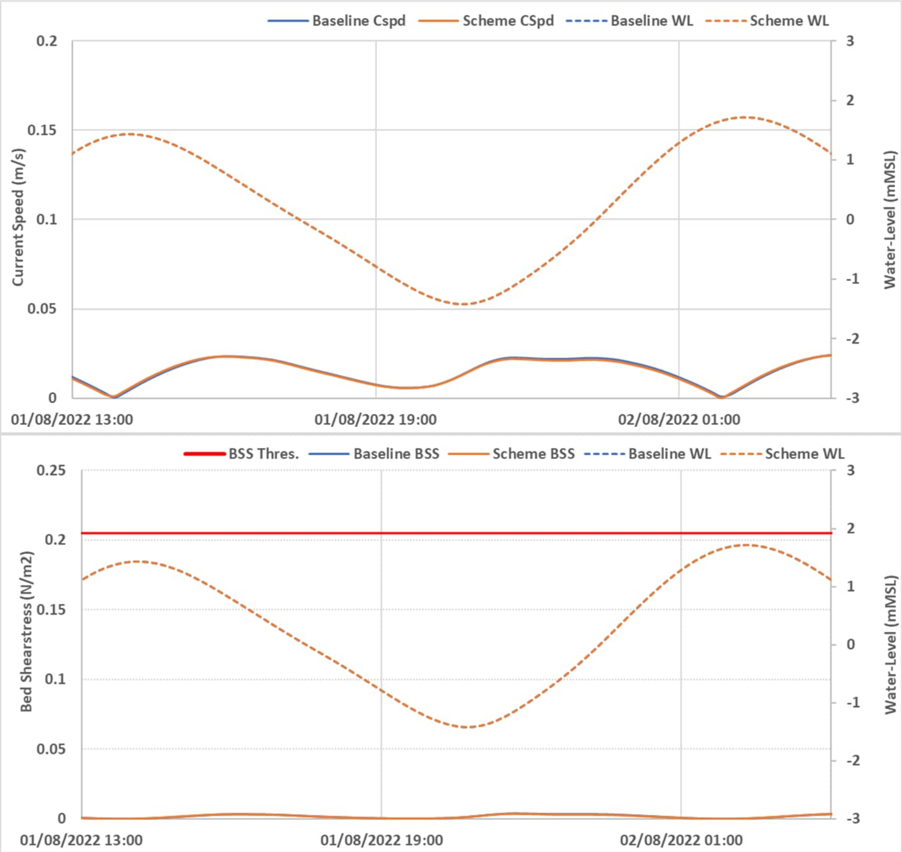

Figure 14. Peak Flood Extraction Differences In Cspd (Top) And Bss (Bottom) With The Inclusion Of The Marine Facility (Development)

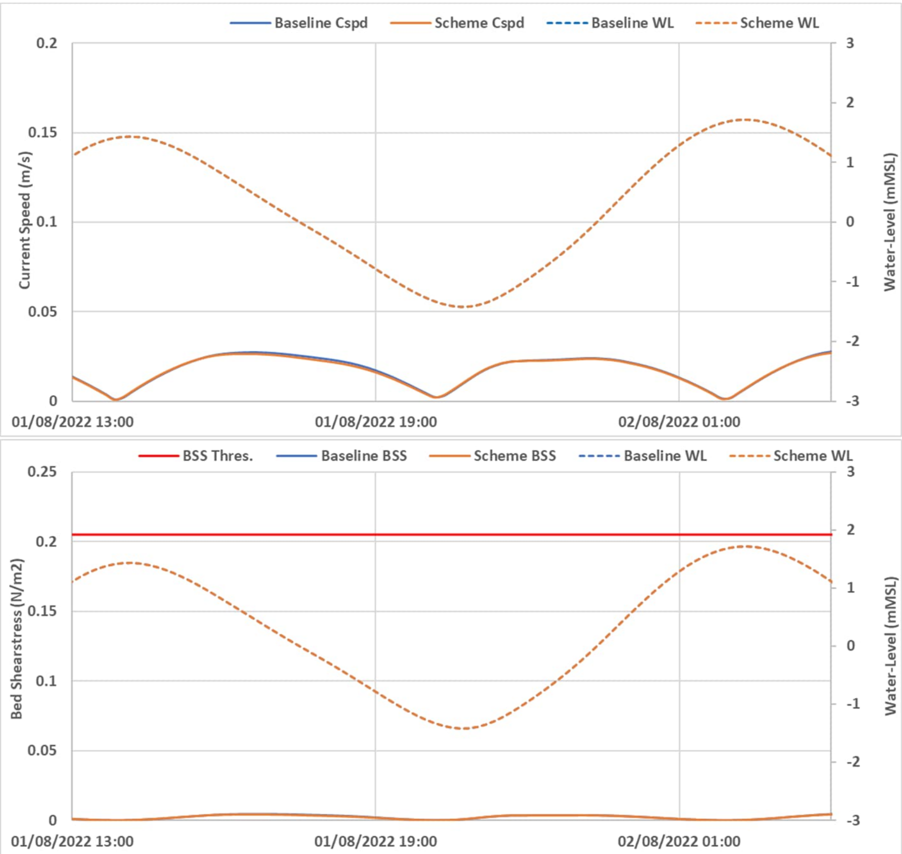

Figure 15. Peak Ebb Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development)

The same extraction locations as presented in *Figure 10.* have been used to extract data comparing baseline against development model runs but with the inclusion of 1:1 wind event from SSW and NE direction sectors. Again, addressing changes north and south of the Marine Facility during peak flows of a mean spring tide. Comparative time-series plots covering a mean spring tide during the representative SSW wind event are presented in *Figure 16. Peak Flood Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development) During An SSW Wind 1:1-Year Event* and *Figure 17. Peak Ebb Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development) During An SSW Wind 1:1-Year Event*, with the NE equivalents in *Figure 18. Peak Flood Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development) During An NE Wind 1:1-Year Event* and *Figure 19. Peak Ebb Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development) During An NE Wind 1 In 1 Year Event.*

These figures both indicate that despite faster current speeds being present due to the inclusion of the wind field, the offsets are still negligible with the inclusion of the Marine Facility. The largest modelled differences occur during the SSW wind event and are in the region of 0.01 m/s for current speeds and 0.03 N/m^2 for BSS. During this event the BSS is momentarily shown to exceed the BSS threshold (by 0.004 N/m^2), but this is reduced to below the threshold following the inclusion of the Development. However, this offset is negligible and only notable through the numerical model.

Even under wind events from direction sectors that will lead to the greatest magnification of current speeds, the installation of the Marine Facility will have minimal influence of both the flow regime and consequentially BSS. Any changes that are caused by the presence of the structure, will be rapidly dissipated.

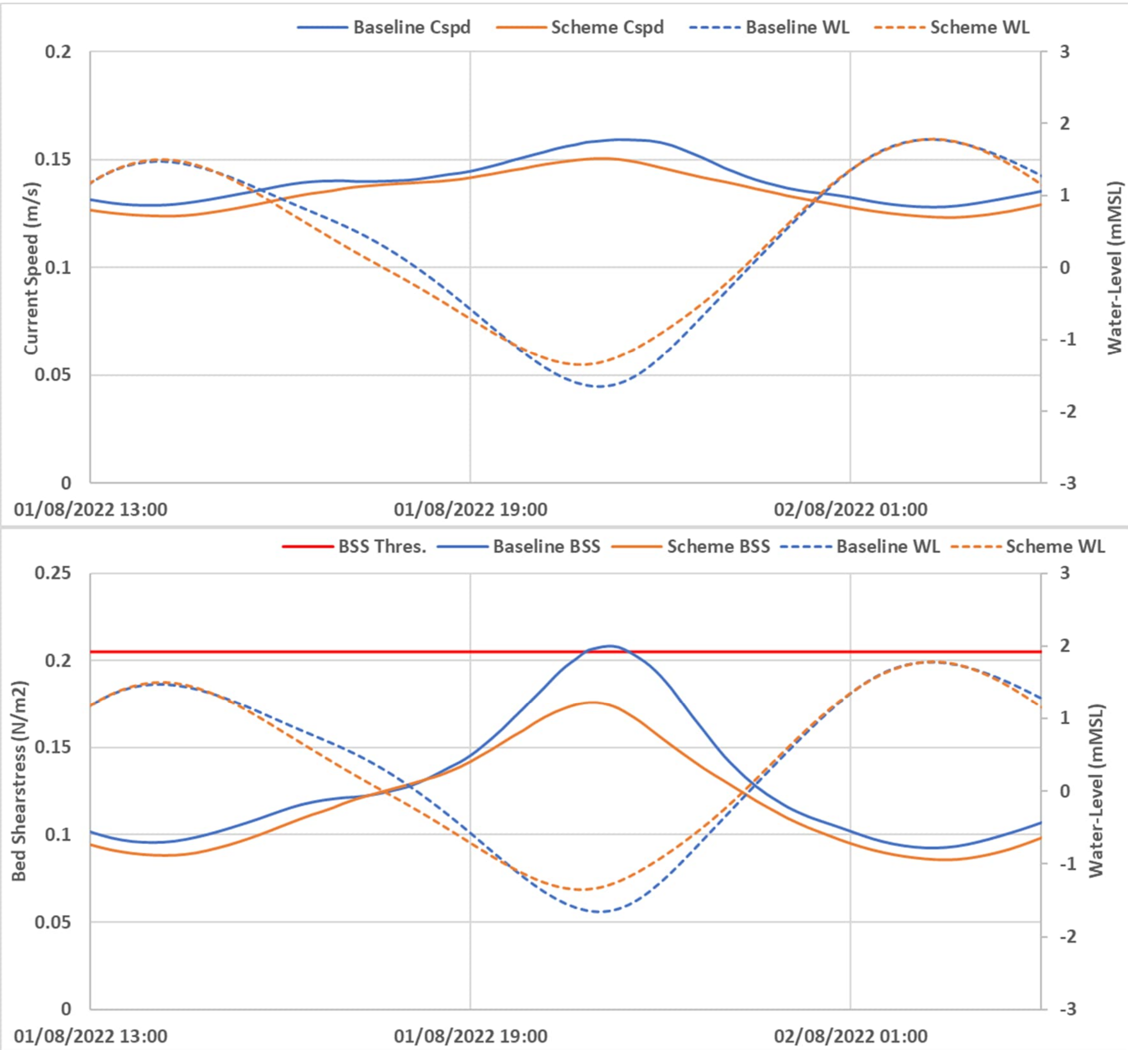

Figure 16. Peak Flood Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development) During An SSW Wind 1:1-Year Event

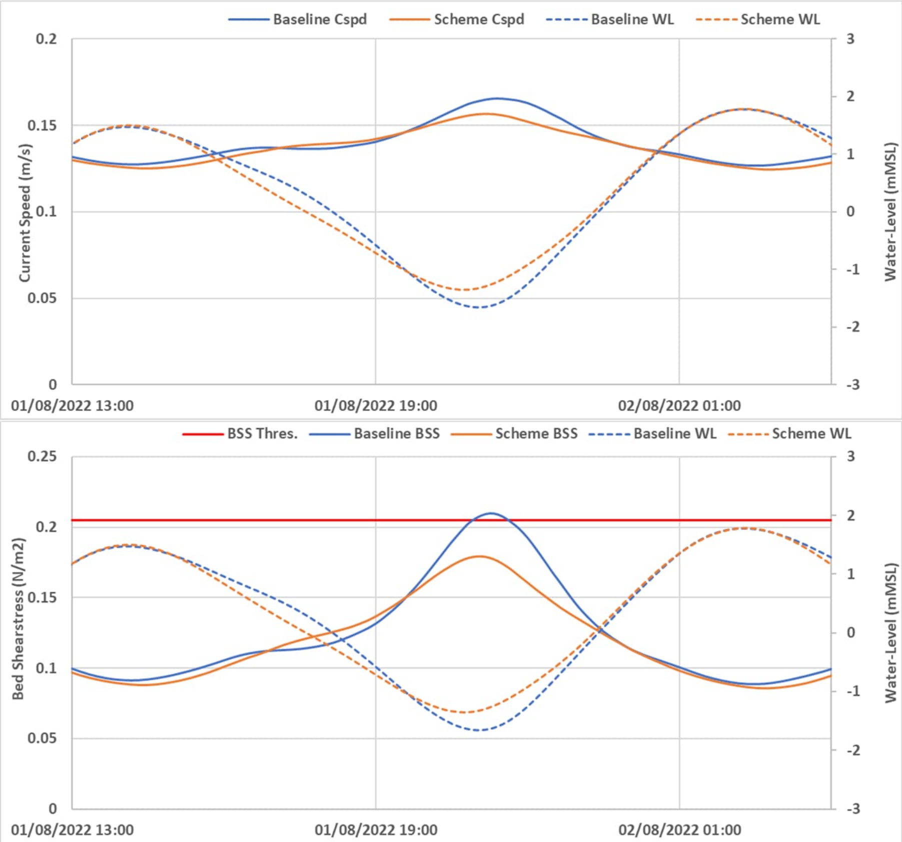

Figure 17. Peak Ebb Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development) During An SSW Wind 1:1-Year Event

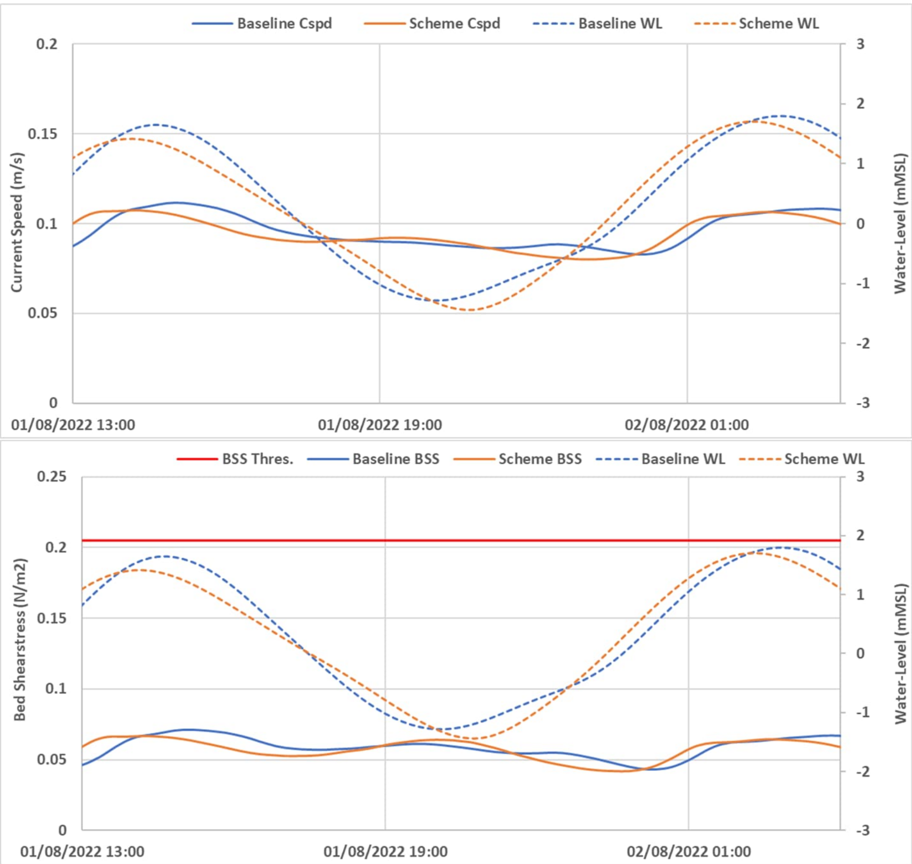

Figure 18. Peak Flood Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development) During An NE Wind 1:1-Year Event

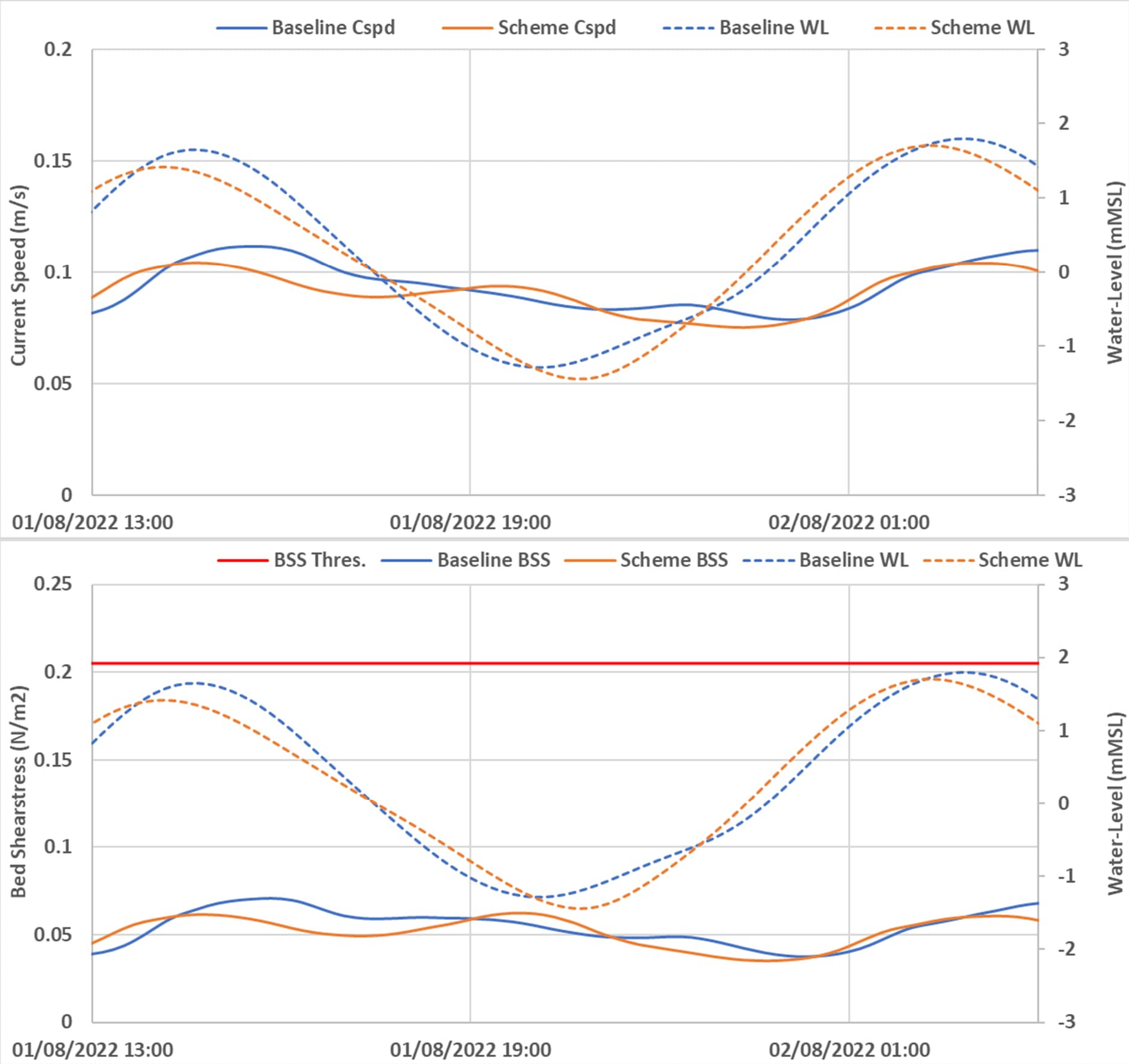

Figure 19. Peak Ebb Extraction Differences In Cspd (Top) And BSS (Bottom) With The Inclusion Of The Marine Facility (Development) During An NE Wind 1 In 1 Year Event

In terms of hydrodynamic conditions and the general sedimentary regime, the sensitivity in both cases is considered to be **High** but due to the **Negligible** magnitude of the effect, the overall significance is assessed as **Minor**.

18.8.2.2 Coastal Morphology and Outfalls

The analysis described above provides a description of changes to the underlying physical processes which drive sediment transport and ultimately dictate potential changes in coastal morphology during the operational phase of the Marine Facility. The predicted changes to hydrodynamic conditions, including both typical tidal conditions and a relatively extreme storm wave condition, demonstrate that there is limited potential for any changes to either the local or wider-scale coastal morphology. Even under more extreme conditions where the threshold BSS is exceeded due to the presence of the Marine Facility structures, this occurs for a very short duration and the associated magnitude is therefore **Negligible**.

Taking the **High** sensitivity of these two receptors (i.e. Coastal morphology and Outfalls) into consideration, the significance of the effect is still assessed as **Minor** in both cases.

18.9 Cumulative Effects

18.9.1 Inter-Cumulative Effects

There are no identified developments in the marine environment that have the potential to interact with the proposed Marine Facility. On this basis there are considered to be no potential inter-cumulative effects affecting the Development.

18.9.2 Intra-Cumulative Effects

There are no identified effects in the marine environment that have the potential for interaction. There are therefore no potential intra-cumulative effects due to the proposed Marine Facility.

18.10 Mitigation and Monitoring

18.10.1 Embedded Mitigation

The embedded mitigation that reduces the impact of the Marine Facility includes the following:

- Piled foundations will be used to support the deck of the Marine Facility. This provides minimal blockage to tidal currents and wave propagation relative to alternative construction options. This will minimise the impact of 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.

18.10.2 Additional Mitigation, Compensation and Enhancement

Due to the negligible effect that the Marine Facility is shown to have on the physical marine environment, no additional mitigation, compensation, or enhancement measures are presented.

18.10.3 Monitoring

Although the effects summarised in *Table 18.5 Summary of Effects: Construction* and *Table 18.6 Summary of Effects: Operation are* limited to having a **Minor** significance, a limited scope of post-construction monitoring is recommended as a precautionary measure, as outlined below:

- 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)

If after 5 years it is found from the monthly inspections that there is no change in local accretion and/or erosion, there would be no requirement for continued monitoring.

18.11 Residual Effects

Due to the 'Negligible' classification of the various potential impacts identified, no requirement for additional mitigation has been identified in which case the residual effects remain as assessed, minor adverse..

Table 18.5 Summary of Effects: Construction provides a summary of construction effects, as determined from the impact assessment presented above with operation effects provided in *Table 18.6 Summary of Effects: Operation*.

Table 18.5 Summary of Effects: Construction

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Intertidal habitat	Direct loss of 6m^2 of intertidal area due to footprint of pile structures	Habitat no longer available. Minor adverse.	None	Minor adverse	Minor **Not Significant**
Subtidal habitat	Direct loss of 22m^2 of subtidal area due to footprint of pile structures	Habitat no longer available. Minor adverse	None	Minor adverse	Minor **Not Significant**
Water quality	Short-term disturbance of bed material due to installation of piles	Transient elevated suspended sediment concentrations in close proximity to the structure. Minor adverse	None	Minor adverse	Minor **Not Significant**

Table 18.6 Summary of Effects: Operation

Receptor	Description of Effect	Effect	Additional Mitigation	Residual Effects	Significance
Hydrodynamic conditions	Change in currents or water levels	Navigation and/or flood issues. Minor adverse.	None	Minor adverse	Minor **Not Significant**
Sedimentary regime	Change in sediment transport	Modified seabed morphology. Minor adverse	None	Minor adverse	Minor **Not Significant**
Coastal morphology	Erosion or accretion of sediment unrelated to natural processes	Unnatural accumulation of sediments along the coast. Minor adverse	None	Minor adverse	Minor **Not Significant**
Coastal outfalls	Local sediment accumulation	Blockage of outfall structure. Minor adverse	None	Minor adverse	Minor **Not Significant**

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Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 19: Shipping & Navigation

ILI (Borders PSH) Ltd

July 2024

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

Distribution List

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19. Shipping and Navigation

19.1 Introduction

This chapter of the EIA Report (EIAR) has been prepared by Anatec Ltd and presents the assessment of likely significant effects of the Development on Shipping and Navigation. This chapter considers the potential impacts arising from the construction and operational phases of the offshore components of the Development.

The Shipping and Navigation assessment of effects has followed the International Maritime Organization (IMO) Formal Safety Assessment (FSA) methodology since this is the internationally recognised approach for assessing the impact to Shipping and Navigation users, and is the approach required for the Maritime and Coastguard Agency (MCA)'s methodology (Annex 1 of Marine Guidance Note (MGN) 654).

The shipping and navigation EIA chapter:

- Presents the existing Shipping and Navigation baseline established from desk studies and stakeholder consultation;
- Identifies any assumptions and limitations encountered in compiling the Shipping and Navigation information;
- Presents the likely significant environmental impacts on Shipping and Navigation arising from the Development and reaches a conclusion on the likely significant effects on Shipping and Navigation, based on the information gathered and the analysis and assessments undertaken; and,
- Highlights any necessary monitoring and/or mitigation measures which are recommended to prevent, minimise, reduce or offset the likely significant adverse effects of the Development on Shipping and Navigation.

19.2 Legislation and Policy

The following sections outline the legislation and policy of relevance to Shipping and Navigation which has been considered within the EIAR.

19.2.1 Legislation

A summary of the legislation relevant to Shipping and Navigation is presented in *Table 19.1 Summary of Legislation Relevant to Shipping and Navigation.*

Table 19.1 Summary of Legislation Relevant to Shipping and Navigation

Relevant Legislation	Summary of Legislation	How and Where Considered in the EIAR
United Nations Convention on the Law of the Sea (UNCLOS)	UNCLOS defines the rights and responsibilities of all nations with respect to their use of the sea, throughout the world. Article 60(7) states "*Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognised sea lanes essential to international navigation*".	UNCLOS is considered fully throughout this EIAR chapter. Particular regard is given to internationally recognised sea lanes (main commercial routes) which are considered a key element of the shipping and navigation baseline (see *section 19.6 Baseline Environment*) and have been considered where relevant as part of the impact assessment (see *section 19.7 Assessment of Effects*).
Convention on International Regulations for Preventing Collisions at Sea (COLREGs)	The COLREGs define the rules which must be adhered to by all vessels navigating internationally. Rule 8 Part (a) states "*Any action taken to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship*". Rule 19 Part (b) states "*Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted*	The COLREGs in full are considered throughout this EIAR chapter with particular regard to collision avoidance (Rule 8) and conduct of vessels in restricted visibility (Rule 19) when considering collision risk in the impact assessment (see *section 19.7 Assessment of Effects*).

Relevant Legislation	Summary of Legislation	How and Where Considered in the EIAR
	visibility a power-driven vessel shall have her engines ready for immediate manoeuvre".	
Chapter V, Safety of Navigation, of the Annex to the International Convention for the Safety of Life at Sea (SOLAS)	SOLAS Chapter V is an international agreement that sets basic minimum criteria for all seafarers, dependent on the size and type of vessel. Regulation 33 states "*The master of a ship at sea which is in a position to be able to provide assistance on receiving a signal from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance*".	SOLAS Chapter V in full is considered throughout this EIAR chapter with particular regard to rendering assistance to persons in distress (Regulation 33) and passage planning (Regulation 34) when considering emergency response capability (see *section 19.6.2 Emergency Response Resources and Historical Incident Data*).

19.2.2 National Planning Policy

A summary of the national planning policy relevant to Shipping and Navigation is presented in *Table 19.2 Summary of Policy Relevant to Shipping and Navigation*.

Table 19.2 Summary of Policy Relevant to Shipping and Navigation

Relevant Policy	Summary of Policy	How and Where Considered in the EIAR
UK Marine Policy Statement (DEFRA, 2011)	The UK Marine Policy Statement provides a framework for preparing Marine Plans and taking decisions affecting the marine environment. Paragraph 3.4.7 states "*Increased competition for marine resources may affect the sea space available for the safe navigation of ships. Marine plan authorities and decision makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety and ensure that their decisions are in compliance with international maritime law".*	Displacement of existing routes and activity, and the resultant increase in collision risk has been considered within the impact assessment (see*section 19.7.1*) .
Scotland's National Marine Plan (Scottish Government, 2015)	*Transport 1 "Navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in United Nations Convention on the Law of the Sea (UNCLOS). The following factors will be taken into account when reaching decisions regarding development and use:* *The extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbour sand navigational safety. This includes commercial anchorages and defined approaches to ports.* *Where interference is likely, whether reasonable alternatives can be identified. Where there are no reasonable alternatives, whether mitigation through measures adopted in accordance with the principles and procedures established by the IMO can be achieved at no significant cost to the shipping or ports sector."* *Transport 2 "Marine development and use should not be permitted where it will restrict access to, or future expansion of, major commercial ports or existing or proposed port sand harbours."* *Transport 3 "Ferry routes and maritime transport to island and remote mainland areas provide essential connections and should be safeguarded from inappropriate marine development.* *Developments will not be consented where they will unacceptably interfere with lifeline ferry services."* *Transport 6 "Developers should ensure displacement of shipping is avoided where possible to mitigate against potential increased journey lengths (and associated fuel costs, emissions and impact on journey frequency)."*	All marine planning policies for shipping, ports, harbours and ferries have been considered fully throughout this EIAR chapter. Particular regard is given to the displacement of vessel traffic and reduced access to local ports. Mitigation measures have been identified to reduce the effect of such impacts (see *section 19.**9**Mitigation and Monitoring*).

19.3 Consultation

A consultation meeting was held via Microsoft Teams on 10th November, and was attended by the MCA, NLB, RYA Scotland and Clydeport. Consultation with the UK Chamber of Shipping was also carried out via email. Consultee feedback was also gathered in the Scoping Opinion. A summary of the key issues raised during consultation undertaken to date, specifically regarding Shipping and Navigation is presented in *Table 19.3 Summary of Consultation relating to Shipping and Navigation.*

Table 19.3 Summary of Consultation relating to Shipping and Navigation

Consultee	Key Issue	Summary of Response	Action Taken
MCA (Scoping Opinion)	The MCA noted the Marine Facility falls within the jurisdiction of Clydeport, who are the Statutory Harbour Authority and will be required to approve the Marine Facility. Local warnings may also be issued to alert vessels navigating in the vicinity of the works.	Clydeport have been consulted as part of the EIAR process.	Liaison with Clydeport will be a key mitigation measure.
RYA Scotland (Scoping Opinion)	Recreational vessel numbers visiting Inveraray are increasing, and there are several visitor moorings. Inveraray is not a good place for recreational vessels to anchor.	It is noted that vessel numbers visiting Inveraray in the future may continue to increase, particularly given the redevelopment of the pier.	Possible increases in visitors to Inveraray are captured in the Future Baseline Assessment, and have been considered within *section 19.7 Assessment of Effects.*
	Impacts on recreational boating should be scoped in.	Impacts on recreational vessels are considered within the **Assessment of Effects.**	Impacts on recreational vessels are considered within the *section 19.7 Assessment of Effects.*
	Inspire Inveraray wish to buy the old pier at Inveraray should be consulted by the Development.[1]	Inspire Inveraray have been included in public consultation events hosted by the Development.	Inspire Inveraray have been consulted by the Development.
Clydeport	Clydeport questioned whether the Marine Facility will remain in place following the construction of the Development.	Based on feedback received at the public consultation phase, it is preferred that the Marine Facility is removed following its use. However the Development remain open to future options for the use of the Marine Facility.	No action required.
	The MoD carry out sounding trials in the area, and submarines are recorded transiting within the Loch Fyne. Therefore, they should be consulted on the Development.	The MoD were consulted at the scoping stage and will be engaged throughout the Development programme.	Liaison with the MoD is included as a mitigation measure.
	Liaison with Clydeport will be useful in terms of coordination of vessel movements and promulgation of information. Details of the Development should be shared at the Clydeport user group meeting.	Liaison with Clydeport will be maintained throughout the Development programme as a key mitigation measure.	Liaison with Clydeport is included as a mitigation measure.
MCA	The MCA questioned whether abnormal loads would be required throughout the operational phase as part of regular maintenance.	Abnormal load deliveries during the operational phase of the Development are expected to be infrequent, and may be carried out by alternative means should the Marine Facility be removed. The Marine Facility may also be reinstalled if required during the lifetime of the Development.	Delivery of materials during the operational phase is considered within *section 19.7Assessment of Effects.*

[1] Inspire Inveraray purchased the pier at Inveraray in July 2023.

Consultee	Key Issue	Summary of Response	Action Taken
RYA Scotland	RYA Scotland noted that the Marine Facility is not considered a navigational risk to recreational vessels.	RYA Scotland's feedback on navigational risk has been considered in the **Assessment of Effects**.	No action required.
	It was queried whether the outlet on Loch Awe would create any risk to recreational users.	It was agreed that the outlet on Loch Awe would be designed such that there would be no impact on either vessels or the marine ecosystem on Loch Awe.	No action required.
	Local cruising clubs should be informed of activities. Clyde Cruising Club should be informed so that their published sailing directions can be updated.	Promulgation of information to local users is considered an embedded mitigation measure, and will include engagement with local user groups and the provision of as-built information.	Promulgation of information and provision of as-built information included as mitigation measures.
	It was queried whether recreational moorings in the area had been considered.	It was noted in the Scoping Report that leisure mooring agreements are in place throughout Loch Fyne. Clydeport indicated that they could provide information to the Development on registered moorings.	Disruption to recreational activities, including recreational moorings is considered within *section 19.7 Assessment of Effects.* Liaison with Clydeport has been considered as an embedded mitigation measure.
MoD (Gatecheck Response)	It was queried whether it was possible to de-conflict piling with trials within Loch Fyne. MoD indicated that if this could be achieved then there were no issues. Trials take place on approximately 12 days per year.	Coordination with the MoD is considered an embedded mitigation measure, and will include a provision to cease piling works within Loch Fyne during trials.	Coordination with the MoD is included within the embedded mitigation measures.
UK Chamber of Shipping (Gatecheck Response)	The UK Chamber of Shipping raised no concerns in response to the Gatecheck Report.	No action required.	No action required.
Northern Lighthouse Board (NLB) (Gatecheck Response)	NLB indicated that they would continue to engage with the developer on navigational safety, including providing marking and lighting recommendations.	Consultation with the NLB on marking and lighting is included as an embedded mitigation measure.	Consultation with the NLB is included within the embedded mitigation measures.
RYA Scotland (Gatecheck Response)	RYA Scotland had no further comments regarding the Gatecheck report, noting that the appropriate engagement had been carried out and the report accurately reflects recreational boating.	No action required.	No action required.
MCA (Gatecheck Response)	The MCA noted that the possibility of abnormal loads being required during maintenance should be considered in the risk assessment.	The Marine Facility is currently anticipated to be removed following the construction of the Development, however some infrastructure may remain to facilitate the delivery of abnormal loads. The use of the Marine Facility during the operational phase has therefore been considered within *section 19.7 Assessment of Effects.*	The effects of delivering abnormal loads to the Marine Facility during the operational phase of the Development are considered within *section 19.7 Assessment of Effects.*
	The MCA would expect the impact on other marine users of Loch Awe to be considered.	Impacts on other marine users relating to the aspects of the Development within Loch Awe are considered separately within *Chapter 16 Socio-Economics, Recreation and Tourism.*	Impacts on other marine users within Loch Awe have been considered in *Chapter 16: Socio-Economics, Recreation and Tourism.*

19.4 Study Area

The Shipping and Navigation Study Area is defined as a 10 nm buffer on the deck footprint of the Marine Facility, constrained to the limits of Loch Fyne. This study area is considered sufficient to capture all Shipping and Navigation activity of relevance to the Development. It is noted that the Development also includes infrastructure within Loch Awe. As this is a freshwater loch, there are not expected to be impacts on Shipping and Navigation receptors. Impacts on marine users within Loch Awe will be considered within the *Chapter 16: Socio-Economics, Recreation and Tourism.*

The Shipping and Navigation Study Area is presented in *Figure 19.1: Shipping and Navigation Study Area.*

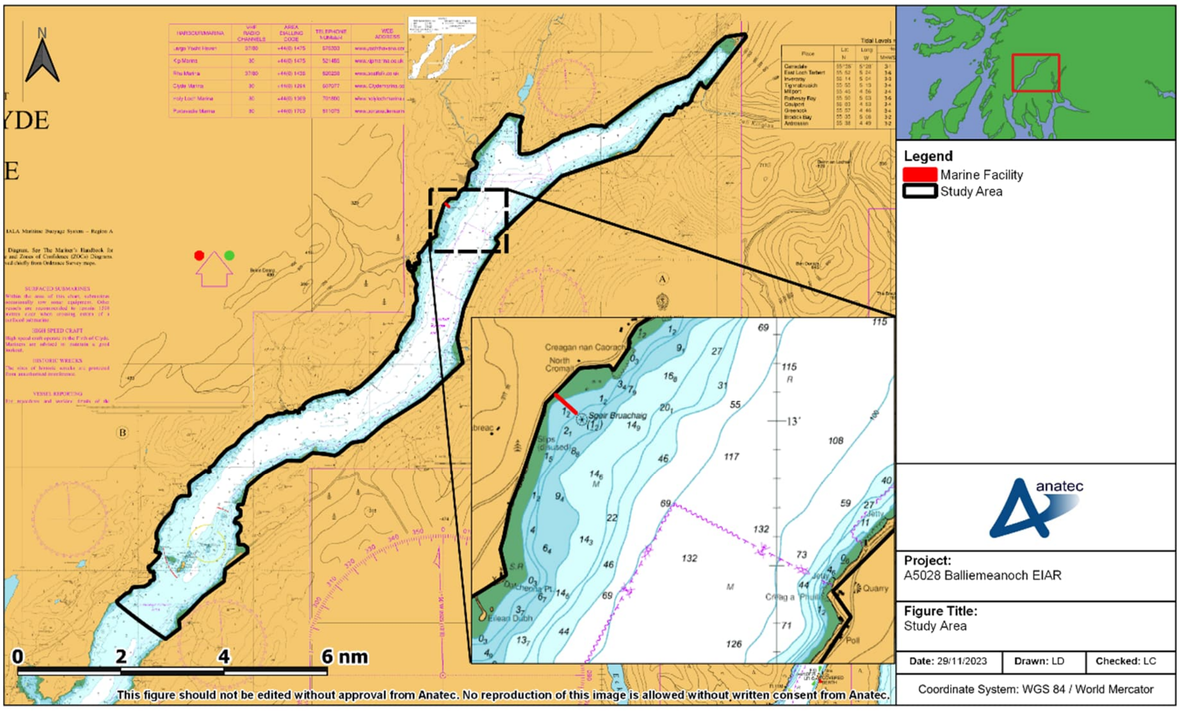


Figure 19.1: Shipping and Navigation Study Area

19.5 Methods

19.5.1 Data Sources

Information on the shipping and navigation baseline was collected through a detailed desktop review of currently accessible studies and datasets. The baseline has been established through the use of data on vessel traffic, navigational features and historical incident data in proximity to the Marine Facility. The key data sources used are presented in *Table 19.4 Data Sources Used to Inform the Shipping and Navigation Baseline*.

Table 19.4 Data Sources Used to Inform the Shipping and Navigation Baseline

Title	Source	Description
Six months of AIS Data	Anatec Ltd	AIS data covering three winter months (December 2022-February 2023) and three summer months (June – August 2023)
Admiralty Nautical Charts (2131, 2382-1 & 2382-2)	UKHO	Admiralty charts characterising navigational features in proximity to the Marine Facility
Marine Accident Investigation Branch (MAIB) Incident Data (2012 – 2021)	MAIB	Incident data covering maritime incidents in proximity to the Marine Facility between 2012 and 2021
Royal National Lifeboat Institution (RNLI) Incident Data (2013 – 2022)	RNLI	Incident data covering RNLI lifeboat responses to incidents in proximity to the Marine Facility between 2013 and 2022
Search and Rescue (SAR) Helicopter Taskings (2015 – 2023)	Department for Transport (DfT)	Incident data covering SAR helicopter taskings in proximity to the Marine Facility between 2015 and 2023

Title	Source	Description
Vessel Monitoring System (VMS) Satellite Fishing Data (2022)	Marine Scotland	12 months VMS data reporting positions of fishing vessels of greater than 12m in length in 2022.

19.5.2 Data Assumptions and Limitations

AIS Data

The carriage of AIS is required on board all vessels of greater than 300 Gross Tonnage (GT) engaged on international voyages, cargo vessels of more than 500 GT not engaged on international voyages, passenger vessels irrespective of size built on or after 1 July 2002, and fishing vessels over 15 m LOA.

When using the AIS dataset, it has been assumed that any vessels under an obligation to broadcast information via AIS have done so. It has also been assumed that those details broadcast via AIS (such as vessel type and dimensions) are accurate unless clear evidence to the contrary was identified. There may be occasional range limitations in tracking certain vessels, especially smaller (Class B AIS) vessels in winter. However the limitations of the AIS data are not considered to compromise confidence in the assessment.

Since the vessel traffic data includes only AIS data, there are limitations associated with vessels not broadcasting on AIS. This includes recreational vessels, military vessels, and fishing vessels of less than 15 m in length, which are not required to broadcast on AIS and may therefore be under-represented. However, all consultees were content with the methodology and data sources used, including the use of additional sources such as VMS data and consultation feedback, and therefore AIS data complemented by the additional data sources is considered to be suitably comprehensive and adequate for the assessment.

Historical Incident Data

All UK commercial vessels are required to report incidents to the MAIB, however there are no requirements for non-commercial recreational craft to report incidents to the MAIB. Nevertheless, the MAIB incident database is considered to be a suitable source for the characterisation of historical incidents and adequate for the assessment.

Admiralty Charts

The Admiralty Charts published by the UKHO are updated periodically, and therefore the information shown may not be reflective of real-time features within the shipping and navigation study area with complete accuracy. Taking into account that the consultees include local port authorities, the characterisation of navigational features is considered to be suitably comprehensive and adequate for the assessment. Only those aids to navigation which are charted and considered key to establishing the shipping and navigation baseline are shown.

19.5.3 Guidance and Standards

The primary guidance used to inform the shipping and navigation data gathering and assessment is as follows:

- IMO (2018). Revised Guidelines for FSA for Use in the IMO Rule-Making Process London: IMO. (IMO, 2018)
- MCA (2021). MGN 654 (Merchant and Fishing) Safety of Navigation: OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response and its Annexes. Southampton: MCA.

19.5.4 Assessment Scope

The Shipping and Navigation assessment focuses on the Marine facility aspect of the Development. The assessment considers a maximum design scenario identified from the project description. *Table 19.5 Maximum Design Scenario relating to Shipping and Navigation* presents the maximum design scenario considered for each of the impacts assessed, and the phases each impact is relevant to.

Table 19.5 Maximum Design Scenario relating to Shipping and Navigation

Impact	Phase	Parameters Assessed
Deviations to vessel routeing resulting in increased vessel to vessel collision risk between third-party vessels	All Phases	Up to 10 vessel movements associated with the construction of the jetty, with a further 10 during the construction phase for the Development. Deck Cargo Barge – 50 m x 15 m, 2 m draught and deadweight tonnage of 1300 tonnes, used only at mean tide and above

Impact	Phase	Parameters Assessed
		Vessel-based Crane – Floating sheerleg, 45.1 m x 20.1 m, 1.6 m draught.
Increased vessel to vessel collision risk between a third-party vessel and a project vessel	All Phases	Up to 10 vessel movements associated with the construction of the jetty, with a further 10 during the construction phase for the Development. Deck Cargo Barge – 50 m x 15 m, 2 m draught and deadweight tonnage of 1300 tonnes, used only at mean tide and above Vessel-based Crane – Floating sheerleg, 45.1 m x 20.1 m, 1.6 m draught.
Increased risk of vessel grounding and restriction on vessel size navigating Loch Fyne to Inveraray	All Phases	Up to 10 vessel movements associated with the construction of the jetty, with a further 10 during the construction phase for the Development. Deck Cargo Barge – 50 m x 15 m, 2 m draught and deadweight tonnage of 1300 tonnes, used only at mean tide and above Vessel-based Crane – Floating sheerleg, 45.1 m x 20.1 m, 1.6 m draught.
Disruption to fishing activities	All Phases	Up to 10 vessel movements associated with the construction of the jetty, with a further 10 during the construction phase for the Development. Deck Cargo Barge – 50 m x 15 m, 2 m draught and deadweight tonnage of 1300 tonnes, used only at mean tide and above Vessel-based Crane – Floating sheerleg, 45.1 m x 20.1 m, 1.6 m draught.
Disruption to recreational activities	All Phases	Up to 10 vessel movements associated with the construction of the jetty, with a further 10 during the construction phase for the Development. Deck Cargo Barge – 50 m x 15 m, 2 m draught and deadweight tonnage of 1300 tonnes, used only at mean tide and above Vessel-based Crane – Floating sheerleg, 45.1 m x 20.1 m, 1.6 m draught.
Disruption to military exercises	All Phases	Up to 10 vessel movements associated with the construction of the jetty, with a further 10 during the construction phase for the Development. Deck Cargo Barge – 50 m x 15 m, 2 m draught and deadweight tonnage of 1300 tonnes, used only at mean tide and above Vessel-based Crane – Floating sheerleg, 45.1 m x 20.1 m, 1.6 m draught.
Allision risk between third-party vessels and new structure	All Phases	Marine facility extending up to 180 m into Loch Fyne with width of 10 m
Reduced access to local harbours	All Phases	Up to 10 vessel movements associated with the construction of the jetty, with a further 10 during the construction phase for the Development. Deck Cargo Barge – 50 m x 15 m, 2 m draught and deadweight tonnage of 1300 tonnes, used only at mean tide and above Vessel-based Crane – Floating sheerleg, 45.1 m x 20.1 m, 1.6 m draught.

19.5.5 Assessment Methodology

Overview

The shipping and navigation impact assessment follows the FSA methodology, which is the internationally recognised approach for assessing impacts to shipping and navigation users. The FSA methodology is centred on risk control and assesses each impact in terms of its frequency and consequence in order that its significance can be determined as ‘broadly acceptable’, ‘tolerable’ or ‘unacceptable’ in a risk matrix.

It is noted that the assessment therefore differs from the standard EIAR Methodology outlined in *Chapter 4 Approach to EIA*, but is a requirement of the MCA for any NRA.

Impact Assessment Criteria

Determining the significance of effects is a two-step process that involves defining the severity of consequence and the frequency of occurrence. This section describes the criteria applied in the assessment of effects to assign values to each of the two factors.

The criteria for defining the severity of consequence are presented in *Table 19.6 Severity of Consequence Ranking Definitions*, with the frequency presented in *Table 19.7: Frequency of Occurrence Ranking Definitions*.

Table 19.6 Severity of Consequence Ranking Definitions

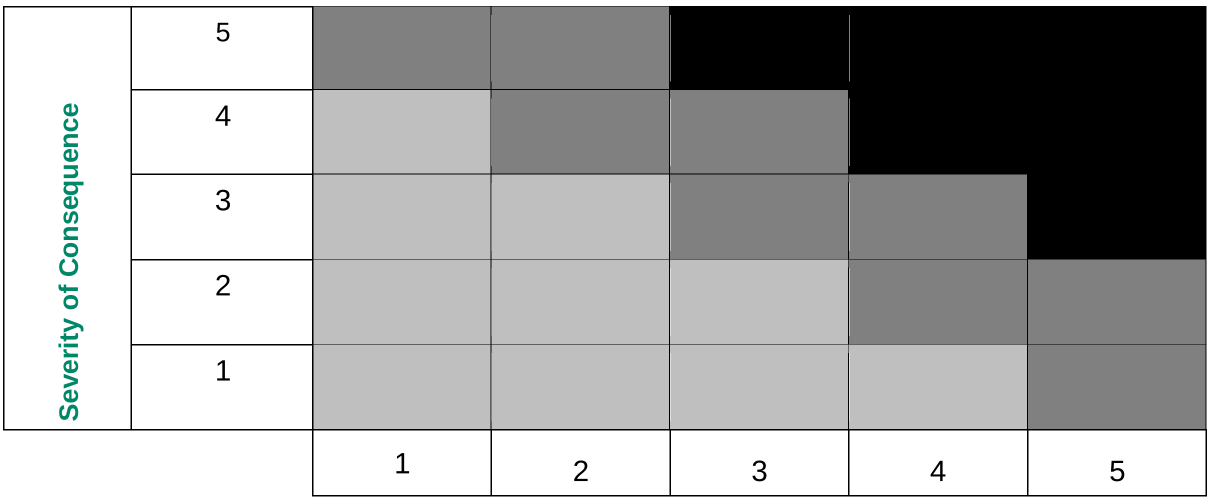
Rank	Description	Definition			
		People	Property	Environment	Business
1	Negligible	No perceptible risk	No perceptible risk	No perceptible risk	No perceptible risk
2	Minor	Slight injury(ies)	Minor damage to property, (i.e. superficial damage)	Tier 1[2] local assistance required	Minor reputational risks – limited to users
3	Moderate	Multiple minor or single serious injury	Damage not critical to operations	Tier 2[3] limited external assistance required	Local reputational risks
4	Serious	Multiple serious injuries or single fatality	Damage resulting in critical risk to operations	Tier 2 regional assistance required	National reputational risks
5	Major	More than one fatality	Total loss of property	Tier 3[4] national assistance required	International reputational risks

Table 19.7: Frequency of Occurrence Ranking Definitions

Rank	Description	Definition
1	Negligible	Less than 1 occurrence per 10,000 years
2	Extremely unlikely	1 per 100 to 10,000 years
3	Remote	1 per 10 to 100 years
4	Reasonably probable	1 per 1 to 10 years
5	Frequent	Yearly

The effects are then assessed using the tolerability matrix presented in *Table 19.8: Tolerability Matrix and Risk Rankings.*

Table 19.8: Tolerability Matrix and Risk Rankings



[2] Tier 1 – Local (within the capability of one local authority, offshore installation operator or harbour authority)
[3] Tier 2 – Regional (beyond the capability of one local authority or requires additional contracted response from offshore operator or from ports or harbours)
[4] Tier 3 – National (requires national resources coordinated by the MCA for a shipping incident and the operator for an offshore installation incident)

	Frequency of occurrence

	Unacceptable (high risk)
	Tolerable (intermediate risk)
	Broadly Acceptable (low risk)

Once identified, the significance of the impact will be assessed to ensure it is As Low As Reasonably Practicable (ALARP). Further risk control measures may be required to mitigate a hazard in line with the ALARP principles. Unacceptable risks are not considered to be ALARP.

For the purposes of this assessment:

- A level of effect of Unacceptable will be considered a 'significant' effect in terms of the EIA Regulations; and
- A level of effect of Broadly Acceptable or Tolerable (if ALARP) will be considered 'not significant' in terms of the EIA Regulations.

19.6 Baseline Environment

The following sections present an overview of the existing shipping and navigation baseline environment.

19.6.1 Navigational Features

This section presents an overview of the navigational features in proximity to the Marine Facility which forms part of the overall Development. The key navigational features are presented in *Figure 19.2: Navigational Features.*

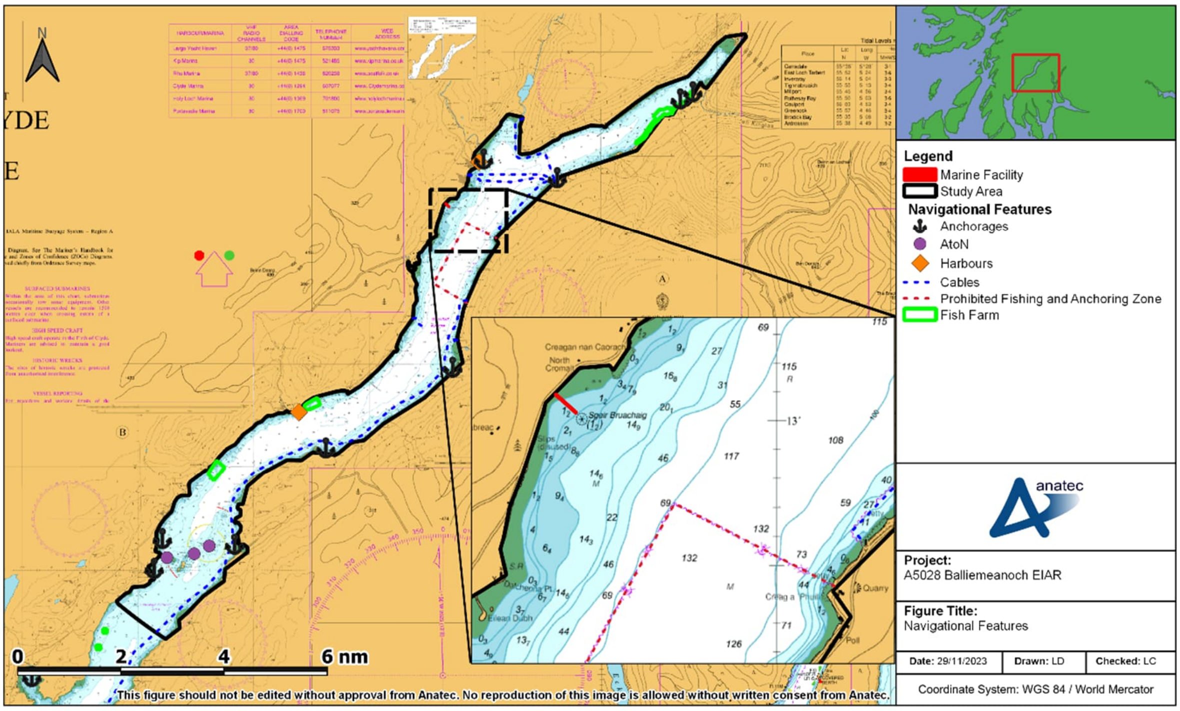


Figure 19.2: Navigational Features

The Marine Facility lies within Upper Loch Fyne, approximately 1 nm to the south of the fishing pier at Inveraray. The Marine Facility extends up to 180 m into the loch from the western shore, in water depths of 1-2 m. At the seaward end of the deck, there is a charted rock reducing the depth to 1.2 m.

There are two harbours within 10 nm of the Marine Facility within Loch Fyne. As noted, Inveraray is located approximately 1nm to the north (noting that the pier is not currently open to the public), while Furnace is located 5nm to the southwest. In addition, there is a pier used by fish farm vessels to the south of Furnace, close to a disused quarry. Anchorages are located throughout the Loch, with a chart note stating that these are recommended for the use of pleasure craft. The closest anchorage to the Marine Facility is adjacent to Inveraray harbour, approximately 1nm to the north, with other charted anchorages located throughout Loch Fyne. It was noted by RYA

Scotland in the Scoping Opinion that the anchorage at Inveraray is not a good anchorage for recreational vessels. An area containing chains and anchors is charted on the opposite bank to the Marine Facility, prohibiting anchoring or fishing activity. The Loch is located within the Clydeport statutory port limits.

It was noted in the Scoping Report that leisure mooring agreements are in place on both banks of Loch Fyne, with the largest being at Strachur. Clydeport indicated during consultation that they could provide the Development with locations of registered moorings.

There are fish farms located throughout Loch Fyne. There is one located within the Upper Loch, approximately 3.8 nm to the northeast of the Marine Facility. There are a further two within the study area, located 4.6 nm and 6.6 nm to the southwest, respectively.

Charted subsea cables are located throughout Loch Fyne. The closest cables to the Marine Facility have landfalls in Newtown Bay, less than 1 nm to the northeast of the Marine Facility. These cables cross Loch Fyne to Saint Catherines. Cables are also located throughout the east bank of Loch Fyne.

The entirety of Loch Fyne is also contained within a submarine exercise area, with it noted in consultation that submarines transit the Loch both submerged and on the surface. It was also noted during consultation that MOD sounding trials take place in the Loch.

19.6.2 Emergency Response Resources and Historical Incident Data

This section outlines the existing emergency response resources and historical incident data in the vicinity of the Marine Facility.

SAR helicopter provision is provided by Bristow Group on behalf of His Majesty's Coastguard (HMCG) from 10 base stations around the UK. The closest station to the Marine Facility is the Prestwick station, located approximately 45 nm to the south. There have been two SAR helicopter taskings within the study area since April 2015, with both of these being support operations located close to Inveraray.

The HMCG coordinates SAR operations through a network of 11 Maritime Rescue Coordination Centres (MRCC), including a Joint Rescue Coordination Centre (JRCC) based in Hampshire. All of the MCA's operations, including SAR, are divided into 18 geographical regions. The Marine Facility is within Area 17: "Kintyre to Mull, Isle of Arran and Inner Hebrides". The closest MRCCs to the Marine Facility are in Belfast, located approximately 95nm to the southwest, and Stornoway, 125nm to the north. It is noted that incident response is not necessarily coordinated by the nearest MRCC, as operators may be unavailable and calls re-routed to another MRCC.

The RNLI operate a fleet of more than 350 lifeboats out of more than 230 stations across the UK and Ireland, with the closest of these being at Tighnabruaich, approximately 20nm to the south of the Marine Facility, noting that any lifeboats would have to route around the southwestern point of the Cowal peninsula to reach the Marine Facility. There were 5 incidents responded to by the RNLI within the study area in the 10 years between 2013 and 2022, with all of these responded to by the station at Tighnabruaich. These incidents included two machinery failures, two "Person in danger" incidents and a vessel thought to be in trouble. All five incidents involved recreational craft or inflatables. As such, all five incidents occurred in the summer months between late May and early September.

All UK flagged vessels and non-UK flagged vessels in UK territorial waters (12 nm), a UK port or carrying passengers to a UK port are required to report incidents to the MAIB. Over a ten year period between 2012 and 2021, two incidents have been reported within the study area, with one accident to person and one machinery failure. Both incidents were located close to Inveraray.

Figure 19.3: Historical Incident Data presents an overview of the historical incident data within the study area from the MAIB and RNLI, as well as the locations of SAR helicopter taskings within the study area.

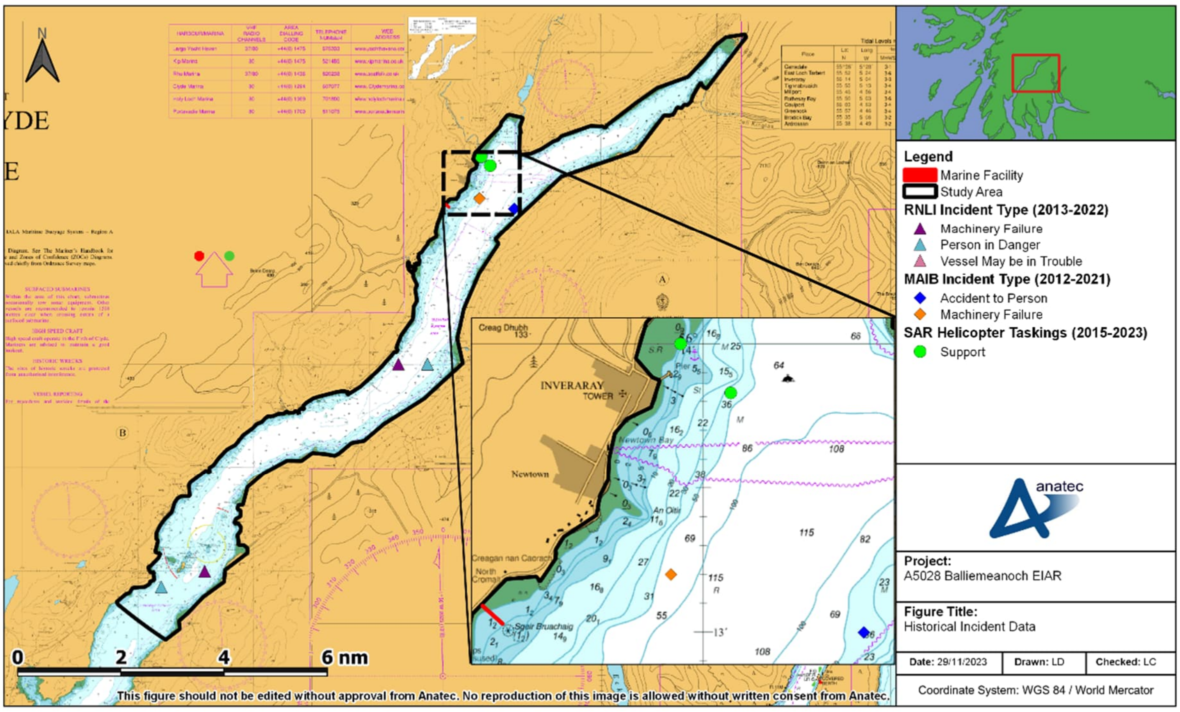


Figure 19.3: Historical Incident Data

19.6.3 Vessel Traffic Overview

The vessel traffic baseline within the shipping and navigation study area has been identified from 6 months of AIS data, covering 3 months between December 2022 – February 2023 (winter period) and a further 3 months recorded between June – August 2023 (summer period).

A plot of the vessel tracks recorded on AIS within the shipping and navigation study area, colour-coded by vessel type, is presented in *Figure 19.8 AIS Vessel Tracks by Vessel Type (6 Months)*. Following this, a vessel density heatmap is presented in *Figure 19.9 AIS Vessel Density (6 Months)*. The heatmap is based on the number of vessel tracks intersecting the 250 m x 250 m cells of a grid. *Figure 19.10: AIS Vessel Tracks by Vessel Type (3 Months Winter)* and *Figure 19.11: AIS Vessel Tracks by Vessel Type (3 Months Summer)* present the vessel tracks recorded in winter and summer, respectively, in order to show the seasonal variation in the traffic composition.

The most common vessel types in the study area were recreational vessels (54%) followed by fish farm support vessels (37%). Fish farm vessels were typically recorded in the south of the study area and did not generally pass close to the Marine Facility, and were recorded exclusively in the winter period. Recreational vessels were recorded throughout Loch Fyne, and were recorded exclusively during the summer period. Other vessels, such as workboats and fishery research/enforcement vessels, were recorded in low numbers throughout the six month data period. *Figure 19.4: Vessel Type Distribution* presents the distribution of vessel types within the study area during both the winter and summer periods.

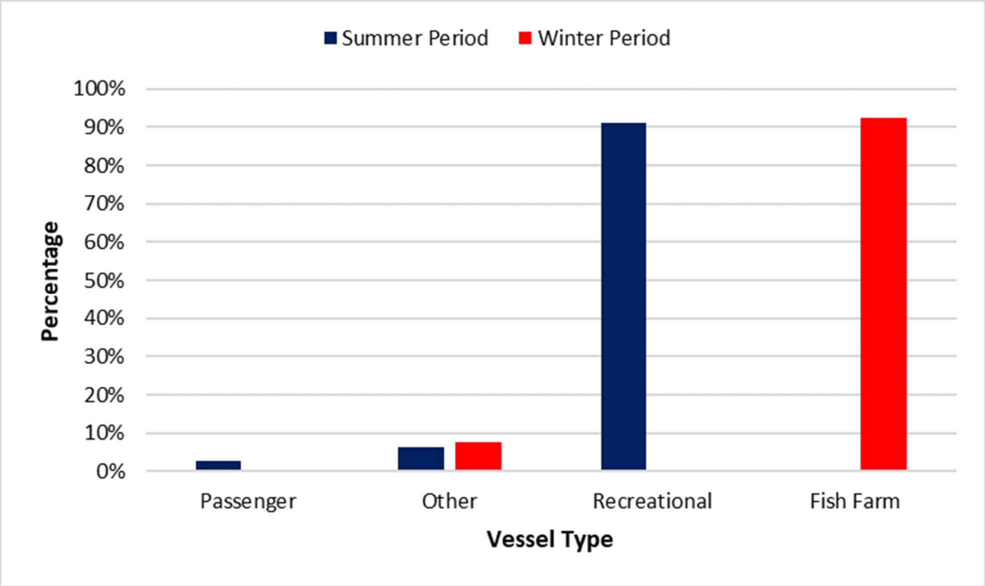


Figure 19.4: Vessel Type Distribution

It can be seen that the densest region of traffic is in the south of the study area, and is associated with the regions where fish farm support vessels coincide with the recreational traffic, noting that the two vessel types were not recorded in the area at the same time.

It was noted in the Scoping Report, based on publicly available sources at the time, that low levels of fishing activity take place within Loch Fyne, typically in the Lower Loch. This includes Nephrops trawling, crab and lobster potting, and scallop diving. Fishing vessel activity in the Upper Loch Fyne was limited to a small number of inshore fishing vessels. No fishing activity was recorded within Loch Fyne on AIS during the summer or winter survey periods, noting that small fishing vessels (less than 15 m in length) may be under-represented on AIS.

VMS data reviewed for 2022 within the study area did reveal low levels of fishing vessel activity in Loch Fyne, with this typically recorded in the lower Loch Fyne area. Vessel speeds were typically below 4 knots, indicating that vessels were potentially actively engaged in fishing. It is noted that fishing is prohibited in the area opposite the Marine Facility.

The average number of unique vessels recorded per day within the shipping and navigation study area per month is presented in *Figure 19.5: Average Daily Vessel Count per Month.*

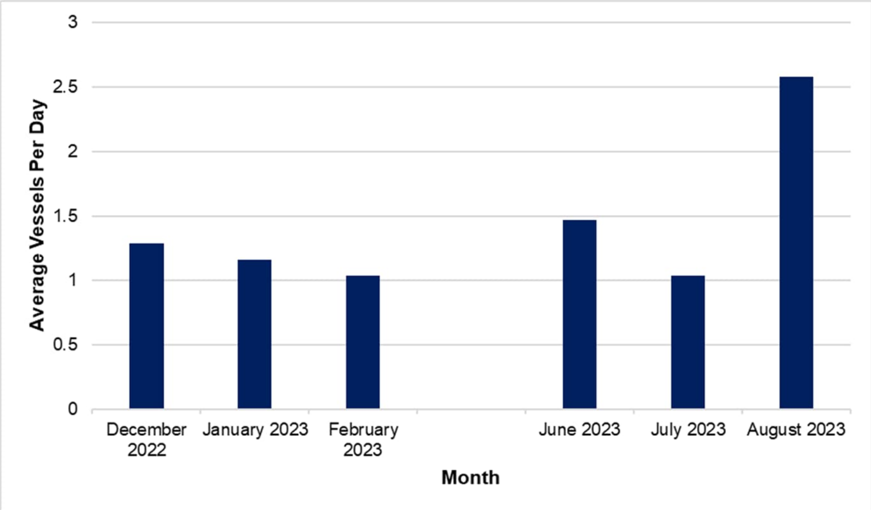


Figure 19.5: Average Daily Vessel Count per Month

There was an average of one to two vessels per day recorded within the study area over the six months of AIS data, with the summer period being slightly busier than winter, with approximately 12 vessels per week compared with eight in winter. The busiest month was August 2023, with two to three vessels per day recorded within the study area. This difference is largely due to the increase in recreational activity during August, with an increase of approximately one recreational vessel per day recorded compared with June and July. While vessel numbers were similar between winter and summer, the composition of the traffic was significantly different, with recreational vessels not present in the study area during winter, and vessels associated with the fish farms in Loch Fyne recorded only during the winter months.

The average length of vessels within the study area was 23 m, with the longest being a fish farm support vessel at 87 m. The largest vessels were most commonly recorded in the south of the study area and were generally associated with the fish farms in the area. These vessels were typically present in the winter period, with very few vessels recorded in proximity to the Marine Facility during the winter period. Vessel lengths in the summer period were smaller, and more reflective of the recreational vessels present in the area. In line with this, more vessels were recorded sailing further up Loch Fyne in closer proximity to the Marine Facility. The average length in the winter period was 37 m, with this dropping to 13 m in the summer period. *Figure 19.6: Vessel Length Distribution* presents the distribution of vessel lengths in both the winter and summer period, highlighting the prevalence of smaller vessels in the summer compared with larger vessels in the winter.

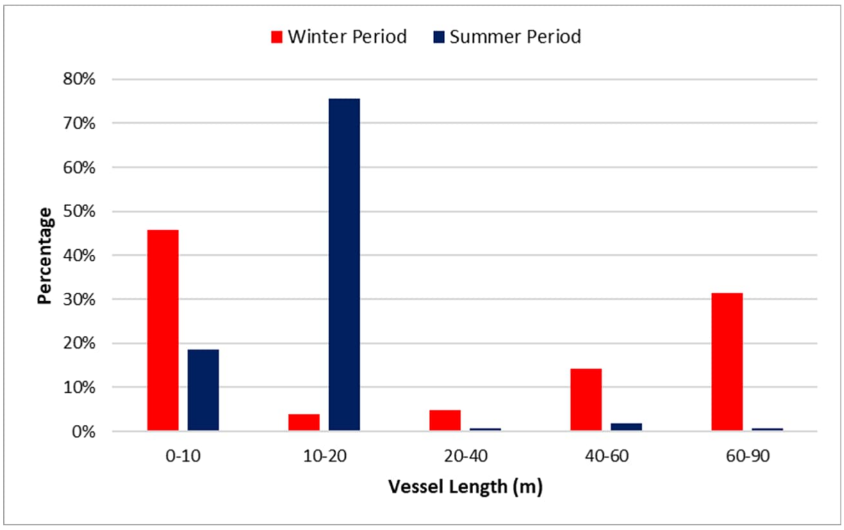


Figure 19.6: Vessel Length Distribution

Vessel speeds within the study area were typically below eight knots, with 34% of vessels being below 4 knots and a further 39% between four and eight knots. The fastest vessels tended to be those in the south of the study area associated with the fish farms, recorded during the winter period. Therefore, vessels in close proximity to the location of the Marine Facility tended to be slower moving vessels.

The maximum vessel draught recorded on AIS within the study area was 6.5 m, recorded by a fish carrier working in the south of the study area close to Furnace. The average draught of vessels within the study area was 4.8m, noting that draught information was unavailable for 73% of vessels. Draught information was generally unavailable for recreational vessels, which generally are expected to have shallow draughts. The distribution of vessel draughts is presented in *Figure 19.7: Vessel Draught Distribution.*

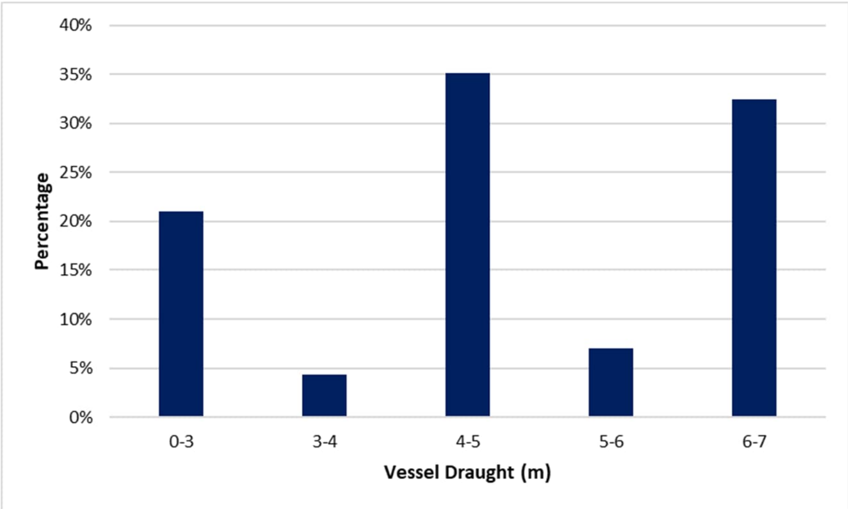


Figure 19.7: Vessel Draught Distribution

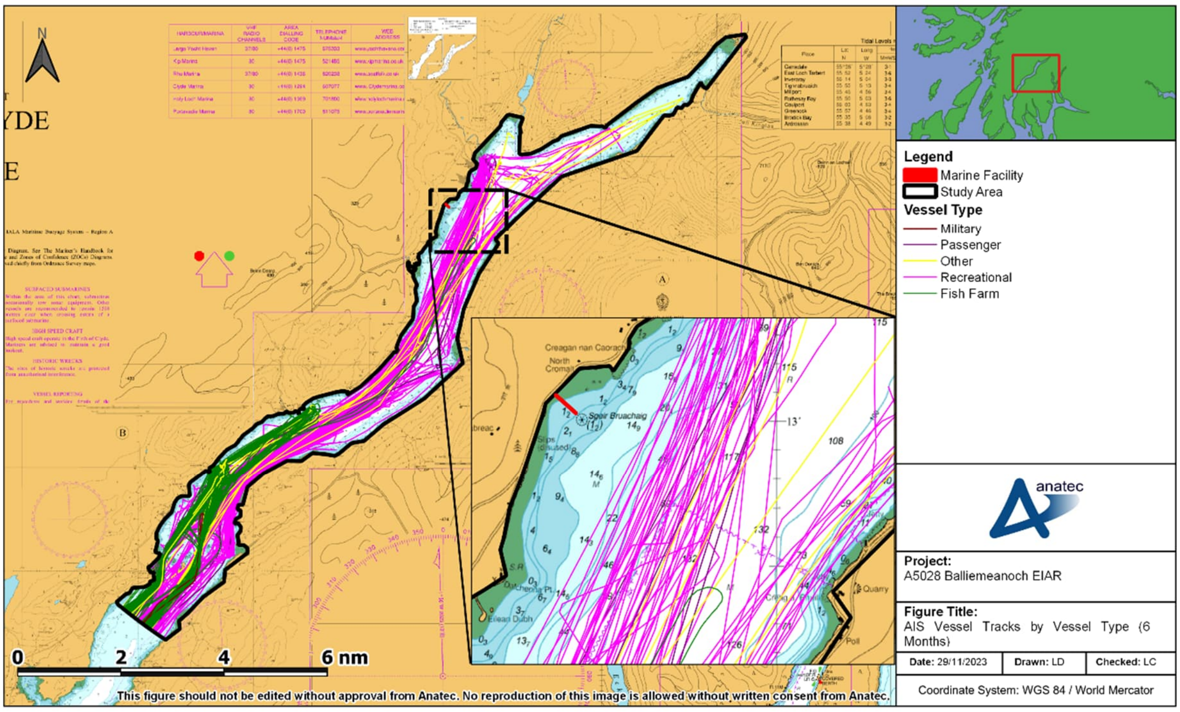


Figure 19.8 AIS Vessel Tracks by Vessel Type (6 Months)

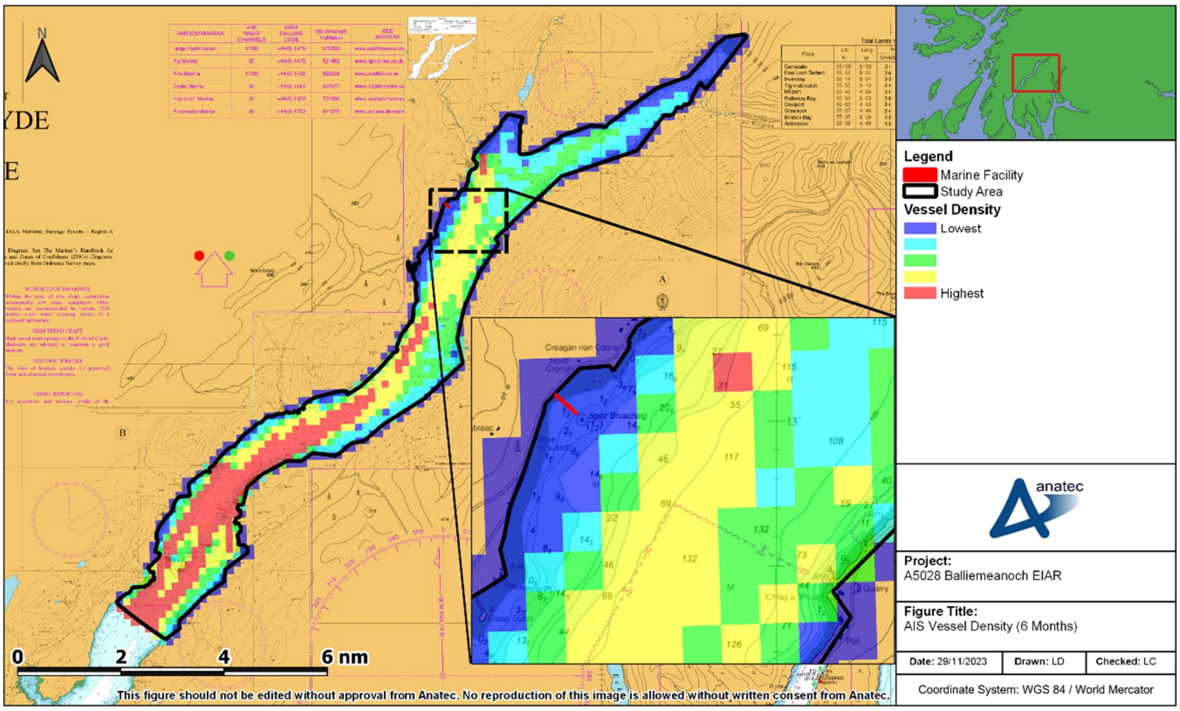


Figure 19.9 AIS Vessel Density (6 Months)

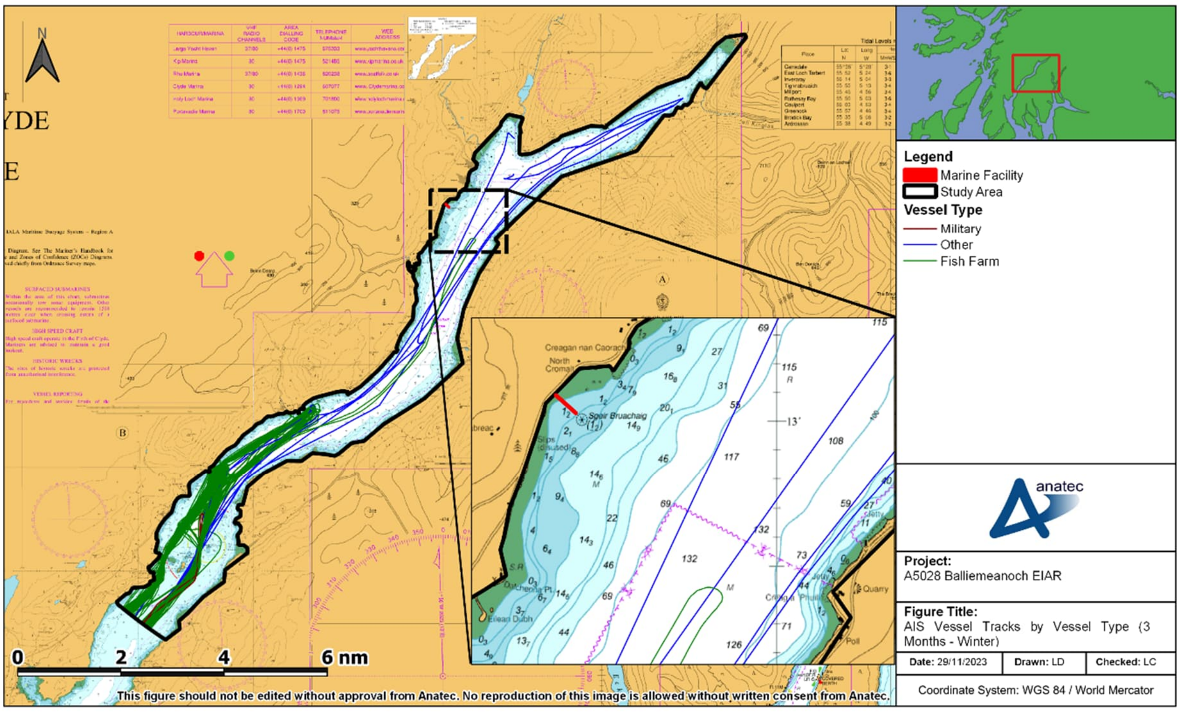


Figure 19.10: AIS Vessel Tracks by Vessel Type (3 Months Winter)

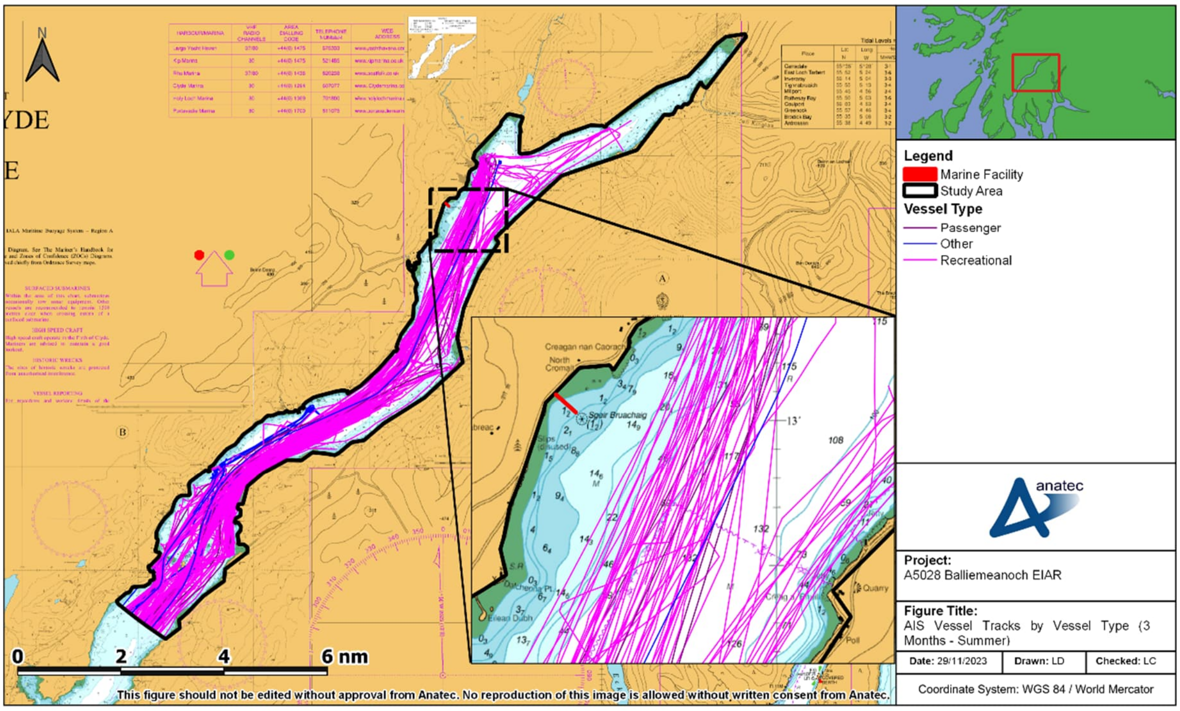


Figure 19.11: AIS Vessel Tracks by Vessel Type (3 Months Summer)

19.6.4 Future Baseline Scenario

This section provides an overview of the future baseline scenario and reviews factors that may lead to changes in vessel routeing and the existing baseline environment.

The pier at Inveraray was bought by the local community in July 2023, with works to renovate the pier beginning in November 2023. The pier is planned to reopen in April 2024, with the potential for this to increase traffic in the area, with recreational activity particularly likely to increase following the re-opening. Recreational activity can be otherwise difficult to predict but is assumed to remain similar or slightly increase in future years. Similarly, the make-up of recreational traffic may vary, with sail and electric-powered vessels expected to become more prominent in place of diesel-fuelled craft. The locations of recreational activity may also vary, while volume of activity may be dependent on other factors such as the weather, climate change and the economy. It is possible that other vessel types, such as small passenger vessels and fishing vessels, may also visit the renovated pier.

Fishing trends are difficult to project into the future, noting that trends are dependent on numerous factors including fish stocks and quotas. Further changes to legislation following Brexit may also impact the size and make-up of the fishing fleet in UK waters.

19.7 Assessment of Effects

This section presents the assessment of the potential impacts to shipping and navigation arising from the construction and operational phases of the Development. The assessment of impacts follows the methodology presented in Assessment Methodology. Due to the long-term lifetime of the Development, the decommissioning phase has been scoped out of this assessment noting that the Marine Facility is expected to be removed following the construction phase and therefore there are not anticipated to be any hazards to shipping and navigation associated with the decommissioning phase.

19.7.1 Deviations to Vessel Routeing Resulting in Increased Vessel to Vessel Collision Risk

Construction Phase

The presence of the Marine Facility and vessel movements both during construction may lead to vessels being displaced from existing routes, leading to more close encounters and a potential increased risk of collision. The Marine Facility is expected to be used up to ten times during the construction phase of the Development, being used to deliver materials required for the construction of the onshore facility. Vessel movements relating to the Development are anticipated to utilise deck cargo barges to transport large, abnormal loads to the Marine Facility, along with a vessel-based crane to deliver them to shore. Operations are planned to take place at mean tide or above to ensure maximum under keel clearance is available to project vessels. It is noted that vessels involved in the activities may be RAM. Given the scale of the Marine Facility and the traffic in the area, no commercial routes are expected to be impacted by the structure, however the presence of large vessels may lead to disruption to vessels within Loch Fyne.

In addition to vessel movements relating to the construction of the onshore Development, there are expected to be up to ten movements associated with the construction of the Marine Facility.

Vessel movements will be coordinated to minimise disruption to other vessels. Promulgation of information via Notices to Mariners, Kingfisher bulletins, radio navigational warnings, NAVTEX and broadcast warnings will serve to inform vessels of activities in the area. The developer will also liaise with Clydeport, the MOD and other local users of the Loch to ensure awareness of the activities. All vessels will be expected to comply with international marine legislation, including both COLREGs and SOLAS.

Severity of Consequence

In the event of a collision incident between third-party vessels, the most likely consequences are minor contact between vessels resulting in minor damage to property and minor reputational effects on business, with no perceptible effect on people. The maximum adverse scenario could lead to foundering of one or more vessels foundering, resulting in Potential Loss of Life (PLL) and the environmental consequence of pollution. Such a scenario would be more likely if one of the vessels involved was a small craft, which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present during the construction phase of the Development, which is scheduled to last up to seven years. However it is anticipated that the delivery of abnormal loads requiring the use of the Marine Facility will be concentrated within a shorter window within this period. Given the low number of vessel movements, and considering that marine coordination and planning will be used to minimise impacts on other vessels, in addition to the low traffic volume within Loch Fyne, it is not anticipated that there will be significant displacement leading to increased vessel encounters. In the event of an encounter, it is expected that vessels complying with the COLREGs would further reduce the likelihood of the situation escalating into a collision incident.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of Impact

Overall, the severity of consequence is deemed to be moderate, and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

Operational Phase

The Marine Facility is currently planned to be removed following the completion of the construction phase, however some infrastructure may be left in place should there be any requirement for the delivery of additional abnormal loads for major maintenance works. If needed, these are expected to be infrequent.

Severity of Consequence

In the event of a collision incident between third-party vessels, the most likely consequences are minor contact between vessels resulting in minor damage to property and minor reputational effects on business, with no perceptible effect on people. The maximum adverse scenario could lead to foundering of one or more vessels foundering, resulting in PLL and the environmental consequence of pollution. Such a scenario would be more likely if one of the vessels involved was a small craft, which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The operational phase is expected to last around100 years, however periods of maintenance requiring abnormal loads to be delivered are expected to be infrequent throughout this. Should the Marine Facility remain in place, and be required, the mitigations in place will ensure that displacement of vessels is low and therefore the increase in collision risk will be low.

The frequency of occurrence is therefore considered to be **negligible**.

Significance of Impact

Overall, the severity of consequence is deemed to be moderate, and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

19.7.2 Increased Vessel to Vessel Collision Risk Between a Third-Party Vessel and a Project Vessel

Construction Phase

During the construction phase of the Development, there will also be increased collision risk between vessels due to the presence of additional vessels associated with the Development. It is noted that many of the vessels visiting the Marine Facility will be slower moving larger vessels transporting abnormal loads, and therefore may be RAM. These vessels may have limited capability to take avoidance action if on a collision course with another vessel, should such a situation arise.

The collision risk is likely to be greater in the higher density areas of the Loch, where encounters are more likely to take place. The vessel density is higher in the lower regions of the Loch, and is generally associated with seasonal vessel activity such as recreational vessels in the summer and fish farm vessels in the winter. Vessel numbers within the study area peaked at two to three vessels per day in August 2023, reflecting the overall low vessel density within Loch Fyne.

Promulgation of information using a variety of means will serve to ensure awareness of project activities, reducing the likelihood of unexpected encounters with other vessels, particularly those which may be RAM. This includes the use of Notices to Mariners, Radio Navigational Warnings, Navigational Telex (NAVTEX), and broadcast warnings, as well as liaison with local sailing clubs and Clydeport. Vessels involved in the Development will also be managed via marine coordination and carry out vessel traffic monitoring, in order to minimise disruption to vessels in the area. Vessels will also display any relevant marks and lights to ensure nearby vessels are aware of their presence.

Severity of Consequence

The most likely consequence in the event of a collision incident between a project vessel and third-party vessel is a minor contact between the vessel and resulting in minor damage to property and minor reputational effects on business. The maximum adverse scenario may involve one or more vessels foundering resulting in PLL and the environmental consequence of pollution. Such a scenario might be more likely if the third-party vessel involved was a small craft (such as a recreational vessel), which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present intermittently throughout the construction phase of the Development, with the Marine Facility anticipated to be used up to a total of ten times throughout the construction phase, with a further ten vessel visits required for the installation of the Marine Facility. Given the low traffic volumes present in the Loch, it is not considered likely that close encounters between project vessels and third-party vessels will occur. In the event that a close encounter does occur, collision avoidance action as per the COLREGs will be implemented, reducing the likelihood of the encounter escalating into a collision incident. This includes Rule 18, which governs responsibilities between vessels if one is RAM.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of Impact
Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

Operational Phase
As previously noted, the Marine Facility is currently planned to be removed following the construction phase. Should the Marine Facility remain in place, it is anticipated that project vessel use of the Marine Facility will limited, and only when maintenance requires the replacement of major components of the Development. Therefore it is unlikely that there will a significant number of project vessel movements within Loch Fyne during the operational phase of the Development.

Severity of Consequence
As per the construction phase, the most likely consequence of a collision incident between a project vessel and third-party vessel is a minor contact, while the maximum adverse scenario may involve vessel foundering resulting in PLL.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The operational phase is expected to last around 100 years, however periods of maintenance requiring abnormal loads to be delivered are expected to be infrequent throughout this. Should the Marine Facility remain in place, and be required, the mitigations in place will ensure the increase in collision risk will be low.

The frequency of occurrence is therefore considered to be **negligible.**

Significance of Impact
Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

19.7.3 Increased Risk of Vessel Grounding and Restriction on Vessel Size Navigating Loch Fyne to Inveraray

Construction Phase
The presence of project vessels navigating within Loch Fyne may reduce navigable room for other vessels transiting in the area. This may lead to vessels being displaced into shallower water, leading to a potential increase in grounding risk. Charted water depths within Loch Fyne are typically in excess of 70 m throughout the centre of the loch, with a central channel of approximately 0.6nm width with depths greater than 70 m, outside of which depths reduce rapidly towards the banks of the loch. While this does allow room for two vessels to pass one another, space is therefore limited within the loch to carry out manoeuvres including any potential collision avoidance actions.

Vessel operations within Loch Fyne are planned to take place at mean tide or above for the purposes of accessing the Marine Facility, meaning that under keel clearance for other vessels will also be increased during periods of activity.

Promulgation of information and liaison with other local users, such as Clydeport and the MoD will help to ensure that encounters between large vessels within the loch are limited and well-coordinated to avoid pushing vessels into dangerous water depths. Project vessels will be managed via marine coordination, marked and lit as required, and broadcast their positions on AIS so as to ensure the awareness of other users. In addition, vessels will comply with the requirements of the COLREGs and SOLAS.

In addition to the risk of grounding, it is also possible that the presence of project vessels may place limitations on access to the navigable space within Loch Fyne, as larger vessels may be unable to pass safely within sufficient water depths.

Severity of Consequence

The most likely consequence due to the reduction in navigable room within Loch Fyne is the temporary loss of some access to the Upper Loch during project activities involving larger vessels. In the event of a grounding occurring, most likely consequences are minor damage to property, as well as minor reputational effects on business, but no perceptible effect on people. The maximum adverse scenario is that of a vessel being pushed into areas with insufficient under keel clearance and suffering a grounding incident, which may lead to pollution, vessel foundering and PLL.

Overall the severity of consequence is considered to be **moderate**.

Frequency of Occurrence

Given the low number of vessel movements, any effect caused by the activities on the navigable room available are expected to be short term. Traffic volumes within the Loch are low, therefore the likelihood of vessels being displaced into dangerously shallow water is low. Vessels using the loch were typically either recreational vessels or fish farm vessels, depending on the season, which both generally have relatively shallow draughts.

Therefore the frequency of occurrence is considered to be **extremely unlikely.**

Significance of Impact

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

Operational Phase

Should the Marine Facility remain in place, vessel activities may have a similar impact on grounding risk within Loch Fyne as in the construction phase.

Severity of Consequence

The consequences of the impact are as described for the construction phase. The severity of consequence is considered to be **moderate**.

Frequency of Occurrence

Considering the anticipated removal of the Marine Facility, and the infrequent vessel visits should it remain in place, it is not expected that there will be a significant increase in grounding risk during the operational phase.

Therefore the frequency of occurrence is considered to be **negligible**.

Significance of Impact

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

19.7.4 Disruption to Fishing and Recreational Activities

Construction Phase

Disruption to fishing activities is considered within this Chapter from a navigational risk perspective, however commercial impacts such as loss of fishing grounds will be considered within Chapter 20: Commercial Fisheries of the EIAR.

Project vessel activities during the construction phase may cause disruption to fishing and recreational activities in the area. No fishing activity was recorded on AIS during either the summer or winter period, however the Scoping Report does indicate that a low level of fishing activity takes place throughout Loch Fyne. It is noted that AIS may under-represent fishing vessels, particularly those under 15 m in length. Fishing activity was recorded on VMS during 2022, with this typically occurring in the Lower Loch. Fishing is prohibited in the area opposite the Marine Facility, meaning that it is considered unlikely that vessel activities at the Marine Facility will impact fishing activities. Some disruption to fishing activities may still be caused during transit through the Loch.

Recreational activity was recorded throughout Loch Fyne during the summer survey period, with an average of one to two recreational vessels per day during the three months. Activity was highest in the Lower Loch, although vessels were also frequently recorded heading north to Inveraray. It is noted that there may be an increase in vessels visiting Inveraray following the re-opening of the pier in April 2024. The presence of leisure mooring agreements throughout Loch Fyne was noted in the Scoping Report.

Key mitigation measures in minimising disruption to fishing and recreational activities will include the promulgation of information using a variety of means, liaison with Clydeport and other local user groups, and the management of project vessels using marine coordination.

Severity of Consequence

Disruption to recreational and fishing activities are anticipated to primarily be related to vessel activities at the Marine Facility, and with vessels passing through Loch Fyne. With the mitigation measures in place and effective liaison with other users, it is anticipated that disruption to fishing and recreational activities are anticipated to be extremely short-term and minor in scale.

Therefore the severity of consequence is expected to be **minor**.

Frequency of Occurrence

Given the low traffic volumes in the area and the relatively small number of vessel movements anticipated, the likelihood of fishing and recreational activity being disrupted is expected to be low.

Therefore the frequency of occurrence is considered to be **extremely unlikely**.

Significance of Impact

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

Operational Phase

The Marine Facility is currently planned to be removed following the construction phase. Therefore it is unlikely that there will a significant impact on fishing or recreational activities during the operational phase of the Development.

Severity of Consequence

As per the construction phase, the most likely consequence of a collision incident between a project vessel and third-party vessel is a minor contact, while the maximum adverse scenario may involve vessel foundering resulting in PLL.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

Periods of major maintenance requiring abnormal loads to be delivered are expected to be infrequent during the operational phase, with the Marine Facility expected to be removed following the construction phase. Should the Marine Facility remain in place, and be required, the mitigations in place will ensure that displacement of vessels is low and therefore the likelihood of disruption to fishing and recreational activities is low.

The frequency of occurrence is therefore considered to be **negligible**

Significance of Impact

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

19.7.5 Disruption to Military Exercises

Construction Phase

Loch Fyne is contained within a submarine exercise area, with it noted during consultation that submarines frequently enter the Loch, both submerged and on the surface during exercises. In addition to this, it was raised during consultation that sounding exercises also take place within the Loch.

The MoD were consulted at the scoping stage, and will continue to be consulted throughout the application process. Liaison with the MoD should also be carried out during the construction phase of the Development to ensure vessel activities within the Loch do not cause disruption to military exercises. It was agreed with the MoD that the piling activities would cease during sounding trials in Loch Fyne, which are expected to take place on approximately 12 days per year.

Severity of Consequence

With appropriate consultation undertaken during the application process and liaison carried out with the MoD throughout the construction phase, with notifications of vessel activities given, it is not expected that there will be significant disruption to any military exercises.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

Given the low number of vessel movements expected during the construction phase, the likelihood of these activities disrupting military exercises is considered to be low.

Therefore the frequency of occurrence is considered to be **extremely unlikely**.

Significance of Impact

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

Operational Phase

As previously noted, the Marine Facility is currently planned to be removed following the construction phase. Therefore it is unlikely that there will a significant impact on military activities during the operational phase of the Development.

Severity of Consequence

As per the construction phase, the severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

Periods of major maintenance requiring abnormal loads to be delivered are expected to be infrequent during the operational phase, with the Marine Facility expected to be removed following the construction phase. Should the Marine Facility remain in place, and be required, the mitigations in place will ensure that displacement of vessels is low and therefore the likelihood of disruption to military exercises is low.

The frequency of occurrence is therefore considered to be **negligible.**

Significance of Impact

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

19.7.6 Allision Risk Between Third-Party Vessels and New Structure

Construction Phase

During the construction phase, the installation of the new Marine Facility will increase the risk of allision between third-party vessels and the new structure. Traffic levels in the vicinity of the Marine Facility are low, and the Upper Loch is mainly used by recreational vessels, and by those only in the summer months, noting that there may be vessel activity not covered by AIS. During the winter months, vessels within Loch Fyne were generally fish farm vessels working in the Lower Loch. It is noted that the re-opening of the Inveraray pier has the potential to increase vessel activity in the vicinity of the Marine Facility, including the potential for other vessel types to visit the new facility. An allision incident may occur either under power, due to watchkeeper failure, or due to a machinery or engine failure leading a vessel to drift towards the Marine Facility.

The Marine Facility will be marked and lit appropriately in agreement with the NLB, and information will be promulgated with local communities and via a range of methods, to ensure that vessels are aware of the Marine Facility.

Severity of Consequence

The most likely consequences of a vessel allision with the Marine Facility are minor contact resulting in minor property damage, and minor reputational effects on business, but no perceptible effect on people. The maximum adverse scenario may involve the foundering of an alliding vessel, leading to PLL and pollution. Such a scenario may be more likely if a recreational vessel or other small craft is involved in an allision, as these may have weaker structural integrity.

The overall severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

Considering the Marine Facility extends only 180 m into the Loch in shallow waters, and the low levels of traffic typical in the Upper Loch Fyne, the likelihood of allision incidents occurring is considered very low.

Therefore the frequency of occurrence is considered to be **negligible**.

Significance of Impact

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

Operational Phase

If the Marine Facility remains in place during the operational phase, an increased allision risk will remain within Loch Fyne as discussed for the construction phase.

Severity of Consequence

The consequences of the impact are as described for the construction phase.

Therefore the severity of consequence is considered to be **moderate**.

Frequency of Occurrence

Considering the anticipated removal of the Marine Facility, it is not expected that there will be a significant increase in allision risk during the operational phase. Should the Marine Facility remain in place, the small extent of the jetty into the Loch and low traffic volume mean that the likelihood of an allision incident occurring remains low.

Therefore the frequency of occurrence is considered to be **negligible**.

Significance of Impact

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

19.7.7 Reduced Access to Local Harbours

Construction Phase

There is the potential for increased disruption to access to local harbours during the construction phase of the Development. The closest harbour to the Marine Facility location is the pier at Inveraray, located approximately 1nm to the north of the Marine Facility, noting that it is currently closed for redevelopment. The pier is expected to re-open in April 2024.

The main source of disruption is likely to be during project vessel activities and movements within Loch Fyne, particular during offloading at the Marine Facility. Project vessels will be managed by marine coordination, display appropriate marks and lights, broadcast on AIS and will be compliant with relevant Flag State regulations including the COLREGs, including Rule 18 which applies to vessels which are RAM. Liaison with Clydeport and local harbours will also help to manage disruption.

Severity of Consequence

Access to Inveraray may be impacted by the presence of vessels which may be RAM. Considering the mitigation measures in place to minimise disruption, most notably promulgation of information and liaison with local user groups, any loss of access is expected to be brief.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

The impact will be present intermittently during the construction phase, with low numbers of vessel movements expected to take place. Given the low traffic volume and the navigable room available, the likelihood of vessels being unable to access harbours is considered to be low.

Therefore the frequency of occurrence is considered to be **extremely unlikely**.

Significance of Impact

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

Operational Phase

As previously noted, the Marine Facility is currently planned to be removed following the construction phase. Therefore it is unlikely that there will a significant impact on harbour access during the operational phase of the Development.

Severity of Consequence

As per the construction phase, any loss of access to the harbour at Inveraray is expected to be temporary and unlikely to impact smaller vessels, which should have room to pass activities.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

Periods of major maintenance requiring abnormal loads to be delivered are expected to be infrequent during the operational phase, with the Marine Facility expected to be removed following the construction phase. Should the Marine Facility remain in place, and be required, the likelihood of any impact to harbour access remains very low as per the construction phase.

The frequency of occurrence is therefore considered to be **negligible**

Significance of Impact

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable adverse** significance, which is **not significant** in EIA terms.

19.8 Cumulative Effects

There are no cumulative schemes anticipated to cause any likely cumulative effects. The only development in the vicinity of the Marine Facility is the redevelopment of the pier at Inveraray, which is considered within the future baseline.

19.9 Mitigation and Monitoring

19.9.1 Embedded Mitigation

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. These measures have and will continue to evolve over the course of the Development process as the EIA progresses and in response to consultation.

These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements. As there is a commitment to implementing these measures, and also to various standard sectoral practices and procedures, they are considered part of the design of the Development.

Embedded mitigation measures are presented in *Table 19.9 Embedded Mitigation Measures Relevant to Shipping and Navigation.*

Table 19.9 Embedded Mitigation Measures Relevant to Shipping and Navigation

Embedded Mitigation Measure	Description
Promulgation of information	Information will be distributed via means such as Notices to Mariners, Radio Navigational Warnings, NAVTEX and/or other navigation broadcast warnings as soon as reasonably practicable in advance of and during vessel activities.
Use of advisory safe clearance distances during vessel activities	Passing vessels will be requested to maintain a safe passing distance around any project vessels restricted in manoeuvrability.
Vessel traffic monitoring and marine coordination	Marine coordination (e.g., the preparation of a Vessel Management Plan) and communication will be used to manage project vessel movements and minimise impact on other vessels. This will include the timing of vessel movements to not interfere with scheduled ferries and other known vessel movements.
Compliance with COLREGs/SOLAS	Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably the COLREGs (IMO, 1972/78) and SOLAS (IMO, 1974).
As-Built Information	The location, extent and nature of the Marine Facility will be communicated with the UKHO and any other relevant bodies to ensure awareness of the Development.
Marking and lighting of Marine Facility and construction vessels	Project vessels will display appropriate marks and lights, and will broadcast their status on AIS at all times, to indicate the nature of the work in progress, and highlight their restricted manoeuvrability, if applicable. The Marine Facility will also be marked and lit as per the requirements of IALA guidance and in agreement with the NLB.
Liaison with Clydeport and local harbours	Liaison with local ports and harbours, particularly Clydeport, during the construction phase.
Liaison with MoD	Liaison with the MoD will be undertaken to ensure project activities do not interfere with military exercises. Piling works associated with the construction phase will cease during trials within Loch Fyne (circa 12 days per year) to avoid generating noise in the water.
Review of feasibility of delivery of construction materials via Loch Fyne	Review of the route through Loch Fyne will be undertaken to ensure the navigation channel is feasible and suitable vessels are used.

Additional Mitigation, Compensation and Enhancement

No additional mitigation measures are considered necessary as all effects were assessed to be of broadly acceptable significance.

19.10 Residual Effects

Summaries of the assessment of effects for the construction and operation phases are presented in *Table 19.10 Summary of Effects: Construction* and *Table 19.11 Summary of Effects: Operation.*

Table 19.10 Summary of Effects: Construction

Receptor	Description of Effect	Severity of Consequence	Frequency of Occurrence	Significance of Effect	Additional Mitigation	Residual Significance
All Vessels	Deviations to Vessel Routeing Resulting in Increased Vessel to Vessel Collision Risk	Moderate	Extremely Unlikely	Broadly Acceptable	N/A	Broadly Acceptable
All Vessels	Increased vessel to vessel collision risk between a third-party vessel and a project vessel	Moderate	Extremely Unlikely	Broadly Acceptable	N/A	Broadly Acceptable
All Vessels	Increased risk of vessel grounding and restriction on vessel size navigating Loch Fyne to Inveraray	Moderate	Extremely Unlikely	Broadly Acceptable	N/A	Broadly Acceptable
Fishing Vessels, Recreational Vessels	Disruption to fishing and recreational activities	Minor	Extremely Unlikely	Broadly Acceptable	N/A	Broadly Acceptable
Military Vessels	Disruption to military exercises	Minor	Extremely Unlikely	Broadly Acceptable	N/A	Broadly Acceptable
All Vessels	Allision risk between third-party vessels and new structure	Moderate	Negligible	Broadly Acceptable	N/A	Broadly Acceptable
All Vessels	Reduced access to local harbours	Minor	Extremely Unlikely	Broadly Acceptable	N/A	Broadly Acceptable

Table 19.11 Summary of Effects: Operation

Receptor	Description of Effect	Frequency of Occurrence	Severity of Consequence	Significance of Effect	Additional Mitigation	Residual Significance
All Vessels	Deviations to Vessel Routeing Resulting in Increased Vessel to Vessel Collision Risk	Moderate	Negligible	Broadly Acceptable	N/A	Broadly Acceptable
All Vessels	Increased vessel to vessel collision risk between a third-party vessel and a project vessel	Moderate	Negligible	Broadly Acceptable	N/A	Broadly Acceptable
All Vessels	Increased risk of vessel grounding and restriction on vessel size navigating Loch Fyne to Inveraray	Moderate	Negligible	Broadly Acceptable	N/A	Broadly Acceptable

Receptor	Description of Effect	Frequency of Occurrence	Severity of Consequence	Significance of Effect	Additional Mitigation	Residual Significance
Fishing Vessels, Recreational Vessels	Disruption to fishing and recreational activities	Minor	Negligible	Broadly Acceptable	N/A	Broadly Acceptable
Military Vessels	Disruption to military exercises	Minor	Negligible	Broadly Acceptable	N/A	Broadly Acceptable
All Vessels	Allision risk between third-party vessels and new structure	Moderate	Negligible	Broadly Acceptable	N/A	Broadly Acceptable
All Vessels	Reduced access to local harbours	Minor	Negligible	Broadly Acceptable	N/A	Broadly Acceptable

19.11 References

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 20: Commercial Fisheries

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

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20. Commercial Fisheries

20.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) has been prepared by Brown and May Marine Ltd and presents the assessment of the likely significant effects (as per the “EIA Regulations”) of the Balliemeanoch Pumped Storage Hydro (PSH) which is the subject of this application (hereafter referred to as the ‘Development’), on commercial fisheries. Specifically, this chapter considers the potential impacts of the Marine Facility associated with the Development, during the construction and operational phases of the Marine Facility. A full description of the Marine Facility is presented in *Chapter 2: Project and Site Description*.

Likely significant effect is a term used in both the “EIA Regulations” and the Habitat Regulations. Reference to likely significant effect in this EIAR refers to “likely significant effect” as used by the “EIA Regulations”.

The assessment presented is informed by the following technical chapters:

- Chapter 08: Marine Ecology; and
- Chapter 19: Shipping and Navigation.

Accompanying this chapter are the following figures which can be found within EIAR *Volume 3 Figures* (aside from *20.7 & 20.8* which are embedded within this chapter):

- Figure 20 1: Commercial Fisheries Study Area
- Figure 20 2: Annual Landings Value (£) By Species (Average 2017 – 2021).
- Figure 20 3: Annual Landings Value (£) By Method (Average 2017 – 2021)
- Figure 20 4: Upper Loch Fyne and Loch Goil Nature Conservation Marine Protected Area
- Figure 20 5: Electrofishing for Razor Clams Trial Areas
- Figure 20 6: Ports Local to the Marine Facility
- Figure 20 7: Landings (£) by Species in Local Ports (Annual Average 2021 – 2022) (Marine Management Organisation , 2023) (within this chapter)
- Figure 20 8: Landings by Gear in Local Ports (Annual Average 2021 – 2022) (Marine Management Organisation , 2023) (within this chapter)
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- Figure 20 19: Inshore Fishing – Crab & Lobster Pots – Value (£)

20.2 Legislation and Policy

Policy on energy infrastructure is presented in the standalone planning statement submitted with the EIAR. Policy specifically in relation to commercial fishing is contained in the Scottish National Marine Plan (SNMP). A summary of SNMP policy provisions related to commercial fisheries is provided in *Table 20.1: Summary of SNMP Policies*

Relevant to Commercial Fisheries. This is focused on those directly of relevance to commercial fisheries in the context of the assessment presented in this chapter.

Table 20.1: Summary of SNMP Policies Relevant to Commercial Fisheries

<table>
<tr><th>Summary of Relevant Policy Framework</th><th>How and Where Considered in the Offshore EIA Report</th></tr>
<tr><td>General Planning Principle (GEN) Policies
GEN-4 – Co-existence: Proposals which enable coexistence with other development sectors and activities within the Scottish marine area are encouraged in planning and decision-making processes, when consistent with policies and objectives of the Plan.</td><td>Due consideration has been given to the potential impacts of the Marine Facility on commercial fisheries within this chapter. This has been informed through the collection of information on fisheries activities and a review of available fisheries data as shown in Section 20.5.3.1: Desktop Study.</td></tr>
<tr><td>Fisheries, Marine Planning Policies
FISHERIES 1 – Taking account of the European Union (EU)'s Common Fisheries Policy, Habitats Directive, Birds Directive and Marine Strategy Framework Directive, marine planners and decision makers should aim to ensure:
– existing fishing opportunities and activities are safeguarded wherever possible;
– protection of vulnerable stocks (in particular juvenile and spawning stocks through continuation of sea area closures where appropriate);
– that other sectors take into account the need to protect fish stocks and sustain healthy fisheries for both economic and conservation reasons; and
FISHERIES 2 - The following key factors should be taken into account when deciding on uses of the marine environment and potential impacts on fishing:
– the cultural and economic importance of fishing, in particular vulnerable coastal communities;
– the potential impact (positive and negative) of marine developments on the sustainability of fish and shellfish stocks and resultant fishing opportunities in any given area;
- the environmental impact on fishing grounds (such as nursery, spawning areas), commercial fisheries species, habitats and species more generally; and
– the potential effect of displacement on fish stocks; the wider environment; use of fuel; socio-economic costs to fishers and their communities and other marine users.</td><td>Due consideration has been given to the potential impacts of the Marine Facility on commercial fisheries within this chapter. This has been informed through the collection of information on fisheries activities and a review of available fisheries data as shown in Section 20.5.3.1: Desktop Study.
Consultation with the fishing industry has been conducted and informed this assessment. Consultation will continue post-consent, throughout the construction, operation and maintenance phases as required.

The potential impacts of the Marine Facility on fish and shellfish stocks, including potential impacts on habitats, spawning and nursery grounds (including on species of commercial importance) have been assessed and are discussed in Chapter 08: Marine Ecology. Potential knock-on effects of impacts on fish and shellfish species on the fisheries that target them as well as the impact of displacement of fishing activities into other areas are assessed in section 20.7 Assessment of Effects.

Socio-economic effects, including aspects of relevance to fishing communities are discussed in Chapter 16: Socioeconomics, Recreation and Tourism. Impacts on other sea users are addressed in Chapter 19: Shipping and Navigation.</td></tr>
<tr><td>Sea Fisheries, Interactions with Other Users
Updated Paragraphs 6.22 to 6.26:
– There are some key emerging issues concerning the interactions between the fishing industry and other interests which should be borne in mind of any proposed marine development and factored into marine planning processes. In respect of developments this includes:
There is also potential for damage to occur to both infrastructure and fishing equipment as a result of interactions, with obvious safety implications. New developments should take into account the intensity of fishing activity in the proposed development area and any likely displacement which the development and associated activity could precipitate, with resultant increased pressure on remaining, often adjacent, fishing grounds.
There may be potential for some infrastructure or development areas to act as nursery grounds for fish and, if appropriately protected, these may lead to an increase in fish stocks in the surrounding</td><td>The potential impact of loss of fishing grounds as a result of the Marine Facility and associated displacement of activity is assessed in section 20.7 Assessment of Effects.

The potential impacts of the Development on fish and shellfish stocks, including potential impacts on habitats, spawning and nursery grounds (including on species of commercial importance) has been assessed and are discussed in Chapter 08: Marine Ecology.</td></tr>
</table>

Summary of Relevant Policy Framework	How and Where Considered in the Offshore EIA Report
areas. This possibility should be considered on a case-by-case basis.	

20.3 Consultation

The Balliemeanoch Pumped Storage Hydro Scheme Scoping Opinion (Scottish Government Energy Consents Unit, 2023) and advice of relevance to the Development and commercial fisheries is summarised in *Table 20-2: Summary of Scoping Opinions and Advice*.

In addition to feedback on commercial fisheries aspects received as part of the Scoping Opinion and Advice, due consideration has been given in this chapter to the outputs of the additional consultation carried out with fisheries stakeholders which is detailed in *Table 20.3: Summary of Consultation*, below.

Table 20-2: Summary of Scoping Opinions and Advice

Consultee	Consultee Response	Summary of Response	Action Taken
Maritime & Coastguard Agency (MCA)	It is not clear from the Scoping Report the extent of the works required in the marine environment for the tail pond inlet/outlet structure located to the north of the site on Loch Awe, and any potential impact on shipping and navigation. It is our understanding that this location falls outside of any statutory harbour authority jurisdiction. The MCA would therefore expect consideration to be given to the impact of the proposed works on shipping and navigation, relative to the scale of the works, including any potential impact on fishing, recreational and commercial vessels. It is likely that any risk can be mitigated through suitably worded conditions and advisories at the formal marine licencing stage.	Concerned regarding the scale of works required in Loch Awe for the tail pond and any potential shipping and navigation impacts.	The potential impacts of the Development on shipping and navigation, including commercial fishing vessels, have been given due consideration in *Chapter 19: Shipping and Navigation*.
Scottish Fishermen's Federation (SFF)	Having discussed this we do not think it will have any impact on our members, so consider us a Nil Response.	No anticipated impacts on SFF members.	The feedback provided by fisheries stakeholders has been accounted for within the baseline characterisation and impact assessment presented in this chapter.

In addition to statutory consultee responses to the Scoping Report, consultation was undertaken to inform the baseline and subsequent impact assessment via email and face-to-face meetings. Consultees were asked to describe their, or their members, fishing activity in relation to the location of the proposed Development's 'Marine Facility'. Consultees were then asked if they had any concerns or feedback regarding the Marine Facility. The consultation undertaken and feedback provided by consultees is summarised in *Table 20.3: Summary of Consultation*. This has been integrated into the baseline characterisation as well as the impact assessment as appropriate.

Face-to-face consultation was conducted during visits to the following local harbours from 27/10/2023 – 28/10/2023:

- Inveraray;
- Tarbert; and
- Strachur.

Table 20.3: Summary of Consultation

Consultee	Method and Date	Consultation	Summary of Response	Action Taken
Campbelltown Fisheries Office	Email 19/09/2023 – 02/10/2023	Email consultation with Campbelltown Fisheries Office to introduce the Development and	The local fisheries office advised that there are only two creel vessels targeting *Nephrops* working in the	The information gathered via consultation has been used to inform the baseline characterisation and impact

Consultee	Method and Date	Consultation	Summary of Response	Action Taken
		gather information regarding fishing activities in waters adjacent to the Marine Facility.	upper reaches of Loch Fyne. Demersal trawling and dredging in the area is banned within the Upper Loch Fyne and Loch Goil Nature Conservation Marine Protected Area (NCMPA).	assessment presented in this chapter.
Clyde Fishermen's Association (CFA)	Email 19/09/2023 – 20/10/2023	Email consultation with CFA to introduce the Development. Requested any comments or concerns regarding the Marine Facility were highlighted.	The CFA circulated plans and information regarding the Marine Facility amongst their members. No CFA members provided any feedback or raised any concerns.	The information gathered via consultation has been used to inform the baseline characterisation and impact assessment presented in this chapter.
Fisher: Inveraray	In-person 27/10/2023	In-person consultation with fisher moored in Inveraray during harbour visit. Introduced the Development and asked if there were any comments or concerns regarding the Marine Facility.	Stated that they fish further out into the loch and therefore had no concerns regarding the Marine Facility. Advised that there was only one other vessel fishing the area moored in Strachur.	• Consulted with Strachur Mooring Association via email to gather feedback from boat moored there regarding the Marine Facility. • The information gathered via consultation has been used to inform the baseline characterisation and impact assessment presented in this chapter.
Local shellfish merchant	In-person 27/10/2023	In-person consultation with local shellfish merchant during harbour visit. Introduced the Development and requested information regarding fishing activity in waters adjacent to the Marine Facility.	Advised that there is no trawling activity past 'Inveraray Golf Course', which is situated between Auchnabreac and Inveraray. They knew of two creelers working in the area, one moored in Inveraray and one moored in Strachur.	• Met with fisher based in Inveraray regarding Marine Facility. • Consulted Strachur Mooring Association via email to gather feedback from boat moored there regarding the Marine Facility. • The information gathered via consultation has been used to inform the baseline characterisation and impact assessment presented in this chapter.
Strachur Moorings Association	Email 02/10/2023 – 11/10/2023	Skipper/owner of fishing vessel moored in Strachur was not available during harbour visit. Email consultation with mooring association. Introduced the Development and asked if the Association for any comments or concerns regarding the Marine Facility.	The following feedback was provided: *"We do not believe that a temporary jetty in the vicinity of Inveraray would impact greatly on the fishing of the Strachur based boat."*	The information gathered via consultation has been used to inform the baseline characterisation and impact assessment presented in this chapter.
Tarbert Harbour Authority	In-person 28/10/2023	In-person consultation with harbour authority during harbour visit. Introduced the Development and requested information regarding fishing activity in waters adjacent to the Marine Facility.	Advised that there is very little fishing past Ardrishag, and there is no trawling in Loch Fyne past Inveraray.	The information gathered via consultation has been used to inform the baseline characterisation and impact assessment presented in this chapter.
South West Coast Regional Inshore Fisheries Group (SWCRIFG)	Email 19/09/2023 – 11/10/2023	Email consultation with SWCRIFG to introduce the Development. Requested any comments or concerns regarding the Marine Facility were highlighted.	The SWCRIFG circulated plans and information regarding the Marine Facility amongst their members. No SWCRIFG members provided any feedback or raised any concerns.	The information gathered via consultation has been used to inform the baseline characterisation and impact assessment presented in this chapter.

20.4 Study Area

The Marine Facility is situated within the Upper Loch Fyne *(Figure 20 1: Commercial Fisheries Study Area (Volume 3: Figures).* Fisheries data are recorded and collated by International Council for the Exploration of the Sea (ICES) statistical rectangles. The commercial fisheries study area has therefore been defined with reference to the ICES rectangles which are as follows:

- ICES rectangle 41E4 - encompasses the Marine Facility and Upper Loch Fyne.

The commercial fisheries Study Area defined in above and *(Figure 20 1: Commercial Fisheries Study Area (Volume 3: Figures)* has been used to identify fishing activities of relevance in the immediate area of the Marine Facility. Where relevant, data and information have been analysed for wider areas to provide context and describe the wider extent of activity of the fisheries included in the assessment.

20.5 Methods

The commercial fisheries baseline and impact assessment have been informed through the review and analysis of available fisheries data and information from relevant publications. In addition, consultation with local fisheries stakeholders has been conducted to aid in defining the baseline and carrying out the impact assessment.

20.5.1 Guidance and Standards

The commercial fisheries assessment of effects has followed the methodology set out in *Chapter 4: Approach to EIA* of the EIAR. Specific to the commercial fisheries assessment, the following guidance documents have also been considered:

- Seafish Industry Authority and UK Fisheries Economic Network (UKFEN) (2012) Best practice guidance for fishing industry financial and economic impact assessments; and
- Marine Scotland Science (2022). Assessing fisheries displacement by other licensed marine activities: good practice guidance, by Xodus for the Scottish Government.

20.5.2 Assessment Scope

The assessment considers the effects during two phases of the Development lifespan as identified in *Chapter 2: Project and Site Description*. The phases include: construction and operation. Decommissioning has been scoped out of assessment as the lifetime of the project is estimated to be around 100 years.

As the assessment presented in this chapter solely considers commercial fisheries, only potential effects arising from the 'Marine Facility', as described in *Section 2.11* of *Chapter 2: Project and Site Description*, have been assessed.

Impacts arising from potential indirect effects (e.g., through sedimentation or effects on fish or shellfish as ecological receptors) will be primarily documented in the relevant receptor chapters of the EIAR. Any residual effects once mitigation measures have been applied will then, if necessary, be considered for their secondary impact on commercial fishing activity.

The assessment considers the following 'likely significant effects' identified during scoping:

- Construction phase:
  - Temporary loss or restricted access to commercial fishing grounds due to movement of vessels involved in construction;
  - Displacement of commercial fishing activities;
  - Obstruction of navigation / steaming routes to commercial fishing grounds; and
  - Indirect effects on commercial fisheries due to impacts on the ecology of fish and shellfish species.
- Operational phase:
  - Permanent loss or restricted access to commercial fishing grounds due to the placement of the Marine Facility;
  - Permanent displacement of commercial fishing activities;

– Obstruction of navigation / steaming routes to commercial fishing grounds; and

Indirect effects on commercial fisheries as a result of impacts on the ecology of fish and shellfish species.

20.5.3 Baseline Data Collection

20.5.3.1. Desktop Study

Information on commercial fisheries within the commercial fisheries study area was collected through a detailed desktop review of existing studies and datasets. These are summarised in *Table 20.4: Summary of Key Fisheries Data and Information*.

Table 20.4: Summary of Key Fisheries Data and Information

Dataset	Year	Coverage	Notes and Limitations
Landings Data by ICES Rectangle, Marine Management Organisation (Marine Management Organisaiton , 2022)	2017-2021	Landings statistics data for UK-registered vessels including: landing year; landing month; vessel length category; ICES rectangle; vessel/gear type; species; live weight (tonnes); and live weight (value (£)).	• Landings data by ICES rectangle are available for areas of relevance to the proposed Development from both the MMO and Marine Scotland. • Although the landings datasets provided by both are the same, the format in which the dataset is provided by the MMO allows a more detailed analysis of information and has therefore been used in the assessment (i.e. data can be filtered for a given method by species, etc). • Landings data has been analysed by value (£) and presented as an annual average for the period 2017-2021. • It should be noted that fishing is normally not equally distributed across the whole area of an ICES rectangle and therefore overall activities identified for a given rectangle may not be necessarily representative of the activity that the specific area where the Marine Facility is located supports.
UK fleet landings and foreign fleet landings by UK port (Marine Management Organisation , 2023)	2021 - 2022	Landings statistics data for UK-registered and foreign vessels including: landing year; landing month; vessel length category; ICES rectangle; vessel/gear type; species; live weight (tonnes); and live weight (value (£)).	• Landings data by port for the years 2021 and 2022 are 'provisional'. • Landings data has been analysed by value (£) and presented as an annual average for the period 2021 – 2022. Data for 2020 was been redacted by the MMO, and prior to 2020 data was collated in a different format. • It should be noted that fishing landed to a port is not always caught in the waters adjacent to the port, and therefore overall activities identified for a given port may not be necessarily representative of the activity that the specific area where the Marine Facility is located supports.
ScotMap – Inshore Fisheries Mapping Project in Scotland (Kafas, et al., 2014)	2007 - 2011	Spatial information on the fishing activity of Scottish-registered commercial fishing vessels under 15 m in length. The data was collected during face-to-face interviews with individual vessel owners and operators and relate to fishing activity for the period 2007 – 2011. Interviewees were asked to identify the areas in which they fish, and to provide associated information on their fishing vessel, species targeted, fishing gear used, and income from fishing.	• Monetary value (£) maps have been used to inform this report. • The information provided in this dataset is based on information gathered via interviews with a sample of fisheries stakeholders and is therefore not necessarily representative of the views of all stakeholders. • In addition, the data was collected between 2007 and 2011, and may therefore not be fully representative of current activities.
Scottish fishing vessels under 12m overall length – gridded fisheries data within Scottish waters	2017 - 2021	Owners or masters of Scottish fishing vessels under 12 m overall length must declare a latitude and longitude position	• Data is derived from positions self-declared by fishers. These positions have not been verified by other sources.

Dataset	Year	Coverage	Notes and Limitations
(Scottish Government, 2022) (Contains information from the Scottish Government (Marine Scotland) licensed under the Open Government Licence v3.0.)		(DD MM) on each fishing day indicating where the majority of the catch was taken. This dataset aggregates the positions declared along with the associated catch weight and values, into C-Squares of 0.05 x 0.05 decimal degrees. The data is grouped into sectors of: • "Pots and traps" - e.g. creels for crabs, lobsters, or Nephrops; whelk pots; or wrasse traps • "Bottom trawls" - e.g. bottom trawls for Nephrops, squid, or demersal fish • "Dredges" - e.g. dredging for bivalve molluscs such as scallops and surf clams • "Rod and lines"- e.g. handlines or jigging for mackerel; set lines for demersal fish • "Other" - e.g. set nets; diving; hand gathering etc	• No data is shown if there are less than 5 vessels in a c-square to protect fisher anonymity.

20.5.4 Assessment Methodology

20.5.4.1. Assessment of Effects

The process for determining the significance of effects is a two-stage process that involves defining the magnitude of the potential impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in *Chapter 4: Approach to EIA of the EIAR*.

The criteria for defining magnitude in this chapter are outlined in *Table 20.5: Definition of Terms Relating to the Magnitude of an Impact*. In determining magnitude within this chapter, each assessment considered the spatial extent, duration, frequency, and reversibility of impact and these are outlined within the magnitude section of each assessment of effects (e.g. a duration of hours or days would be considered for most receptors to be of short-term duration, which is likely to result in a low magnitude of impact).

Table 20.5: Definition of Terms Relating to the Magnitude of an Impact

Magnitude of Impact	Definition
High	The area affected by the impact sustains very high levels of fishing activity and/or represents a critical fishing ground for a given fishery/fleet; and/or the effect is permanent/very long term; and/or limited fisheries liaison or management measures can be implemented.
Medium	The area affected by the impact sustains high/moderate levels of fishing activity and represents a significant extent of the grounds available to a given fishery/fleet; and/or the effect is long term; and/or some suitable fisheries liaison or management measures can be implemented.
Low	The area affected by the impact sustains low/moderate levels of fishing activity and represents a relatively small extent of the grounds available to a given fishery/fleet; and/or the effect is short to medium term; and/or a range of suitable liaison or management measures can be implemented.
Negligible	The area affected by the impact sustains low/negligible levels of fishing activity and/or affects a small/negligible extent of grounds; and/or the effect is very short term.

The criteria for defining sensitivity in this chapter are outlined in *Table 20.6: Definition of Terms Relating to the Sensitivity of the Receptor*.

Table 20.6: Definition of Terms Relating to the Sensitivity of the Receptor

Magnitude of Impact	Definition
High	Very limited operational range and lack of operational versatility (ability to deploy only one gear type and limited range of target species); and/or high dependence on a single fishing ground; and/or no or very limited ability to adapt to the potential impact.
Medium	Limited operational range and/or some versatility with regards to fishing gear/target species; and/or dependence upon a limited number of grounds; and/or limited ability to adapt to the potential impact.
Low	Extensive operational range and/or versatility with regards to fishing gear/target species; and/or ability to exploit a varied range of fishing grounds; and/or high adaptability to the potential impact.
Negligible	Very extensive operational range and/or versatility with regards to fishing gear/target species: and/or ability to exploit numerous and extensive fishing grounds; and/or fully adaptable to the potential impact.

The significance of the effect upon commercial fisheries is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in *Chapter 4: Approach to EIA*.

In cases where a range is suggested for the significance of effect, there remains the possibility that this may span the significance threshold (i.e. the range is given as minor to moderate). In such cases, the final significance conclusion is based upon the author’s professional judgement as to which outcome delineates the most likely effect, with an explanation as to why this is the case. Where professional judgement is applied to quantify final significance from a range, the assessment will set out the factors that result in the final assessment of significance. These factors may include the likelihood that an effect will occur, data certainty and relevant information about the wider environmental context.

For the purposes of this assessment:

- a level of residual effect of moderate or more will be considered a ‘significant’ effect in terms of the EIA Regulations; and
- a level of residual effect of minor or less will be considered ‘not significant’ in terms of the EIA Regulations.

Effects of moderate significance or above are therefore considered important in the decision -making process, whilst effects of minor significance or less warrant little, if any, weight in the decision-making process. A matrix used for the assessment of the significance of the effect is provided in *Chapter 4: Approach to EIA*.

20.5.5 Limitations And Assumptions

As described in the UK Sea Fisheries Statistics Report 2020 (Marine Management Organisation , 2021) multiple factors impact fishing activity and landings tend to fluctuate considerably over time. In 2020, the ongoing COVID-19 pandemic (where effects were felt from March 2020) resulted in considerable impacts on commercial fishing. Like all parts of the UK economy, the pandemic had differential impacts on different sectors of the fishing industry. Overall, shellfish fisheries were hit most severely as shellfish species tend to be landed and sold fresh for use in the hospitality sector and demand from this sector in the UK and abroad dropped dramatically as lockdowns were being imposed across the UK and EU.

A number of limitations have been identified in relation to the fisheries datasets publicly available. These are described in detail in *Table 20.4: Summary of Key Fisheries Data and Information* and include issues associated with the potential for some historic datasets to not be fully representative of current activities, redaction of annual data, and inconsistencies with data categorisation. Additionally, limitations with regards to available spatial data on fisheries is more evident for smaller vessels (under 15 m in length).

To address these issues, consultation with the fisheries stakeholders, including local fishermen, has been undertaken to help inform the baseline characterisation (see *Table 20.3: Summary of Consultation*).

20.6 Baseline Environment

The Study Area supports a range of commercial fisheries activities, with shellfish species being principally targeted. Analysis of landings values (£) indicates that pots and traps[1] are the main fishing activity, predominantly for

[1] Although ‘creeling’ is more commonly used in Scotland, ‘pots and traps’ has been used here for consistency with the categorisation of methods within the data sources used.

Nephrops (*Figure 20 2: Annual Landings Value (£) By Species (Average 2017 – 2021) (Volume 3 Figures)*; *Figure 20 3: Annual Landings Value (£) By Method (Average 2017 – 2021)(Volume 3: Figures)*. Edible crab and lobster are also caught via pots and traps within the Study Area, but to a lesser extent. Landings from demersal trawling and dredging for scallops are also recorded in the Study Area. It should be noted, however, that demersal trawling and dredging are prohibited in the upper reaches of Loch Fyne under the Upper Loch Fyne and Loch Goil NCMPA and therefore not carried out in the proximity of the Marine Facility (*Figure 20 4: Upper Loch Fyne and Loch Goil Nature Conservation Marine Protected Area) (Volume 3: Figures)*).

Razor clams are also landed in the Study Area. Since February 2018, fishing for razor clams is restricted to participants of the 'Electrofishing for Razor Clams Trial' being conducted by Marine Scotland. For a trial period, Marine Scotland has issued licences to fish for razor clams via 'electrofishing' in certain areas around Scotland for scientific research (Scottish Government, 2022). As shown in *Figure 20 5: Electrofishing for Razor Clams Trial Areas (Volume 3: Figures)*) there are no razor clam trial areas in the immediate vicinity to the Marine Facility.

Landings from other fishing methods are recorded at negligible levels in the Study Area.

It is important to note that the Marine Facility has a small footprint compared to that of the Study Area and that most fishing activity recorded in ICES rectangle 41E4 is undertaken on its western section. Therefore, the overall landings of ICES rectangle 41E4, although useful for context, are not necessarily representative of fishing activity in the waters adjacent to the Marine Facility. To establish baseline fishing activity in the Marine Facility area consultation was undertaken with local fisheries stakeholders, along with analysis of fisheries data of a finer spatial scale.

Landings by port were reviewed to provide a more localised insight into fishing activity of relevance. An overview of the value (£) of landings from ports local to the Marine Facility is provided in *Figure 20 7: Landings (£) by Species in Local Ports (Annual Average 2021 – 2022) (Marine Management Organisation , 2023*) (below) and *Figure 20 8: Landings by Gear in Local Ports (Annual Average 2021 – 2022) (Marine Management Organisation , 2023*) (below).

As shown, *Nephrops* are the greatest contributor to the overall value (£) of landings in ports local to the Marine Facility. Scallops contribute less to landings in local ports compared to the overall ICES landings data for the Study Area. Trawling represents the main fishing activity by value, followed by traps, however, demersal trawl and dredging are prohibited in the upper reaches of Loch Fyne under the Upper Loch Fyne and Loch Goil NCMPA.

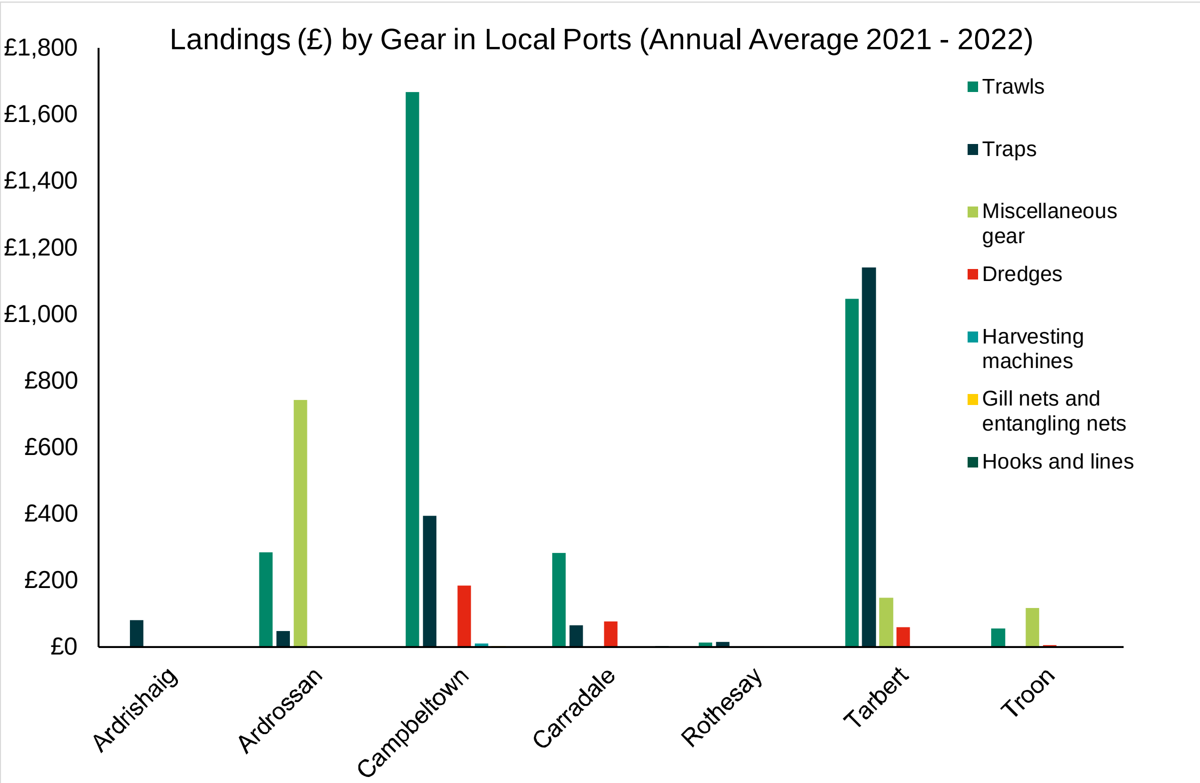

Figure 20-1: Landings (£) by Species in Local Ports (Annual Average 2021 – 2022) (Marine Management Organisation , 2023)

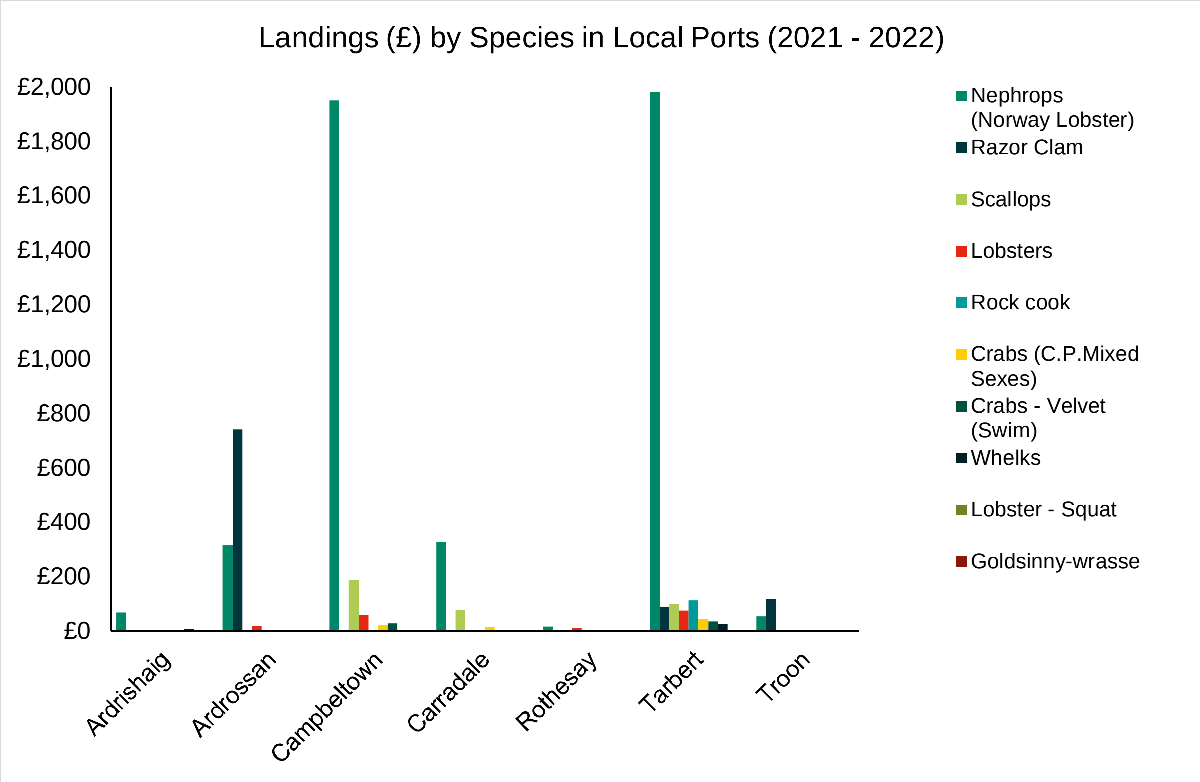

Figure 20-2: Landings by Gear in Local Ports (Annual Average 2021 – 2022) (Marine Management Organisation , 2023)

Although the overall Study Area, and local ports, shows moderate to high landings, there is low fishing activity in the waters adjacent to the Marine Facility. The Scottish fishing vessels under 12 m data shows moderate to high landings value (£) within the Study Area, however, this is restricted to the western side of the ICES rectangle. No data is shown for the upper reaches of Loch Fyne, in waters adjacent to the Marine Facility, as there are less than 5 vessels reportedly working in the area (*Figure 20 9: Scottish Under 12m Vessels – Annual Average Value (£) (2017- 2021) – Dredges; Figure 20 10: Scottish Under 12m Vessels – Annual Average Value (£) (2017- 2021) - Bottom Trawl; Figure 20 11: Scottish Under 12m Vessels – Annual Average Value (£) (2017- 2021) – Pots & Traps; Figure 20 12: Scottish Under 12m Vessels – Annual Average Value (£) (2017- 2021) – Rods & Lines; and Figure 20 13: Scottish Under 12m Vessels – Annual Average Value (£) (2017- 2021) – Other (Volume 3: Figures)*.

Limited fishing activity in the upper reaches of the loch is also shown in the ScotMap Inshore Fisheries Mapping data. The ScotMap data shows moderate to high value scallop diving activity to be present in the lower reaches of Loch Fyne (*Figure 20 14: Inshore Fishing – Scallop Divers – Value (£))*.; *Figure 20 15: Inshore Fishing – Scallop Dredging – Value (£)*; *Figure 20 16: Inshore Fishing – Nephrops Pots – Value (£)*; *Figure 20 17: Inshore Fishing – Trawl Excluding Nephrops– Value (£)*.; *Figure 20 18: Inshore Fishing –Nephrops Trawl– Value (£)*; and *Figure 19: Inshore Fishing – Crab & Lobster Pots – Value (£) (Volume 3: Figures)*.

Similarly, trawling excluding Ne*phrops* is also absent from the upper reaches of the loch (*Figure 20 17: Inshore Fishing – Trawl Excluding Nephrops– Value (£) (Volume 3: Figures)*), while moderate value (£) *nephrops* trawling is present in the upper reaches of the loch (*Figure 20 18: Inshore Fishing –Nephrops Trawl– Value (£))(Volume 3: Figures)*). Although the data shows *nephrops* trawl activity in the upper reaches of the loch, it is important to note that the ScotMap data predates the designation of the Upper Loch Fyne and Loch Goil NCMPA, which prohibits dredging and trawling. The NCMPA was designated under the Marine (Scotland) Act 2010 and came into force August 2014 (*Figure 20-4: Upper Loch Fyne and Loch Goil Nature Conservation Marine Protected Area*) *(Volume 3: Figures)*).

Nephrops potting is the only fishing activity present in the upper reaches of the loch where the Marine Facility is to be situated (*Figure 20 16: Inshore Fishing – Nephrops Pots – Value (£)*) *(Volume 3: Figures)*). Although not prohibited in the upper reaches of the loch, potting for crab & lobster is also absent from the waters adjacent to the Marine Facility *Figure 19: Inshore Fishing – Crab & Lobster Pots – Value (£) (Volume 3: Figures)*).

Consultation with fisheries stakeholders reflected the findings of the desk-based study (*Table 20.3: Summary of Consultation*), which indicates that the only activity of relevance to the area of the Marine Facility is potting for *Nephrops*. Stakeholders reported two *Nephrops* potting vessels working in the waters adjacent to the Marine Facility only. No concerns regarding the Marine Facility were raised by any stakeholders during consultation.

20.6.1 Baseline Receptors

The desktop review paired with consultation with local fishers and relevant fisheries stakeholders has identified the receptors listed below in *Table 20.7: Commercial Fisheries Receptors and Sensitivities*.

Table 20.7: Commercial Fisheries Receptors and Sensitivities

Receptor	Sensitivity	Justification
Pots and traps – *Nephrops*	Medium	Restricted to suitable *Nephrops* habitat.

Receptors not being considered within this assessment, and the justification for not considering them further, is provided below (*Table 20.8 Commercial Fisheries Receptors not Considered in this Assessment*).

Table 20.8 Commercial Fisheries Receptors not Considered in this Assessment

Receptor	Justification
Trawl – *Nephrops*	Trawling is banned in the waters adjacent to the Marine Facility under the Upper Loch Fyne and Loch Goil NCMPA.
Dredging – Scallop	Dredging is banned in the waters adjacent to the Marine Facility under the Upper Loch Fyne and Loch Goil NCMPA.
Pots and traps – lobster and crab	No activity reported in waters adjacent to the Marine Facility.
Scallop Diving	No activity in upper reaches of Loch Fyne.
Demersal trawl (excluding *nephrops*)	Dredging is banned in the waters adjacent to the Marine Facility under the Upper Loch Fyne and Loch Goil NCMPA.
Electrofishing – razor clams	Restricted to trial areas.

20.7 Assessment of Effects

An assessment of the likely significance of effects arising from the Marine Facility on commercial fisheries receptors (*Table 20.7: Commercial Fisheries Receptors and*), *Section 20.5.6* above, caused by each identified impact (Assessment Scope section) is presented below.

20.7.1 Construction

Temporary loss or restricted access to commercial fishing grounds due to movement of vessels involved in construction

<u>Magnitude of impact</u>

The design of the Marine Facility is outlined in *Chapter 2: Project and Site Description*. Construction of the Marine Facility is anticipated to take 12 months, and will involve the installation of a prefabricated (likely steel) deck structure and approximately 72 steel piles by 10 vessels.

Given the limited vessel movements expected associated with the construction of the Marine Facility magnitude of the impact is expected to be negligible.

<u>Significance of the Effect</u>

Overall, as the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium (*Table 20.7: Commercial Fisheries Receptors and Sensitivities*). The effect will, therefore, be of **negligible adverse significance**, which is not significant in EIA terms.

Displacement of commercial fishing activities

Magnitude of impact

The design of the Marine Facility is outlined in *Chapter 2: Project and Site Description*. Construction of the Marine Facility is anticipated to take 12 months, and result in a loss of access to an area of approximately 1,800 m^2.

Due to the small spatial footprint, and temporary nature, of the Marine Facility the magnitude of the impact is considered to be negligible.

Significance of the Effect

Overall, the magnitude of the impact is deemed to be negligible, and the sensitivity of the receptor is considered to be medium (*Table 20.7: Commercial Fisheries Receptors and Sensitivities*). The effect will, therefore, be of **negligible adverse significance**, which is not significant in EIA terms.

Obstruction of navigation / steaming routes to commercial fishing grounds

Magnitude of impact

The design of the Marine Facility is outlined in *Chapter 2: Project and Site Description*. Construction of the Marine Facility is anticipated to take 12 months and will involve 10 vessels. During this time installation works could potentially result in navigation/steaming routes to commercial fishing grounds being temporarily obstructed.

Given the short term, temporary, and localised nature of the works, and the limited commercial fisheries activity within the upper reaches of Loch Fyne under the Upper Loch Fyne and Loch Goil NCMPA, the magnitude of the impact is considered to be negligible.

Significance of the Effect

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium (*Table 20.7: Commercial Fisheries Receptors and Sensitivities*). The effect will, therefore, be of **negligible adverse significance**, which is not significant in EIA terms.

Indirect effects on commercial fisheries as a result of impacts on the ecology of commercial fish and shellfish species

The likely significant effects of the construction of the Marine Facility on marine ecology, including fish and shellfish species of commercial importance, are assessed in Chapter 08: Marine Ecology and are not expected to exceed minor adverse significance and are therefore considered not significant in EIA terms. Consequently, any impacts associated with this on the commercial fisheries that target them are also not expected to exceed minor adverse significance and are therefore considered not significant.

20.7.2 Operational Phase

Long-term loss or restricted access to commercial fishing grounds due to the placement of the Marine Facility

Magnitude of impact

The design of the Marine Facility is outlined in *Chapter 2: Project and Site Description*. The deck of the Marine Facility will be temporary and it is expected to be installed for up to seven years to accommodate up to ten deliveries. At the end of the construction phase of the Development, the piles will remain *in situ* to allow for the deck to be reinstated to facilitate maintenance and repairs to the Development should they be required during its anticipated 100 year operational life. The dimensions of the proposed Marine Facility are to be circa 180 m long and 10 m wide, resulting in a loss of access to an area of approximately 1,800 m^2, with 72 x 600 mm diameter steel piles at 5 m spacing.

Given the very localised footprint of the Marine Facility the magnitude of the impact is considered to be negligible.

Significance of the Effect

Overall, the magnitude of the impact is deemed to be negligible, and the sensitivity of the receptor is considered to be medium (*Table 20.7: Commercial Fisheries Receptors and Sensitivities*). The effect will, therefore, be of **negligible adverse significance**, which is not significant in EIA terms.

Long-term displacement of commercial fishing activities

Magnitude of impact

The design of the Marine Facility is outlined in *Chapter 2: Project and Site Description*. The Marine Facility will be temporary and is expected to be installed for up to seven years to accommodate up to ten deliveries. At the end of the construction phase of the Development, the piles will remain *in situ* to allow for the deck to be reinstated to facilitate maintenance and repairs to the Development should they be required during its anticipated 100 year operational life. The dimensions of the Marine Facility is proposed to be circa 180 m long and 10 m wide with paired 600 mm diameter steel piles at 5 m spacing, which would result in a loss of access to an area of approximately 1,800 m^2. The Marine Facility could potentially displace fishing activities due by obstructing access to fishing grounds.

Given the very localised footprint of the Marine Facility the magnitude of the impact is considered to be negligible.

Significance of the Effect

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium (*Table 20.7: Commercial Fisheries Receptors and Sensitivities*). The effect will, therefore, be of **negligible adverse significance**, which is not significant in EIA terms.

Obstruction of navigation / steaming routes to commercial fishing grounds

Magnitude of impact

The design of the Marine Facility is outlined in *Chapter 2: Project and Site Description*. The Marine Facility will be temporary and is expected to be installed for up to seven years to accommodate up to ten deliveries. At the end of the construction phase of the Development, the piles will remain *in situ* to allow for the deck to be reinstated to facilitate maintenance and repairs to the Development should they be required during its anticipated 100 year operational life. The dimensions of the Marine Facility is proposed to be circa 180 m long and 10 m wide with paired 600 mm diameter steel piles at 5 m spacing, which would result in a loss of access to an area of approximately 1,800 m^2. The Marine Facility could potentially result in navigation/steaming routes to commercial fishing grounds being obstructed.

Given the very localised footprint of the piles the magnitude of the impact is considered to be negligible.

Significance of the Effect

Overall, as the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium (*Table 20.7: Commercial Fisheries Receptors and Sensitivities*). The effect will, therefore, be of **negligible adverse significance**, which is not significant in EIA terms.

Indirect effects on commercial fisheries as a result of impacts on the ecology of fish and shellfish species

Magnitude of impact

The likely significant effects of the construction of the Marine Facility on marine ecology, including fish and shellfish species of commercial importance, are assessed in *Chapter 08: Marine Ecology* and are not expected to exceed minor adverse significance and are therefore considered not significant in EIA terms. Consequently, any impacts associated with this on the commercial fisheries that target them are also not expected to exceed minor adverse significance and are therefore considered not significant.

20.8 Cumulative Effects

At the time of writing, there are no other projects or activities planned that could have an impact on the commercial fisheries receptors identified as requiring an assessment in relation to the Marine Facility. Therefore cumulative effects to commercial fisheries receptors are predicted to be negligible and not significant..

20.9 Mitigation and Monitoring

The likely effects of the Marine Facility on commercial fisheries receptors are not significant in EIA terms. As such, specific mitigation and monitoring in relation to commercial fisheries is not considered necessary and all effects remain as .**negligible adverse significance**.

20.10 References

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Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 21: Summary of Assessment

ILI (Borders PSH) Ltd

July 2024

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	July 2024	Submission	DL	David Lee	Technical Director

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Table of Contents

Tables

21. Summary of Assessment

21.1 Introduction

This chapter provides a summary of the residual effects following the implementation of the embedded and any additional mitigation measures as required. Full details can be found in the respective topic chapters of this EIA Report ("EIAR").

21.2 Summary of Mitigation Measures

Schedule 4, part 7 of the EIA Regulations requires an EIA report to include *"a description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements".*

The mitigation, monitoring and enhancement measures included in this EIAR fall into one of the following categories:

- Embedded mitigation incorporated into the design;
- Embedded mitigation in methods of construction as included within the Outline Construction Environment Management Plan ("Outline CEMP") (*Appendix 3.1, Volume 5 Appendices*); and
- Additional mitigation measures identified as a result of the EIA, such as topic specific management plans.

The Mitigation Register appended to this chapter (*Appendix 21.1, Volume 5 Appendices*) lists each item of mitigation relied on or identified in the EIAR and shows how it is secured, either through the Section 36 Application or through other mechanisms.

21.3 Residual Effects

The residual effects of the Development following implementation of the mitigation measures have been assessed.

Each technical chapter contains a detailed account of residual effects and *Table 21-1* summarises the main residual effects. The criteria for assigning the significance of effects are set out in *Chapter 4: Approach to Environmental Impact Assessment of* this EIAR and within relevant technical chapters where a different, topic-specific approach is followed.

Note, as set out in *Chapter 4 Approach to EIA*, Negligible effects are not considered to be residual and have therefore not been included in *Table 21-1* below. Minor effects are not considered significant, and Moderate and Major Effects are considered significant.

The Development will result in the following beneficial residual effects:

- The Development results in some operational emissions associated with electricity storage, maintenance and worker travel. However, the benefits of generating renewable energy from the Development far outweigh the associated emissions. The Development's operational phase results in a reduction of Green House Gas (GHG) emissions compared to the without-project baseline. Operational emissions also align with Scotland's trajectory towards Net Zero. The impact of GHG emissions arising during the operation of the Development on the climate are therefore likely to have **Significant Beneficial** effects on GHG emissions during operation.
- Job creation and local expenditure by the developer and contractors within the study area throughout construction period will likely have a **Moderate Beneficial** effect on the local economy.
- Creation of jobs within study area during construction phase will likely have a **Minor Beneficial** effect on the local job market.
- Potential for setting of historic attractions to be altered by the Development is likely to have a **Minor Beneficial** effect on visitor services through the implementation of the LEMP (*Appendix 5.4, Volume 5 Appendices)* and addition of benches and information boards to be installed informing visitors of the pumped storage hydro scheme purpose and benefits.

- Diversions may be required for certain informal recreational routes and forestry paths within Development Site during operation. These are likely to have a **Minor Beneficial** effect on recreational routes through the finalised Access Management Plan, which will be prepared post consent and will set out where temporary and permanent diversions of certain forestry paths are necessary to maintain health and safety of users, in addition to additional forestry paths to be provided as part of Development, improving accessibility of the area for active travel users.

Table 21-1. List of Adverse Residual Effects

Discipline	EIA Ref	Residual Effect	Significance
Landscape and Visual Amenity	Table 5-8	**Construction** Effect on landscape character will be **Moderate Adverse** for the following landscape features: • North Argyll LLA • West Loch Fyne (Coast) LLA	**Significant**
		Effect on landscape character will be **Minor Adverse** for the following landscape features: • East Loch Fyne (Coast) LLA • Inveraray Castle GDL • WLA 09 Loch Etive Mountains	Not Significant
		Effect on landscape character will be **Moderate Adverse** for the following landscape character types: • LCT 35 Rugged Mountains • LCT 40 Craggy Upland - Argyll • LCT 53 Rocky Coastland - Argyll	**Significant**
		Effect on landscape character will be **Minor Adverse** for the following landscape character types: • LCT 34 Steep Ridges and Mountains • LCT 39 Plateau Moor & Forest - Argyll	Not Significant
		Effect on landscape character will be **Major Adverse** for the following viewpoints: • Viewpoint 1 - Dun Na Cuaiche, Inveraray • Viewpoint 5 - Loch shore off coastal road between Inverinan and Dalavich • Viewpoint 6 - Inverinan • Viewpoint 7 - Eilean na Moadail peninsula • Viewpoint 8 - Ben Cruachan • Viewpoint 12 - Stob Garbh • Viewpoint 17 - Loch Awe watercraft • Viewpoint 19 - A83 lay-by	**Significant**
		Effect on visual amenity will be **Moderate Adverse** for the following viewpoints: • Viewpoint 2 - Minor road - near A815 • Viewpoint 4 - Dalavich Jetty • Viewpoint 18 - A815 – St Catherines	**Significant**
		Effect on visual amenity will be **Minor Adverse** for the following viewpoints: • Viewpoint 3 - Kilmaha • Viewpoint 10 - Ardanaiseig GDL • Viewpoint 11 - A85 • Viewpoint 13 - Ben Eunaich	Not Significant
	Table 5-9	**Operation Year 1** Effect on landscape character will be **Minor Adverse** for North Argyll LLA.	Not Significant
		Effect on landscape character will be **Moderate Adverse** for the following landscape character types: • LCT 40 Craggy Upland - Argyll • LCT 53 Rocky Coastland - Argyll	**Significant**
		Effect on landscape character will be **Minor Adverse** for the following landscape character type: '35 Rugged Mountains'.	Not Significant
		Effect on landscape character will be **Major Adverse** for the following viewpoints: • Viewpoint 5 - Loch shore off coastal road between Inverinan and Dalavich • Viewpoint 17 - Loch Awe watercraft	**Significant**
		Effect on visual amenity will be **Moderate Adverse** for the following viewpoints:	**Significant**

Discipline	EIA Ref	Residual Effect	Significance
		• Viewpoint 4 - Dalavich Jetty • Viewpoint 6 - Inverinan • Viewpoint 7 - Eilean na Moadail peninsula • Viewpoint 8 - Ben Cruachan • Viewpoint 12 - Stob Garbh • Viewpoint 19 - A83 lay-by	
		Effect on visual amenity will be **Minor Adverse** for the following viewpoints: • Viewpoint 1 - Dun Na Cuaiche, Inveraray • Viewpoint 2 - Minor road - near A815 • Viewpoint 3 - Kilmaha • Viewpoint 18 - A815 – St Catherines	Not Significant
	Table 5-10	**Operation Year 15** Effect on landscape character will be **Minor Adverse** for North Argyll LLA	Not Significant
		Effect on landscape character will be **Minor Adverse** for the following landscape character types: • LCT 35 Rugged Mountains • LCT 40 Craggy Upland - Argyll • LCT 53 Rocky Coastland - Argyll	Not Significant
		Effect on visual amenity will be **Moderate Adverse** for the following viewpoints: • Viewpoint 4 - Dalavich Jetty	**Significant**
		Effect on visual amenity will be **Minor Adverse** for the following viewpoints: • Viewpoint 5 - Loch shore off coastal road between Inverinan and Dalavich • Viewpoint 6 - Inverinan • Viewpoint 7 - Eilean na Moadail peninsula • Viewpoint 8 - Ben Cruachan • Viewpoint 12 - Stob Garbh • Viewpoint 17 - Loch Awe watercraft	Not Significant
Terrestrial Ecology	Table 6-7	**Construction**	
		Direct loss of ancient semi-natural woodland. With the expansion of native woodland with ecologically appropriate planting; translocation of ASNW turves from Tailpond to adjacent degraded ancient woodland with sympathetic adjacent planting of native trees as standards; protection of retained ASNW this is assessed to be a **permanent Adverse effect of local significance.**	Not Significant
		Direct loss of blanket bog. With 3km2 peatland / upland habitat rehabilitation zone with deer exclusion, conservation-level livestock grazing and no burning; and local restoration of bare peat and drainage grip filling, this is assessed to be a **medium-term temporary Adverse effect of regional significance; ameliorating to permanent Adverse effect of local significance in ~20 years**.	Initially **Significant**; ameliorating to **Not significant in ~20 years.**
		Direct loss of Species-rich ledge / ravine. With Retained areas demarcated / signposted as needed under ECoW guidance to exclude any entry / damage, and monitored, this is assessed to be a **permanent Adverse effect** of **local significance**.	Not Significant
		Direct loss of GWDTE. With Micro-siting Access Tracks / compounds as far as possible; tracks / compounds to be permeable where GWDTE affected; retained areas demarcated / signposted as needed under ECoW guidance to exclude any entry / damage, and monitored, this is assessed to be a **permanent Adverse effect** of **local significance**.	Not Significant
		Direct loss of other notable habitat. With retained areas demarcated / signposted as needed under ECoW guidance to exclude any entry / damage, and monitored, this is assessed to be a **permanent Adverse effect** of local significance.	Not Significant
		Direct loss of other notable flora is assessed to be a **permanent Adverse effect** of **local significance**.	Not Significant
		Direct loss of habitat and refuges of otter. With ECoW survey / monitoring; preparation of species protection plan; licensing; appropriate design of watercourse crossings / construction lighting (plus embedded mitigation including pre-construction survey, best-practice protection measures during construction and low construction vehicle speeds), this is assessed to be a **permanent Adverse effect** of **local significance**.	Not Significant

Discipline	EIA Ref	Residual Effect	Significance
		Disturbance to otter. With ECoW survey / monitoring; preparation of species protection plan; licensing; appropriate design of watercourse crossings / construction lighting (plus embedded mitigation including pre-construction survey, best-practice protection measures during construction and low construction vehicle speeds), this is assessed to be a **temporary Adverse effect** of **local significance**.	Not Significant
		Direct loss of habitat and refuges to water vole. With watercourse crossing design; licensing and preparation of species protection plan to remove or displace water voles (plus embedded mitigation including pre-construction survey), this is assessed to be a **permanent Adverse effect** of **Local Significance.**	Not Significant
	Table 6-8	**Operation**	
		Impact of loss of wild deer habitat on retained blanket bog will likely result in a **permanent Adverse effect** of **local significance**.	Not Significant
		Impact of loss of wild deer habitat on retained GWDTE will likely result in a **permanent Adverse effect** of **local significance**.	Not Significant
		Impact of loss of wild deer habitat on retained other notable habitat will likely result in a **permanent Adverse effect** of **local significance**.	Not Significant
Aquatic Ecology	Table 7-8	**Construction**	
		Construction of the cofferdam on the shoreline of Loch Awe, including piling, de-watering, and substrate removal, with mitigation, will likely have a **Minor residual effect** on Loch Awe (Habitat) and high value fish assemblage in Loch Awe.	Not Significant
		Watercourse crossings for temporary Access Tracks and temporary site compounds, including diversion and culverting of watercourses, with mitigation will likely have a **Minor residual effect** on the following: • Watercourses throughout the Site are assessed as of medium value (Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, Unnamed tributary of River Aray: BL-23) or otherwise Low value. • Atlantic salmon present in Allt Criche (tributary of Erralich Water): BL-01, and brown/sea trout present in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, Unnamed tributary of River Aray: BL-23.	Not Significant
		Construction of the Headpond and Headpond Embankments, including land take and transport of excavated material, with mitigation, will likely have a **Minor** residual effect on Lochan Airigh	Not Significant
		Transport of excavated tunnel material to Headpond via dump trucks, and spoil management of material from tunnelling works will likely have a **Minor** residual effect on the following: • Loch Awe (Habitats) • Atlantic salmon present in Allt Criche (tributary of Erralich Water): BL-01, and brown/sea trout present in Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02, River Aray: BL-22, and Unnamed tributary of River Aray: BL-23	Not Significant
		Potential spread or introduction of INNS will likely have a **Minor** residual effect on the following: • Medium value watercourses Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02 River Aray: BL-22, and Unnamed tributary of River Aray: BL-23, and water bodies of medium value (Lochan Airigh and Lochan Breac-liath) • Fish assemblage in Loch Awe (High value) • Atlantic salmon (High value) in Allt Criche (tributary of Erralich Water): BL-01	Not Significant
	Table 7-9	**Operation**	
		Effects on water levels in Loch Awe, with mitigation, will likely have a **Moderate** residual effect on migratory fish species in Loch Awe and River Awe, including Atlantic salmon, brown/sea trout, European eel, and lamprey species.	**Significant**
		Effects on water levels in Loch Awe, with mitigation, will likely have a **Minor** residual effect on Loch Awe habitats.	Not Significant
		Inlet / Outlet structure on Loch Awe shoreline, including Screen during operation will likely have a **Minor** residual effect on: • Loch Awe (Habitats) • Fish species of High value in Loch Awe (Atlantic salmon, brown/sea trout, arctic char, European eel, and lamprey species), including migratory species	Not Significant

Discipline	EIA Ref	Residual Effect	Significance
		Watercourse crossings for permanent Access Tracks, including culverting of watercourses, with mitigation, will likely have a **Minor** residual effect on: • Medium value watercourses Allt Criche (tributary of Erralich Water): BL-01, Erralich Water: BL02 River Aray: BL-22, and Unnamed tributary of River Aray: BL-23 • Atlantic salmon (High value) in Allt Criche (tributary of Erralich Water): BL-01	Not Significant
Marine Ecology	Table 8.12	**<u>Construction</u>** Impacts on Benthic ecology will likely have a **Minor** adverse residual effect from: • Permanent loss of benthic habitat due to installation of piles • Habitat modification from introduction of artificial surfaces on the seabed • Temporary disturbance of benthic habitats	Not Significant
		Underwater sound from construction of the jetty within Loch Fyne will likely have **Minor** adverse impacts on fish and shellfish ecology	Not Significant
		Impacts on marine mammal ecology will likely have **Minor** adverse residual effects from: • Underwater sound during construction of the jetty within Loch Fyne • Airborne sound and visual disturbance during construction of the jetty within Loch Fyne • Vessel presence and collision risk during construction	Not Significant
	Table 8.13	**<u>Operation</u>** No residual effects during operation on Marine Ecology	n/a
Ornithology	Table 9-8	**<u>Construction</u>** Loss of suitable habitat is estimated to have the potential to result in the loss of two curlew breeding territories. This would represent approximately 1% of the NHZ 14 breeding population. With mitigation, this is identified as a residual effect of **Permanent Adverse effect of local significance.**	Not Significant
		Curlew are considered to be highly sensitive to disturbance. Based on the distribution of this species at the Development Site, as identified by field survey, it is considered that two pairs could be subject to disturbance during the construction phase (assuming the loss of another territory within the footprint of the Headpond). This could lead to the temporary loss of two territories from the ZoI of the Development. With mitigation, this is identified as a residual effect of **Temporary Adverse effect of local significance.**	Not Significant
		The loss of Golden eagle habitat (Details within Confidential Appendix 9.1: Schedule 1 Birds, Volume 6: Confidential Appendices) could have a residual effect of **Permanent Adverse effect of Regional Significance.**	**Significant**
		The displacement of Golden eagles (Details within Confidential Appendix 9.1: Schedule 1 Birds, Volume 6: Confidential Appendices) could have a **Temporary Adverse effect of Regional Significance.**	**Significant**
	Tale 9-9	**<u>Operation</u>** No residual effects during operation on Ornithology	n/a
Geology and Soils	Table 10-7	Excavation for the Development Site above ground infrastructure, resulting in loss of peat and release of carbon into the atmosphere is likely to result in a **Minor** adverse residual effect.	Not Significant
Water Environment	Table 11-34	**<u>Construction</u>** **Loch Awe** — **Water Quality – Sediment Runoff** Potential contamination associated with: • Sediment-laden runoff associated to earthworks; and • Sediment washing downstream from Allt Beochlich and other water courses within the catchment. Effect identified as: **Minor Adverse**	Not Significant
		Water Quality – Contaminated Runoff Potential contamination associated with runoff of chemical spillages from PC03 and TC01. Pollutants also associated to Allt Beochlich and other water courses within the catchment which wash downstream. Effect identified as: **Minor Adverse**	Not Significant
		Loch Fyne — **Water Quality – Sediment Runoff** Increased areas of hardstanding/bare earth could lead to an inflow of sediment. Effect identified as: **Minor Adverse**	Not Significant

Discipline	EIA Ref	Residual Effect		Significance
			Water Quality – Contaminated Runoff Works associated with the jetty may involve various fuels and construction chemicals which could be at risk of entering Loch Fyne. Effect identified as: **Minor Adverse**	Not Significant
		River Aray and tributaries (LF1)	**Water Quality - Sediment Runoff** Potential contamination sediment-laden runoff from Inverary bypass. Effect identified as: **Minor Adverse**	Not Significant
		Allt Beochlich and tributaries (LA6)	**Water Quality – Sediment Runoff** Potential sediment inflow could be associated with the following: • The Access Tracks; • Increased hardstanding areas from compounds (PC06, TC07, TC08, PC09, TC16, PC17, PC18, PC19 and TC11) increasing runoff; • Inflow of sediment laden runoff from Headpond excavations Effect identified as: **Minor Adverse**	Not Significant
			Water Quality – Contaminated Runoff Potential contamination could be associated with the following: • Contaminated runoff from compound PC06, TC07, TC08, PC09, TC16, PC17, PC18, PC19 and TC11; and • Contaminated runoff from Access Tracks. Effect identified as: **Minor Adverse**	Not Significant
			Hydromorphology Construction of Embankment and Headpond. Effect identified as: **Minor Adverse**	Not Significant
			Hydromorphology Diversion or over pumping of river during construction resulting in disruption to sediment transport. Effect identified as: **Minor Adverse**	Not Significant
		Lochan Beochlich (LA8)	**Water Quality – Sediment Runoff** Potential sediment inflow associated to run-off from works associated to Headpond and Embankment construction. This also includes works being carried out at TC07 and PC09. Effect identified as: **Minor Adverse**	Not Significant
			Water Quality – Contaminated Runoff Contaminated run-off from spillages associated to Embankment and Headpond construction. Effect identified as: **Minor Adverse**	Not Significant
	Table 11-35	**<u>Operation</u>**		
		Loch Awe	**Water Quality** Changes in water level leading to a concentration of pollutants in a still water body. Effect identified as: **Minor Adverse**	Not Significant
			Water Quality Thermal Stratification. Effect identified as: **Moderate Adverse**	**Significant**
			Water Quality Headpond discharges (temperature). Effect identified as: **Minor Adverse**	Not Significant
			Water Quality Discharge of concrete residues from Headpond. Effect identified as: **Minor Adverse**	Not Significant
			Water Quality Potential risk of algal blooms. Effect identified as: **Minor Adverse**	Not Significant
		Allt Beochlich and tributaries (LA6)	**Hydromorphology** Loss of 5.4 km^2 of catchment with numerous tributaries, resulting in changes to the downstream flow regime due to the dam. Reduction in sediment transport downstream due to the dam and inundation of reaches. Effect identified as: **Minor Adverse**	Not Significant

Discipline	EIA Ref	Residual Effect		Significance
Water Resources and Flood Risk	Table 12-4	**Construction Effects:**		
		Loch Awe, River Awe and Awe barrage operation- High	Fluctuation of water level within Loch Awe. Effect identified as: **Low Adverse**	Not Significant
		Offsite properties – High	Fluctuation of water level within Loch Awe Effect identified as: **Low Adverse**	Not Significant
		Development- Low	Fluctuation of water level within Loch Awe Effect identified as: **Low Adverse**	Not Significant
		Loch Awe and River Awe water level – High	Reduction in water levels in Loch Awe during low flows Effect identified as: **Low Adverse**	Not Significant
		Development - Low	Reduction in water levels in Loch Awe during low flows Effect identified as: **Low Adverse**	Not Significant
Cultural Heritage	Table 13-6	**Construction**		
		Potential physical impacts on the following heritage assets has been identified to likely result in a **Minor Adverse** effect: • Loch Airigh Shielings (WoSAS 44155) • Possible Shieling/Area of Agricultural Activity (AECOM 003)		Not Significant
		Potential physical impacts on heritage asset: Possible standing stone (AECOM 001) has been identified to likely result in a **Moderate Adverse** effect. It should be noted that this is a worst-case scenario based on the asset being a prehistoric standing stone, and further detailed investigations may find this not to be the case.		**Significant**
		Temporary impacts on the setting of Inveraray Garden and Designed Landscape (GDL00223) has been identified to likely result in a **Minor Adverse** effect.		Not Significant
	Table 13-7	**Operation**		
		The potential permanent impact on the setting of the following assets has been identified to have a **Minor Adverse** effect: • Ballimeanoch Chapel (SM4227) • Carn Dubh Crannog (SM4175) • Keppochan Cup Marked Stone (SM4186)		Not Significant
Access, Traffic and Transport	Table 14-22	Severance of Communities	In terms of severance, the significance of effects for most road links would be negligible. One public road link is forecast to have a direct temporary **Minor Adverse** effect: B840 Cladich – this will not carry HGV construction traffic.	Not Significant
		Road User and Pedestrian Safety	The magnitude of change for most road links is considered to be low as accidents for Development traffic are forecast to be substantially less than 1 'slight' injury accident and substantially less than 1 'serious' injury accident per annum on study area roads. Study Area roads that are proposed to carry HGV construction traffic are low or negligible in terms of sensitivity of receptors, therefore the effect on severance following mitigation will remain a **direct temporary Minor Adverse**	Not Significant
		Non-motorised User Amenity	In terms of non-motorised amenity, the significance of effects for most road links would be negligible. One public road link is forecast to have a direct temporary **Minor Adverse** effects: B840 Cladich – this will not carry HGV construction traffic.	Not Significant
		Non-motorised User Delay	In terms of non-motorised user delay, the significance of effects for most road links would be negligible. One public road link is forecast to have a direct temporary **Minor Adverse** effects: B840 Cladich – this will not carry HGV construction traffic.	Not Significant
		Driver Delay	In terms of driver delay, the significance of effects for most road links would be negligible. One public road link is forecast to have a direct temporary **Minor Adverse** effects: B840 Cladich – this will not carry HGV construction traffic.	Not Significant
Noise and Vibration	Table 15-32	**Construction**		
		Surface Plant Noise will likely have a **Minor Adverse** effect on NSR376/ NSR378		Not Significant

Discipline	EIA Ref	Residual Effect	Significance
		Access Track Upgrade/ Construction will have a **Minor** (at worst) effect on NSR216, NSR424, NSR090, and NSR220.	Not Significant
		Access Track Upgrade/ Construction will have a **Moderate** at worst effect on NSR278 for a short temporary period, but **Minor** at worst for the majority of the time.	Not Significant
		Temporary Jetty Impact Piling Noise will have a Negligible to **Minor** effect on NSR440 and NSR041.	Not Significant
		Temporary Jetty Impact Piling Vibration will have a **Minor** effect on NSR440.	Not Significant
		Cofferdam Piling will have a **Minor** effect on all NSRs	Not Significant
		Road Traffic Noise will likely have a Negligible **to Minor Adverse** effect on NSRs near Links 1-3, 11, 13-15,17,18	Not Significant
		Haul road traffic noise using southern track “exit” only will likely have a **Negligible to Minor Adverse** effect on NSRs near Link 8	Not Significant
		Haul road traffic noise on Link 12 will likely have a **Minor Adverse** on NSRs near Link 12 (except NSR220)	Not Significant
		Haul road traffic noise on Link 12 will likely have a **Minor Adverse** on NSR220	Not Significant
		Temporary Jetty Impact Piling will likely have a Negligible to **Minor Adverse** effect on NSR041 and NSR440	Not Significant
		Blasting will likely have a **Minor Adverse** effect on all NSRs	Not Significant
		Road Traffic Noise on northern and southern routes to site will likely have a **Minor Adverse** effect on all NSRs near Link 5, 9, 10, and 16.	Not Significant
	Table 15.33	**Operation** No residual effects during operation on noise sensitive receptors	n/a
Socio-economics and Tourism	Table 16.9	**Construction** Job creation and local expenditure by the developer and contractors within the study area throughout construction period will likely have a **Moderate Beneficial** effect on the local economy.	**Significant Beneficial**
		Creation of jobs within study area during construction phase will likely have a **Minor Beneficial** effect on the local job market.	Not Significant Beneficial
	Table 16.10	**Operation** Potential for setting of historic attractions to be altered by the Development is likely to have a **Minor Beneficial** effect on visitor services through the implementation of the oLEMP and addition of benches and information boards to be installed informing visitors of the pumped storage hydro scheme purpose and benefits.	Not Significant Beneficial
		Diversions may be required for certain informal recreational routes and forestry paths within Development Site during operation are likely to have a **Minor Beneficial** effect on recreational routes through the finalised Access Management Plan which will be prepared post consent and will set out where temporary and permanent diversions of certain forestry paths are necessary to maintain health and safety of users, in addition to additional forestry paths to be provided as part of Development, improving accessibility of the area for active travel users.	Not Significant Beneficial
Climate	Table 17-23	**Construction**	
		During the pre-construction and construction of the Development, there will be unavoidable GHG emissions due to the use of materials, energy, fuel, and transportation. However, additional GHG savings are expected to be achieved by implementing the GHG Mitigation Measures listed in the Embedded Mitigation Section. Impacts on global atmosphere during construction are likely to therefore be **Minor Adverse**	Not Significant
		The impact of projected future climate change on the Development Is likely to have **Low to Medium** effects with mitigation.	Not Significant
		The combined impact of future climate conditions and the Development on various receptors as identified by each discipline in their assessment, is likely to result in **Negligible to Low** effects with mitigation measures detailed within the technical chapters that identified ICCIs.	Not Significant
	Table 17-24	**Operation** Impact of GHG emissions arising during the operation of the Development on the climate are likely to have **Beneficial** effects on GHG emissions during operation.	**Significant Beneficial**

Discipline	EIA Ref	Residual Effect	Significance
		The impact of projected future climate change is likely to have **Low to Medium** effects on the Development. The combined impact of future climate conditions and the Development on various receptors as identified by each discipline in their assessment, is likely to result in **Negligible to Low** effects with mitigation measures detailed within the technical chapters that identified ICCIs.	Not Significant Not Significant
Marine Physical Environment and Coastal Processes	Table 18.5	**<u>Construction</u>**	
		The direct loss of 6 m^2 of intertidal area due to the footprint of pile structures will likely have a **Minor Adverse** effect on intertidal habitats.	Not Significant
		The direct loss of 22 m^2 of subtidal area due to the footprint of pile structures will likely have a **Minor Adverse** effect on subtidal habitat.	Not Significant
		Short-term disturbance of bed material due to the installation of piles will likely have a **Minor Adverse** effect on water quality within Loch Fyne.	Not Significant
	Table 18-6	**<u>Operation</u>**	
		Change in currents or water levels are likely to have a **Minor Adverse** effect on navigation and/or flood issues impacted by changes in hydrodynamic conditions within Loch Fyne.	Not Significant
		Impacts on the sedimentary regime may result from a change in sediment transport which are likely to result in **Minor Adverse** effects due to modified seabed morphology.	Not Significant
		Impacts on coastal morphology may include erosion or accretion of sediment unrelated to natural processes with **Minor Adverse** effects from unnatural accumulation of sediments along the coast of Loch Fyne.	Not Significant
		Blockages of coastal outfall structures may result in **Minor Adverse** effects from local sediment accumulation.	Not Significant
Shipping and Navigation	Table 19-10 & Table 9-11	Due to the ‘Broadly Acceptable’ (low risk) significance of the various potential effects identified, no requirement for additional mitigation has been identified in which case all residual effects remain **Broadly Acceptable** for all receptors during construction and operation of the Development .	Not Significant
Commercial Fisheries	Section 20.9	The likely effects of the Marine Facility on commercial fisheries receptors are not significant in EIA terms. As such, specific mitigation and monitoring in relation to commercial fisheries is not considered necessary and all effects remain as **Negligible** adverse significance.	Not Significant

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