8 GEOLOGY, PEAT, HYDROLOGY & HYDROGEOLOGY

Executive Summary

An assessment has been undertaken of the potential effects on geology (including soils and peat) and the water environment (hydrology and hydrogeology) during the construction, operation, and decommissioning phases of the Proposed Development. The scope of the assessment was informed by scoping responses received from statutory and non-statutory consultees.

Information for the assessment was compiled using baseline information from a desk study and was then verified by an extensive programme of field work. The field work included investigation of private water supply sources in order to determine those which might be hydrologically connected to and at risk from the Proposed Development. Measures required to protect these sources have been confirmed. A site-specific private water supply (PWS) risk assessment has been prepared and is presented in **Technical Appendix (TA) 8.6: Private Water Supply Risk Assessment (PWSRA) (EIAR Volume 4)**.

The field work also included a programme of peat depth probing and condition assessment and a hydrological walkover survey by an experienced SLR hydrologist.

The assessment undertaken considered the sensitivity of receptors identified during the baseline study and confirmed by the field work, and the (embedded) mitigation measures incorporated in the Proposed Development design. It has also considered potential future changes to baseline conditions.

The design of the Proposed Development has been informed by a detailed programme of peat depth probing in accordance with Policy 5 of the National Planning Framework 4 (NPF4) and it has been shown that wherever possible areas of deep peat have been avoided. The assessment of peat and carbon rich soils has considered all of the proposed infrastructure, including new and upgraded permanent access tracks. A project specific peat management plan **(TA 8.2: Peat Management Plan (PMP) (EIAR Volume 4))** has been prepared which confirms the soils disturbed by the Proposed Development are limited in volume and that these soils can be readily and beneficially reused in restoration works on site.

Subject to adoption of best practice construction techniques and a final Construction Environmental Management Plan (CEMP), **no significant adverse effects** on geology (including soils and peat) and the water environment have been identified. The final CEMP will include provision for drainage management plans which will be agreed with statutory consultees, including Scottish Environment Protection Agency (SEPA), Stirling Council (SC) and Perth and Kinross Council (PKC) which will be used to safeguard water resources and manage flood risk. A commitment to deploy Sustainable Drainage Systems (SuDS) in these plans has been made. The final CEMP will also include provision of a Pollution Prevention Plan which would also be agreed with statutory consultees including SEPA prior to any construction works being undertaken. An Outline CEMP (OCEMP) has been prepared and is presented in **TA 2.1 (EIAR Volume 4)**. The final CEMP will be agreed with statutory consultees prior to construction.

Notwithstanding these safeguards, a programme of baseline and construction phase water quality monitoring is proposed which would be used to confirm that the Proposed Development does not have a significant effect on geology and the water environment. Monitoring of watercourses that drain from the Site will be included in the monitoring plan. It is proposed that the monitoring schedule includes one PWS source. Monitoring would commence prior to construction and continue throughout the construction phase and immediately post construction. It is anticipated that the monitoring programme would be secured by a pre-development planning condition to be agreed with statutory consultees.

8.1 Introduction

8.1.1 This Chapter considers the likely significant effects on geology (including peat and soils) and the water environment (hydrology and hydrogeology) associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the Chapter are to:

- describe the geological and water environment baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect, and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

8.1.2 The assessment has been carried out under the supervision of Gordon Robb (BSc, MSc, MBA, C.WEM, FCIWEM), of SLR Consulting Ltd (SLR). He has more than 30 years' experience assessing wind farm and electrical transmission projects in similar site settings.

8.1.3 This Chapter is supported by the Figures **(EIAR Volume 2)** and TAs **(EIAR Volume 4)** listed in **Table 8-1,** which are referenced throughout the Chapter.

Table 8-1: Supporting Figures and Technical Appendices

Document Location	Document Description
Figure 8.1: Local Hydrology (EIAR Volume 2)	Figure which shows the local hydrological setting.
Figure 8.2: Soils (EIAR Volume 2)	Figure which shows an extract of the National Soil Map of Scotland.
Figure 8.3: Superficial Geology (EIAR Volume 2)	Figure which shows an extract of the British Geological Survey (BGS) superficial geology mapping.
Figure 8.4: Peatland Classification (EIAR Volume 2)	Figure which shows an extract of the Carbon and Peatland 2016 map.
Figure 8.5: Bedrock Geology (EIAR Volume 2)	Figure which shows an extract of the British Geological Survey (BGS) bedrock geology mapping.
Figure 8.6: Regional Hydrogeology (EIAR Volume 2)	Figure which shows the 1:625,000 scale hydrogeological setting.
Figure 8.7: Groundwater Vulnerability (EIAR Volume 2)	Figure which shows the 1:100,000 scale aquifer classification and groundwater vulnerability data
Figure 8.8a-g: Potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs) (EIAR Volume 2)	Figure which shows areas of potential GWDTE based on the National Vegetation Classification (NVC) survey and with reference to SEPA LUPS-31 guidance.
Technical Appendix 8.1: Peat Landslide Hazard and Risk Assessment (PLHRA) (EIAR Volume 4)	Site-specific PLHRA which identifies, mitigates and manages peat slide hazards and associated risks associated with the Proposed Development.
Technical Appendix 8.2: Peat Management Plan (PMP) (EIAR Volume 4)	Site-specific PMP which shows how soils and peat will be safeguarded.
Technical Appendix 8.3: Borrow Pit Appraisal (EIAR Volume 4)	Report provides an initial assessment of the aggregate requirements for the proposed development and identifies potential borrow pits suitable for providing this aggregate.

Document Location	Document Description
Technical Appendix 8.4: Schedule of Watercourse Crossings (EIAR Volume 4)	Report outlines photographs and dimensions of watercourses which will be crossed as part of the Proposed Development.
Technical Appendix 8.5: GWDTE Assessment (EIAR Volume 4)	Detailed assessment of potential GWDTEs across the Site.
Technical Appendix 8.6: Private Water Supply Risk Assessment (PWSRA) (EIAR Volume 4)	Presents potential impacts on private water supplies and proposed mitigation measures, as required.
Technical Appendix 8.7: Assessment Methodology	Details the assessment methodology for this Chapter.
Technical Appendix 8.8: Carbon Calculator	Details the carbon calculator outputs.

8.1.4 The assessment uses information and findings presented in **Chapter 7: Ecology (EIAR Volume 1)** to inform the assessment of potential effects on possible areas of Groundwater Dependent Terrestrial Ecosystems (GWDTEs) which are presented in this Chapter.

8.2 Assessment Methodology and Significance criteria

Scope of Assessment

8.2.1 The assessment of geology (including peat and soils) and the water environment (hydrology & hydrogeology) impacts of the Proposed Development has been determined through a combination of professional judgement, reference to relevant guidance documents and consultation with stakeholders. It considers the following main potential impacts upon geological and water environment receptors associated with construction, operation and decommissioning of the Proposed Development:

- disturbance and loss of carbon rich soils and peat deposits;
- ground instability (including peat slide risk);
- impacts on surface water and groundwater quality from pollution from fuel, oil, concrete or other hazardous substances;
- discharge of sediment-laden runoff to drainage systems and watercourses;
- increased flood risk to areas downstream of the Site during construction and through increase in areas of tracks and hardstanding at turbines;
- changes in groundwater levels, or saturation of peat deposits, from dewatering excavations;
- potential change of groundwater flow paths and contribution to areas of peat and GWDTEs;
- disturbance of watercourse bed and banks from the construction of culverts;
- potential pollution impacts to public and private water supplies; and
- disturbance and/or pollution resulting from borrow pit formation and use.

8.2.2 The assessment is based on the Proposed Development as described in **Chapter 2: Development Description (EIAR Volume 1).**

Legislation, Policy and Guidance

8.2.3 The aquatic environment in Scotland is afforded significant protection through key statutes and the regulatory activity of Scottish Environment Protection Agency (SEPA) and local authorities. Relevant legislation and guidance documents have been reviewed and considered as part of this assessment.

Legislation[1]

- EU Water Framework Directive (2000/60/EC);
- EU Drinking Water Directive (98/83/EC);
- The Environment Act 1995;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- Environmental Protection Act 1990;
- The Flood Risk Management (Scotland) Act 2009;
- The Water Environment and Water Services (Scotland) Act 2003 (WEWS);
- Water Environment (Controlled Activities) (Scotland) Amendment Regulations (CAR) 2013;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017;
- The Water Supply (Water Quality) (Scotland) Regulations, 2001; and
- Private Water Supplies (Scotland) Regulations 2006.

Planning Context

8.2.4 National Planning Framework 4 (NPF4)[2] provides planning guidance and polices regarding sustainable development. **Chapter 4: Planning and Energy Policy (EIAR Volume 1)** provides a detailed overview of the relevant planning policy. Policies relevant to this Chapter include:

- Policy 2 (Climate Mitigation and Adaptation);
- Policy 4 (Natural Places);
- Policy 5 (Soils);
- Policy 11 (Energy);
- Policy 20 (Blue and Green Infrastructure); and
- Policy 22 (Flood Risk and Water Management).

8.2.5 In addition, Stirling Council's (SC) Local Development Plan (LDP)[3] and Perth and Kinross Council's (PKC) LDP[4] provide planning guidance on the type and location of the development that can take place in the region. The LDPs present development polices of which the following are relevant to this Chapter:

SC's LDP:

- Policy 3.2: Site Drainage
- Policy 4.2: Protection of Carbon-Rich Soils
- Policy 5: Flood Risk Management
- Policy 12.1: Wind Energy Developments
- Policy 13: The Water Environment

PKC's LDP:

- Policy 33: Renewable and Low Carbon Energy
- Policy 38: Environment and Conservation
- Policy 51: Soils
- Policy 52: New Development and Flooding

[1] While EU Directives ceased to have legal effect following Brexit, national legislation including the 2013 Order had incorporated and given effect to the WFD so that its provisions were effectively assimilated. As the term WFD remains used by SEPA and other agencies it is used in this Report.

[2] Scottish Government (2023) National Planning Framework 4 (NPF4)

[3] Stirling Council (2018) Stirling Local Development Plan

[4] Perth and Kinross (2019) Local Development Plan 2

- Policy 53: Water Environment and Drainage

Guidance

8.2.6 The following guidance is also applicable to the assessment.

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

- PAN 50 Controlling the Environmental Effects of Surface Mineral Workings;
- PAN 61 Planning and Sustainable Urban Drainage Systems; and
- Online Planning Advice on Flood Risk (which supersedes PAN 69).

8.2.8 SEPA Guidance on Pollution Prevention (GPP):

- GPP01 Understanding your environmental responsibilities – good environmental practices;
- GPP02 Above Ground Oil Storage;
- GPP03 Use and Design of Oil Separators in Surface Water Drainage Systems;
- GPP05 Works and Maintenance in or near Water;
- GPP06 Working at Construction and Demolition Sites;
- GPP08 Safe Storage and Disposal of Used Oils;
- GPP13 Vehicle Washing and Cleaning;
- GPP21 Pollution Incident Response Planning; and
- GPP22 Dealing with Spills.

8.2.9 Construction Industry Research and Information Association (CIRIA) publications:

- C532, Control of Water Pollution from Construction Sites (2001);
- C648, Control of Water Pollution from Linear Construction Projects – Technical Guidance (2006);
- C741, Environmental Good Practice on Site (2015);
- C753, The SUDS Manual (2015); and
- R179, Ground Engineering Spoil: Good Management Practice (1997).

8.2.10 SEPA Publications

- Engineering in the Water Environment: Good Practice Guide – River Crossings (2010);
- Engineering in the Water Environment: Good Practice Guide – Sediment Management (2010);
- Development on Peat and Offsite Uses of Waste Peat (2017);
- Groundwater Protection Policy for Scotland, Version 3 (2009);
- Land Use Planning System Guidance Note 4 – Onshore Wind Developments, Version 9 (2017);
- Land Use Planning System SEPA Guidance Note 2a – Flood Risk, Version 4 (2018);
- Land Use Planning System SEPA Guidance Note 2e - Soils, Version 1 (2015);
- Land Use Planning System SEPA Guidance Note 31 - GWDTE, Version 3 (2017);
- Position Statement – Culverting of Watercourses, Version 2 (2015); and
- Regulatory Position Statement – Developments on Peat (2010).

8.2.11 Other Guidance

- Scottish Natural Heritage (now NatureScot), Constructed Tracks in Scottish Uplands, 2nd Edition (2013);
- Scottish Government, Proposed Electricity Generation Developments: Peat Landslide Hazard Best Practice Guide (2017);

- Scottish Government, Guidance on Development on Peatland, Peatland Survey (2017);
- A joint publication by Scottish Renewables, NatureScot, Scottish Environment Protection Agency, Forestry Commission Scotland and Historic Environment Scotland, Good Practice during Windfarm Construction (2024); and
- Scottish Renewables and SEPA, Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (2012).

Consultation

8.2.12 Consultation for the Proposed Development was undertaken with statutory and non-statutory bodies as set in **Chapter 4: Planning and Energy Policy (EIAR Volume 1).**

8.2.13 **Table 8-2** below summarises the consultation undertaken throughout the EIAR process, including Scoping and further pre-application consultation, relevant to soils, geology (including peat) and the water environment.

Table 8-2: Consultees and Responses

Organisation and Type of Consultation	Response	How Response has been Considered
Scottish Government Energy Consents Unit (ECU) Scoping Response Dated 22 February 2023	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 enquires to confirm whether there are 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.	Assessments of potential impacts on the water environment, including Scottish Water assets and Drinking Water Protected Areas (DWPAs), is assessed in Section 8.3 and Section 8.4 of this Chapter.
Scottish Government ECU Scoping Response Dated 22 February 2023	Scottish Ministers request that the Company investigates the presence of any private water supplies which may be impacted by the development. The EIA report should include details of any supplies identified by this investigation, and if any supplies are identified, the Company should provide an assessment of the potential impacts, risks and any mitigation which would be provided.	Potential impacts on private water supplies and proposed mitigation measures, as required, are discussed in full in **TA 8.6: PWSRA (EIAR Volume 4)** and summarised in this Chapter.
Scottish Government ECU Scoping Response Dated 22 February 2023	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 http://www.gov.scot/Publications/2017/04/8868, 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.	Potential impacts on peat and proposed mitigation measures are summarised in this Chapter and discussed in full in **TA 8.1: PLHRA (EIAR Volume 4)** and **TA 8.2: PMP (EIAR Volume 4)**.

Organisation and Type of Consultation	Response	How Response has been Considered
Scottish Government ECU Scoping Response Dated 22 February 2023	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'.	A borrow pit appraisal is included as **TA: 8.3: Borrow Pit Appraisal (EIAR Volume 4).**
PKC Scoping Response 02 February 2023	PKC agrees with the topics, potential impacts (as noted in **Table 7-1** of the Scoping Report) and assessment methodology. PKC acknowledges an assumption that there is little or no impacts from the operation of the windfarm on the River Tay SAC. These assumptions will need to be confirmed through field studies and via the proposed CEMP mitigation.	Noted. It has been confirmed that no development is proposed within the River Tay catchment and therefore the Proposed Development is not hydraulically connected to the River Tay SAC. Potential effects on the SAC are therefore not discussed further in this Chapter. Other potential effects on the SAC are considered further in **Chapter 7: Ecology (EIAR Volume 1**).
NatureScot Scoping Response 30 January 2023	We note the applicant states there are no geological or hydrological designations within the site vicinity. Fintulich SSSI/Geological Conservation Review (GCR) designated for Caledonian Igneous features is approximately 3.5km from the proposal boundary. Glen Ample GCR is also approximately 1.8km from the boundary of the site, however the proposal is unlikely to have any impact on either of these SSSI/GCR sites.	Noted. It has been confirmed that no development is proposed within the GCR sites and therefore these are not considered at risk from the Proposed Development and are not discussed further.
NatureScot Scoping Response 30 January 2023	We welcome the commitment to avoid areas of deep peat and to include measures to minimise peat disturbance during excavation, construction and decommissioning. The Applicant should include measures to avoid both direct and indirect impacts to the most sensitive and high quality peatland habitats, this should be considered as part of the site design. At present the current site design looks to show turbines 1, 2, 5 and 7 are sited on areas of Class 1 peatland with turbine 3 bordering an area of Class 1 peatland. Following on from proposed programme of field work, the Applicant should consider mitigation such as revising the proposed site design to exclude and protect areas of deep peat and priority peatland habitats. Mitigation should be detailed where impacts on peatland habitats are unavoidable. We recommend consideration of	Potential impacts on peat and proposed mitigation measures are summarised in this Chapter and discussed in full in **TA 8.1: PLHRA (EIAR Volume 4)** and **TA 8.2: PMP (EIAR Volume 4).** The condition of the peat is also discussed in **Chapter 7: Ecology (EIAR Volume 1)** and **TA 7.1 (EIAR Volume 4)**. An Outline Biodiversity Enhancement and Management Plan (BEMP) is provided in **TA 7.6 (EIAR**

Organisation and Type of Consultation	Response	How Response has been Considered
	degraded peatland areas which could be included as part of the Habitat Management Plan which may be used as compensatory and enhancement measures. We are supportive of the inclusion of a Peat Management Plan.	**Volume 4)** and **TA 7.7 (EIAR Volume 4)** respectively.
NatureScot Scoping Response 30 January 2023	We refer the Applicant to SEPA for advice on the methodology and scope of the hydrology and hydrogeology assessment.	Noted.
Scottish Water Scoping Response 18 January 2023	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 18 January 2023	A review of our records indicates that the proposed activity falls within a drinking water catchment where a Scottish Water abstraction is located. Scottish Water abstractions are designated as Drinking Water Protected Areas (DWPA) under Article 7 of the Water Framework Directive. The River Earn supplies Glenfarg Water Treatment Works (WTW) and it is essential that water quality and water quantity in the area are protected. In the event of an incident occurring that could affect Scottish Water we should be notified immediately using the Customer Helpline number 0800 0778 778. Turbines T01, T02, T05 and T07 all lie in an area where the soil has the highest carbon class, 6, with Turbine T03 lying on the edge of the area with same soil carbon class. The remaining turbines all lie within areas where the soil carbon class is ranked from 3 to 2. Peat that is in unfavourable condition or disturbed can exacerbate the release of organic material into the water environment. Water containing a high organic content can affect WTW processes and water supply. Given this we would deem that this activity is likely to present a risk to water quality and the appropriate mitigation measures including peatland restoration are considered necessary prior to any construction on site including the creation of access tracks. Scottish Water have produced a list of precautions for a range of activities. This details protection measures to be taken within a DWPA, the wider drinking water catchment and if there are assets in the area. Please note that site specific risks and mitigation measures will require to be assessed and implemented. These documents and other supporting information can be found on the activities within our catchments page of our website at www.scottishwater.co.uk/slm For a full assessment we would also require to see all sections of the access track mapped or where possible if we could be sent Shapefiles of the track and any other	Noted. Assessments of potential impacts on the water environment, including Scottish Water assets and DWPAs, is assessed in Section 8.3 and Section 8.4 of this Chapter. The condition of the peat and peatland habitat across the Site is discussed in detail in **TA 8.1: PLHRA (EIAR Volume 4)**, **TA 8.2: PMP (EIAR Volume 4), Chapter 7: Ecology (EIAR Volume 1)** and **TA 7.1 (EIAR Volume 4)**.

Organisation and Type of Consultation	Response	How Response has been Considered
	prominent infrastructure this would allow us to indicate further the main areas of risk, as it is likely some of these areas are also within areas of high carbon class soil. It also appears as though it may cut through an area where we have had previous consultation regarding a Woodland creation. We welcome receipt of this notification about the proposed activity within a drinking water catchment where a Scottish Water abstraction is located. The fact that this area is located within a drinking water catchment should be noted in future documentation. Also, anyone working on site should be made aware of this during site inductions. We would request further involvement at the more detailed design stages, to determine the most appropriate proposals and mitigation within the catchment to protect water quality and quantity. We would also like to take the opportunity, to request that 3 months in advance of any works commencing on site, Scottish Water is notified at protectdwsources@scottishwater.co.uk. This will enable us to be aware of activities in the catchment and to determine if a site meeting would be appropriate and beneficial.	
SEPA Scoping Response 12 December 2023	Ensuring that it is clearly demonstrated that impacts on peat have been minimised as much as possible is likely to be the most significant issue for SEPA with development of this site. The main way this can be achieved is by avoiding areas of deep peat and any good quality peatland habitat and ensuring supporting infrastructure is minimised e.g. by using existing access tracks (there appears to be existing access options from Glen Tarken and St Fillans). We understand peat depth surveys are to be completed. Please note this must be to full depth and follow the survey requirements of the Scottish Government's Guidance on Developments on Peatland - Peatland Survey. Please note SEPA concerns in relation to peat and carbon rich soils also includes Class 5 peat. We ask we are sent a copy of the outcome of the survey when available with current proposed infrastructure overlain. We would wish to work with the developer to ensure that the phase 2 peat probing informs the layout to concentrate effort where it is likely to be most useful. A number of the turbines and the access track are proposed on Class 1 peat which comprises nationally important carbon-rich soils, deep peat and priority peatland habitat. We request that a peat condition assessment is also submitted as this will provide the required level of detail on this sensitive site. The purpose is to identify pristine or near-natural areas which must be avoided, and to identify modified, drained and actively eroding areas for restoration and enhancement. Further	Potential impacts on peat and proposed mitigation measures are summarised in this Chapter and discussed in full in **TA 8.1: PLHRA (EIAR Volume 4)** and **TA 8.2: PMP (EIAR Volume 4**) where the results of site-specific peat depth probing are presented. The condition of the peat is also discussed in **Chapter 7: Ecology (EIAR Volume 1)** and **TA 7.1 (EIAR Volume 4).** A BEMP is provided in **TA 7.7 (EIAR Volume 4)**.

Organisation and Type of Consultation	Response	How Response has been Considered
	guidance is available here: Guidance-Peatland-Action-Peatland-Condition-Assessment-Guide-A1916874.pdf (nature.scot). It should be clearly shown that development avoids any areas of good quality peat forming habitat.	
SEPA Scoping Response 12 December 2023	We understand NVC and GWDTE surveys are to be completed in summer 2023 and ask that we be sent copies of the information including a plan showing the current proposed layout overlain with NVC plus any related target notes shown. Our expectation is that this clearly demonstrates that the proposal avoids impacts on any highly groundwater dependant habitats and minimises impacts on any other groundwater dependent habitats.	Noted. Details of the NVC surveys are presented in **Chapter 7: Ecology (EIAR Volume 1).** Potential impacts on GWDTE and proposed mitigation measures, as required, are discussed in **TA 8.5: GWDTE Assessment (EIAR Volume 4)**.
SEPA Scoping Response 12 December 2023	We are pleased the scoping layout includes a 50m buffer between turbines and watercourses and lochans shown on OS mapping. Consideration may also need to be given to smaller watercourses and water features if there are any on the site. The current layout suggests a number of new watercourse crossings will be required due to the new site access from Glen Beich. We recommend the applicant consider whether there are opportunities to reduce the number of crossings required by reusing or upgrading existing infrastructure (e.g. utilising the existing access through Glen Tarken or from St Fillans).	It is confirmed that a 50m buffer to all watercourses / bodies has been applied, as shown on **Figure 8.1 (EIAR Volume 2)**. A schedule of watercourse crossings is included as **TA 8.4 (EIAR Volume 4**).
NatureScot Gatecheck Response 07 October 2024	Thank you for consulting NatureScot on the Gatecheck Report, we are content that the points we raised at scoping have been acknowledged by the developer. Since the Scoping Report we have updated our guidance on peatland, carbon-rich soils and priority peatland habitats, we would therefore refer the applicant to this guidance and the supporting Annexes: https://www.nature.scot/doc/advising-peatland-carbon-rich-soils-and-priority-peatland-habitats-development-management. In addition, we would advise the applicant to be clear at the application stage with any offsetting and enhancement measures proposed, this should include the level of commitment and minimum deliverables.	Noted. A BEMP is provided **TA 7.7 (EIAR Volume 4)**.
SEPA Gatecheck response 08 October 2024	The entire development appears to be either blanket bog, wet modified bog with either peat over 1m or highly dominant potential GWDTE. 'Highly dominant potential GWDTE' areas have been mapped (Fig 2 Environmental Constraints). More detail will be required for a full assessment in the form of NVC data and potentially a hydrological assessment; it has been stated that this will be discussed in EIAR within Ecology and Hydrology chapters and we expect the habitat survey to be presented as NVC rather than UKHab. This NVC survey data is requested with all the proposed	An assessment on potential GWDTEs and proposed mitigation measures, as required, are discussed in **TA 8.5 (EIAR Volume 4).**

Organisation and Type of Consultation	Response	How Response has been Considered
	infrastructure overlain and to include the buffer zones. Where areas of GWDTE cannot be avoided then mitigation must be in place to protect continuity of groundwater flows unless it can be shown that these are not groundwater dependent for which a hydrological assessment will be required.	
SEPA Gatecheck response 08 October 2024	We would expect a peat assessment to be provided with the detail of the probing mapped. A Peat Management Plan would provide information on the peat volumes of the different types of peat to be excavated, how these volumes are to be kept to a minimum and mitigation to include how peat arisings are to be reused for ecological benefit. In areas of peat over 1m floating tracks have been proposed.	A site-specific peat management plan is presented in **TA 8.2 (EIAR Volume 4)**.
SEPA Gatecheck response 08 October 2024	Depending on the condition of the bog habitat NatureScot may request additional protection for the blanket bog. We found no detail on the NVC habitats present (for the GWDTE comments) not the condition of any of the blanket bog beyond being modified in places.	Noted. Details of the NVC survey is presented in **Chapter 7: Ecology (EIAR Volume 1)**.
SEPA Gatecheck response 08 October 2024	Biodiversity enhancement opportunities will be considered and a HMP is to be developed to mitigate or enhance habitat though this is no longer anything we provide comment on.	A BEMP is provided in **TA 7.7 (EIAR Volume 4)**.
SEPA Gatecheck response 08 October 2024	A permanent battery storage area (BESS?) was also proposed but we could not see where this will be located.	BESS will be located within the proposed substation platform as shown on **Figure 2.1** and discussed in **Chapter 2: Development Description (EIAR Volume 1).**
SEPA Gatecheck response 08 October 2024	There are some sizeable areas of highly dominant potential GWDTE that have been mapped in Figure 2 particularly within the mid-section of the proposed cut track; we don't see how these can be avoided unless there is an alternative route for the access track. We presume the alternative access to Glen Tarken via the existing hydro scheme (or St Fillans) has been considered; though is not necessarily any better. There is a lot of blanket bog present which is potentially Annex 1 habitat though it is expected that NatureScot would comment on the sensitivity and impact on this habitat.	Potential GWDTEs are discussed in **TA 8.5: GWDTE Assessment (EIAR Volume 4)**. Details of the Proposed Development design evolution is discussed in **Chapter 3: Evolution of Design and Alternatives (EIAR Volume 1)**.
SEPA Gatecheck response 08 October 2024	There are 2 tracks on the access from the main road; one upgraded to the proposed borrow pit search area and a new cut track to the west. Are both tracks necessary? (there may be constraints due to gradient). Upgrading the existing track could reduce the number of river crossings and move the track away from the ancient woodland.	The existing farm track will be upgraded to reach BP 6. However, the gradients are too steep for WTG deliveries/operations, therefore an additional new section of track (to the west) is also required.

Organisation and Type of Consultation	Response	How Response has been Considered
		Details of the Proposed Development design evolution is discussed in **Chapter 3: Evolution of Design and Alternatives (EIAR Volume 1)**.
SEPA Gatecheck response 08 October 2024	The second proposed borrow pit up the track is within an area of highly dominant potential GWDTE; if this is groundwater fed habitat then we would expect this to be avoided to prevent disruption to groundwater flows.	**TA 8.5: GWDTE Assessment (EIAR Volume 4)** confirms that the highly dominant potential GWDTE near the borrow pit is underlain by low permeability deposits and therefore likely surface water fed rather than groundwater.
SEPA Gatecheck response 08 October 2024	The track then crosses a number of areas of highly dominant potential GWDTE, wet modified bog and some areas of deeper peat. We would require mitigation to protect the groundwater flows unless it can be shown that these are not groundwater fed. All areas of deeper peat have been shown as having floating tracks.	Mitigation to protect GWDTEs are discussed in **Section 8.5** of this Chapter and in **TA 8.5 (EIAR Volume 4)**.
SEPA Gatecheck response 08 October 2024	The track and the proposed temporary construction compound are on areas of deeper peat. Could these be moved northwest slightly to avoid the slightly deep peat >3m (and blanket bog). And the permanent substation platform moved slightly southwest.	Noted. Further details on the site design and evolution are provided in **Chapter 3: Site Design and Evolution (EIAR Volume 1).**
SEPA Gatecheck response 08 October 2024	T11-this is on blanket bog and no detail is available of the sensitivity of this habitat but fine in terms of GWDTE and peat. T1-within blanket bog and on the edge of an area of deeper peat and highly dominant potential GWDTE. Could the track and base be sited to the northeast slightly to avoid the deeper peat, though floating track has been proposed here. Track to T5 and T16 appears to be within buffer zone of watercourse and bisects areas of highly dominant potential GWDTE. Mitigation would be required to protect groundwater flows; design and construction of the track should not cause any damage to water quality. T16 floating track over deeper peat has been proposed. Proposed temporary laydown area and batching plant-some areas of deeper peat and highly dominant potential GWDTE. Could these be located closer to the track and avoid the peat and GWDTE. T2-the turbine base appears out with the deeper peat. The access track across peat has been shown to be floating; could micrositing avoid the deepest areas. T3-could the turbine base be located away from the deeper peat (slightly northwest).	Noted. Where technically possible the design has sought to avoid deep areas of peat, avoid GWDTEs and maintain a 50 m buffer to all watercourses / bodies. Proposed mitigation measures, as required, are discussed in Section 8.4 of this Chapter, **TA 8.5: GWDTE Assessment (EIAR Volume 4)**, **TA 8.1: PLHRA (EIAR Volume 4)** and **TA 8.2: PMP (EIAR Volume 4)**. Further details on the site design and evolution are provided in **Chapter 3: Site Design and Evolution (EIAR Volume 1).**

Organisation and Type of Consultation	Response	How Response has been Considered
	T4-could the base and hardstanding be switched to the opposite side of the track to avoid the deeper peat. T6-Turbine base appears to be in area of deeper peat. Could this be moved to the opposite end of the permanent hardstanding? The access track bisects areas of deeper peat (floating track proposed) and lies just within a watercourse buffer zone. T21-could the turbine and hardstanding be moved to the southeast away from the deeper peat. T20-on the front page maps this appears to be on a watercourse but the detail shows it to be out with the buffer zone. Location is acceptable though is in an area of blanket peat. T10-could the base and infrastructure be located out with the area of deeper peat (very slightly to west due to watercourse buffer zone). Access track-could this be spurred off further to the east to avoid the deeper peat (though this is to be floating track).	
SEPA Further consultation 13 November 2024	All of the peat condition was reported to be modified in some way at the locations discussed. Our priority should always be avoiding the disturbance of peat, particularly unmodified peat. The consultant said that the area of development is to be on peatland that is not in near or natural condition (ie eroded, drained or modified).	An acknowledgement and response to SEPA's feedback was provided on 6th December 2024. Peat condition is discussed in **Chapter 7: Ecology (EIAR Volume 1)** and shown on **Figures 7.5.1** to **7.5.3**.
SEPA Further consultation 13 November 2024	T6, T10-request to move the actual turbine base itself out of the deeper peat; only a short distance away. T21-as suggested would like to see that relocated as base and hardstanding all in deep peat. The laydown, batching areas, BESS and compounds have been considered for micrositing following GI.	Noted. An acknowledgement and response to SEPA's feedback was provided on 6th December 2024. Further details on the site design and evolution are provided in **Chapter 3: Site Design and Evolution (EIAR Volume 1)**.
SEPA Further consultation 13 November 2024	Mitigation was to be provided where certain features could not be avoided eg GWDTE and using floating roads in areas of peat >1m. Where GWDTE is present we would prefer avoidance 1 and T6 - we would like to be considered for siting out with the GWDTE as well as the proposed access track borrow pit area. These and some sections of track would require mitigation to preserve groundwater flows. Mitigation has been mentioned though details not included at this stage.	Noted. An acknowledgement and response to SEPA's feedback was provided on 6th December 2024. An assessment of potential areas of GWDTE is presented in **TA 8.5 (EIAR Volume 4).** Examples of proposed safeguards which will be used to maintain existing surface water flow paths and maintain existing surface water quality

Organisation and Type of Consultation	Response	How Response has been Considered
		are discussed in Section 8.4 of this Chapter.
SEPA Further consultation 13 November 2024	We would require more information in terms of volumes of peat being extracted There is a large volume of peat and the result is a deficit, however the consultant says that it is all modified peat. No details have been provided of how the peat is to be re-used (apart from where) therefore we are uncertain if this would be an acceptable re-use eg a large volume of catotelmic peat is to be re-used for the cut track, floating track and main compound.	An acknowledgement and response to SEPA's feedback was provided on 6th December 2024. Peat excavation and re-use volumes are provided in **TA 8.2: PMP (EIAR Volume 4)**.

8.2.14 Full details of all consultation undertaken is provided in **TA 1.2: Consultation Register (EIAR Volume 4**).

Potential Effects Scoped Out

8.2.15 On the basis of the desk based and survey work undertaken, policy, guidance and standards, the professional judgement of the Environmental Impact Assessment (EIA) team, feedback from consultees and experience from other relevant projects, the following topic areas have been scoped out of the assessment:

- **Detailed flood risk and drainage impact assessment**. Published mapping confirms the Site is not located in an area identified as being at flood risk. A screening assessment of potential flooding sources (fluvial, coastal, groundwater, infrastructure etc.) is presented in Section 8.4 of this Chapter and measures that would be used to control the rate and quality of runoff will be specified in the CEMP which would be agreed with SC and PKC prior to any development;
- **Baseline water quality monitoring**. As the assessment is informed by classification data obtained from SEPA which shows that there are no known sources of potential water pollution, no additional baseline water quality monitoring is considered necessary to complete the assessment. Note, water quality monitoring is proposed prior to, during and post construction if the Proposed Development were to be granted consent. Details of monitoring suites, locations, frequencies and reporting would be specified in the CEMP; and
- **Potential effects on geology**. With the exception of peat, there are no protected geological features within the application boundary or Study Area. Furthermore, the nature of the activities during construction, operation and decommissioning of the Proposed Development would not alter regional or solid geology. Potential effects on peat and carbon rich soils are not scoped out of the assessment and are considered in full.

Method of Baseline Characterisation

Extent of the Study Area

8.2.16 The Study Area is shown on **Figures 8.1 to 8.8 (EIAR Volume 2)** and includes all the proposed site infrastructure and a 500 m buffer from the Site. Beyond this distance, any effect is considered to be so diminished as to be undetectable and therefore **not significant**.

8.2.17 The Study Area for cumulative effects uses the catchments within the Study Area, with a maximum downstream distance of 5 km from the Proposed Development.

Desk Study

8.2.18 An initial desk study has been undertaken to determine and confirm baseline characteristics by reviewing available information on soils, geology, hydrology and hydrogeology. The following data sources were consulted in order to characterise the baseline conditions:

- Ordnance Survey 1:50,000 and 1:25,000 scale mapping;
- UK Centre for Ecology and Hydrology, Flood Estimation Handbook (FEH) webservice[5];
- NatureScot SiteLink[6];
- James Hutton Institute, National Soil Map of Scotland (1:250,000 scale)[7];
- Scottish Natural Heritage (now NatureScot) Carbon and Peatland 2016 data[8];
- British Geological Survey (BGS) Onshore Geoindex [9];
- BGS Hydrogeological Maps of Scotland (1:100,000 scale)[10];
- SEPA rainfall data[11];
- SEPA flood maps[12];
- SEPA reservoir inundation map[13];
- SEPA environmental data[14];
- The Scottish Flood Defence Asset Database (SFDAD)[15];
- data request with SEPA regarding details of registered / licenced abstractions and discharges (March 2024); and
- data requests with PKC and SC regarding details of historical flooding records and private water abstractions (March 2024).

Field Survey

8.2.19 The project hydrologists, geologists and ecologists have worked closely on this assessment to ensure that appropriate information is gathered to allow a comprehensive impact assessment to be completed.

8.2.20 Detailed site visits and walkover surveys have been undertaken by SLR on the following dates:

- December 2023: conduct an initial site reconnaissance exercise;
- February 2024: conduct an initial phase 1 peat and soil depth probing exercise;
- July 2024: complete an additional peat and soil depth probing exercise, watercourse crossing survey, GWDTE survey and private water supply survey; and
- August 2024: complete an additional watercourse crossing survey, additional peat and soil depth probing survey and additional GWDTE survey exercise.

8.2.21 The fieldwork has been undertaken in order to:

- verify the information collected during the desk and baseline study;

[5] UK Centre for Ecology and Hydrology, Flood Estimation Handbook (FEH) webservice, available online at https://fehweb.ceh.ac.uk/ [Accessed October 2024]
[6] NatureScot SiteLink, available online at https://sitelink.nature.scot/home [Accessed October 2024]
[7] The James Hutton Institute, National Soil Map of Scotland (1:250,000 scale), available online at https://soils.environment.gov.scot/maps/soil-maps/national-soil-map-of-scotland/ [Accessed Oct 24]
[8] Scottish Natural Heritage (now NatureScot), Carbon and Peatland 2016 map, available online at https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/ [Accessed October 2024]
[9] British Geological Survey, Onshore Geoindex, available online at https://mapapps2.bgs.ac.uk/geoindex/home.html [Accessed October 2024]
[10] British Geological Survey, Hydrogeological maps of Scotland (1:100,000 scale), available online at https://www.bgs.ac.uk/datasets/hydrogeological-maps-of-scotland/ [Accessed October 2024]
[11] Scottish Environment Protection Agency, Rainfall data for Scotland, available online https://www2.sepa.org.uk/rainfall/ [Accessed October 2024]
[12] Scottish Environment Protection Agency, Flood Maps, available online at https://beta.sepa.scot/flooding/flood-maps/ [Accessed October 2024]
[13] Scottish Environment Protection Agency, Reservoir Maps, available online at https://map.sepa.org.uk/reservoirsfloodmap/Map.htm [Accessed October 2024]
[14] Scottish Environment Protection Agency, Environmental data, available online at https://www.sepa.org.uk/environment/environmental-data/ [Accessed October 2024]
[15] Scottish Government, The Scottish Flood Defence Asset Database (SFDAD), available online at https://www.scottishflooddefences.gov.uk/Default.aspx [Accessed October 2024]

- undertake a visual impact assessment of the main surface waters and identify and verify private water supplies;
- identify drainage patterns, areas vulnerable to erosion or sediment deposition, and any pollution risks;
- visit any identified potential GWDTE (in consultation with the project ecologist);
- visit any potential watercourse crossings and prepare a schedule of potential watercourse crossings if required;
- inspect rock exposures and establish by probing, an estimate of overburden thickness, peat depth and stability;
- confirm underlying substrate, based on the type of refusal of a peat probe and by coring; and
- allow appreciation of the Site, determine gradients, potential borrow pit locations, access routes, ground conditions, etc, and to assess the relative location of all the components of the Proposed Development

8.2.22 The desk study and field surveys have been used to identify potential development constraints and have been used as part of the iterative design process.

8.2.23 The data obtained as part of the desk study and collected as part of the field work has been processed and interpreted to complete the impact assessment and recommended mitigation measures where appropriate.

Method of Assessment

8.2.24 The significance of potential effects of the Proposed Development has been assessed by considering two factors: the sensitivity of the receiving environment and the potential magnitude of impact, should that effect occur.

8.2.25 The assessment methodology has also been informed by experience of carrying out such assessments for a range of wind farm and other developments, knowledge of the geology and water environment characteristics in Scotland and cognisance of good practice.

8.2.26 This approach provides a mechanism for identifying the areas where mitigation measures are required and for identifying mitigation measures appropriate to the significance of potential effects, such as detailed in the site-specific OBEMP **(TA 7.7, EIAR Volume 4)**, PMP and PLHRA.

8.2.27 The full assessment methodology, including criteria for assessing sensitivity of receptors, magnitude of change and cumulative effects, as well as overall significance criteria and approach to mitigation, is detailed in **TA 8.7: Assessment Methodology (EIAR Volume 4).**

Residual Effects

8.2.28 A statement of residual effects, following consideration of any further specific mitigation measures where identified, is then given.

Limitations and Assumptions

8.2.29 The assessment uses site investigation, survey data and publicly available data sources, including but not limited to SEPA, NatureScot, Met Office, SC, PKC and commercial data supply companies, as well as additional information supplied from stakeholders during the scoping and consultation stages.

8.2.30 It is considered that the data and information used to complete this assessment is robust and that there are no significant data gaps or limitations.

8.3 Baseline Conditions

Current Baseline

Site Setting

8.3.1 The Site is located approximately 2.8 km east of Lochearnhead, Perthshire and is centred on National Grid Reference (NGR) NN 65264 28479. The majority of the Site comprises rough hill pasture, heathland and moorland.

8.3.2 Ground elevations within the Site range from approximately 100 m Above Ordnance Datum (AOD) along the southern boundary of the Site near Loch Earn to approximately 700 m AOD near the summit of Creag Ruadh within the north eastern extent of the Site. Elevations generally decrease southwards towards Loch Earn.

8.3.3 SEPA provided precipitation data[11] for the Glen Ample rain gauge (station number 335745) which is located approximately 4.2 km south west of the proposed site entrance off the A85. In 2023, an annual rainfall of 2030.4 mm was recorded.

8.3.4 The standard average annual rainfall (SAAR) based on data obtained from the FEH webservice[5] for the Beich Burn and Glentarken Burn surface water catchments (tributaries of Loch Earn which drain the majority of the Site), confirms a slightly lower annual rainfall of 1,724 mm and 1,650 mm respectively.

Statutory Designations

8.3.5 A review of NatureScot's SiteLink webpage[6] confirms that no designated sites are located within the Site.

8.3.6 The Dalveich Meadows Site of Special Scientific Interest (SSSI) is located within the Study Area, approximately 800 m west of the proposed access point off the A85. The SSSI is designated for low calcareous and neutral grasslands. No development is proposed within the SSSI, and the designated site is located within a different surface water catchment to the Proposed Development. It is therefore not considered further in this Chapter. Other potential effects on the SSSI are considered further in **Chapter 7: Ecology (EIAR Volume 1)**.

Soils

8.3.7 An extract of the 1:250,000 Scotland Soils mapping[7] is presented as **Figure 8.2 (EIAR Volume 2)**. The northern extent of the Site, where the turbines are proposed, is shown to be underlain by peat, montane soils and mineral podzols. The western extent of the Site, where the access track is proposed, is generally underlain by peaty gleys and mineral gleys to the north and mineral podzols and alluvium soils to the south, near the A85.

Superficial Geology (including Peat)

8.3.8 BGS mapping[9] (see **Figure 8.3 (EIAR Volume 2)**) illustrates that, where present, the superficial deposits within the Site comprise of glacial till, hummocky glacial deposits and till and morainic deposits. Superficial deposits within the northern and eastern extent of the Site have not been mapped by BGS.

8.3.9 Priority peatland mapping[8] (see **Figure 8.4 (EIAR Volume 2)**) published by Scottish Natural Heritage (now NatureScot) indicates that part of the centre and northern extent of the Site is underlain by Class 1, Class 3 and Class 5 peatlands. Class 1 peatlands are classified as nationally important carbon-rich soils, deep peat and priority peatland habitat likely of high conservation value whilst Class 3 and 5 peatlands are

classified as areas where no or occasional peatland habitats are recorded however soils may remain carbon-rich with areas of deep peat.

8.3.10 The remainder of the Site is shown to be underlain by mineral soil (Class 0). Peatland habitats are not typically found on such soils.

8.3.11 As part of the baseline assessment, a comprehensive peat depth probing exercise has been undertaken and has informed the PLHRA and PMP (**TA 8.1: PLHRA (EIAR Volume 4)** and **TA 8.2: PMP (EIAR Volume 4)**). In summary, the site investigations have confirmed:

- the depth of soils and peat was recorded at more than 7,900 locations;
- all elements of the proposed site infrastructure have benefitted from peat probing;
- a programme of peat augering has also been undertaken to assess the characteristics of the peat at the Site;
- approximately 80% of all peat probes recorded a peat depth of less than 1m (approximately 57% recorded no peat or a peat depth of less than 0.5m); and
- peat was classified using the Von Post classification as between H2 and H7, showing insignificant to moderate decomposition.

Bedrock Geology and Linear Features

8.3.12 An extract of the regional BGS bedrock mapping is shown in **Figure 8.5 (EIAR Volume 2)**. The western extent of the Site is generally underlain by psammites and semipelites of the Pitlochry Schist Formation and Southern Highland Group. The eastern extent of the Site is underlain by metagabbro and metamicrograbbro of the Dalradian Supergroup and felsite igneous rocks of the North Britain Siluro-Devonian Calc-Alkaline Dyke Suite.

8.3.13 The south western boundary of the Site is underlain by metalimestone rocks of the Loch Tay Limestone Formation.

8.3.14 A sinistral strike-slip fault is noted along the south western boundary of the Site, on the boundary of the Loch Tay Limestone Formation and Pitlochry Schist Formation bedrocks. The fault is shown to have a north east to south west trend within the Site.

Hydrogeology

Aquifer Characteristics and Groundwater Vulnerability

8.3.15 Extracts of the BGS 1:625,000 scale regional hydrogeological mapping[9] and 1:100,000 scale aquifer productivity and groundwater vulnerability datasets[10] are presented in **Figure 8.6 (EIAR Volume 2)** and **Figure 8.7 (EIAR Volume 2)** respectively.

8.3.16 **Figure 8.6 (EIAR Volume 2)** confirms that the proposed development is underlain by Precambrian and intrusive bedrock units classified as low productivity aquifer whereby small amounts of groundwater are expected in the near surface weathered zone and secondary fractures.

8.3.17 The Aquifer Productivity and Groundwater Vulnerability datasets (**Figure 8.7 (EIAR Volume 2)**) classify the underlying aquifer (superficial and bedrock) according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity.

8.3.18 It is shown that the superficial deposits at the Site are classified as not a significant aquifer. The bedrock aquifer is confirmed to be a very low to low productivity aquifer, generally without groundwater except at shallow depth with flow almost entirely through fractures and other discontinuities.

8.3.19 Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable. Review of **Figure 8.7 (EIAR Volume 2)** shows that the potential groundwater vulnerability in the uppermost aquifer beneath the Proposed Development has a vulnerability of Class 4a and 5. The highest vulnerability is noted where little to no superficial deposits are recorded, and thus little attenuation of potential pollutants might occur prior to entry to groundwater.

Groundwater Levels and Quality

8.3.20 Groundwater recharge at and surrounding the Site is limited by the following factors:

- steep topographic gradients result in rainfall forming surface water runoff;
- peat and till deposits inhibit infiltration owing to their generally low bulk permeability; and
- the underlying bedrock displays a low permeability that inhibits groundwater recharge.

8.3.21 SEPA do not maintain any groundwater level monitoring locations within the Study Area. In the absence of published information or data held by SEPA, it is anticipated that groundwater will be present as perched groundwater within the more permeable horizons of glacial till and within the weathered zone, fractures or faults within the bedrock deposits.

8.3.22 All of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas under the Water Environment (Drinking Water Protected Area) (Scotland) Order 2013 and require protection for their current use or future potential as drinking water resources.

8.3.23 The current status of groundwater bodies in Scotland has been classified by SEPA in accordance with the requirements of the Water Framework Directive (WFD). SEPA has identified that the Site is underlain by the Killin, Aberfeldy and Angus Glens groundwater body (SEPA ID: 150699). In 2022 (the latest reporting cycle) the groundwater body was classified as having a Good overall status with no pressures identified.

Groundwater Dependant Terrestrial Ecosystems

8.3.24 A National Vegetative Classification (NVC) mapping exercise was conducted as part of the ecological baseline assessment, and this has been used to identify potential areas of GWDTE within the Site. The methodology and results of the NVC habitat mapping exercise are discussed in detail within **Chapter 7: Ecology (EIAR Volume 1)**. With reference to SEPA LUPS-31 guidance[16], areas of potential GWDTE are shown in **Figure 8.8 (EIAR Volume 2)**. An assessment of potential areas of GWDTE, and in particular a discussion whether the habitats are sustained by ground or surface water is presented in **TA 8.5: GWDTE Assessment (EIAR Volume 4)**.

8.3.25 The GWDTE assessment confirms that the majority of potential GWDTE habitats are predominantly sustained by the high average rainfall, surface water runoff and water logging of low permeability bedrock and superficial deposits. However, some base rich groundwater flushes are recorded and support GWDTE habitats. These are assessed in full in **TA 8.4: GWDTE Assessment (EIAR Volume 4)** and discussed further in Section 8.5.

[16] Scottish Environment Protection Agency (2017) Land Use Planning System, SEPA Guidance Note 31, Guidance on Assessing the Impacts on Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 3

Hydrology

Local Hydrology

8.3.26 The Site is located within the surface water catchment of Loch Earn specifically within the sub catchments of the Beich Burn to the west and the Glentarken Burn (also called Tarken Burn) to the east.

8.3.27 The Loch Earn surface water catchment has been designated as a Drinking Water Protected Area (DWPA). Consultation with Scottish Water **(Table 8-2)** indicates that the DWPA supplies Glenfarg WTW.

8.3.28 As shown on **Figure 8.1 (EIAR Volume 2)** only a small extent of the Proposed Development is located within the area designated as the DWPA including the southern extent of the proposed access track and part of the eastern boundary of the Site (east of turbine T8). However, it is noted that the entire Proposed Development is drained by tributaries of Loch Earn and therefore the DWPA is hydrologically connected to the Proposed Development and, as a consequence, is considered further in this assessment.

Surface Water Quality

8.3.29 SEPA classify larger watercourses within the Site as part of its responsibility under the WFD[14]. The quality of watercourses and waterbodies relevant to the Site are presented in **Table 8-3**.

Table 8-3: Surface Water Quality

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical Status	Hydro-morphology	Pressures
Beich Burn (6822)	Heavily modified - Good Ecological Potential	Moderate	Not monitored	Moderate	Heavily modified due to physical alterations for water storage in relation to hydroelectricity generation.
Tarken Burn (6820)	Heavily modified - Moderate Ecological Potential	Moderate	Not monitored	Moderate	Heavily modified due to physical alterations for water storage in relation to hydroelectricity generation.
Loch Earn (100251)	Heavily modified - Moderate Ecological Potential	Moderate	Good	Moderate	Heavily modified due to physical alterations for water storage in relation to hydroelectricity generation.

8.3.30 Smaller watercourses which rise from the Site are not monitored or classified by SEPA.

Fisheries

8.3.31 Fisheries within the area are managed by the Tay Foundation in partnership with the Tay District Salmon Fishery Board (TDSFB). Fishery interests are discussed in more detail and assessed within **Chapter 7: Ecology (EIAR Volume 1)**.

Watercourse Crossings

8.3.32 Twenty three new watercourse crossings and one existing crossing which is scheduled to be upgraded are required to facilitate the Proposed Development. The locations of the proposed crossings are shown on **Figure 8.1a** to **8.1d (EIAR Volume 2)** and a schedule of these crossing points, which includes photographs and dimensions of each crossing is shown in **TA 8.4: Schedule of Watercourse Crossings (EIAR Volume 4)**.

Flood Risk

8.3.33 SEPA has developed national flood maps[12] that present modelled flood extents for river, coastal, surface water and groundwater flooding. The river, coastal, surface water and groundwater maps were developed using a consistent methodology to produce outputs for the whole of Scotland, supplemented with more detailed, local assessments where available and suitable for use. Flood extents are presented in three likelihoods:

- High likelihood: A flood event is likely to occur in the defined area on average more than once every ten years (1:10). Or a 10% chance of happening in any one year;
- Medium likelihood: A flood event is likely to occur in the defined area on average more than once in every two hundred years (1:200). Or a 0.5% chance of happening in any one year; and
- low likelihood: A flood event is likely to occur in the defined area on average more than once in every thousand years (1:1000). Or a 0.1% chance of happening in any one year.

8.3.34 SEPA have also produced reservoir inundation maps for sites currently regulated under the Reservoir Act 2011[13].

8.3.35 A summary of the potential sources of flooding and a review of the potential risks posed by each source is presented in **Table 8-4**. Current and future flood maps which account for the potential effects of climate change (to 2080) published by SEPA have also been reviewed.

Table 8-4: Flood Risk Screening

Potential Flood Sources	Potential Risk to the Site	Justification
Coastal Flooding	No	The Site is remote from the coast and situated at an elevation of at least 100 m AOD. In addition, SEPA mapping indicates that the Site is not at coastal flood risk.
Fluvial Flooding	No	SEPA mapping indicates that the Proposed Development is not at risk of fluvial flooding. Floodplains are noted along the banks of the Beich Burn, which is located along the western boundary of the Site, however this is not shown to encroach onto the Proposed Development itself. It is noted that the SEPA flood maps are unlikely to show flooding associated with the smaller watercourse within the Site. In these instances, floodplains are likely to be limited and confined to the watercourse corridor. Except for watercourse crossings and small sections of the access tracks, no development is proposed within 50m of the watercourses and waterbodies. It is therefore considered that the Site is not at risk of fluvial flooding.
Surface Water Flooding	Yes (minor)	SEPA have identified several small discrete areas of surface water flooding across the Site, which generally coincide with watercourses and waterbodies within the Site. Flood extents are shown to be very small, never forming larger, linked areas or flow paths. Therefore, surface water flooding is not considered a development constraint.
Groundwater Flooding	No	Review of the SEPA groundwater flood maps confirms that the study area is not at risk from groundwater flooding. This concurs with the desk-based assessment where limited groundwater is expected.
Flooding due to dam or reservoir failure	No	SEPA has produced reservoir inundation maps for sites currently registered under Reservoirs Act 2011[13]. Review of these maps indicates that the Site is not at risk from a reservoir breach.
Flood Defence Breach	No	SEPA indicate that there are no Flood Risk Management Target Areas within the study area. In addition, no formal flood defences are noted on the SFDAD[15] within the study area.

Potential Flood Sources	Potential Risk to the Site	Justification
Flooding from Artificial Drainage Systems	No	The Proposed Development is located within a remote area and no significant artificial drainage systems are recorded within the study area. It is noted that pipework associated with the local SSE hydro schemes cross the Proposed Development. The majority of the Proposed Development, including all the proposed turbines and sensitive infrastructure, is located upstream of this pipework and is therefore not at risk from any surcharging events.

Private Water Supplies and Licensed Abstractions

8.3.36 Consultation with PKC, SC and SEPA has been undertaken to gather details of private and licensed water abstractions within the Study Area.

Licensed Sites

8.3.37 SEPA has provided information on Controlled Activities Regulation (CAR) authorisations within the Study Area. Two authorisations for discharges to private sewage systems are recorded within the Study Area. No licenced abstractions have been recorded by SEPA in the Study Area.

8.3.38 SSE has provided details on the neighbouring SSE Hydro Scheme infrastructure, including the St Fillans Power Station, Lednock Power Station and Dalchonzie Power Station. A review of this information confirms that source of water for the hydro schemes is not located within the Site, however, the proposed access track for the Proposed Development will cross the existing pipework at two locations (located at NGR NN 63877 28695 and NN 64503 29468 respectively). Required additional mitigation, to safeguard the distribution pipework is included in Section 8.5 of this Chapter.

Private Water Supplies

8.3.39 A data request was made to PKC and SC who provided details of private water supply (PWS) sources. In addition, a site investigation programme has been undertaken to confirm the location of PWS locations.

8.3.40 The risk the Proposed Development poses to PWSs has been considered as part of this assessment and is presented in **TA: 8.6: PWSRA (EIAR Volume 4)**. It confirms that:

- one PWS source is potentially at risk from the Proposed Development;
- the distribution pipework associated with one PWS is potentially at risk from the Proposed Development; and
- two PWS sources are not at risk from the Proposed Development.

8.3.41 The measures that are required to safeguard these PWS and a monitoring schedule which can be used to confirm that the PWS is not impaired should the Proposed Development be granted planning permission is also included in **TA: 8.6: PWSRA (EIAR Volume 4)**.

Future Baseline

8.3.42 Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside higher average temperatures. This suggests that there may be greater pressures on water supplies and lower water levels in summer months in the future. Additionally, summer storms are predicted to be of greater intensity. Peak fluvial and surface water flows associated with extreme storms events may also increase in volume and velocity, and sea level rise is anticipated. These potential changes are considered in the assessment of effects.

8.3.43 Whilst there is uncertainty surrounding the future baseline environment, there are no other anticipated changes to the soils or geology, hydrological or hydrogeological environment throughout the anticipated lifetime of the development besides climate change.

Sensitive Receptors

8.3.44 A summary of identified sensitive/ important hydrological, geological and hydrogeological receptors is provided within **Table 8-5**.

Table 8-5: Summary of Identified Sensitive/ Important Geological, Hydrological and Hydrogeological Receptors

Receptor	Sensitivity	Reasons for Sensitivity
Water Dependant Designated Sites	Not sensitive	No water dependent designated sites are considered to be hydraulically connected to the Proposed Development.
Peat and Carbon-rich Soils	High	Presence of peat and carbon-rich soils have been confirmed by site investigations. These are important carbon stores and need to be safeguarded.
Soils and Geology	Not sensitive	Deposits have been shown to be common regionally and have no rarity value. No designated geological sites are recorded in the Study Area.
Groundwater	High	Groundwater has been classified by SEPA as Good and vulnerability is classified as Class 4 and 5.
GWDTE	High	Areas of potential GWDTE have been identified by NVC mapping. It has been shown that the majority of habitats within 250m of the Proposed Development are not sustained by groundwater but by surface water. Measures will be required to preserve contributing catchment areas and sustain existing surface water flow paths to these habitats.
Surface Water	High	Watercourses within the Study Area have been classified by SEPA as Good to Moderate ecological potential. The Loch Earn surface water catchment has also been designated as a DWPA.
Flooding	Moderate	Negligible flood risk (limited to discrete areas of surface water flooding) has been identified on-site, but the development has potential to alter surface water flow paths and increase flood risk.
DWPA	High	It has been confirmed that a small extent of the Proposed Development is located within the Loch Earn surface water catchment which has been designated as a DWPA.
Private Water Supplies	High	Private water supplies have been confirmed within the Study Area, one of which is at risk from the Proposed Development without appropriate controls.
Licensed Abstractions	Not sensitive	SEPA have not identified any licenced water abstractions within the Study Area. The source of water which supplies the hydro schemes is not located within the Site however proposed mitigation is required to ensure that the pipework is safeguard.

8.4 Assessment of Likely Effects

8.4.1 The assessment of effects is based on the Proposed Development description outlined in **Chapter 2: Development Description (EIAR Volume 1)** and is structured as follows:

- details of embedded mitigations included in the development design and good practice measures which will be adopted;
- construction effects of the Proposed Development;
- operational effects of the Proposed Development;
- decommissioning effects of the Proposed Development; and

- any cumulative effects as a result of the Proposed Development.

8.4.2 The effects have been identified with reference to relevant guidance, through consultation and project team discussions, through targeted research on hydrological and water quality effects and by considering the information provided by the project engineers on infrastructure and construction methods.

Embedded Mitigation

Design Iterations

8.4.3 The Proposed Development has undergone extensive design iterations and evolution in response to the constraints identified as part of the baseline studies and field studies so as to avoid and/or minimise potential effects on receptors where possible, as outlined in **Chapter 3: Evolution of Design and Alternatives (EIAR Volume 1).** This has included areas of peat and carbon rich soils, geological, hydrological and hydrogeological constraints which include slope stability, watercourse locations, areas of potential flooding, and GWDTEs. Details of the avoidance and embedded mitigation measures are given below.

Peat Occurrence and Avoidance

8.4.4 The potential presence of peat within the Site formed a key consideration in the design of the Proposed Development. Informed by the extensive programme of peat probing undertaken across the Site, typically the design has aimed to avoid areas of deeper peat (>1 m) and where possible limit development to areas of peat less than 1 m or where peat is absent.

Buffer to Watercourses

8.4.5 In accordance with wind farm construction best practice guidelines and SEPA consultation advice, a 50 m buffer has been applied to watercourses (as shown on OS 1:50:000 mapping) where technically feasible.

8.4.6 The design has strived to minimise the number of locations where infrastructure does encroach within the buffer. The layout of the access tracks was also designed to minimise the requirement for additional watercourse crossings and existing crossings and tracks have been used where technically feasible.

8.4.7 As a result, the majority of the Proposed Development is located outside of this buffer (see **Figure 8.1 (EIAR Volume 2**)) with the exceptions of parts of the proposed access track.

8.4.8 It is recognised that during construction within the watercourse buffer there is a need for increased monitoring and management of the works. Specific drainage management plans, methods statements, monitoring, and pollution incident response plans relevant to the works at these locations are required and need to be agreed with statutory consultees, including SEPA.

8.4.9 Examples of the additional safeguards that would be deployed at these locations and incorporated into the management plans, subject to agreement with consultees, include, but are not limited to the following:

- focussed induction and training for staff highlighting sensitivities;
- a wet weather working protocol and provision to cease works during prolonged rainfall or periods of high runoff (pluvial or fluvial);
- reduction in extent of working area to minimise the potential to disturb ground;
- additional passive water quality control measures, such as temporary water diversion ditches, silt fences and silt traps to control and treat runoff from working areas;

- daily inspection of works and watercourses and full-time supervision of construction and restoration works;
- deployment of real-time water quality monitoring telemetry with predetermined water quality trigger levels based on baseline water quality data (e.g. for pH, dissolved oxygen and electrical conductivity); and
- documentation that clearly identifies responsibilities and actions and contact details should a pollution event be recorded.

Groundwater Dependent Habitats

8.4.10 SEPA's wind farm planning guidance[16] states a National Vegetation Classification (NVC) survey should be undertaken to identify wetland areas that might be dependent on groundwater. If potential GWDTE are identified within (a) 100 m of roads, tracks, and trenches, or (b) within 250 m of borrow pits and foundations, then it is necessary to assess how the potential GWDTE may be affected by the Proposed Development.

8.4.11 It has been shown that the majority of areas identified initially as potentially highly or moderately groundwater dependent within the Site are predominantly sustained by incident rainfall and local surface water runoff rather than groundwater. Accordingly, the buffers proposed in SEPA's GWDTE guidance need not be applied provided adequate safeguards are in place to sustain surface flows and preserve water quality.

8.4.12 A number of flush habitats, which are at least partially supported by groundwater, have been recorded by the NVC survey. Two M32 flushes have been determined to be at risk of the Proposed Development, without appropriate safeguards, associated with hardstanding of turbine T3, as discussed in **TA 8.5: GWDTE Assessment (EIAR Volume 4)**.

8.4.13 Consequently, measures such as permeable access tracks and regular cross track drains, have been proposed at locations where there is a risk that surface runoff could be impeded and to ensure there is no effect on the M32 flushes within 250 m of turbine T3. It is considered therefore that the water dependent habitats identified by the NVC mapping can be sustained. This will be confirmed, in accordance with good practice, by the Ecological / Environmental Clerk of Works (ECoW) at the time of the construction who will ensure existing surface water flow paths and water flushes are maintained.

Good Practice Methods

8.4.14 Good practice measures would be applied in relation to pollution risk, sediment management and management of surface runoff rates and volumes. These would form part of the final CEMP.

8.4.15 Key good practice measures are stated below. In undertaking the assessment of potential effects from the Proposed Development, good practice measures are assumed to be embedded mitigation. As appropriate, these mitigation measures will be outlined within the CEMP or by an appropriately worded condition post determination, as required. An Outline CEMP is provided in **TA 2.1 (EIAR Volume 4)**.

8.4.16 Any further specific mitigation which may be required to reduce the significance of a potential effect is identified in the assessment of likely effects during the construction, operation, and decommissioning phases.

General Measures

8.4.17 As a principle, preventing the release of any pollution/sediment is preferable to dealing with the consequences of any release. There are several general measures which cover all effects assessed within this Chapter and the details are given in the sections below.

8.4.18 Prior to construction, a site-specific drainage plan would be produced. This would consider any existing local drainage which may not be mapped and incorporate any site-specific mitigation measures identified during the assessment.

8.4.19 Measures would be included in the final CEMP for dealing with pollution/sedimentation/flood risk incidents and would be developed prior to construction. This would be adhered to should any incident occur, reducing the effect as far as practicable.

8.4.20 The final CEMP will contain details on the location of spill kits, would identify 'hotspots' where pollution may be more likely to originate from; provide details to site personnel on how to identify the source of any spill; and state procedures to be adopted in the case of a spill event. A specialist spill response contractor would be identified to deal with any major incidents.

8.4.21 A wet weather protocol would be developed. This would detail the procedures to be adopted by all staff during periods of heavy rainfall. Tool box talks would be given to engineering /construction /supervising personnel.

8.4.22 Roles would be assigned to site staff and the inspection and maintenance regimes of sediment and runoff control measures would be adopted during these periods. In extreme cases, this protocol would dictate that work onsite may have to be temporarily suspended until weather/ground conditions improve.

Ecological / Environmental Clerk of Works

8.4.23 To ensure all reasonable precautions are taken to avoid negative effects on the water environment, a suitably qualified ECoW will be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on all ecological and hydrological matters. The ECoW will be required to be present on-site during the construction phase and will carry out monitoring of works and briefings with regards to any ecological and hydrological sensitivities on the Site to the relevant staff of the Principal Contractor and subcontractors.

8.4.24 With respect to the water environment, the ECoW will also have responsibility to ensure water flow paths and quality to water dependant habitat are sustained during all phases of the Proposed Development.

Safeguarding of Carbon-rich Soils and Peat

8.4.25 The peat depth probing data compiled as part of the baseline assessment has been used to accurately determine the volume of peat which will be disturbed by the Proposed Development. This data has been used to prepare a site-specific PMP (see **TA 8.2: PMP (EIAR Volume 4)**) which details the volume of acrotelmic and catotelmic peat which will be disturbed and how this will be safeguarded and reused on site. Further, the condition of the peat, and areas of peat that would potentially benefit from restoration have been identified and are discussed in **Chapter 7: Ecology (EIAR Volume 1)** and **TA 7.6: BEMP (EIAR Volume 4**).

8.4.26 As shown in **TA 8.1: PLHRA (EIAR Volume 4)** and **TA 8.2: PMP (EIAR Volume 4)** measures have been proposed to ensure the stability of peat and carbon-rich soils and that peat and soils that will be disturbed

by the Proposed Development can be safeguarded and beneficially re-used on-site. The Policy aims of NPF4, regarding soils and peat, are therefore met; further details are provided below.

Peat Management

8.4.27 A detailed review of the distribution and depth of peat at the Site is contained in **TA 8.2: PMP (EIAR Volume 4)**. The site design has largely avoided areas of deep peat where possible and where peat will be encountered by the Proposed Development it can be readily managed and accommodated within the site layout without significant environmental impact. No surplus peat will be generated, and the volumes of peat / peaty soil generated from the proposed excavations will be used to reinstate track verges, turbine bases, crane hardstandings and for restoration of onsite borrow pits.

Peat Landslide Hazard

8.4.28 The site-specific PLHRA (**TA 8.1: PLHRA, EIAR Volume 4**) confirms, regarding peat stability, that there are very few areas of peat instability risk across the Proposed Development and the hazard impact assessment concluded that, with the employment of appropriate mitigation measures, all of the areas of peat instability can be considered as an insignificant risk.

8.4.29 A Design and Geotechnical Risk Register will be compiled to include risks relating to peat instability, as this will be beneficial to both the developer and the Principal Contractor in identifying potential risks that may arise during construction.

8.4.30 Good construction practice and methodologies to prevent peat instability within areas that contain peat deposits are identified in **TA 8.1: PLHRA (EIAR Volume 4)**. These include:

- measures to ensure a well-maintained drainage system, to include the identification and demarcation of zones of sensitive drainage or hydrology in areas of construction;
- minimisation of 'undercutting' of peat slopes, but where this is necessary, a more detailed assessment of the area of concern will be required;
- careful micro-siting of turbine bases, crane hardstandings and access track alignments to minimise effects on the prevailing surface and sub-surface hydrology;
- raising peat stability awareness for construction staff by incorporating the issue into the site induction (e.g. peat instability indicators and good practice);
- introducing a 'Peat Hazard Emergency Plan' to provide instructions for site staff in the event of a peat slide or discovery of peat instability indicators;
- developing methodologies to ensure that degradation and erosion of exposed peat deposits does not occur as the break-up of the peat top mat has significant implications for the morphology, and thus hydrology, of the peat (e.g. minimisation of off-track plant movements within areas of peat);
- developing robust drainage systems that will require minimal maintenance; and
- developing drainage systems that will not create areas of concentrated flow or cause over/under-saturation of peat habitats.

8.4.31 Notwithstanding any of the above good construction practices and methodologies, detailed design and construction practices will need to consider the particular ground conditions and the specific works at each location throughout the construction period. An experienced and qualified engineering geologist/geotechnical engineer will be appointed as a supervisor, to provide advice during the refinement and construction phases of the Proposed Development.

Water Quality Monitoring

8.4.32 Water quality monitoring before and during the construction phase would be undertaken for the surface water catchments that drain from the Site to ensure that none of the tributaries of the main channels are carrying pollutants or suspended solids. Monitoring would be carried out at a specified frequency (depending upon the construction phase) on these catchments.

8.4.33 Monitoring would continue throughout the construction phase and immediately post construction. Monitoring would be used to trigger a rapid response to any pollution incident as well as assess the impact of good practice or remedial measures. Monitoring frequency would increase during the construction phase if remedial measures to improve water quality were implemented. Water quality monitoring plans would be developed during detailed design. Scottish Water, SEPA, SC, PKC and Marine Scotland would be consulted, as required, on the plans and these would be contained within the final CEMP.

8.4.34 It is also proposed that the private water supply (PWS04) that is considered potentially at risk from the Proposed Development, as discussed in **TA 8.6: PWSRA (EIAR Volume 4)**, is also included as part of the monitoring programme.

8.4.35 The performance of the good practice measures would be kept under constant review by comparing data taken during construction with a baseline data set, sampled prior to the construction period.

Distribution Pipework

8.4.36 The baseline assessment and **TA 8.6: PWSRA (EIAR Volume 4)** have confirmed that the proposed access road will cross existing pipework to the SSE hydro schemes and the distribution pipework for a private water supply (PWS01). As part of the detailed design stage of the project, the location of the pipework at these locations will be confirmed and necessary protection implemented to ensure the integrity of their infrastructure is maintained.

Pollution Risk

8.4.37 Good practice measures in relation to pollution prevention would include the following:

- refuelling would take place at least 50 m from watercourses and where there is no risk that oil from a spill could directly enter the water environment;
- foul water generated on-site would be managed in accordance with best practice and be drained to a sealed tank and routinely removed from Site;
- a vehicle management plan and speed limit would be strictly enforced onsite to minimise the potential for accidents to occur;
- plant nappies would be placed under stationary vehicles which could potentially leak fuel/oils;
- areas would be designated for washout of vehicles which are a minimum distance of 50 m from a watercourse;
- washout water would also be stored in the washout area before being treated and disposed of;
- treatment of any water contaminated with silt or chemicals prior to discharge;
- water would be prevented as far as possible, from entering excavations;
- procedures would be adhered to for storage of fuels and other potentially contaminative materials in line with the CAR, to minimise the potential for accidental spillage; and

- a plan for dealing with spillage incidents would be designed prior to construction, and this would be adhered to should any incident occur, reducing the effect as far as practicable. This would be included in the final CEMP.

8.4.38 Site investigation (e.g., trial pitting and/or boreholes) will be undertaken prior to any construction works at locations where excavation will be required to establish the wind farm, and it will inform detailed design and construction methods to ensure pollution risk is further considered prior to construction.

Erosion and Sediment

8.4.39 Good practice measures for the management or erosion and sedimentation would include the following:

- all stockpiled materials would be located out with a 50 m buffer from watercourses, including on up gradient sides of tracks and battered to limit instability and erosion;
- stockpiled material, excluding peat, would either be seeded or appropriately covered, minimising the area of exposed bare ground. Peat will be handled in accordance with best practice as outlined in **TA 8.2: PMP (EIAR Volume 4)**;
- monitoring of stockpiles/excavation areas during rainfall events;
- water would be prevented as far as possible, from entering excavations through the use of appropriate cut-off drainage;
- where the above is not possible, water that enters excavations would pass through at least two forms of treatment (e.g. settlement lagoons, silt/sediment traps) to remove silt prior to indirect discharge into the surrounding drainage system. Detailed assessment of ground conditions would be required to identify locations where settlement lagoons would be feasible;
- clean water on-site would be separated and diverted away from construction disturbed areas;
- if the material is stockpiled on a slope, silt fences would be located at the toe of the slope to reduce sediment transport;
- the amount of ground exposed, and time period during which it is exposed, would be kept to a minimum and appropriate drainage would be in place to prevent surface water entering deep excavations, specifically borrow pit excavations;
- a design of drainage systems and associated measures to minimise sedimentation into natural watercourses would be developed - this may include silt traps, check dams and/or diffuse drainage;
- silt/sediment traps, single size aggregate, geotextiles or straw bales would be used to filter any coarse material and prevent increased levels of sediment. Further to this, activities involving the movement or use of fine sediment would avoid periods of heavy rainfall where possible; and
- construction personnel and the Principal Contractor would carry out regular visual inspections of watercourses to check for suspended solids in watercourses downstream of work areas.

Fluvial Flood Risk

8.4.40 Sustainable Drainage Systems (SuDS) shall be incorporated as part of the Proposed Development.

8.4.41 SuDS techniques aim to mimic pre-development runoff conditions and balance or throttle flows to the rate of runoff that might have been experienced at site prior to development. Good practice in relation to the management of surface water runoff rates and volumes and potential for localised fluvial flood risk would include the following:

- drainage systems would be designed to ensure that any sediment, pollutants or foreign materials which may cause blockages are removed before water is discharged into a watercourse;
- on-site drainage would be subject to routine checks to ensure that there is no build-up of sediment or foreign materials which may reduce the efficiency of the original drainage design causing localised flooding;
- appropriate drainage would attenuate runoff rates and reduce runoff volumes to ensure minimal effect upon flood risk;
- where necessary, check dams would be used within cable trenches in order to prevent trenches developing into preferential flow pathways and trenches shall be backfilled with retained excavated material; and
- as per good practice for pollution and sediment management, prior to construction, site-specific drainage plans would be developed and construction personnel made familiar with the implementation of these.

8.4.42 Further information on ground conditions and drainage designs would be provided in the final CEMP.

Water Abstractions

8.4.43 For any water for construction activities, good practice that would be followed in addition to the CAR regulations includes:

- water use would be planned so as to minimise abstraction volumes;
- water would be re-used where possible;
- abstraction volumes would be recorded; and
- abstraction rates and volumes would be agreed with SEPA to prevent significant water depletion in any third party water source.

Watercourse Crossings

8.4.44 Twenty three new watercourse crossings and one existing crossing which is scheduled to be upgraded are required to facilitate the Proposed Development as detailed within **TA 8.4: Schedule of Watercourse Crossings (EIAR Volume 4)** and shown on **Figure 8.1 (EIAR Volume 2)**.

8.4.45 The crossings would be designed to pass the 200-yr flood event plus an allowance for climate change and their design and construction details would be agreed with SEPA.

Potential Construction Effects

Peat and Soils

8.4.46 It has been shown (see **TA 8.1: PLHRA (EIAR Volume 4)** and **TA 8.2: PMP (EIAR Volume 4)** and the above Embedded Mitigation Section) that the disturbance of peat and soils as a result of the construction of the Proposed Development can be minimised and the peat deposits and carbon rich soils safeguarded.

8.4.47 Peat is a high sensitivity receptor. With the identified safeguards and proposed good practice methods, the magnitude of impact on deposits of carbon rich soils and peat is assessed as negligible and thus the significance of effect is negligible and therefore **not significant**.

Pollution Risk

8.4.48 During the construction phase, there is the potential for a pollution event to affect surface and ground waterbodies impacting on their quality. This would have a negative impact on these receptors, potentially

resulting in degradation of the water quality which would impact on any aquatic life and private and public water supplies abstracting from the watercourses and groundwater.

8.4.49 Pollution may occur from excavated and stockpiled materials during site preparation and excavation of borrow pits. Contamination of surface water runoff from machinery, leakage and spills of chemicals from vehicle use and the construction of hardstandings also have the potential to affect surface and groundwater bodies. Potential pollutants include sediment, oil, fuels and cement.

8.4.50 The risk of a pollution incident occurring would be managed using industry standard good practice measures as detailed in the preceding section. Many of these practices are concerned with undertaking construction activities away from watercourses, sensitive peat and vegetation habitats and identifying safe areas for stockpiling or storage of potential pollutants that could otherwise lead to the pollution.

8.4.51 The baseline assessment has shown that the watercourses surrounding the Proposed Development and groundwater beneath the Proposed Development (including PWSs and the Loch Earn DWPA) are considered high sensitivity receptors.

8.4.52 The Good Practice Measures (outlined above and to be set out in the final CEMP) would minimise the risk of a pollution event occurring to negligible. These measures will also include an emergency response plan which will be triggered in the case of an accident occurring to mitigate pollution risk. The magnitude of impact associated with a pollution event is considered negligible and thus the significance of effect is negligible and **not significant**.

Erosion and Sediment

8.4.53 Construction traffic, runoff from areas of hardstanding and features such as stockpiles, tracks and excavations etc., have the potential to cause erosion and increase sedimentation which could be washed by rainfall into local surface water features. This has the potential to reduce surface water quality, increase turbidity levels, reduce light and oxygen levels and affect ecology including fish populations.

8.4.54 Excavation of borrow pits, construction of hardstandings, diversion of drainage channels and the construction of water crossings associated with the Proposed Development are the key sources of erosion and sediment generation. Adherence to good practice measures would ensure that any material generated is not transported into nearby watercourses, to groundwater, or onto areas of peat or GWDTE.

8.4.55 The implementation of location specific good practice measures will form part of the final CEMP and would be used to minimise the potential for erosion and sedimentation.

8.4.56 After consideration of good practice measures, the magnitude of impact associated with erosion and sedimentation is assessed as negligible. The baseline assessment has shown that the watercourses surrounding the Proposed Development and groundwater beneath the Proposed Development (including peat, GWDTE, PWSs and the Loch Earn DWPA) are considered high sensitivity receptors. The significance of effect is therefore assessed as negligible and **not significant**.

Flood Risk

8.4.57 Construction of hardstandings including the substation compound, construction compound and turbine bases would create impermeable surface areas which could increase runoff rates and volumes.

8.4.58 Adherence with good practice measures including appropriate sustainable drainage systems and compliance with the drainage management plan in the final CEMP would limit potential impacts to being localised and short duration and so of negligible magnitude.

8.4.59 It is proposed that any rainwater and limited groundwater ingress which collects in the turbine excavations during construction would be stored and attenuated prior to controlled discharge to ground adjacent to the excavation.

8.4.60 Attenuation of runoff generated within the proposed turbine excavations would allow settlement of suspended solids within the runoff prior to discharge in accordance with 'Site control' component of the SuDS 'management train'.

8.4.61 The magnitude of impact on flood risk, which is considered to have a moderate sensitivity, is therefore assessed as being negligible and thus the significance of effect is therefore assessed as negligible and **not significant**.

8.4.62 The magnitude of the increase in the impermeable area is not sufficient to have a measurable effect on groundwater levels, as the extent of the impermeable area is insignificant compared to the extent of the underlying geology and groundwater body.

Infrastructure and Man-made Drainage

8.4.63 Excavations associated with construction works (e.g. cut tracks, turbine bases foundations, cable trenches, borrow pits etc.) can result in local lowering of the water table. This is an important consideration in areas of peat deposits, where the water table is characteristically near the ground surface.

8.4.64 Dewatering associated with construction of turbine foundations is temporary and would not be required post construction. Cable laying, without appropriate mitigation measures, can also lower high groundwater levels and provide a preferential drainage route for groundwater movement that can lead to local and permanent drying of soils, superficial deposits and/or water supplies.

8.4.65 The design of the Proposed Development has avoided areas of high ecological or habitat interest, including GWDTE, wherever possible.

8.4.66 Good practice measures will form part of the final CEMP and would be used to minimise the potential for drainage and dewatering effects.

8.4.67 During the construction of the Proposed Development, water may be abstracted for uses such as dust suppression, vehicle washing, batching plant activities and welfare facilities. The volume abstracted will be in accordance with General Binding Rules (GBRs) or the appropriate level of CAR authorisation will be obtained.

8.4.68 The sensitivity of the receptor (groundwater, water supplies and habitat that may be dependent on groundwater) has been assessed as being high. The magnitude of impact is assessed as negligible and therefore the potential significance of effect of changes to groundwater levels and flow due to dewatering is considered negligible and **not significant**.

Private Water Supplies and DWPAs

8.4.69 It has been shown that part of the Proposed Development is located within the Loch Earn DWPA and one PWS is potentially at risk from the Proposed Development.

8.4.70 PWS and DWPA are considered high sensitivity receptors. With the best practice construction techniques to protect surface water and groundwater receptors outlined above, in combination with the proposed monitoring programme (see example in **TA 8.6: PWSRA (EIAR Volume 4)**) the magnitude of impact is assessed as negligible, and the resultant significance of effect is assessed as negligible and **not significant**.

Potential Operational Effects

8.4.71 During the operational phase of the Proposed Development, it is anticipated that routine maintenance of infrastructure and tracks would be required across the site. This may include work such as maintaining access tracks and drainage and carrying out maintenance of turbines.

8.4.72 Should any maintenance be required on-site during the operational life of the project which would involve construction type activities; mitigation measures would be adhered to and potential effects avoided.

Peat and Soils

8.4.73 No excavation, movement or storage of peat is expected to take place for the duration of the Site's operation.

8.4.74 Peat is a high sensitivity receptor. The magnitude of impact on deposits of soil and peat is therefore assessed as negligible and thus the significance of effect is therefore negligible and **not significant**.

Pollution Risk

8.4.75 The possibility of a pollution event, resulting in surface water or groundwater impairment, occurring during operation is very unlikely. There would be a limited number of vehicles required on-site for routine maintenance and for the operation of the Proposed Development. Storage of fuels/oils on-site would be limited to the hydraulic oil required in turbine gearboxes and this would be bunded to prevent fluid escaping.

8.4.76 The Good Practice Measures (to be set out in an Operational Environmental Management Plan) would minimise the risk of a pollution event occurring to negligible and there are measures that would be put in place in the case of an accident occurring to mitigate pollution risk. Therefore, the magnitude of a pollution event during the operational phase of the Proposed Development is assessed as negligible. The significance of effect for a pollution event during the operational phase of the Proposed Development is predicted to be negligible and **not significant**.

Erosion and Sedimentation

8.4.77 During the operation of the Proposed Development, it is not anticipated that there would be any significant excavation or stockpiled material beyond the clearing of SuDS features to maintain their efficiency, reducing the potential for erosion and sedimentation effects.

8.4.78 Immediately post-construction, newly excavated drains and track dressings may be prone to erosion as any vegetation would not have matured. Appropriate design of the drainage system, incorporating sediment traps and swales, would reduce the potential for the increased delivery of sediment to natural watercourses. Potential effects from sedimentation or erosion during the operational phase are considered to come from linear features on steeper slopes, where velocities in drainage channels are higher. Immediately post-construction, flow attenuation measures would remain and be maintained to slow runoff velocities and prevent erosion until vegetation becomes established.

8.4.79 The magnitude and impact associated with a short duration erosion and sedimentation event would be negligible following adherence to Good Practice Measures. Therefore, the potential significance of effect on identified receptors is negligible and **not significant**.

8.4.80 Should any non-routine maintenance be required at the sections of track crossing wet areas (defined visually on-site by a contractor or operational personnel) there would be potential for erosion and sedimentation effects to occur due to the existence of disturbed material. Should this type of activity be required, then Good Practice Measures would be implemented on a case by case basis. Any extensive work at water crossings/adjacent to water features will require approval from SEPA under the CAR (depending upon the nature of the activity).

Fluvial Flood Risk

8.4.81 The risk of an effect on fluvial flood risk arises as a result of a potential restriction of flow at a permanent water crossing following intense rainfall. In accordance with good practice, routine inspection and clearing of watercourse crossings at the Site would be undertaken, reducing the likelihood of a blockage occurring.

8.4.82 The SuDS drainage measures deployed alongside access tracks and turbine bases etc. during construction will be maintained and used to locally collect, treat and discharge incident rainfall runoff. These measures will also attenuate the rate of runoff and mitigate the potential for flood risk to be increased off-site.

8.4.83 In the unlikely event of a blockage, any flooding would be localised, and the magnitude of impact is therefore assessed as negligible, and thus the significance of effect is assessed as negligible and **not significant**.

Infrastructure and Man-made Drainage

8.4.84 Operation of the Proposed Development would require limited activities relative to the construction phase.

8.4.85 The magnitude of potential effect on groundwater and sub-surface flows as a result of permanent hardstandings and associated drainage would be negligible on the overall groundwater body due to the dispersed nature of the proposed hardstandings. The significance of effect is assessed as negligible and **not significant**.

Private Water Supplies and DWPAs

8.4.86 With the best practice techniques to protect surface water and groundwater receptors outlined above, the magnitude of impact is assessed as negligible, and the resultant significance of effect is assessed as negligible and **not significant**.

Potential Decommissioning Effects

8.4.87 Potential decommissioning effects are expected to be similar to potential construction effects. Decommissioning the wind farm and its associated infrastructure would be carried out in accordance with an approved decommissioning plan which would be expected to include the same safeguards as those provided during the construction stage of the project.

8.4.88 The magnitude of impact for decommissioning the Proposed Development is therefore considered negligible and the potential effect on identified receptors is negligible and **not significant**.

Potential Cumulative Effects

8.4.89 No other developments are noted both within 5 km of the Proposed Development and within the same surface water catchment as the Proposed Development. Therefore, cumulative effects are not anticipated as a result of the Proposed Development.

8.4.90 The proposed Glen Lednock Wind Farm (scoping) is noted immediately north east of the Proposed Development however the development is proposed within the surface water catchment of the River Lednock. No activity associated with the Proposed Development is located within the River Lednock catchment and therefore potential cumulative effects associated with this development are not considered further.

8.5 Additional Mitigation

8.5.1 The Developer is committed to the implementation of the Good Practice Measures described above. On this basis, there are no predicted significant effects and under the terms of the EIA Regulations no specific additional mitigation measures during construction are required.

8.5.2 It has been recognised in this assessment that a programme of water monitoring will be required prior to any construction activity and during construction of the Proposed Development. The monitoring programme will be agreed with Scottish Water, SEPA, SC, PKC and Marine Scotland and it is expected to include monitoring of the watercourses which drain from the Site.

8.5.3 As detailed in **TA 8.1: PLHRA (EIAR Volume 4),** it is proposed that a geotechnical risk register is maintained during the construction and post-construction phase of the Proposed Development. It is expected that this will be maintained by the Developer, and again, secured by an appropriately worded predevelopment condition of consent.

8.5.4 As detailed in **TA 8.2: PMP (EIAR Volume 4),** during and following construction the drainage measures deployed at the site (temporary and permanent) will be subject to routine inspection by the dedicated site ECoW and the Developer. This will be specified in the final CEMP and will be secured by an appropriately worded predevelopment condition of consent.

8.6 Assessment of Residual Effects

8.6.1 No significant residual effects on soils and peat, geology, surface water or groundwater receptors are predicted during the construction, operational and decommissioning phases of the Proposed Development.

8.7 Summary

8.7.1 An assessment has been carried out of the likely impacts of the Proposed Development on the hydrological, hydrogeological, geological environment within a defined Study Area (comprising land within 500 m of the Site Boundary). The assessment has considered construction, operation and decommissioning of the Proposed Development.

8.7.2 Following the identification and assessment of the key receptors, taking into account the potential effects listed in **Section 8.4**, a comprehensive suite of embedded mitigation and Good Practice Measures has been incorporated into the design, including avoidance of areas of deep peat and inclusion of extensive water buffer areas. In addition, a final CEMP as well as detailed design of infrastructure and associated mitigation will be implemented to protect the groundwater and surface water resources from pollution and minimise changes to the hydrological environment.

8.7.3 The impact assessment has taken into account the hydrological regime, highlighting that the principal effects will occur during the construction phase. Following the successful design and implementation of mitigation measures the significance of construction effects on all identified receptors are not defined as significant. The assessment of predicted operational effects has determined that there are **no significant effects** on the receptors identified within the Study Area.

8.7.4 Good practice design and construction of the Proposed Development delivered through a skilled team of competent workers, with mitigation and compliance monitored in collaboration with SEPA, SC and PKC and other engaged stakeholders, will result in a risk that is **not significant** in terms of the EIA Regulations.

8.7.5 A summary of assessed effects and identified mitigation measures required to reduce the potential effects to acceptable levels are identified in **Table 8-6**.

Table 8-6: Summary of Potential Significant Effects

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/ Residual Effect
Construction			
Degradation of peat and carbon rich soils.	Mitigation by design and good practice measures	Final CEMP to be submitted for the written approval of SC, PKC, SEPA and NatureScot prior to construction commencing. Geotechnical Risk Register. Implementation of Peat Management Plan.	Not significant.
Reduced surface water runoff contribution to water dependent habitats, including M32 springs, leading to habitat loss.	Measures such as permeable access tracks and regular cross track drains, have been proposed to safeguard existing surface water flow paths and maintain existing water quality.	Ecological / Environmental Clerk of Works (ECoW) will ensure existing surface water flow paths and water flushes are identified and preserved by installing suitable cross track drainage during construction.	Not significant
Generation of pollution impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Final CEMP to be submitted for the written approval of SC, PKC, SEPA and NatureScot prior to construction commencing. Confirmatory water quality monitoring the scope and frequency of which will be agreed with Scottish Water, SEPA, SC, PKC and Marine Scotland prior to construction commencing.	Not significant.
Erosion and sedimentation impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Final CEMP to be submitted for the written approval of SC, PKC, SEPA and NatureScot prior to construction commencing.	Not significant.
Drainage and dewatering impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Final CEMP to be submitted for the written approval of THC, SEPA and NatureScot prior to construction commencing.	Not significant.

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/ Residual Effect
Flood risk.	Good practice measures.	Commitment to deploy SuDS and prepare a detailed drainage design as part of the final CEMP.	Not significant.
Private water supplies and DWPAs.	Good practice measures.	Final CEMP to be submitted for the written approval of SC, PKC, SEPA and NatureScot prior to construction commencing. Confirmatory water quality monitoring the scope and frequency of which will be agreed with Scottish Water, SEPA, SC, PKC and Marine Scotland prior to construction commencing.	Not significant.
Operation			
Generation of pollution impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Appropriate storage and handling of potential pollutants in accordance with CAR authorisations.	Not significant.
Erosion and sedimentation impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Appropriate drainage design that incorporates sediment management measures, including sediment traps, to attenuate and treat runoff. Adopted through a long-term operational drainage and monitoring programme.	Not significant.
Drainage and dewatering impairing surface water, groundwater, habitat and water supplies.	Good practice measures.	Good practice measures adopted through a long term operational drainage and monitoring programme.	Not significant.
Flood risk.	Good practice measures.	Inspection of the operational drainage system and compliance with the attenuated rate of runoff agreed with SC and PKC at the detailed design stage. Removal of blockages from watercourse crossings in the unlikely event of occurrence.	Not significant.
Private water supplies and DWPAs.	Good practice measures.	Good practice measures adopted through a long term operational monitoring programme.	Not significant.