Chapter 8: Geology, Hydrology and Peat

Contents

8 Geology, Hydrology and Peat

8.1 Executive Summary

8.1.1 An assessment has been carried out to evaluate likely significant effects of the Proposed Development on the hydrological and hydrogeological environment and on peat during the construction, operation, and decommissioning phases of the Proposed Development.

8.1.2 The assessment was informed by scoping responses received from statutory and non-statutory consultees.

8.1.3 Baseline information was initially gathered through a desk study and subsequently validated through an extensive fieldwork programme. The fieldwork involved a comprehensive programme of peat depth probing, peat condition assessment, and a hydrological walkover survey conducted by an experienced Green Cat Renewables Ltd (GCR) hydrologist.

8.1.4 Designated sites and environmental receptors which were deemed to have hydrological connectivity within the Site were included within the assessment.

8.1.5 The assessment considered the sensitivity of environmental receptors identified during the baseline study and verified through fieldwork, alongside the embedded mitigation measures integrated into the project design. Potential future changes to baseline conditions were also taken into account.

8.1.6 The baseline study identified five categories of sensitive hydrological and hydrogeological receptors within the Study Area. These include surface water features, the Cowal and Lomond groundwater unit, private water supplies (PWS), peat and groundwater dependent terrestrial ecosystems (GWDTEs). The final assessment concluded that, with careful site layout and the implementation of standard good practice and project-specific mitigation measures, potential impacts on these receptors can be reduced to acceptable levels.

8.1.7 The final design layout was informed by a range of constraints with an emphasis placed on avoiding areas of deeper peat in accordance with National Planning Framework 4 (NPF4). Where technically feasible, areas of deep peat have been avoided. The assessment of peat and carbon-rich soils covered all proposed infrastructure, including both new and upgraded permanent access tracks. An Outline Peat Management Plan (OPMP) has been prepared, confirming that soil disturbance is minimised as far as possible and that excavated soils can be effectively reused for on-site restoration.

8.2 Introduction

8.2.1 This chapter assesses the likely significant effects of the Proposed Development on the hydrology and hydrogeology environments. The risk of pollution or disruption of watercourses, groundwater bodies, and private water sources, within or near the Site, needs to be assessed and appropriately mitigated where necessary. Potential impacts could include:

- Erosion and sedimentation;
- Impacts to surface runoff characteristics;
- Impacts on surface water quality;
- Impacts on river flows and flooding;
- Impacts on Groundwater Dependent Terrestrial Ecosystems (GWDTE);
- Impacts on soils;
- Impacts on peat hydrological regime;
- Chemical pollution of groundwater;
- Disruption or fouling of private water supplies;
- Impacts on public water supplies and abstractions;
- Modifications to hydrogeological regime; and
- Peat Slide Risk

8.2.2 The assessment uses information and findings presented in Chapter 6 to inform the assessment of potential effects on possible areas of GWDTE which are presented in this chapter.

8.2.3 The report is supported by following documents and figures associated with the hydrological assessment and within the Ecological Impact Assessment (EcIA) by LUC Ltd:

- Appendix 6.2: Habitats and Vegetation Survey Report;
- Figure 6.1: Ecology Survey Areas;
- Figures 6.3a and 6.3b: Phase 1 Habitat Survey Results;
- Figures 6.4a to 6.4f: National Vegetation Classification (NVC) Survey Results;
- Figure 6.5: Areas of Guidance-Stated Potential Groundwater Dependency;
- Appendix 8.1: Outline Peat Management Plan;
- Appendix 8.2: Peat Slide Hazard Risk Assessment
- Appendix 8.3: Water Crossing Assessment;
- Figure 8.1: Hydrological Context Map;
- Figures 8.1A – 8.1F Hydrological Context Map Block Plans; and
- Figure 8.1.1: Peat Depth Map

8.3 Legislation, Policy and Guidelines

8.3.1 Statutory, general, national, and local guidance consulted during this assessment is listed below.

Legislation

8.3.2 Relevant legislation and guidance documents have been reviewed and taken into account as part of this Hydrological assessment. Of particular relevance are:

- The Housing Scotland (Act) 1987 (Sect 86);
- Water Environment and Water Services (Scotland) Act 2003;
- The Flood Risk Management (Scotland) Act 2009;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations, 2017;
- The Public and Private Water Supplies (Miscellaneous Amendments) (Scotland) Regulations 2017;
- The Pollution Prevention and Control (Scotland) Regulations, 2012;
- Water Environment (Controlled Activities) (Scotland) Regulations 2011;
- Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017;

8.3.3 Relevant retained European legislation of particular relevance are:

- Freshwater Fish Directive 2006/44/EC;
- Groundwater Directive 2006/118/EC;
- Water Framework Directive (WFD) 2000/60/EC;
- Dangerous Substances Directive 76/464/EEC;

Planning Policy

8.3.4 Planning policies relevant to this chapter include National Planning Framework 4 (NPF4), in particular:

- Policy 3: Biodiversity
- Policy 4: Natural Places
- Policy 5: Soils
- Policy 11: Energy
- Policy 22: Flood Risk and Water Management

8.3.5 Regional planning policies relevant to this chapter include:

- Policy 04 – Sustainable Development
- Policy 30 – The Sustainable Growth of Renewables
- Policy 55 – Flooding
- Policy 56 – Land Erosion
- Policy 58 – Private Water Supplies and Water Conservation

- Policy 59 – Water Quality and The Environment
- Policy 60 – Private Sewage Treatment Plans and Wastewater Drainage Systems
- Policy 61 – Sustainable Drainage Systems (SUDS)
- Policy 62 – Drainage Impact Assessments
- Policy 75 – Development Impact on Sites of Special Scientific Interest (SSSIs) and National Nature Reserves
- Policy 79 – Protection of Soil and Peat Resources
- Policy 80 – Geodiversity

Guidance

8.3.6 This assessment has been prepared in accordance with the following best practice guidelines.

8.3.7 Planning Advice Notes (PANs) published by the Scottish Government, including:

- PAN 79: Water and Drainage, 2006;
- Planning Advice Note (PAN) 61: Planning and SuDS, 2001;
- Scottish Government (2017) Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments; and
- Scottish Government (2017) Planning Advice on Wind Farm Developments on Peatland

8.3.8 SEPA Guidance

- GPP 1 Understanding your environmental responsibilities – good environmental practices;
- GPP 2 Above Ground Oil Storage Tanks;
- GPP 3 Use and design of oil separators in surface water drainage systems;
- GPP 4 Treatment and disposal of wastewater where there is no connection to the public foul sewer;
- GPP 5 Works and maintenance in or near water;
- GPP 6 Working at Construction and Demolition Sites;
- GPP 8 Safe Storage and Disposal of Used Oils;
- GPP 13 Vehicle washing and cleaning;
- GPP 21 Pollution Incident Response Planning;
- GPP 22 Dealing with spills;
- Managing River Habitats for Fisheries, 2002;
- Special Requirements for Civil Engineering Contracts for the Prevention of Pollution, Version 2, SEPA, 2006;
- Culverting of Watercourses, WAT-PS-06-02, 2015;
- Natural Flood Management Handbook, 2015;
- Indicative River & Coastal Flood Map (Scotland);
- Planning advice on wastewater drainage, 2011;
- Water Run-Off from Construction Sites, WAT-SG-75, 2021;
- Temporary Construction Methods, WAT-SG-29, 2009;
- SEPA Flood Risk and Planning Briefing Note, 2009;
- Groundwater Protection Policy for Scotland, v3, 2009;
- SEPA Position Statement 'The role of SEPA in Natural Flood Management', 2012;
- Technical flood risk guidance for stakeholders, SS-NFR-P-002, 2015;
- SEPA Regulatory Position Statement – Developments on peat, 2010;
- Engineering in the water environment: good practice guide - River crossings, 2010;
- Environmental Standards for River Morphology, WAT-SG-21, 2012;

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 - A practical guide, Version 8.3 February 2019;
- Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, 2017;
- Land Use Planning System SEPA Guidance Note 4: Planning guidance on onshore windfarm developments, 2017; and
- SEPA Water quality classification interactive database (2023 data).

8.3.9 CIRIA Guidance:

- CIRIA C515 Groundwater Control - Design and Practice;
- CIRIA C532 Control of Water Pollution from Construction Sites;
- CIRIA C648 Control of Water Pollution from Linear Construction Projects;
- CIRIA C689 Culvert Design and Operation Guide;
- CIRIA C741 Environmental Good Practice on Site; and
- CIRIA C753 SuDS Manual.

8.3.10 Other relevant guidance documents include:

- A handbook on environmental impact assessment - Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland. NatureScot, 2018
- River Crossings and Migratory Fish: Design Guidance, A Consultation Paper, The Scottish Executive
- Good Practice During Windfarm Construction, 2019 (4th Edition), Scottish Renewables (SR), NatureScot, SEPA, Forestry Commission Scotland (FCS), Historic Environment Scotland and Marine Scotland Science
- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland, on-line version only
- Forestry & Water Scotland (2018) Protecting Private Water Supplies During Forestry Activities
- List of Precautions for Drinking Water and Assets, Scottish Water, 2020

8.4 Consultation

8.4.1 Consultation for the Proposed Development was undertaken with statutory and non-statutory bodies. A full list of consultees is outlined in Appendix 4.1.

8.4.2 A summary of the consultation responses provided by the consultees relevant to this chapter are outlined in Table 8.1.

Table 8.1 – Consultation Responses

Consultee and Date	Consultation Response	Applicant Response
Argyll and Bute Council Scoping Opinion 4 April 2024	As per the 'HYDROLOGY, GEOLOGY & HYDROGEOLOGY' Section of the Response, "*the Hydrological Context Map (produced by Green Cat Renewables Ltd, dated 17th November 2023) displays 50m buffer zones surrounding watercourses and the proposed locations of the wind turbines. There is a small overlap of the buffer zones with two of the proposed turbine locations (turbine numbers 4 and 5). It is advised that these are relocated outwith the 50 m buffer zone, so that they are located at a stand-off distance of at least 50m from the watercourse.*"	– -Scoping responses were taken into consideration and a new design layout has been proposed. This updated design avoids all watercourse buffer zones. It is confirmed that no turbine locations are situated within the 50 m buffer zone.
Argyll and Bute Council Scoping Opinion 4 April 2024	As per the 'HYDROLOGY, GEOLOGY & HYDROGEOLOGY' Section of the Response: *"Should watercourse crossings be required to access the turbines; these should be designed in a way so as not to reduce the existing capacity of the channel, and if possible, be designed to convey the 200 year plus climate change flow. It is recommended that this be made a planning condition. In designing the crossings,*	– Twelve watercourse crossings are required as part of the Proposed Development. The proposed water crossings will be constructed as feasibly close to right-angles with the watercourse as possible, in accordance with standard practice set out in SEPA's Engineering in the

Consultee and Date	Consultation Response	Applicant Response
	considerations should be given to options such as bottomless culverts, and it is recommended that any changes to crossings should not reduce the existing capacity of the crossing, e.g. culverts should not be made smaller."	water environment: Good Practice Guidance – River Crossings (2010). Bottomless arch culverts will be implemented where possible, with one flush crossing proposed where a clear water channel is not present. All new and upgraded watercourse crossings will be designed to accommodate the 1 in 200 year flood event plus an allowance for climate change, and the capacity of any upgraded crossings will be maintained or improved.
Argyll and Bute Council Scoping Opinion 4 April 2024	As per the 'HYDROLOGY, GEOLOGY & HYDROGEOLOGY' Section of the Response: *"Given the risk of surface water flooding across the site, it is recommended that drainage of surface water be designed in accordance with CIRIA C753 and SuDS guidance... Surface water drainage should be designed such that post development surface water runoff does not exceed the predevelopment surface water runoff."*	– Drainage for the Proposed Development has been designed in accordance with CIRIA C753 and SuDS guidance. The Proposed Development drainage design is illustrated in Figure 3.2
Energy Consents Unit (ECU) Scoping Opinion 10th May 2024	As per Section 3.8 of the Scoping Opinion: *"Scottish Water provided information on whether there are any drinking water protected areas or Scottish Water assets on which the development could have any significant effect. Scottish Ministers request that the Company contacts Scottish Water (via EIA@scottishwater.co.uk) and makes further enquiries to confirm whether there any Scottish Water assets which may be affected by the development,and includes details in the EIA report of any relevant mitigation measures to be provided*."	Refer to Scottish Water response below.No further consultation was required with Scottish Water to complete the assessment.
Energy Consents Unit (ECU) Scoping Opinion 10th May 2024	As per Section 3.9 of the Scoping Opinion: "*Scottish Ministers request that the Company investigates the presence of any private water supplies which may be impacted by the development*."	– PWS data was requested from Argyll and Bute Council and was used to determine which PWS may be at risk of impacts from the Proposed Development. – PWS with potential hydrological connectivity were visited where possible to confirm the source location and source type (See Section 8.6).
ECU Scoping Opinion 10th May 2024	As per Sections 3.11 and 3.12 of the Scoping Opinion, the Scottish Ministers request that: *"in addition to identifying the main watercourses and waterbodies within and downstream of the proposed development area, developers should identify and consider, at this early stage, any areas of Special Areas of Conservation where fish are a qualifying feature and proposed felling operations particularly in acid sensitive areas."* *"Developers are required to submit the completed checklist in advance of their application submission."*	– This chapter assesses the potential effects of the Proposed Development on the water environment. Required mitigation measures and best practice that would be adopted are also presented in this chapter. – No SACs were identified within the Study Area.
ECU Scoping Opinion 10th May 2024	As per Section 3.13 of the Scoping Opinion: "*Scottish Ministers consider that where there is a demonstrable requirement for peat landslide hazard and risk assessment ("PLHRA"), the assessment should be undertaken as part of the EIA process to provide Ministers with a clear understanding of whether the risks are acceptable and capable of being controlled by mitigation measures. The Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition), published at Proposed electricity generation developments: peat landslide hazard best practice guide -gov.scot (www.gov.scot), should be followed in the preparation of the EIA report, which should contain such an assessment and details of mitigation measures. Where a PLHRA is not required clear justification for not carrying out such a risk assessment is required."*	– A comprehensive programme of peat depth probing and condition assessment has been completed. – Potential impacts on peat and proposed mitigation measures are summarised in this chapter and discussed in full in Technical Appendix 8.1, Technical Appendix 8.2 and Technical Appendix 6.2.

Consultee and Date	Consultation Response	Applicant Response
ECU Scoping Opinion 10th May 2024	As per Section 3.18 of the Scoping Opinion, where borrow pits are proposed as a source of on-site aggregate they should be considered as part of the EIA process and included in the EIA report detailing information regarding their location, size and nature. Ultimately, it would be necessary to provide details of the proposed depth of the excavation compared to the actual topography and water table, proposed drainage and settlement traps, turf and overburden removal and storage for reinstatement, and details of the proposed restoration profile. The impact of such facilities (including dust, blasting and impact on water) should be appraised as part of the overall impact of the working. Information should cover the requirements set out in 'PAN 50: Controlling the Environmental Effects of Surface Mineral Workings'.	– There are no borrow pits proposed as part of the Proposed Development. – Should any borrow pits be considered at a later date, a borrow pit assessment will be conducted.
NatureScot Scoping Response 29th March 2024	As per Section 3.3 of the Response: *"the Carbon and Peatland Map (2016) indicates that the majority of the proposed development site is mapped as Class 2 peatland, with Class 1 peatland located to the north of the site (encompassing proposed turbine T7); therefore, the site could contain nationally important carbon-rich soils and priority peatland habitats which are likely to be of high conservation value. The Scoping Report mentions that the development is likely to include bog habitats, and that 'potential effects on habitats of conservation concern' will be scoped in, defined in the report as Annex 1 habitats."* *"We agree with the proposed survey scope and assessment method as described within the Scoping Report, which confirms that habitat surveys, including National Vegetation Classification (NVC) surveys, are to commence in 2024. This should be undertaken across the entire development site due to the potential for priority peatland to be affected. We recommend that these survey results are used to inform the design and layout process, so that the development avoids, where possible, sensitive habitats such as blanket bog and montane heath. Where this is not possible, impacts should be minimised and suitable mitigation, restoration and/or compensation measures be proposed."* *"In addition, the protection of soils (Policy 5) intends to protect carbon-rich soils including restoration of peatlands and minimising disturbance to soils from development; Policy 5a states that proposals will only be supported if they are designed and constructed in accordance with the mitigation hierarchy, and in a manner that protects soil from damage. Policy 5d requires a detailed site-specific assessment where development on peatland, carbon-rich soils or priority peatland is proposed; baseline peat depth and habitat condition surveys are required as well as an assessment of the stability of the carbon-rich soil (e.g. Peat Landslide Hazard Risk Assessment), as well as an assessment of effects. Policy 3 (Biodiversity) also applies to all development proposals, so any proposal affecting carbon-rich soils and peatlands must also take into account the requirements to conserve, restore and enhance biodiversity, including priority peatland habitats.* *We advise that these site-specific assessments and surveys inform the project design and siting to ensure compliance with the mitigation hierarchy, avoiding impacts to priority peatland habitats as far as possible. Where impacts cannot be avoided, we recommend that restoration to achieve offsetting (i.e. compensation rather than biodiversity enhancement) should be in the order of 1:10 (lost:restored), i.e. 1ha loss of peatland should result in measures to restore 10ha of peatland."*	– A Phase 1 and 2 peat probing survey was conducted and used to inform site design. – Appendix 9.1 provides an Outline Peat Management Plan for the Site. – A National Vegetation Classification (NVC) survey was conducted to identify potential priority peatland habitat. – A Peat Landslide Hazard Risk Assessment was conducted and is presented in Appendix 8.2. The Site layout was designed and will be constructed in accordance with the mitigation hierarchy. -The Site was surveyed for all potential restoration areas and whilst a 1:10 ratio was not feasible due to site conditions, an enhancement plan, total restoration area and the resulting ratio to be implemented is outlined in Appendix 6.5.
SEPA Scoping Response	As per the Advice section of the Response: *" to avoid delay and potential objection the EIA submission must contain a scaled plan of sensitivities,*	– Refer to Figures 6.1, 8.1 and 8.2 and Appendix 6.5.

Consultee and Date	Consultation Response	Applicant Response
12th March 2024	*for example peat, GWDTEs, proximity to watercourses, overlain with proposed development. This is necessary to ensure the EIA process has informed the layout of the development to firstly avoid, and then reduce then mitigate significant impacts on the environment. We consider that the issues covered in Appendix 1 below must be addressed to our satisfaction in the EIA process. This provides details on our information requirements and the form in which they must be submitted."*	
SEPA Scoping Response 12th March 2024	As per Section 1.2 of the Response*: "The plans at present do not appear to show all watercourses and buffers – and appear to show turbines T5 & T7 within 50m of a watercourse which would not be acceptable to us."*	– All watercourses and waterbodies on 10k mapping were identified and a 50m buffer was applied. The final Site layout was designed to avoid these areas. – Detail of the design methodology is outlined in Section 8.7.
SEPA Scoping Response 12th March 2024	As per Sections 1.3 and 1.4 of the Response: *"The plans at present show T7 within Class 1 - Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas likely to be of high conservation value and T1, T2, T3, T4, T5, T6 and T8 within Class 2 - Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential.* *We will require a peat condition assessment and peat depth survey for the site and would object to any proposed infrastructure on near natural peatland/high conservation value and look for identification of areas with restoration potential."*	– Phase 1 and 2 peat probing surveys were conducted and used to inform the final design layout. – Infrastructure has been sited to avoid areas of deep peat and peat in good ecological condition, minimising potential impacts on near-natural peatland and high conservation value areas. – Details of peat probing surveys, peatland condition assessment and potential restoration areas are outined in Appendix 8.1, 8.2 and 6.5.
SEPA Scoping Response 12th March 2024	As per Section 1.6 of the Response: "*Provided watercourse crossings are designed to accommodate the 1 in 200 year event plus climate change and other infrastructure is located well away from watercourses, we do not foresee from current information a need for detailed information on flood risk*."	– It is confirmed that watercourse crossings would be sized to pass the 1 in 200 year flood event plus an allowance for climate change. – A screening assessment of flood risk is included in Section 8.9 of this chapter.
Scottish Water Scoping Response 13th March 2024	*"Scottish Water has no objection to this planning application; however, the applicant should be aware that this does not confirm that the proposed development can currently be serviced."*	– Noted
Scottish Water Scoping Response 13th March 2024	*"A review of our records indicates that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed activity."*	– Noted
Scottish Water Scoping Response 13th March 2024	*"For reasons of sustainability and to protect our customers from potential future sewer flooding, Scottish Water will not accept any surface water connections into our combined sewer system. There may be limited exceptional circumstances where we would allow such a connection for brownfield sites only, however this will require significant justification from the customer taking account of various factors including legal, physical, and technical challenges. In order to avoid costs and delays where a surface water discharge to our combined sewer system is anticipated, the developer should contact Scottish Water at the earliest opportunity with strong evidence to support the intended drainage plan prior to making a connection request. We will assess this evidence in a robust manner and provide a decision that reflects the best option from environmental and customer perspectives."*	– It is confirmed that no connection to the Scottish Water sewer system or network is proposed as part of the drainage strategy for the Proposed Development.
Fisheries Management Trust Scotland	*"The Proposed Development falls within the district of the Eachaig District Salmon Fishery Board, and the catchment relating to the Argyll Fisheries Trust. It is*	– .A response was received from the River Eachaig Fishery Syndicate of

Consultee and Date	Consultation Response	Applicant Response
Scoping Response 8th March 2024	*important that the proposals are conducted in full consultation with these organisations."*	the Argyll District Salmon Fishery Board outlining the need for baseline data, in addition to data colllection during the construction and operational phases of the Proposed Development. – Further consultation will be conducted post-consent.
Fisheries Management Trust Scotland Scoping Response 8th March 2024	"*Due to the potential for such developments to impact on migratory fish species and the fisheries they support, FMS have developed, in conjunction with Marine Scotland Science, advice for DSFBs and Trusts in dealing with planning applications. We would strongly recommend that these guidelines are fully considered throughout the planning, construction and monitoring phases of the proposed development."*	– Guidance has been and will be fully considered throughout the planning, construction and monitoring phases of the Proposed Development. – -Potential impacts to fish have been assessed in this chapter and appropriate mitigation has been outlined in Section 8.7. – Bottomless arch culverts will be used for water crossings to avoid disruption to fish migration and will be constructed in accordance with standard practice set out in SEPA's Engineering in the water environment: Good Practice Guidance – River Crossings (2010). – To limit potential impacts to water quality, 50m watercourse buffers have been adhered ot during the design phase.
Argyll District Salmon Fishery Board Scoping Response 13th March 2024	*"the proposed layout suggests a low level of threat to the Scoops Burn tributary of the Glenkin Burn and Allt na Chriche tributary. It is possible that brown trout and European eel are present within the site in these burns, and sea trout in the lower Glenkin Burn / Little Eachaig. We therefore suggest that pre (baseline), during and post construction data is collected as per Marine Directorate's guidelines to demonstrate that the fishery has been protected."*	– Pre-construction baseline data will be collected and data will be monitored throughout the duration of the construction and post-construction phases of the Proposed Development. – Potential for runoff entering the Scoops Burn tributary, which has been known to host salmonid species has been considered and watercourses are assessed as part of the hydrological impact assessment. – Further consultation with the Argyll District Salmon Fishery Board will occur prior to construction.

8.5 Assessment Methodology and Significance Criteria

8.5.1 The assessment of the likely significant effects of the Proposed Development on hydrology, hydrogeology and peat was carried out by the method described in the following sub-sections.

Study Area

8.5.2 Given the scale of the Proposed Development, a conservative study radius of 1.2 km around the proposed infrastructure has been used for the assessment. The criteria for defining the Study Area have been established based on professional judgement, experience regarding expected working areas, relevant SEPA guidance, and other relevant guidance on hydrological assessment. The 1.2 km study radius accommodates any micrositing allowances, which are typically <100 m and therefore do not effect the overall extent. This is designed to capture any effects from the Proposed Development footprint on surrounding hydrological receptors. The ecological Study Area extent and biodiversity enhancement measures are addressed separately in Chapter 6. The Cumulative Effects Study Area includes the catchments within the Study Area and within 5 km of the Site. A 5 km Study Area was selected, as cumulative impacts beyond this distance are not considered likely to be significant or detectable to potential receptors.

Identification of Baseline Conditions

8.5.3 The purpose of the baseline study is to identify:

- Land use across the Site;

- Topography and surface water hydrology, including water courses, springs, and drains;
- The extent of river catchments and all flooding risk;
- Geological and hydrogeological conditions of the Site;
- Any current dewatering, abstraction, or foul drainage;
- Private drinking water abstractions and private water supplies;
- The extent of habitats across the Site, particularly any GWDTEs; and
- Depth and condition of peatland.

8.5.4 Baseline conditions within the Site are established through a desktop survey and later through a site visit. The following sources have been consulted:

- Ordnance survey 1:10,000 and 1:50,000 map data
- Ordnance survey digital terrain model (DTM)
- BGS – Geology of Britain Viewer https://www.bgs.ac.uk/map-viewers/geology-of-britain-viewer/
- BGS – Hydrogeological Map 1:625,000
- BGS – Groundwater Vulnerability Map 1:625,000
- Scotland's soils, Carbon and Peatland 2016 Map https://map.environment.gov.scot/Soil_maps/?layer=10
- Scotland's Environment Map https://map.environment.gov.scot/sewebmap/?layers=riverClass
- Consultation with statutory and non-statutory organisations, including SEPA, NatureScot, Scottish Water, and the Council's Environmental Health Department.
- SEPA Flood Maps https://map.sepa.org.uk/floodmap/map.htm
- SEPA River Basin Management Plan (RBMP) interactive Map https://www.sepa.org.uk/data-visualisation/water-environment-hub/
- NatureScot Sitelink https://sitelink.nature.scot/map
- Argyll Fisheries Trust https://argyllfisheriestrust.co.uk/
- Eachaig District Salmon Fishery Board https://www.eachaigfishing.com/the-fishing/

8.5.5 A National Vegetation Classification (NVC) and habitats survey was undertaken by LUC Ltd between June and October 2024. The aim of this survey was to identify and map the vegetation communities within the Site to identify the areas of greatest ecological interest, including potential GWDTEs and priority peatland habitat. The habitat and vegetation surveys were based on the Proposed Development footprint, oversail and anticipated land take of the originally considered nine turbine layout. The surveys comprehensively covered the entire Site area, encompassing any subsequent changes in layout.

8.5.6 The Site was walked through by GCR and LUC Ltd and the vegetation was mapped using the Phase One Habitat Classification and the National Vegetation Classification. Further details regarding the NVC study are presented in Appendix 6.2.

Assessment of Likely Effect Significance

8.5.7 The assessment of likely effect significance is determined by the sensitivity of the receptor and the magnitude of impact to the receptor.

Receptor Sensitivity

8.5.8 With the baseline established, sensitive receptors can be determined. The criteria set out in Table 8.2 outlines the various factors considered in the assessment of the sensitivity of potential receptors.

Table 8.2 - Sensitivity Table

Sensitivity	Definition
High	Receptor of high quality, rarity of a regional or national scale, and limited potential for substitution or replacement. This includes: – Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPA) or Special Area of Conservation (SAC) – SEPA Water Quality defined as High

Sensitivity	Definition
	– Abstraction for public water supply – Private water supplies – 0 to 100 m from construction activities – Designated salmonid fishery and/or salmonid spawning grounds present – Watercourse widely used for recreation, directly related to watercourse quality (e.g., swimming, salmon fishery) <1.2 km downstream of development – Active flood plain area (important in relation to flood defence) – Groundwater - public drinking water supply – Groundwater aquifer productivity classed 1A or 2A in the BGS 1:625000 Hydrogeology Map – Geology that is rare or of national importance as defined by SSSI or Regional Important Geological Site (RIGS) – GWDTE defined as Class 1, and/or defined as 'High Conservation Value' by Ecologist – Peat defined as Class 1 and Class 2 – Peat Slide Risk likelihood of 'probable' or 'almost certain'
Medium	Receptor of medium quality, rarity of a local, regional, or national scale, and limited potential for substitution/replacement. This includes: – SEPA Water Quality defined as Good – Surface water abstractions for private water supply for more than fifteen people – Private Water Supplies – Surface water abstractions within 100–600 m of construction activities, groundwater spring abstractions within 100–400 m of construction activities, and groundwater borehole abstractions within 0– 200 m of construction activities – Designated salmonid fishery and/or cyprinid fishery – Watercourse widely used for recreation, directly related to watercourse quality (e.g., swimming, salmon fishery) >1.2 km downstream of development – Groundwater aquifer productivity classed as 1B or 2B in the BGS 1:625000 Hydrogeology Map – GWDTE defined as Class 2, and/or defined as 'Medium Conservation Value' by Ecologist – Peat Slide Risk of 'Likely'
Low	Receptor of low quality, rarity of a local, regional, or national scale, and limited potential for substitution/replacement. This includes: – SEPA Water Quality defined as Moderate or Poor – Occasional or local recreation (e.g., local angling clubs) – Conveyance of flow and material, main river <10 m wide or ordinary watercourse >5 m wide – Existing flood defences – Private Water Supplies – Surface water abstractions >600 m from construction activities, groundwater spring abstractions within 400–800 m of construction activities, and groundwater borehole abstractions within 200–600 m of construction activities – May be subject to improvement plans by SEPA – Designated cyprinid fishery, salmonid species may be present and catchment locally important for fisheries – Watercourse not widely used for recreation, or recreation use not directly related to watercourse quality – Groundwater aquifer productivity classed as 1C or 2C in the BGS 1:625000 Hydrogeology Map – Groundwater dependent terrestrial ecosystems (GWDTE) defined as Class 3, and/or defined as 'Local Conservation Value' by Ecologist – Peat Slide Risk of 'Unlikely'
Negligible	Receptor of low quality, rarity of a local scale, and limited potential for substitution/replacement. Environmental equilibrium is stable and is resilient to changes that are greater than natural fluctuations, without detriment to its present character. This includes: – SEPA water quality defined as Bad – Fish sporadically present or restricted, no designated features – Receptors not used for recreation, e.g., no clubs or access route associated with watercourse – Watercourse <5 m wide – flow conveyance capacity of watercourse low - very limited floodplain as defined by topography, historical information and SEPA flood map – Private Water Supplies – groundwater spring abstraction >800 m from construction activities, and groundwater borehole abstractions >600 m from construction activities – No public drinking water supplies – Groundwater aquifer productivity classed as 3 in the BGS 1:625000 Hydrogeology Map – Receptor heavily engineered or artificially modified and may dry up during summer months – Geology not designated under a SSSI or RIGS or protected by specific guidance – Peat defined as Classes 3, 4 and 5

Sensitivity	Definition
	– Peat Slide Risk of 'Negligible'

Assessment of Magnitude of Impact

8.5.9 The analysis of the significance of each impact is based on its magnitude. The magnitude of impact includes the timing, scale, size, frequency and duration of the potential impact. For the purposes of this assessment the magnitude criteria are defined in Table 8.3.

Table 8.3 - Magnitude of Impact Table

Magnitude	Criteria	Description and Example
Large	Results in loss of attribute	– Fundamental (long term or permanent) changes to geology, hydrology, water quality and hydrogeology – Loss of designated Salmonid Fishery – Loss of national level designated species/habitats – Changes in WFD water quality status of river reach – Loss flood storage/increased flood risk – Pollution of potable source of abstraction compared to pre-development conditions
Medium	Results in impact on integrity of attribute or loss of part of attribute	– Material but non-fundamental and short to medium term changes to the geology, hydrology, water quality and hydrogeology – Loss in productivity of a fishery – Contribution of a significant proportion of the discharges in the receiving water, but insignificant enough so as not to change its water quality status – No significant impact on the economic value of the receptor – No significant increase in flood risk
Small	Results in minor impact on attribute	– Detectable but non-material and transitory changes to the geology, hydrology, water quality and hydrogeology – No significant impact on the economic value of the receptor – No increase in flood risk
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use/integrity	– No perceptible changes to the geology, hydrology, water quality and hydrogeology – Discharges to watercourse but no loss in quality, fishery productivity or biodiversity – No significant impact on the economic value of the receptor – No increase in flood risk

Assessment of Receptor Significance

8.5.10 The sensitivity of the receptor together with the magnitude of impact defines the significance of the impact as outlined in Table 8.4.

8.5.11 The significance of any identified effects will be assessed in terms of Major, Moderate, Minor or Negligible. The matrices should not be used as a prescriptive tool but will allow for the exercise of professional judgement.

8.5.12 Any effects that are classified as Major or Moderate, will be considered to be equivalent to likely significant effects referred to in the EIA Regulations. Where an effect is deemed to be significant, mitigation will be employed to reduce those impacts to a non-significant level.

Table 8.4 - Significance of Impact Matrix

Sensitivity	Magnitude			
	Large	**Medium**	**Small**	**Negligible**
High	Major	Major	Moderate	Negligible
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Mitigation and Assessment of Residual Impact

8.5.13 There are recognised best practices and measures to mitigate and eliminate predicted impacts. These may be grouped in decreasing order of preference as follows: avoid, minimise, restore and offset. In

line with NPF4 Policy 3b, the Proposed Development commits to implementing targeted enhancement measures that will provide a demonstrable net environmental benefit (See Appendix 6.5).

8.5.14 Once each predicted impact is associated with a mitigating measure, the residual magnitude is derived. The sensitivity of the receptor together with the residual magnitude of impact defines the significance of the post-mitigation impact, as outlined in Table 8.4.

Cumulative Assessment

8.5.15 The assessment also considers potential cumulative effects associated with other developments within 5 km of the Site Boundary and in the same surface water catchments as the Proposed Development.

8.5.16 A cumulative effect is considered to be the effect on a hydrological, hydrogeological or geological receptor arising from the Site in combination with other developments which are likely to affect soils or geology, surface water and groundwater.

8.5.17 Cumulative schemes considered in this assessment are initially identified in Chapter 4.

8.5.18 Based on their proximity and potential hydrological connectivity, the following wind farm development within 5 km of the Site has been identified as relevant to the cumulative assessment:

• Inverchaolain (Scoping) – 13 turbines, located 4.4 km south-west.

Limitations to Assessment

8.5.19 The fieldwork followed standard field methods with visual inspections of watercourses and ground conditions. The walkover survey was carried out in April and May of 2025 during a period of dry weather, when the water table may not have been at its highest point. There may have been unnamed burns and drains that were dried out at the time of the site visit. The grounds and vegetation were visually inspected for any signs of previous gullying.

8.5.20 Private water supply (PWS) information was provided by Argyll and Bute Council in January 2025; however, it is recognised that this information may be incomplete or incorrect and precautionary mitigation measures will be put in place as a result. Additionally, the closest PWS to the Proposed Development was visited to confirm the abstraction location. Precautionary mitigation measures are detailed within Section 8.10.

8.5.21 Whilst some information gaps have been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of any potential significant effects on geology, hydrology, and hydrogeology receptors.

8.6 Baseline Conditions

Site Overview

8.6.1 The Proposed Development is located on and around the hills surrounding Eilligan (469 m AOD) and Strone Saul (314 m AOD) and, at its nearest point, is situated c.1.2 km west of Sandbank and c.1.3 km west of Dunoon, on the Cowal Peninsula of Argyll and Bute. The Study Area is largely comprised of shrub heathland with rough grassland and blanket bog habitat, spread across the upper slopes of a mountainous ridge. The outer edges of the Study Area and the wider setting are predominantly comprised of dense stands of coniferous forestry, which are intersected by several forestry tracks and watercourses. The Glenkin Burn flows through the forestry to the north-west, cutting through the raised landscape to form the Glen Kin valley. To the north-east of the Study rea, an inlet of water from the Firth of Clyde forms the Holy Loch.

8.6.2 The topography within the Study Area is varied and characterised by several peaks, which is illustrated in Figure 8.1 – Hydrological Context Map. Within the Study Area, topography ranges from 70 m AOD at the base of Glenkin Valley, to the summits of Bishop's Seat (504 m AOD); Big Knap (452 m AOD); Eilligan (469 m AOD); Strone Saul (314 m AOD); and Finbracken Hill (198 m AOD).

8.6.3 The Proposed Development is discussed in further detail within Chapter 2.

Hydrological Overview

8.6.4 The Study Area is situated entirely within the Cowal / Clyde Sealochs Coastal catchment area of the Scotland River Basin District.

8.6.5 A mountainous ridge is central to the Study Area encompassing several raised peaks which enables surface water to flow in several directions.

8.6.6 The north of the Study Area is drained by the Allt na Criche which stems from a small lochan near the summit of Strone Saul. It then flows north through coniferous forestry, merging with several unnamed burns before dispelling into the Little Eachaig River c.730 m beyond the northern extent of the Study Area. The Little Eachaig River then flows under and follows the B836, before flowing under the A815 and entering the Holy Loch.

8.6.7 The north-east of the Study Area is drained by the Allt a Chromain and a series of tributary burns which flow on a north-eastern trajectory, flowing through the surrounding stands of forestry, entering a small reservoir, and flowing underneath the A885 road, before discharging into the Holy Loch c.0.8 km beyond the Study Area.

8.6.8 To the east, a series of unnamed burns merge and enter the Eas a Chaibeil before it dispels into Loch Loskin, c.0.9 km east of the Study Area. The Milton Burn exits Loch Loskin to the south before flowing through the town of Dunoon and into the Firth of Clyde at the East Bay, c.2.5 km downstream of the study area.

8.6.9 The southern extent of the Study Area encompasses the summits of Bishops Seat and Eilligan with the Badd Burn stemming from between their peaks. The Badd Burn and an array of adjacent unnamed burns flow on a south-eastern trajectory and merge with the Balgaidh Burn as it flows beyond the southern extent of the Study Area. This burn follows the Bishop's Glen and feeds Dunoon Reservoir, which is also known as Bishop's Glen Reservoir and is a stocked fishery. The outflow from this waterbody then flows under Kilbride Road and the A815 before it dispels into the Firth of Clyde at the West Bay at Dunoon, c.2.5 km downstream of the Study Area.

8.6.10 An array of burns to the west of the Study Area, including the named Spout Burn, flow on a western trajectory and enter Glen Kin Burn. The Glen Kin Burn flows north though a valley, with further tributaries including Allt an Lubhair, Birchen Burn and Dubh Lag entering from the eastern flanks of Tom Mor and Meall Buidhe. The burn ultimately dispels into Little Eachaig River, north of the Study Area.

8.6.11 Whilst outwith the Study Area, it is worth noting that the far west of the Site is drained by Giant's Burn and its associated tributaries which stem from the summits of The Socach and Giants Knowe. Several tributaries and the headwaters of Glenkin Burn also traverse the western Site extent.

Surface and Groundwater Classification

8.6.12 SEPA has classified the quality of all significant waterbodies in Scotland under the Water Framework Directive (WFD) (2019). No classified waterbodies lie within the Study Area.

8.6.13 The nearest classified waterbody is the 'Little Eachaig River/Cruach Neuran Burn' (SEPA ID: 10202), which is located c.0.2 km to the north of the Study Area at its nearest point. The 'Little Eachaig River/Cruach Neuran Burn' was classified as having an overall status of "Moderate Ecological Potential" in 2023 on the SEPA Water Classification Hub, and a 'Moderate' status for its Pre-Heavily Modified Water Body status and its Overall ecology. The water quality for this waterbody was classed as high. It is noted that the watercourse has undergone significant modifications and physical alterations that cannot be further altered without resulting in impacts on its use as water storage for the Cowal Hydro-Electric Power Scheme.

8.6.14 The Study Area is fully situated upon the Cowal and Lomond groundwater unit (SEPA ID: 150689) which spans an area of 1163 km^2. The Cowal and Lomond groundwater unit was awarded an overall status of "Good" with no limiting parameters in 2023.

Fisheries & Recreation

8.6.15 The Proposed Development falls within the jurisdiction of the Argyll District Salmon Fishery Board. The River Eachaig Fishery Syndicate (no longer active) and Argyll District Salmon Fishery Board were consulted and it was noted that it is possible there may be brown trout and European eel present within tributaries of Glenkin Burn and Allt na Chriche. Additionally, there may be sea trout within in the lower sections of Glenkin Burn and Little Eachaig.

Flood Risk

8.6.16 SEPA's Flood Hazard and Risk Map illustrates the indicative flood extents of high likelihood (1 in 10-year probability), medium likelihood (1 in 100-year probability), or low likelihood (1 in 200-year probability) of coastal, surface, and river floods.

8.6.17 The Glen Kin Burn has been identified as having a high risk of River flooding and a high likelihood of Surface Water flooding at intermittent locations. Tributaries of the Burn have also been identified as having a high likelihood of Surface Water flooding. These flood extents are predominantly localised to the extents of the watercourse channels.

8.6.18 The majority of the burns and tributaries on Site are indicated to be areas with potentially high likelihood of Surface Water flooding. Again, these areas are primarily within the extents of the watercourse channels.

8.6.19 Across the Study area there are several smaller areas with high likelihood of surface water flooding which appear to be periodic pools associated with areas of lower topography.

8.6.20 The eastern section of the Study Area (to the east of the ridge provided by the summits of The Socach, Bishop's Seat, Eilligan, and unnamed summits to the north) is located within a 'Potentially Vulnerable

Area', which indicates an area of nationally significant flood risk that could potentially impact on vulnerable areas of people, properties, community services, and specific environmental sites.

Hydrogeology

8.6.21 The British Geological Survey (BGS) 1:50,000 map indicates that the northern region of the study area is underlain predominantly by the Beinn Bheula Schist Formation which is mostly comprised of psammite, pelite, and semipelite along with trace metaconglomerate, mica schist, schist, siltstone, and wacke.

8.6.22 The north and south of the Study Area is separated by the Loch Katrine Volcaniclastic Formation - Metavolcaniclastic sedimentary rock which forms a band running south-west to north-east across the Site. The Loch Katrine Volcaniclastic Formation is a mixed-grained sandstone rock that is interbedded with semipelite and pelite.

8.6.23 The southern portion of the Study Area is predominantly underlain with the Loch Katrine Volcaniclastic Formation - Psammite.

8.6.24 Superficial deposits within the Study Area are limited with the bedrock presenting close to the surface. There are some areas identified as Diamicton - Devensian Till and which are dispersed across the forested areas in the north-western and south-eastern extents of the Study Area. There are also some strips of Alluvium and River Terrace Deposits associated with the Glenkin Burn.

8.6.25 The BGS Aquifer Classification Dataset classifies the potential for bedrock to supply groundwater and describes the potential groundwater flow mechanism. The various bedrock underlying the Study Area is classed as a 2C low productivity aquifer, whereby flow is virtually all through fractures and other discontinuities, with small amounts of groundwater in near surface weathered zone and secondary fractures.

Private Water Supplies

8.6.26 Private Water Supply (PWS) data was requested from Argyll and Bute council on 16 January 2025. A response was received on 21 January 2025 which provided all known PWS locations within 5 km of the Proposed Development.

8.6.27 This dataset indicated that there were two PWS located to the north-west of the Site and associated with Stronsaul and Glenkin Cottages, and a further PWS located to the far north of the Site which is associated with Balagowan Deer Larder.

8.6.28 All PWS were visited to confirm the exact location of their abstraction point. Through this visit it was noted that there are three PWS associated with the Stronsaul and Glenkin cottages. PWS1 is located c. 1.2 km from the nearest turbine infrastructure and was noted on Site to be supplied by surface water abstracted from a small watercourse which flows west from the Site through forestry (not visible on 10k mapping). This is the primary water supply for Stronsaul cottages. PWS2 is located c. 1.5 km from the nearest turbine infrastructure and is supplied by surface water abstracted from Allt an Lubhair, flowing east towards the Study Area. This supplies Stronsaul and Glenkin cottages. PWS3 is located c. 1.5 km from the nearest turbine infrastructure and is supplied by surface water abstracted from Birchen Burn, again flowing east towards the Study Area. This supplies Glenkin cottages. PWS4 is located 179 m north-west of the access tracks at the Site entrance. Whilst the exact abstraction point is unconfirmed, the PWS location provided by Argyll and Bute Council is situated west of the tracks, adjacent to the Little Eachaig River. This flows west to east and lies c. 0.7 km to the north of the Study Area. PWS4 supplies Balgowan Deer Larder.

8.6.29 Public Water Supplies

8.6.30 Two public water supplies have been identified within close proximity, but outwith the Study Area. A small unnamed reservoir is located to the north-east, approximately 0.89 km downstream of the nearest proposed infrastructure component. The Bishop's Glen/Dunoon Reservoir is situated to the south-east, approximately 2.17 km downstream of the nearest proposed infrastructure component.

Peat

8.6.31 The NatureScot Carbon and Peatland Map (2016) identifies a band of Class 2 peatland which runs through the Study Area, along the mountainous ridge running from south-west to north-east, and underlays a large portion of the Proposed Development footprint. Additionally, there is a small area to the north of the Site which has been identified as Class 1 peatland. Class 1 and Class 2 peats are nationally important carbon-rich soils that are likely to be of high conservation value.

8.6.32 Phase 1 and Phase 2 peat probing was carried out across the Site to determine areas of 'deep peat', held to be depths greater than 0.5 m. The recorded peat depths and the estimated peat excavation volumes are detailed within Appendix 8.1 (OPMP) and Figure 8.1.1.

8.6.33 The remainder of the Site comprises areas of Class 3 peatland (Predominantly peaty soil with some peat soil), Class 4 peatland (Predominantly mineral soil with some peat soil), Class 5 peatland (Peat soil with no peatland vegetation), and Class 0 peatland (mineral soils).

Designated Habitats

8.6.34 There are no known ecological or geological designations located within the Study Area.

8.6.35 The nearest designation is the Holy Loch Local Nature Reserve (LNR). It is situated c.0.7 km to the north-east of the Study Area at its closest point and holds a variety of habitats that support local wildlife, such as ungrazed saltmarsh, wildflower meadow, woodland, reedbed, and bog habitats.

Groundwater Dependent Terrestrial Ecosystem (GWTDE)

8.6.36 The underlying aquifer is classed as low productivity which suggests that groundwater flow to the surface is minimal and true GWDTEs are unlikely within the Site.

8.6.37 During the hydrological Site walkover, peat pipes and small springs were noted along the north-eastern Site extent. These appeared to have a steady flow exiting from them despite weather conditions being dry in the weeks prior. It is therefore possible that there is some groundwater influence on plant communities within the Site.

8.6.38 A Site walkover and National Vegetation Classification (NVC) study was conducted by LUC (See Appendix 6.1). This survey identified six communities with potential to be GWDTEs based on SEPA guidance. These communities were widespread across the Site. It should be noted that those areas shown in Figure 8.1 and Figure 6.5 which comprise a mosaic of communities may not all be indicative of GWDTE. However, for the purpose of this assessment, any mosaic community containing potentially GWDTE has been mapped as potentially groundwater dependant.

8.6.39 GWDTEs are divided into two categories based on their sensitivity to hydrological change. Class 1 GWDTEs are considered highly dependent on groundwater inputs and are sensitive to even small changes in groundwater quality or level. Class 2 GWDTEs are considered to have a weaker or more variable dependence on groundwater and are therefore less sensitive to potential hydrological changes.

8.6.40 An assessment of the aforementioned communities is outlined in Table 8.5.

Table 8.5 - GWDTE Assessment

NVC Community	Location and Distribution within the Site and Likely Groundwater Dependency
M6	This community was initially considered to have high potential groundwater dependency (Class 1) based on SEPA guidance.. M6 dominant polygons were seen in Ecology plans to feature across the north-eastern portion of the Site, within the 250m zone of dewatering for T1 – T7. Additionally, infrastructure for T7, T5, and the tracks adjacent to T3 and T2, overlay several of these identified M6 communities. The areas surrounding T4 were noted to have bog pools present suggesting that they are fed by an accumulation of surface water. The M6 communities around T2, T3 and T5 were within an area with several flushes noted. Weather conditions had been dry prior to the site visit, however the smaller watercourses here appeared to be flowing well suggesting there may be some reliance on groundwater, in addition to surface water. The M6 communities noted near T7 are adjacent to the Allt na Criche and are likely surface water fed. As there is potential for some of these communities to have some reliance on both groundwater and surface water, they will be treated as moderately dependant (Class 2) for the purpose of the assessment.
M10	This community was initially considered to have high potential groundwater dependency (Class 1). The M10 community was noted to occur in the south-west of the Site, between The Socach and Bishops Seat, and within a mosaic of blanket bog and acid grassland communities. As this community was identified adjacent to Giants Burn, it is assumed that this community is fed by surface water rather than groundwater. As such it has not been considered further.
M23	This community was initially considered to have moderate potential groundwater dependency (Class 2). M23 communities were identified across the Site, predominantly seen in close proximity to watercourses and bog pools. M23 communities are often associated with surface water features when occurring close to watercourses. Therefore, it is anticipated that the M23 communities on Site are fed by surface water, rather than groundwater. As such, they have not been considered further.

NVC Community	Location and Distribution within the Site and Likely Groundwater Dependency
M25	This community was initially considered to have low potential groundwater dependency (Class 3). Smaller areas of M25 dominant polygons are located across the Site, with further additional M25 observed within larger mosaics across the Site extent. Many of these communities appear to congregate around the tributaries of Spout Burn, Allt a Chromain, Giants Burn, and Badd Burn. Additionally, M25 communities were noted within larger mosaics surrounding the bog pools at T4 and T3. It is therefore expected that these communities are fed by surface runoff and waterlogged peat soil, rather than groundwater. As such, they have not been considered further.
U6	This community was initially identified as having moderate potential groundwater dependency (Class 2). The U6 dominant community is part of a larger mosaic polygon located predominantly in the south-western portion of the Study Area upon and around the summits of The Socach, Giants Knowe, and Little Knap. The headwaters of Giants Burn and its associated tributaries stem from here, suggesting that this community may be fed by surface runoff, rather than groundwater. As such, they have not been considered further.
W4	This community was initially identified as having high potential groundwater dependency (Class 1). The W4 community is present between Spout Burn and a tributary of Glenkin Burn to the west of the Site. The community was also noted as part of a mosaic to the far west of the Site. Similarly, this mosaic was limited to the immediate area surrounding tributaries of the Glenkin Burn. The topography of these areas is steep, sloping west towards Glenkin Burn. For these reasons, it is anticipated that these communities rely on surface water features, rather than groundwater. The W4 community is expected to remain stable, with no anticipated changes to local hydrology or habitat condition due to ongoing reliance on surface water and existing land use. As such, they have not been considered further.

8.7 Embedded Mitigation

8.7.1 Proposed mitigation measures can be grouped under three headings:

- Mitigation built into the design. The design process has aimed to reduce environmental impacts through careful siting of proposed infrastructure.
- Adoption of Best Practice during construction, including further micro-siting where required.
- Post-construction restoration and delivery of targeted biodiversity enhancement measures across the Site.

Mitigation Through Design

Avoidance of Sensitive Areas

8.7.2 The proposed layout has been designed to avoid sensitive areas wherever possible. This includes adhering to appropriate separation distances from watercourses as much as possible and avoiding the sensitive habitats on Site such as priority peatland, peat slide risk areas, GWDTEs, and areas of potential flooding.

Avoidance of Watercourses

8.7.3 In accordance with wind farm construction best practice guidelines and SEPA consultation advice, a 50 m buffer has been applied to watercourses and waterbodies visible on 1:10,000 mapping.

8.7.4 During the initial design phase, the potential layouts were carefully considered to ensure that these watercourse buffers were adhered to where technically feasible. The original layout passed through an area of bog pool habitat resulting in a breach of the 50 m buffer. The layout was then redesigned to avoid these areas entirely.

Peatland and Potential Instability

8.7.5 The original Site layout considered was noted to pass through an area of deep peat and bog pool habitat. This would have potentially interfered with priority habitat. Additionally, the land surrounding T6

infrastructure was noted to have peat depths of up to 3 m. It was determined that the layout would need to be revised to avoid this area and as a result, T6 was moved.

8.7.6 Access tracks previously travelled through the centre of the Site. Following Phase 1 and Phase 2 peat probing surveys, it was noted that there were areas of deeper peat which should be avoided. With consideration for additional Site constraints, tracks were redirected to follow the eastern boundary of the Site where shallower peat was identified.

8.7.7 A Peat Slide Risk Assessment was also conducted to ensure that infrastructure would not be placed in areas at risk, and is outlined in Appendix 8.2.

GWDTE

8.7.8 SEPA's wind farm planning guidance states that an NVC survey should be undertaken to identify wetland areas that might be dependent on groundwater. A NVC survey was conducted by LUC which identified areas of potential groundwater dependency. As stated above in Section 8.6, it is thought that several communities across the Site may have some reliance on groundwater.

8.7.9 A 250 m buffer was applied to turbine foundations and infrastructure, and a 100 m buffer was applied to access tracks where there is potential for dewatering activities to disrupt these communities. Where possible, these habitats were avoided. Where infrastructure is sited upon these communities, further mitigation will be implemented to minimise impacts and includes measures such as micro-siting, use of floating tracks, and drainage controls designed to maintain local hydrological conditions.

Pollution, Erosion and Sedimentation

Clean Water Cut Off Ditches

8.7.10 Clean water cut-off ditches are proposed for the access track and hardstandings at all turbines. This system will allow clean discharge from ground uphill of the track to pass into the ground downstream, to maintain existing conditions and prevent drying out.

8.7.11 Ditches will be located on the 'high-side' of the relevant infrastructure and will be installed immediately ahead of construction. Stone check dams will be employed to slow water flow along the ditches.

8.7.12 Surface runoff will be collected in the ditches and passed through regularly spaced dedicated piped culverts under the access track to reduce the volumes of flows in the ditch and provide a more even redistribution on the downhill side.

8.7.13 Discharge points will be designed to encourage sheet flow, rather than as a single point discharge, in order to slow and spread the flow and minimise potential scour. Clean discharge will thus infiltrate into the existing vegetation in close proximity to its origin.

8.7.14 The presence of cut-off ditches will also restrict capacity build-up of infiltration trenches adjacent to the relevant infrastructure.

Access Track Sizing, Camber, and Cross-drains

8.7.15 All tracks will be constructed with a camber sufficient to minimise ponding and prevent the track becoming a conduit for runoff. The track will be constructed using a relatively large aggregate size, enabling runoff to percolate through the track. A large aggregate size also minimises the amount of fine sediment in the construction material.

8.7.16 Low verges will be constructed, allowing surface water to drain naturally and diffusely. Any runoff will be collected in adjacent infiltration trenches.

8.7.17 Given that peat soils are dominant on the Site, access tracks will be floated where possible rather than cut into the soil to minimise the excavation of peat. On sections of floating tracks and infrastructure, the design approach taken is that water will be encouraged to shed, and to a lesser degree, infiltrate through the track and into the adjacent and underlying peat. To help achieve this, a relatively large aggregate size will be used, minimising the amount of fines present. Floated areas of track and infrastructure are outlined in Appendix 8.1

Infiltration trenches

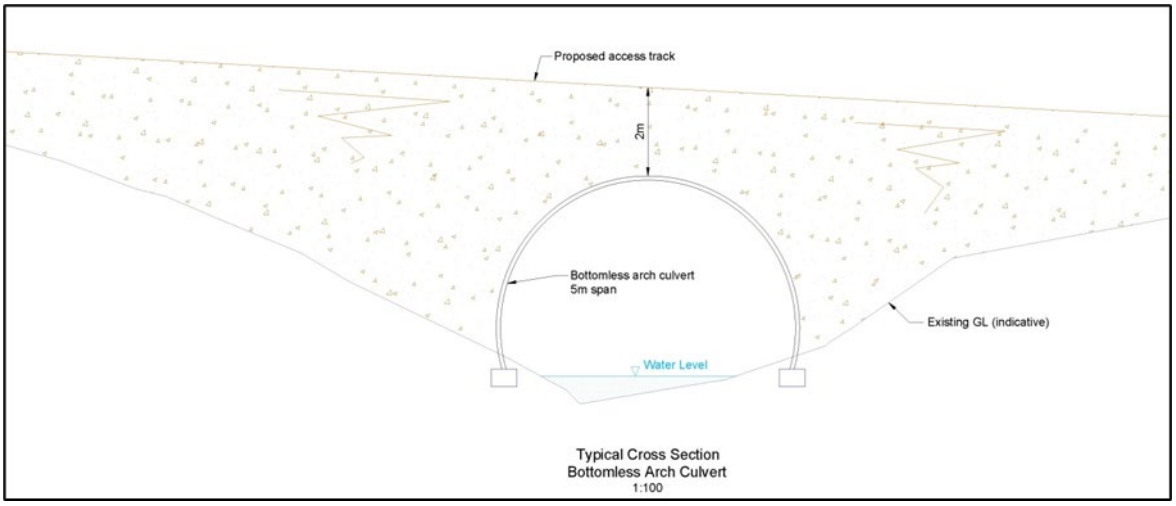
8.7.18 Runoff will be collected in infiltration trenches running adjacent to infrastructure, where a series of check dams will slow flow and promote sedimentation. These features act as mini settlement ponds, providing the primary means of removing contaminants before runoff reaches the outfall location. Where an infiltration trench is not suitable to divert such run-off, V-Ditches with check dams will be installed alongside the hardstanding and access tracks to collect the runoff. The check dams will be constructed from clean, granular materials or straw bales. This will help sediments and pollutants to be filtered from the water and will also slow water flow along the ditches.

Water Crossings

8.7.19 There are five new water crossings required as part of the Proposed Development, and a further seven which are existing but will require upgrading. The locations of these are shown on Figure 8.1 and an assessment is provided in Appendix 8.3.

8.7.20 Water crossing one (WC1) requires a new crossing and is proposed to span the Allt na Criche within an area of forestry. Water crossings two to eight (WC2 to WC8) are associated with the existing forestry tracks and will potentially require some alterations such as widening. Water crossings nine to 11 (WC9 to WC11) span smaller tributaries of the Eas a Chailbeil and the Allt a Chromain, whilst water crossing 12 (WC12) spans the headwaters of the Allt a Chromain. All water crossings are expected to require a standard bottomless arch culvert, excluding WC12 which would require a flush crossing.

8.7.21 It is considered that a bottomless arch culvert would be required to maintain the integrity of the banks and minimise impacts on the local ecology. Bottomless arch culverts require no in-water construction activities and are also effective in maintaining natural river morphology and do not provide a barrier for fish movement. An indicative bottomless arch culvert design is shown in Drawing 1.

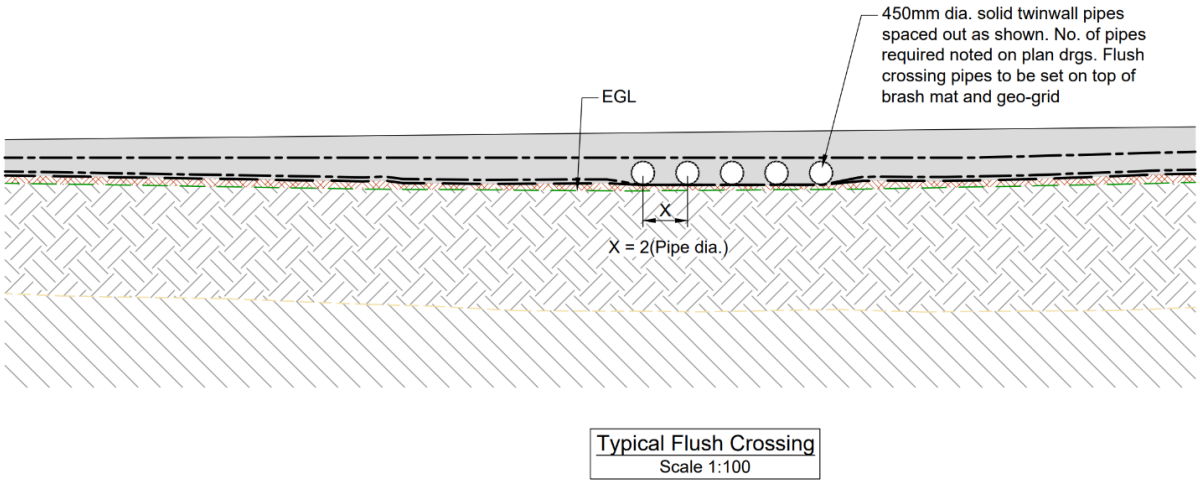


Drawing 1 - Indicative Cross Section of a Bottomless Arch Culvert

8.7.22 The proposed water crossings will be constructed as feasibly close to right-angles with the watercourse as possible, in accordance with standard practice set out in SEPA's Engineering in the water environment: Good Practice Guidance – River Crossings (2010). During construction of the crossings, existing water flow will be controlled by temporary pumping around the construction area to minimise disturbance and sediment pollution to the watercourse.

8.7.23 At WC12, the flush to be crossed is > 2 m in width. It is considered that a flush crossing would be more appropriate than a typical culvert crossing to prevent any interference with flow paths. This crossing will likely require Controlled Activities Licence (CAR Licence) (or replacement of environmental authorisation).

8.7.24 A flush crossing culvert design is shown in Drawing 2.



Drawing 2 - Typical Flush Crossing

Mitigation during Construction

Tree Felling

8.7.25 Upon felling, tree residues (i.e. needles, twigs and branches) will be left in situ to form brash material mats, which are effective in protecting the disturbed topsoil underneath and reducing erosion. This can also be used to form windrows for reforestation purposes after construction. The proposed strategy for forestry on the Site is outlined in Chapter 12.

Excavations

8.7.26 Prior to excavations, an end-use will be identified for the excavated material and an appropriate storage solution determined accordingly. Stored materials will be kept away from surface water bodies to minimise the possibility for sediments entering the aquatic environment.

8.7.27 Soils will be stripped to avoid cross contamination between distinct horizons. Stripped materials will be side- cast or stockpiled for use in the same area as they are excavated from, or they will be stored in appropriately designed and clearly defined separate stockpiles for re-use elsewhere.

8.7.28 Given that peat soils are dominant on the Site, access tracks will be floated where possible rather than cut into the soil to minimise the excavation of peat. Given that the topography of the Site is steep in many areas, the potential to float tracks is limited.

8.7.29 A portion of access track to the east of T3 was identified as an area where the topography could accommodate floating. This section is approximately 150 m in length, the remaining tracks total 3.8 km.

8.7.30 Across the rest of the Site, where peat excavations are unavoidable, the resulting volume of excavated peat will be re-used on-site for redressing track, crane pad, and hardstanding verges. Any surplus peat will be used as part of a restoration programme.

8.7.31 Peat bunds may be used to help stop drainage from the surrounding peatland.

8.7.32 A OPMP is outlined in Appendix 8.1 and a Peat Management Plan (PMP) will be submitted for approval prior to construction.

8.7.33 Where appropriate, temporary silt fences will be installed to filter runoff that is potentially carrying silt from excavations or stockpiles. This will be effective in protecting surface water quality in adjacent watercourses and eliminate the possibility for silt laden runoff to enter them.

Reinstatement

8.7.34 Early reinstatement of excavated materials is required to minimise visual impact, to reduce time required for temporary storage/stockpiling of soils, and to encourage vegetation and habitat restoration as early as possible.

8.7.35 As far as is reasonably practical and achievable, excavated material horizons will be replaced in sequence and depths similar to those recorded prior to excavation, or similar to the surrounding undisturbed ground at the point of reinstatement.

8.7.36 Any detailed reinstatement and restoration proposals will consider and mitigate all residual risks to environmental receptors where practicable.

Dewatering

8.7.37 Dewatering shall be avoided where possible to minimise impacts on sensitive habitat. However, formation of the turbine foundations would likely involve dewatering to temporarily lower the water table and enable work in the excavated areas. Gravity foundations are proposed, which will limit depths of excavations and associated impacts.

8.7.38 Details of the pre-construction ground investigation will include an assessment of the ground permeability and water potential; the results will be used to inform any dewatering required on Site.

8.7.39 Where dewatering is required, it shall comply with the Abstraction Regime of CAR General Binding Rule (GBR) 2 and GBR 15, or any replacement regime.

8.7.40 Details of how dewatering will be managed shall be provided within a Construction Method Statement (CMS) prior to construction of the Proposed Development. Mitigating measures will include: using an irrigation sprinkler head to maintain moisture in the upper soil horizons of nearby GWDTE; and, keeping the foundation construction duration as short as practicable. This will maintain a continuous water supply to sensitive habitats and minimise the overall impact of dewatering.

Enhanced Sedimentation Control

8.7.41 To avoid potential impacts on sensitive habitats, any potential runoff will be appropriately treated prior to discharge into the natural environment. This will keep clean and contaminated runoff separate to avoid further contamination and maintain the sustainable urban drainage system (SuDs) capacity, which will mitigate the possibility of contaminants entering watercourses and impacting the aquatic environments.

8.7.42 These mechanisms of clean water cut-off ditches, sediment capture, and infiltration trenches, are intended to reduce the speed of flow, filter runoff, and allow suspended silts and particulates to settle out naturally thus minimising the potential impacts upon downstream aquatic environments, nearby PWS, or GWDTEs.

8.7.43 If the standard system is not proving to be effective, then a 'Siltbuster' system of control via settlement tanks will be employed. The 'Siltbuster' system is regularly used on construction sites situated close to waterways or in extreme situations where the combination of soil stripping and wet weather has given rise to normal silt control methods being overrun.

General Site Pollution Control

8.7.44 The proposed mitigation for the construction of the access roads will continue to function through the life of the project. Routine maintenance for the roads will be carried out in summer months when the tracks are dry. Operational good practice procedures will continue to be adopted, with the risk of water pollution from such activities considered to be negligible.

8.7.45 With regard to vehicles, fleet vehicles entering the Site will be regularly checked and maintained to prevent leakage of contaminants. Concrete will be premixed off-site and delivery wagons will only be washed out in areas where suitable control measures are in place. The concrete used will be of a high grade that is not prone to leaching alkalis. The number of on-site vehicles will be highest during construction. The ongoing risk of pollution on the Site after construction is considered to be very low.

8.7.46 Good practice procedures in the handling, use and storage of fuel, oils, and chemicals will be adhered to at all times.

8.7.47 Prior to construction, a Construction Environmental Management Plan (CEMP) and a Pollution Prevention Plan (PPP) will be put in place, and approved by Argyll and Bute Council, following consultation with SEPA. These documents will outline mitigation measures to reduce or nullify potential impacts on the ground and surface water environment.

8.7.48 The CEMP and PPP will address the following issues:

- Reinstatement and Restoration;
- Decommissioning;
- Contractor Duties;
- Tool Box Talks;
- Pollution Prevention and Mitigation;
- Control of Substances Hazardous to Health (COSHH);
- Pollution Monitoring & Controls; and

- Site Waste Management Plan.

Mitigation During Restoration

8.7.49 Early reinstatement of excavated materials is required to minimise visual impact, to reduce time required for temporary storage/stockpiling of soils, and to encourage vegetation and habitat restoration as early as possible.

8.7.50 As far as is reasonably practical and achievable, excavated material horizons will be replaced in sequence and depths similar to those recorded prior to excavation, or similar to the surrounding undisturbed ground at the point of reinstatement.

8.7.51 Any detailed reinstatement and restoration proposals will consider and mitigate residual risks to environmental receptors, where practicable.

8.8 Receptors Brought Forward for Assessment

8.8.1 Several watercourses could potentially be at risk of adverse impacts to water quality, ecology, or geomorphology. In addition, the Cowal/Clyde Sealochs Coastal catchment as a whole is known to support salmonid species. As such, the watercourses within the Study Area will be treated as a receptor with high sensitivity.

8.8.2 The Study Area is entirely encompassed by the Cowal and Lomond groundwater unit and holds an overall status of "Good" for its water quality. The various bedrock underlying the Site can be grouped as a low productivity aquifer (2C). There is limited potential for contaminated groundwater movement and, as such, the groundwater unit will be included as a receptor with medium sensitivity.

8.8.3 Although nearby watercourses may support salmonid species such as trout, the potential for significant impact is considered low due to the limited extent of in-channel works and the temporary, localised nature of potential disturbance. Standard good practice measures to protect the water environment will be implemented, including both good design measures (e.g. 50 m watercourse buffers where feasible) and standard construction controls. Pre-construction fish habitat surveys will ensure that watercourse crossings are microsited to avoid sensitive features, and that habitats are retained or reinstated as necessary. An Ecological Clerk of Works will supervise the construction of crossings, and post-construction fish habitat surveys and monitoring will be undertaken (See Chapter 6). Fisheries will therefore not be included as a sensitive receptor.

8.8.4 Although areas of flood risk have been identified along several unnamed watercourses within the Site and along the tributaries of the Glen Kin Burn, these are limited in extent and largely confined to the watercourse channels. The application of proposed mitigation measures and best practice construction techniques will minimise any potential risk to flooding and ensure that there is no impact on the identified PVA, and therefore flood risk will not be included as a sensitive receptor.

8.8.5 PWS1 is located within the Study Area at c.1.2 km from the Proposed Development and is advised to be fed by surface water. It is potentially hydrologically connected to the site, albeit the summit/shoulder of Strone Saul would direct any surface water runoff to the south and northeast of PWS1 and temper the potential for impact.

8.8.6 The remaining PWSs were outwith the Study Area.

8.8.7 PWS2 and PWS3 are advised to be fed by surface water. From observing the topography of the area, it is anticipated that PWS2 and PWS3 are fed by the burns entering the Glenkin Burn from the West and therefore are unlikely to be hydrologically connected to the Proposed Development.

8.8.8 The exact abstraction location of PWS4 is currently unconfirmed. Given topography in the area, it is likely upstream of any proposed development infrastructure and to lie on the other side of both the Little Eachaig River and the B836. It is therefore unlikely to experience any impacts as a result of surface runoff. However, as the abstraction location for PWS4 may be within the 100 m zone of dewatering there is potential for impacts to occur. As such, PWS will be considered as a receptor with high sensitivity.

8.8.9 Due to the significant downstream distance between the Proposed Development and both the unnamed reservoir to the north-east and the Bishop's Glen/Dunoon Reservoir to the south-east, as well as the associated dilution and dispersion of any potential impacts, these assets are not considered to be at risk. This is further supported by the standard good practice mitigation measures outlined, and therefore public water supplies will not be included as a sensitive receptor.

8.8.10 Areas of Class 1 and Class 2 peat have been identified within the Study Area, these are of national importance and conservation value. Peat has the potential to be degraded as a result of the Proposed Development and therefore will be included as a receptor with high sensitivity.

8.8.11 There are no known ecological or geological designated sites located within the Study Area. The Holy Loch LNR is found 0.7 km to the north-east of the Study Area and is separated from the Proposed Development by commercial forestry, Allt na Criche, Dalinlongart Hill and Finbracken Hill, residential

properties, and the A885 Road. As such, it is considered that the Proposed Development will not have an adverse impact on the designated site and therefore, the Holy Loch LNR will not be included as a sensitive receptor.

8.8.12 The NVC study identified six plant communities within the Site that have potential to be GWDTEs, with these vegetation communities graded as Class 1, Class 2, and Class 3 (high, moderate and low potential dependency). There is potentially moderate dependency on groundwater discharge for M6 communities across the north-eastern portion of the Site (as outlined in Table 8.6 and detailed within Appendix 6.2). These habitats are of conservation value and may be impacted by constructional works on the Site. As such, the Class 2 moderately dependant GWDTEs are considered as a receptor with high sensitivity.

8.8.13 The identification of sensitive receptors, considering baseline conditions, is summarised below.

Table 8.6 - Sensitive Receptors

Receptor	Sensitivity	Comment
Watercourses	High	Several watercourses could potentially be at risk of adverse impacts to water quality, ecology, or geomorphology
Groundwater Unit	Medium	There is potential for groundwater movement within the Study Area.
PWS	High	PWS1, associated with Stronsaul Cottages is supplied by a watercourse which flows from the western extent of the Study Area and PWS4 is within 100 m of access tracks.
Peat	High	Deep peat and areas of Class 1 and 2 peatland are present across the Site.
GWDTEs	Medium	Several potential GWDTE areas are located within 250 m of Proposed Infrastructure.

8.9 Potential Effects

Construction

Increase in Runoff

8.9.1 Replacing natural land cover with impermeable surfaces will reduce the rate of infiltration of rainwater into the underlying strata and increase runoff from the Site.

8.9.2 Construction of access track, crane hardstanding(s), turbine foundations, laydown areas, construction compounds, BESS compound and a substation will increase the impermeable footprint of the Site and result in localised changes to surface water hydrology. In addition, the cambered tracks may interrupt natural flow paths and will shed water more quickly than the existing ground cover.

8.9.3 An increase in runoff in the area can compound various other predicted impacts, such as sedimentation, erosion, chemical pollution, and flood risk.

Table 8.7 - Impact of increase in Runoff

Receptor	Sensitivity	Magnitude of Impact	Significance of Impact Without Mitigation	Significance of Impact After Mitigation
Watercourses	high	medium	**major**	**negligible**
Groundwater Unit	medium	negligible	**negligible**	**negligible**
PWS	high	small	**moderate**	**negligible**
Peat	high	medium	**major**	**negligible**
GWDTEs	medium	medium	**moderate**	**negligible**

Sedimentation & Erosion

8.9.4 Construction activities on or near the edges of watercourses can impact the structural integrity of the banks of watercourses, either through direct damage to bankside material or indirect loosening of soil structure. This can affect localised watercourse morphology and water quality through erosion or even collapse of the banks.

8.9.5 Construction works such as excavations for infrastructure can involve the relocation of peat and mineral soils, and the importation of new substrates such as aggregate for civil enabling works. This introduces the possibility for sediments to be washed out of materials before they are sufficiently compacted.

8.9.6 Poorly implemented drainage systems can create new runoff pathways that have the potential to erode rills into loosely aggregated substrates such as alluvial deposits.

8.9.7 Although the cable trenches proposed will require only shallow excavations, the action of cable-laying also has the potential to damage soils and introduce new drainage pathways which could generate silt laden runoff. The Site drainage plan is illustrated in Figure 3.2.

8.9.8 If erosion was to occur around the proposed infrastructure, an increased sediment load could lead to the constriction of the channels draining into the local river systems. This would negatively impact water quality and degrade habitat for any existing aquatic receptors.

8.9.9 The amount of suspended solids pollution will be greater during heavy rainfall events, although the dilution potential of the watercourses is also at its greatest during these periods

Table 8.8 - Impact of Sedimentation & Erosion

Receptor	Sensitivity	Magnitude of Impact	Significance of Impact Without Mitigation	Significance of Impact After Mitigation
Watercourses	high	medium	**major**	**negligible**
Groundwater Unit	medium	small	**minor**	**negligible**
PWS	high	small	**moderate**	**negligible**
Peat	high	medium	**major**	**negligible**
GWDTEs	medium	medium	**moderate**	**minor**

Chemical Pollution

8.9.10 There are various sources of potential contamination during construction. Runoff from construction areas and excavations may become contaminated by construction material or spilt pollutants, which ultimately enter watercourses or groundwater. Concrete or cement brought onto site for the construction of foundations may be spilt. Construction-related oil, grease, fuel, or foul water may also be accidentally leaked. Only small quantities of potential chemical pollutants will be brought on site; however, even a small amount of these pollutants can have a serious negative impact on water quality and aquatic ecosystems. The likelihood of such pollution occurring is considered extremely low due to the limited volumes of hazardous materials required during construction and the implementation of outlined pollution prevention measures.

Table 8.9 - Impact of Chemical Pollution

Receptor	Sensitivity	Magnitude of Impact	Significance of Impact Without Mitigation	Significance of Impact After Mitigation
Watercourses	high	medium	**major**	**negligible**
Groundwater Unit	medium	small	**minor**	**negligible**
PWS	high	medium	**major**	**negligible**
Peat	high	medium	**major**	**negligible**
GWDTEs	medium	medium	**moderate**	**minor**

Disruption to Flow Paths & Flood Risk

8.9.11 Construction of proposed infrastructure may interrupt natural flow paths and result in localised changes to surface water hydrology. This can result in the 'drying out' of hydrologically sensitive areas, or alternatively, result in an increase in flood risk that can see sensitive areas flooded and contaminated with mineral matter.

8.9.12 Proposed infrastructure includes water crossing points. As detailed in SEPA's SG25, 'Engineering in the water environment: good practice guide – River Crossings (2010)', a poorly designed and constructed crossing can lead to a variety of detrimental impacts including:

- Loss or damage of plants, animals and their habitats;
- Create a barrier to the movement of fish and other wildlife;
- Prevent sediment and woody debris being moved downstream
- Prevent natural river movement;
- Increase flood risk; and
- Erosion of the stream bed.

8.9.13 These watercourse crossings will be permanent features to allow maintenance throughout the construction and operational phase. The construction of poorly designed water crossings can have the potential to reduce the river channel's capacity, leading to increased flood risk upstream of the infrastructure.

Table 8.10 - Impact of Disruption to Flow Paths & Flood Risk

Receptor	Sensitivity	Magnitude of Impact	Significance of Impact Without Mitigation	Significance of Impact After Mitigation
Watercourses	high	medium	**major**	**negligible**
Groundwater Unit	medium	small	**minor**	**negligible**
PWS	high	small	**moderate**	**negligible**
Peat	high	medium	**major**	**negligible**
GWDTEs	medium	medium	**moderate**	**minor**

Dewatering & Abstraction

8.9.14 Given what is known about the ground conditions in the area and the expected extent of the excavation works, groundwater will likely enter excavations. As such, dewatering will likely be required to temporarily lower the water table for larger excavations, such as those for the turbine foundations. This can result in the temporary 'drying out' of hydrologically sensitive areas.

8.9.15 SEPA guidance specifies that the potential zone of dewatering impact can be up to 250 m from excavations that exceed 1 m in depth, and 100 m from excavations less than 1m in depth. Once construction activities within the excavation are complete and the excavations are reinstated the groundwater table is expected to recover in a matter of days.

Table 8.11 - Impact of Dewatering & Abstraction

Receptor	Sensitivity	Magnitude of Impact	Significance of Impact Without Mitigation	Significance of Impact After Mitigation
Watercourses	high	medium	**major**	**negligible**
Groundwater Unit	medium	small	**minor**	**negligible**
PWS	high	medium	**major**	**negligible**
Peat	high	medium	**major**	**negligible**
GWDTEs	medium	large	**major**	**negligible**

Operation

8.9.16 The access track, crane hardstanding(s), turbine foundations, laydown areas, construction compounds, BESS compound and substation will remain in-situ during operation requiring some basic maintenance and resulting in localised changes to the surface water hydrology for the duration of the Proposed Development.

8.9.17 Regular on-site activities will be required during operation of the Proposed Development relating to regular maintenance and repair of the equipment. During these activities there will be a need to bring small quantities of oil, greases, and other materials on to the Site.

8.9.18 For the purposes of this assessment, the potential impacts are as discussed for Construction Impacts. This is considered a conservative approach due to the operational phase requiring less on-site activities.

Decommissioning

8.9.19 It is envisaged that detailed method reports, in compliance with relevant current legislation, will be drawn up prior to decommissioning. The following is based on the standards at time of writing.

8.9.20 No new infrastructure will be added to the Site during decommissioning and the required removal of infrastructure would decrease the impermeable footprint of the Site. Infrastructure such as access tracks and hardstandings will remain in situ, while foundations would only have the top 1 m removed.

8.9.21 Any earthworks or landscaping undertaken as part of the decommissioning may provide scope for sedimentation or erosion to occur. However, the scope of the required works is predicted to be significantly reduced relative to that of the construction phase.

8.9.22 There will be no new excavations opened during the decommissioning phase of the Proposed Development, so no dewatering or abstraction activities will take place.

8.9.23 For the purposes of this assessment, the potential impacts are as discussed for Construction Impacts. This is considered a conservative approach due to the decommissioning and restoration phase requiring less on-site activities.

Enhancement Works and Compensatory Planting

8.9.24 Enhancement works such as habitat reinstatement and improvements to drainage features, are expected to have localised positive effects on surface water management within the Site by improving the resilience of natural drainage pathways and reducing the risk of sedimentation and erosion by stabilising exposed surfaces and re-establishing vegetated cover.

8.9.25 Compensatory planting (See Chapter 12), is not anticipated to significantly alter the wider hydrological regime due to the limited area affected. Localised improvements to water retention and infiltration may occur over time where planting replaces compacted or degraded soils. This may help regulate runoff rates and promote more stable flow conditions downstream.

8.10 Additional Mitigation

Mitigation

8.10.1 In the absence of appropriate mitigation, potential significant impacts were identified for all sensitive receptors. Through the implementation of the mitigation outlined in Section 8.7, these potential impacts will be reduced to acceptable levels. Some residual effects were identified for GWDTEs; these are associated with impacts from sedimentation & erosion, chemical pollution and disruption to flow paths & flood risk.

8.10.2 Additional mitigation will be outlined and directed by the Ecological Clerk of Works (ECoW) during the construction phase, and includes:

- Review and verification of (CEMP).
- Daily site supervision and toolbox briefings.
- Regular compliance audits and incident reporting.
- Groundwater and surface water monitoring will begin six months prior to construction to establish baseline conditions.
- Predefined thresholds will guide assessment of water chemistry, flow, and sediment levels.
- Contingency measures (e.g. silt barriers, drainage revision, excavation changes) will be implemented within 48 hours if adverse trends are identified.
- Monitoring records and responses will be documented and made available to regulators.

8.10.3 Case specific measures will be put in place to maintain the baseline subsurface flow paths and avoid disruption to the potential GWDTEs identified. Six months prior to construction, monitoring will commence to determine the baseline conditions. This data will inform ongoing assessments during construction, enabling the early identification of changes in groundwater flow or chemistry and allowing for the prompt implementation of the following mitigation measures:

- Installation of additional silt fencing or sediment traps.
- Deployment of temporary attenuation ponds or settlement tanks.
- Modification of drainage layouts to reduce runoff to sensitive areas.
- Restricting or rescheduling works during adverse weather conditions.
- Use of protective mats or low-ground-pressure equipment to reduce soil compaction.
- Implementation of enhanced pollution prevention controls such as spill response kits and fuel handling protocols.
- Temporary halting of works to allow site conditions to stabilise.
- Targeted restoration or re-vegetation of disturbed areas to reduce erosion.

Restoration

8.10.4 There are not anticipated to be residual impacts to peat left in situ as a result of increased runoff, sedimentation & erosion, chemical pollution, disruption to flow paths & flood risk and dewatering, However, the excavation of peat is necessary for the Proposed Development which will result in loss of some habitat and has the potential to degrade the quality of the peat excavated. A full list of mitigation measures proposed to avoid degradation of peat during storage, handling and reuse is fully outlined in Appendix 8.1.

8.10.5 As outlined in Appendix 8.1, all excavated peat will be reinstated on Site or used to aid restoration techniques. In addition to the reuse of peat soils, Appendix 6.5 outlines the proposed habitat restoration, enhancement, and management measures. This Biodiversity Enhancement Strategy (BES) is intended to improve the Sites overall ecological importance, in addition to general mitigation.

8.11 Residual Effects

Construction

8.11.1 With the committed implementation of the measures incorporated into the design, adherence to best practice construction techniques, and the additional mitigation outlined in Section 8.10, no significant residual effects are predicted during the construction of the Proposed Development.

Operation

8.11.2 Provided that the design-integrated measures, standard good practice, and additional commitments outlined in Section 8.10, no significant residual effects are predicted during the operation of the Proposed Development.

Decommissioning

8.11.3 Following the application of embedded mitigation, best practice construction techniques, and the additional mitigation outlined in Section 8.10, no significant residual effects are predicted during the decommissioning of the Proposed Development.

8.12 Cumulative Assessment

8.12.1 Cumulative impacts refer to the additional effects of the Proposed Development when combined with other developments which are located within 5 km of the Site and are at the planning, consented, construction, or operational stages. Although potential cumulative impacts on soil and geology are considered to be limited to the study area, surface water and groundwater pathways have the potential to create or exacerbate a wider zone of cumulative impact.

8.12.2 Cumulative schemes are identified within Chapter 4.

8.12.3 Due to their proximity, there is also potential for localised cumulative impacts to arise in conjunction with the following wind farm developments within 5 km:

- Inverchaolain (Scoping) – 13 turbines, 4.4 km south-west.

8.12.4 Inverchaolain Wind Farm is also within the Cowal / Clyde Sealochs Coastal Catchment area. Terrain would dictate that, if consented, some surface runoff from this development would enter the Balgaidh Burn which could create potential for cumulative impacts to arise on its water quality and quantity.

8.12.5 As Inverchaolain is in the Scoping stage, the scoping layout may be subject to change. As such, there is not sufficient information to fully assess the potential for cumulative hydrological impacts alongside the Proposed Development.

8.13 Summary

8.13.1 A desk-based study and Site walkover were conducted to establish the baseline hydrological environment of the Study Area, whereby potential impacts from the Proposed Development were identified.

8.13.2 It was determined that there were five categories of sensitive receptor within the Study Area, these being: surface water features, the Cowal and Lomond groundwater unit, PWS, Peat, and GWDTEs.

8.13.3 Careful Site layout design and the application of the proposed mitigation measures are expected to effectively eliminate the potential impacts identified during the assessment. As a result, no likely significant effects on any of the identified sensitive receptors are predicted during the construction, operation, or decommissioning phases of the Proposed Development.

8.14 References

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