10.0 Geology, Hydrology and Hydrogeology

10.1 Introduction

This chapter considers the likely significant effects of the proposed development on geology (including peat and soils) and the water environment (hydrology and hydrogeology). The assessment of potential impacts has been made on the basis of the proposed development layout as fully described in **Chapter 2: Proposed Development Description**. It outlines the embedded good practice methods which have been incorporated into the design and would be used during the construction and operation of the proposed development to prevent or reduce identified effects and risks.

Further mitigation methods to address any potential effects are proposed, where appropriate, and residual effects are assessed.

The chapter is supported by:

- Technical Appendix 10.1: Peat Landslide Hazard Risk Assessment (PLHRA);
- Technical Appendix 10.2: Peat Management Plan (PMP);
- Technical Appendix 10.3: Private Water Supply Risk Assessment (PWSRA);
- Technical Appendix 10.4: Schedule of Watercourse Crossings; and
- Technical Appendix 10.5: Borrow Pit Assessment

Supporting Figures 10.1 – 10.8 are referenced in the text where relevant.

The assessment uses information and findings presented in **Chapter 8: Ecology and Biodiversity** to inform the assessment of potential effects on possible areas of Groundwater Dependent Terrestrial Ecosystems (GWDTEs) which are presented in this Chapter.

10.2 Legislation, Policy and Guidance

10.2.1 Planning Context

Planning policies relevant to geology, hydrology and hydrogeology are listed below. Further information regarding planning policy is provided in **Chapter 4: Climate Change, Renewable Energy and Planning Policy**, and in **Chapter 5: Approach to EIA and Consultation.** The **Planning Statement** addresses the planning policy position in full and should be referred to.

However, in summary The National Planning Framework 4 (NPF4) adopted by the Scottish Government on 13 February 2023 provides planning guidance and policies regarding sustainable development, tackling climate change and achieving net zero. 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).

In addition, Moray Council (MC)'s Local Development Plan (LDP) provides planning guidance on the type and location of the development that can take place in the region. The LDP presents development policies of which are relevant to this study:

- Policy DP9: Renewable Energy;

- Policy DP10: Minerals;
- Policy EP1: Natural Heritage Designations;
- Policy EP12: Management and Enhancement of the Water Environment;
- Policy EP14: Pollution, Contamination and Hazards; and
- Policy EP16: Geodiversity and Soil Resources.

10.2.2 Legislation and Guidance

The following legislation and guidance documents are applicable to this assessment.

10.2.2.1 Legislation

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

10.2.2.2 Guidance

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
- PAN 69 Planning and Building Standards Advice on Flooding.

Scottish Environment Protection Agency (SEPA) Pollution Prevention Guidance Notes (PPG) and Guidance of 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;
- PPG07 Safe Storage - The Safe Operation of Refuelling Facilities;
- GPP08 Safe Storage and Disposal of Used Oils;
- GPP13 Vehicle Washing and Cleaning;
- GPP21 Pollution Incident Response Planning; and

- GPP22 Dealing with Spills.

CIRIA publications:

- C532, 2001, Control of Water Pollution from Construction Sites;
- C648, 2006, Control of Water Pollution from Linear Construction Projects – Technical Guidance;
- C741, 2015, Environmental Good Practice on Site; and
- C753, 2015, The SUDS Manual

SEPA publications:

- SEPA, 2010, Engineering in the Water Environment: Good Practice Guide – River Crossings;
- SEPA, 2010, Engineering in the Water Environment: Good Practice Guide – Sediment Management;
- SEPA, 2017, Guidance: Development on Peat and Off-site Uses of Waste Peat;
- Groundwater Protection Policy for Scotland, Version 3 (2009);
- SEPA, 2017, Land Use Planning System Guidance Note 4, Version 9;
- SEPA, 2018, Land Use Planning System SEPA Guidance Note 2a, Version 2;
- SEPA, 2015, Land Use Planning System SEPA Guidance Note 2e, Version 1;
- SEPA, 2017, Land Use Planning System SEPA Guidance Note 31, Version 3;
- SEPA, 2015, Position Statement – Culverting of Watercourses, Version 2.0; and
- SEPA, 2010, Regulatory Position Statement – Developments on Peat.

Other relevant guidance documents:

- Scottish Natural Heritage (now NatureScot), 2013, Constructed Tracks in Scottish Uplands, 2nd Edition;
- Scottish Government, 2017, Proposed Electricity Generation Developments: Peat Landslide Hazard Best Practice Guide;
- Scottish Government, 2017, Guidance on Development on Peatland, Peatland Survey;
- A joint publication by Scottish Renewables, Scottish Natural Heritage (now NatureScot), Scottish Environment Protection Agency, Forestry Commission Scotland and Historic Environment Scotland, 2019, Good Practice during Windfarm Construction, Version 4; and
- Scottish Renewables and SEPA, 2012, Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste.

10.3 Scope and Consultation

10.3.1 Consultation

Consultation for the proposed development was undertaken with statutory and non-statutory bodies, as set out in **Chapter 5: Approach to EIA and Consultation**.

The outcome of the relevant consultation with regards to geology (including peat) and the water environment is summarised in **Table 10-1.**

Table 10-1: Summary of Key Issues

Consultee	Summary of Responses	Where Addressed in Chapter
The Deveron, Bogie & Isla Rivers Charitable Trust and River Deveron District Salmon Fishery Board Scoping Response 07 December 2021	During construction and operation, the waterways downstream of the Site will be vulnerable to pollution from both point source and diffuse sources and potentially sedimentation as a result of construction activities. The Aultmore and Isla support productive populations of salmon and trout and baseline electrofishing and habitat surveys should be completed in advance of construction as part of the EIA and then continued during and post construction for two years to ensure there is no impact from the development. This should be further accompanied by water quality monitoring before, during and after construction to monitor for any changes that would not otherwise be detected by electrofishing. One of the main characteristics of the Aultmore site is the underlying peat across most of the development area. It is essential that peat across the entire area is not only protected but restored. All turbines, access tracks and cable trenches should be located and routed to areas with minimal depth (<0.5m peat) and all peat should be reinstated post construction. Furthermore, it would be desirable if the development proposal could include a peat restoration plan to restore peatland across the entire forest area. This should include the blocking of existing peat drainage ditches, removal of commercial forestry as appropriate and riparian planting with native deciduous trees.	Assessments of potential impacts on the water environment is included in this Chapter. Potential ecological and fishery impacts are discussed in **Chapter 8: Ecology and Biodiversity**. Potential impacts on peat and proposed mitigation measures are discussed in this chapter and **Technical Appendix 10.1: PLHRA** and **Technical Appendix 10.2: PMP.** Proposals for water quality monitoring are made in this Chapter and for fisheries **Chapter 8: Ecology and Biodiversity.**
Marine Science Scotland Scoping Response July 2020	Responded to the ECU with their wind farm standing guidance and requested that their signposting form is completed as part of the application.	Guidance has been referred to in this Chapter and **Chapter 8: Ecology and Biodiversity.**
NatureScot Scoping Response 08 December 2021	Figure 9.1 of the scoping report shows the results of the peat probing and indicates an area of potentially deeper peat near Broken Moan on the map. There is potential to investigate peatland restoration here as part of the project.	Noted. Potential impacts on peat and proposed mitigation measures are summarised in this Chapter and discussed in full in **Technical Appendix 10.1: PLHRA** and **Technical Appendix 10.2: PMP.** Proposals for habitat restoration are presented in **Chapter 8: Ecology and Biodiversity** and **Technical Appendix 8.5: Outline Biodiversity Enhancement and Restoration Plan.**
Scottish Water Scoping Response 14 December 2021	Scottish Water confirm that the development may impact on existing Scottish Water assets. It was requested that the applicant identify any potential conflicts with Scottish Water assets and contact the Asset Impact Team to apply for a diversion. The applicant should be aware that any conflict with assets identified may be subject to restrictions on proximity of construction.	Noted. Assessments of potential impacts on the water environment, including Scottish Water assets and Drinking Water Protected Areas, is included in this Chapter and includes

Consultee	Summary of Responses	Where Addressed in Chapter
	Scottish Water confirm that the proposed activity falls within a drinking water catchment whereby a Scottish Water abstraction is located. The River Deveron supplies Turriff Water Treatment Works (WTW) and Scottish Water advise that it is essential that water quality and water quantity in the area is protected. They further advise that it is a relatively large catchment, and the activity (e,g, the proposed development) is a sufficient distance from the intake that it is likely to be low risk, however care should be taken, and water quality protection measures must be implemented.	assessment of water quality and quantity. A draft schedule for water quality monitoring, to confirm the efficacy of proposed mitigation measures are also made.
Scottish Water Further Consultation 29 September 2023	Scottish Water confirmed the proposed development lies within the surface water catchment and 40km from the intake to the Turriff WTW via the Burn of Aultmore, River Isla and River Deveron. They also advised the proposed development should present low risk to water quality but would like to ensure they are fully notified as the development progresses. The proposed development will have a low impact on the yield of the catchment; therefore it is rated as a low-impact development with regards to water resources.	
Scottish Environment Protection Agency (SEPA) Scoping Response 16 December 2021	SEPA welcome the initial peat probing work and the commitment for further detailed probing. Final location of infrastructure should avoid deep peat (>1m). Enough phase 2 probing should be carried out to inform the process – a dynamic approach could be taken, limiting probing in areas of shallow peat and concentrating on areas where there are changes in depth. SEPA encourage proposals for peatland restoration (off-site locations should be considered if limited on-site opportunities exist) and any other ecological improvements that can be considered. The planning submission must demonstrate how the layout has been designed to minimise disturbance of peat and consequential release of CO_2 and outline the preventative / mitigation measures to avoid significant drying or oxidation of peat through, for example, the construction of access tracks, drainage channels, cable trenches, or the storage and re-use of excavated peat. The submission must include: • a detailed map of peat depths with all the built elements overlain to demonstrate how the development avoids areas of deep peat and other sensitive receptors. • a table which details the quantities of acrotelmic, catotelmic and amorphous peat which will be excavated for each element and where it will be re-used during reinstatement. • dependent upon the volumes of peat likely to be encountered and the scale of the development, applicants must consider whether a PMP is required or whether the above information be best submitted as part of the schedule of mitigations. SEPA welcomes the approach to assessing the impact on GWDTE. GWDTE are protected under the WFD and therefore the layout and design of the development	Potential impacts on peat and proposed mitigation measures are summarised in this Chapter and discussed in full in **Technical Appendix 10.1: PLHRA** and **Technical Appendix 10.2: PMP** and where the results of additional Phase 1 and Phase 2 peat depth probing are presented. A draft Biodiversity Enhancement and Restoration Plan is presented as **Technical Appendix 8.5**, and incudes proposals for peat land restoration. **Chapter 3: Site Selection and Design Evolution** presents the design evolution and **Technical Appendix 10.2: PMP** details how deposits of peat and carbon rich soils have been safeguarded. **Technical Appendix 10.2: PMP** presents a detailed plan of peat depths, confirms the peat excavation quantities and characteristics of the peat. **Figure 10.8** illustrates the location of habitat that could be sustained by groundwater

Consultee	Summary of Responses	Where Addressed in Chapter
	must avoid impact on such areas. The following information must be included: • a map demonstrating that all GWDTE and existing groundwater abstractions are outwith 100m radius of all excavations shallower than 1m and outwith 250m of all excavations deeper than 1m and proposed groundwater abstractions. • if minimum buffers cannot be achieved, a detailed site specific qualitative and/or quantitative risk assessment will be required. We are likely to seek conditions securing appropriate mitigation for all GWDTE affected. A minimum buffer of 50m around each loch or watercourse should be applied. If this minimum buffer cannot be achieved, each breach must be numbered on a plan with associated photographs of the location, dimension of the loch or watercourse and drawings of what is proposed in terms of engineering works. Watercourse crossings must be designed to accommodate the 0.5% Annual Exceedance Probability (AEP) flows, or information provided to justify smaller structures. If it is thought the development could result in an increased risk of flooding to a nearby receptor then a Flood Risk Assessment must be submitted in support of the planning application. A schedule of mitigation must be submitted which include reference to best practice pollution prevention and construction techniques and regulatory requirements. Information relating to the borrow pits must also be provided.	and this Chapter presents a GWDTE risk assessment. It is confirmed that a buffer of 50m to watercourses and bodies has been included in the site design. This is shown on **Figure 10.1.** The number of required watercourse crossings has been minimised and a schedule of required crossings is presented as **Technical Appendix 10.4: Water Course Crossing Assessment**. It has been confirmed that watercourse crossings would be sized to pass the 0.5% AEP plus an allowance for climate change. A flood risk screening assessment is presented in this Chapter. Required mitigation measures and best practice that would be adopted is presented in this Chapter. A pollution prevention plan would be included as part of the CEMP. Information on borrow pits is provided in **Technical Appendix 10.5: Borrow Pit Assessment.**
SEPA Gatecheck Response (13 July 2023)	We have reviewed the Stage 1 Gate Check Report and are pleased to note Private Water Supplies (PWS), GWDTE and avoidance of areas of deeper peat have been considered in the design process. However, as no further detailed information on these and other constraints (such as 50m buffers around watercourses, location of PWS and peat probing depths) has been provided in the report we cannot offer comment on the appropriateness of the site design at this stage. We will consider our position when formally consulted on the application and associated EIAR	Noted. Further information on PWS, GWDTE and peat are considered in this Chapter and in **Chapter 8: Ecology and Biodiversity.** Further information on the design process is found in **Chapter 3: Site Selection and Design Evolution**
Moray Council Scoping Response 20 January 2022	At full application the developer will need to provide a Drainage Impact Assessment (DIA) including the following information: • design of crossings points for access roads across existing watercourses; • the crossing points should be designed so that the natural flow of the watercourse is not restricted; and	Principles, design standards and best practice measures for the management and control of drainage that would be adopted by the Principal Contractor are included within this Chapter and within the **Technical Appendix 2.1: Outline CEMP**.

Consultee	Summary of Responses	Where Addressed in Chapter
	• drainage design for impermeable areas on the site to be development, including details for any temporary impermeable areas. SEPA flood maps show that there might be some isolated pockets of surface water flooding in the area of the Site, though it is noted that this will be majorly affected by the development. The applicant should however include details in the DIA to show that their proposed drainage solution will not affect flood risk in the immediate area of the site, or downstream of the site. In accordance with the Moray Council Flood Risk and Drainage Impact Supplementary Guidance any drainage system will need to be designed to 1:30 year rainfall event, including 35% climate change. If the applicant intends to discharge drainage from impermeable areas to existing watercourses they need to provide details on how they intend to restrict the rate of discharge into the watercourse. The post development runoff rate should not exceed the pre-development runoff rate.	A DIA would be prepared as part of the detailed design stage of the project and be developed using the standards detailed in this Chapter in MC guidance. As part of the design evolution the number of required watercourse crossings has been minimised. It is confirmed all new crossings would be sized to pass the 0.5% AEP plus an allowance for climate change. Measures to maintain existing surface water flow paths are presented in this Chapter. Sustainable drainage approaches and standards that would be adopted are also given.
Scottish Government Energy Consents Unit Scoping Response March 2022	Scottish Ministers are satisfied with the scope of the EIA set out in Chapter 4 of the scoping report. Scottish Water have 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 and makes further enquiries to confirm what impacts, if any, are on any Scottish Water assets that might be affected by the development and includes details in the EIA report of any relevant mitigation measures to be provided. 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. In addition to identifying the main watercourses and waterbodies within and downstream of the proposed development area, developers should identify and consider any areas of Special Areas of Conservation where fish are a qualifying feature and proposed felling operations particularly in acid sensitive areas. Scottish Ministers request the Company now review SEPA's advice with regard to Phase 2 peat surveys and existing infrastructure. Where there is a demonstrable requirement for peat landslide hazard risk assessment, the assessment should be 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 should	Noted. Refer to Scottish Water response above. A private water supply risk assessment (PWSRA) is included in **Technical Appendix 10.3: PWSRA.** Mitigation measures and a proposed private water supply monitoring is presented. Designated sites downstream of the development and potential effects are discussed in this Chapter. Potential effects on fisheries interests are considered in **Chapter 8: Ecology and Biodiversity** and **Technical Appendix 8.6: Fisheries**. A site specific PLHRA has been prepared. Potential impacts on peat and proposed mitigation measures are summarised in

Consultee	Summary of Responses	Where Addressed in Chapter
	be followed in the preparation of the EIA report, which should contain such assessment and details of mitigation measures. Scottish Ministers advise that the Company liaise with NatureScot regarding deeper peat called Broken Moan in the area of the development and to investigate peatland restoration.	this Chapter and discussed in full in **Technical Appendix 10.1: PLHRA** and **Technical Appendix 10.2: PMP.** Noted. Broken Moan is considered within the Outline Biodiversity Enhancement and Restoration Plan (BERP) which is presented in **Technical Appendix 8.6: BERP**

10.3.2 Effects Scoped Out

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 topics 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 simple screening of potential flooding sources (fluvial, coastal, groundwater, infrastructure etc.) is presented in the EIA Report (see Existing Conditions) and measures that would be used to control the rate and quality of runoff will be specified in the Construction and Environmental Management Plan (CEMP) which would be agreed with MC prior to construction commencing;
- Water quality monitoring: As the assessment is informed by classification data obtained from SEPA and which shows that there are no known sources of potential water pollution, no additional water quality monitoring is considered necessary to complete the assessment. Note that 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;
- 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 superficial or solid geology. Potential effects on peat and carbon rich soils are not scoped out of the assessment and are considered in full; and
- Potential effect on the water environment due to forestry felling. Details of forestry felling for the construction of the proposed development are given in **Technical Appendix 2.2: Forestry**. This shows that the felling which is required to establish the proposed development is very small in extent when compared to the surface water catchments in which the felling will occur (less than 5% of the total catchment area). The area of felling is well below forest best practice felling guidance thresholds and therefore no impact on water quality or rainfall-runoff response, subject to adoption of industry standard best practice, is anticipated.

10.4 Approach and Methodology

10.4.1 Scope of Assessment

The scope of the assessment has been determined through a combination of professional judgement, reference to relevant guidance documents and consultation with stakeholders. The

assessment has also been cognisant of the previous assessments completed at the Site (ECU ref. ECU00003365, March 2022).

10.4.2 Baseline Characterisation

10.4.2.1 Study Area

The study area is shown on **Figure 10.1** and includes all the proposed site infrastructure located within the Site. In addition, details of local water use and quality within a buffer of 1km from the site infrastructure has been considered as proposed during Scoping. Beyond this any effect is considered to be so diminished as to be undetectable and therefore not significant.

10.4.2.2 Cumulative Study Area

The study area for potential cumulative effects uses catchments within the study area, with a maximum distance of 5km from the nearest element of the proposed development infrastructure.

10.4.2.3 Information and Data Sources

The following sources of information have been consulted in order to characterise the baseline conditions:

- previous assessments and planning applications at the Site;
- Ordnance Survey (OS) 1:50,000 and 1:25,000 scale mapping;
- UK Centre for Ecology and Hydrology, Flood Estimation Handbook (FEH) webservice[1];
- NatureScot SiteLink[2];
- James Hutton Institute, Soil map of Scotland (partial cover) (1:25,000 scale) and Carbon and Peatland 2016 data[3];
- British Geological Survey (BGS) Onshore Geoindex[4];
- BGS Hydrogeological Maps of Scotland (1:100,000 scale)[5];
- UK Centre for Ecology and Hydrology, National River Flow Archive (NFRA)[6];
- SEPA rainfall data[7];
- SEPA flood maps[8];
- SEPA environmental data[9];

[1] UK Centre for Ecology and Hydrology, Flood Estimation Handbook (FEH) webservice, available online at https://fehweb.ceh.ac.uk/ [Accessed August 2023]

[2] NatureScot SiteLink, available online at https://sitelink.nature.scot/home [Accessed August 2023]

[3] James Hutton Institute, Soil map of Scotland (partial cover) (1:25,000 scale) and Carbon and Peatland 2016 data, available online at https://soils.environment.gov.scot/ [Accessed August 2023]

[4] British Geological Survey, Onshore Geoindex, available online at https://mapapps2.bgs.ac.uk/geoindex/home.html [Accessed August 2023]

[5] 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 August 2023]

[6] UK Centre for Ecology and Hydrology, National River Flow Archive (NRFA), available online at https://nrfa.ceh.ac.uk/ [Accessed August 2023]

[7] SEPA Rainfall data for Scotland, available online at https://www2.sepa.org.uk/rainfall [Accessed August 2023]

[8] SEPA Flood Maps, available online at https://www.sepa.org.uk/environment/water/flooding/flood-maps/ and https://map.sepa.org.uk/reservoirsfloodmap/Map.htm [Accessed August 2023]

[9] SEPA, Environmental data, available online at https://www.sepa.org.uk/environment/environmental-data/ [Accessed August 2023]

- Data requests with SEPA regarding details of registered / licenced abstractions and discharges (August 2023); and
- Data requests with MC regarding details of historical flooding records and private water abstractions (August 2023).

10.4.2.4 Desk Study / Field Survey

The project hydrologists, hydrogeologist, 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.

An initial desk study has been undertaken to determine and confirm the baseline characteristics by reviewing available information on geology, hydrology, and hydrogeology using the sources of information outlined in Section 10.4.2.3. A programme of field surveys was then undertaken.

Detailed site visits and walkover surveys have been undertaken by the authors of this assessment on the following dates:

- September 2022, December 2022 and June 2023 for peat depth probing, augering, and characterisation, and assessment of potential borrow pit search areas; and
- August 2023 to complete a watercourse crossing survey and private water supply survey.

The field work has been undertaken in order to:

- verify the information collected during the desk and baseline study, and that reported in previous assessments completed at Site;
- allow appreciation of the Site, determine gradients, assess access routes, ground conditions, etc., and to assess the relative location of all the components of the proposed development;
- assess peat extent and depth, peat slide landslide risk and Site geomorphology;
- undertake a visual assessment of the main surface waters and identify and verify the location of private water supplies;
- identify drainage patterns, areas vulnerable to erosion or sediment deposition, and any pollution risks;
- assess areas of potential GWDTE; and
- visit and prepare a schedule of potential watercourse crossings.

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. It has also been processed and interpreted to complete the impact assessment and recommended mitigation measures where appropriate.

10.4.3 Assessment Methods

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 change, should that effect occur. These are detailed in Section 10.4.3, 10.4.4 and 10.4.5.

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.

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 presented by the proposed development, such as detailed in the site-specific habitat management plan, peat management plan and peat landslide hazard risk assessment.

The criteria for determining the significance of effect are provided in **Table 10-2**, **Table 10-3**, and **Table 10-4**.

10.4.3.1 Sensitivity Criteria

The sensitivity of the receiving environment (i.e. the baseline quality of the receiving environment) is defined as its ability to absorb an effect without a detectable change and can be considered through a combination of professional judgement and a set of pre-defined criteria as set out in **Table 10-2**. Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at the associated level of sensitivity.

Table 10-2: Criteria for Assessing Sensitivity of Receptor

Sensitivity	Definition
High	• soil type and associated land use is highly sensitive (e.g. unmodified blanket bog peatland); • SEPA WFD Water Body Classification: High-Good or is close to the boundary of a classification Moderate to Good or Good to High; • receptor is of high ecological importance or national or international value (e.g. Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), habitat for protected species) which may be dependent upon the hydrology of the Site; • receptor is at risk from flooding in the future (2085) and/or water body acts as a current active floodplain or flood defence; • receptor is used for public and/or private water supply (including Drinking Water Protected Areas (DWPA); • groundwater vulnerability is classified as high; and • if a GWDTE is present and identified as being of high sensitivity.
Moderate	• soil type and associated land use is moderately sensitive (e.g. arable, commercial forestry); • moderate classification of groundwater aquifer vulnerability.
Low	• soil type and associated land use not sensitive to change in hydrological regime and associated land use (e.g. intensive grazing of sheep and cattle); • SEPA Water Framework Directive Water Body Classification Poor or Bad; • receptor is not at risk of flooding in the future (2085); and • receptor not used for water supplies (public or private).
Not Sensitive	• receptor would not be affected by the proposed development, e.g., lies within a different and unconnected hydrological / hydrogeological catchment.

10.4.3.2 Magnitude of Effect

The potential magnitude of an impact would depend upon whether the potential effect would cause a fundamental, material, or detectable change. In addition, the timing, scale, size and duration of the potential effect resulting from the proposed development are also determining factors.

Good practice measures implemented and embedded as part of the design and construction of the proposed development and use of professional judgement where appropriate. Good practice measures (i.e. embedded mitigation) are discussed later in the Chapter.

The criteria that have been used to assess the magnitude of impact are defined in **Table 10-3**. The characteristics of the impacts are described as: direct/indirect, temporary(reversible) or permanent (irreversible), together with timescales (short, medium and long term).

Table 10-3: Criteria for Assessing Magnitude of Impact

Magnitude of Impact	Criteria	Definition
Major	Results in loss of attribute	Long term or permanent changes to the baseline geology, hydrology, hydrogeology and geology such as: • permanent degradation and total loss of soils habitat (inc. peat) and geology; • loss of important geological structure/features; • wholesale changes to watercourse channel, route, hydrology or hydrodynamics; • changes to the site resulting in an increase in runoff with flood potential and also significant changes to erosion and sedimentation patterns; • major changes to the water chemistry; and • major changes to groundwater levels, flow regime and risk of groundwater flooding
Medium	Results in impact on integrity of attribute or loss of part of attribute	Material and short to medium term changes to baseline geology, hydrology, hydrogeology and water quality, such as: • loss of extensive areas of soils and peat habitat, damage to important geological structures/features; • some changes to watercourses, hydrology or hydrodynamics; • changes to site resulting in an increase in runoff within system capacity; • moderate changes to erosion and sedimentation patterns; • moderate changes to the water chemistry of surface runoff and groundwater; and • moderate changes to groundwater levels, flow regime and risk of groundwater flooding.
Low	Results in minor impact on attribute	Detectable but non-material and transitory changes to the baseline geology, hydrology, hydrogeology and water quality, such as: • minor or slight loss of soils and peat or slight damage to geological structures/feature; • minor or slight changes to the watercourse, hydrology or hydrodynamics; • changes to Site resulting in slight increase in runoff well within the drainage system capacity; • minor changes to erosion and sedimentation patterns; • minor changes to the water chemistry of surface runoff and groundwater; and • minor changes to groundwater levels, flow regime and risk of groundwater flooding.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use/integrity	No perceptible changes to the baseline geology, hydrology, hydrogeology and water quality such as: • no impact or alteration to existing important soils (inc. peat) geological environs; • no alteration or very minor changes with no impact to watercourses, hydrology, hydrodynamics, erosion and sedimentation patterns; • no pollution or change in water chemistry to either groundwater or surface water; and • no alteration to groundwater recharge or flow mechanisms.

10.4.3.3 Significance of Effects

The sensitivity of the receptor together with the magnitude of impact determines the significance of the effect, which can be categorised into a level of significance as identified in **Table 10-4**.

In some cases, the potential sensitivity of the receiving environment or the magnitude of potential impact cannot be quantified with certainty and therefore professional judgement remains the most robust method for identifying the predicted significance of a potential likely effect.

Table 10-4: Significance of Effect

Magnitude of Impact	Sensitivity of Receptor			
	High	Moderate	Low	Not Sensitive
Major	**Major**	**Major**	**Moderate**	Negligible
Medium	**Moderate**	**Moderate**	Minor	Negligible
Low	**Moderate**	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Effects of major or moderate significance, as outlined in **Table 10-4** are considered to be significant in terms of the EIA Regulations.

10.4.3.4 Cumulative Effects

The assessment also considers potential cumulative effects associated with other material developments within 5km of the nearest element of the proposed development and in the same surface water catchments as the proposed development. A cumulative effect is considered to be the effect on a hydrological, hydrogeological or geological receptor arising from the Site in combination with other developments which are likely to affect soils or geology, surface water and groundwater.

10.4.3.5 Mitigation

Any potential effects of the proposed development on geology or the water environment identified by the assessment have been addressed and mitigated by the design and the application of good practice guidance to be implemented as standard during construction and operation to prevent, reduce or offset effects where possible. As such a number of measures would form an integral part of the construction process and these have been taken into account prior to assessing the likely effects of the proposed development (embedded mitigation). Where appropriate, and furthermore tailored mitigation measures have been identified prior to determining the likely significance of residual effects.

Good practice measures would be applied in relation to pollution risk, sediment management, peat management and management of surface runoff rates and volumes. This would form part of the CEMP to be implemented for the proposed development which would be secured by a planning condition and would be prepared prior to construction commencing.

The final CEMP would include details and responsibilities for environmental management onsite for environmental aspects and would outline the necessary surface water management, oil and chemical delivery and storage requirements, waste management, traffic and transport management and would specify monitoring requirements for wastewater, water supply and all appropriate method statements and risk assessments for the construction of the proposed development.

10.4.3.6 Residual Effects

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

10.4.4 Assumptions, Limitations and Confidence

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

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.

10.5 Environmental Baseline and Potential Sources of Impact

10.5.1 Current Baseline

10.5.1.1 Site Setting

The proposed development is located approximately 6km north of Keith and approximately 7km south of Buckie, Moray. The Site is currently a commercial forest and is centred at E 344832 / N 858169. Access to the Site would be from a new track and site entrance to the west of the Site, off the B9016.

Ground elevations across the Site generally range from approximately 300m Above Ordnance Survey (AOD) near the summit of Millstone Hill to 160m AOD along the south-eastern boundary of the Site near the Burn of Aultmore.

SEPA has provided precipitation data for the nearest rain gauge (Keith at E 343119 / N 851593), approximately 3.9km south of the Site[7]. In 2022, a precipitation total of 923mm was recorded. Average annual rainfall data provided by the FEH[1] for the Burn of Aultmore (the largest catchment which drains the site) reports a similar annual precipitation total of 905mm.

An extract of OS mapping for the site, which shows its setting, is presented on **Figure 10.1**.

10.5.1.2 Statutory Designated Sites

Review of NatureScot Sitelink webpage[2] confirms that the there are no statutory designated sites located within the Application Boundary or within the study area.

10.5.1.3 Geology

Soils and Superficial Geology

An extract of the Soil map of Scotland (partial cover)[3] is presented as **Figure 10.2**. The principal soil types underlying the Site are shown as basin and valley peat, blanket peat and podzols. Areas of humus-iron podzols and noncalcareous gleys are noted within the north-western and eastern extent of the Site whilst small areas of alluvium soils are noted along the banks of the larger watercourses, particularly the Burn of Aultmore and Burn of Blackhills.

BGS mapping[4] (see **Figure 10.3**) indicates that the majority of the Site is underlain by glacial till with discrete areas of peat. Alluvium is recorded to bound the banks of the larger watercourses. The hill tops locally are shown to be absent of any superficial deposits.

An extract of the peatland classification dataset published by Scottish Natural Heritage (now NatureScot)[3] is shown on **Figure 10.4**. This shows that the majority of the Site is underlain by Class 4 and 5 peatland which are not considered to be peatland habitats; however the soils remain carbon rich and may contain areas of bare soil and deep peat.

Discrete areas of Class 1 peatland are noted within the centre of the Site and within the western boundary of the Site near the proposed site entrance. Class 1 peatland are nationally important carbon rich soils, deep peat and priority peatland habitats.

As part of the baseline assessment, a comprehensive peat probing exercise has been conducted and informs the PLHRA and PMP (**Technical Appendix 10.1: PLHRA** and **Technical Appendix 10.2: PMP**). In summary:

- the depth of soils and peat was recorded at more than 3,700 locations;
- all elements of the proposed site infrastructure have benefited from peat probing;
- a programme of peat augering has also been undertaken to assess the characteristics of the peat at the Site;
- 90% of all peat probes recorded a peat depth of less than 1m (80% recorded a depth less than 0.5m) ; and
- where encountered, most of the peat is classified as between H2 and H5, using the Von Post[10] classification, showing insignificant to moderate decomposition.

Bedrock Geology

An extract of the regional BGS bedrock geological mapping[4] is presented on **Figure 10.5** which shows that the Site is underlain by the Findlater Flag Formation comprising psammite, semipelite and quartzites. The western boundary is underlain by the Cairnfield Calcareous Flag Formation (comprising psammites and calcareous semi pelites) whilst the south-eastern corner of the Site is underlain by bedrocks of the Keith Intrusions (comprising foliated metagranites).

Several inferred faults are noted within the eastern extent of the Site, as shown on **Figure 10.5**.

10.5.1.4 Hydrogeology

Aquifer Characteristics and Groundwater Vulnerability

Extracts of the BGS regional hydrogeological[4] and groundwater vulnerability[5] mapping (see **Figure 10.6** and **Figure 10.7** respectively) confirm that the superficial deposits, where present, and the bedrock beneath the Site are unlikely to contain significant amounts of groundwater. BGS classify the bedrock as a low productivity aquifer, whereby small amounts of groundwater may be present within the near surface weathered zone or secondary fractures.

A description and hydrogeological classification of the geological units at the Site are presented in **Table 10-5**.

Table 10-5: Hydrogeological Classifications

Period	Geological Unit	Hydrogeological Characterisation	Hydrogeological Classification
Pleistocene to Recent	Till	Sand and gravel horizons within this unit can store groundwater, although their lateral and vertical extent realises a variable and often small groundwater yield. Clay within this unit acts as an aquitard to the more permeable sand and gravel lenses and will hinder/prevent large scale groundwater movement. Regionally, groundwater flow will be limited by the variability of these deposits and consequently any groundwater yields are normally low.	Not a significant aquifer

[10] https://www.blacklandcentre.org/the-science/von-post-humification-scale/

Period	Geological Unit	Hydrogeological Characterisation	Hydrogeological Classification
	Peat	Where not degraded or eroded, characteristically wet underfoot and dominated by Sphagnum. Typically, peat consists of two layers: the upper very thin (up to 30cm) acrotelm layer contains upright stems of Sphagnum mosses and allows relatively free water movement and the lower catotelm layer comprising the thicker bulk of peat where individual plant stems have collapsed. Water movement in the catotelm layer is very slow and normally the water table in a peat never drops below the acrotelm layer.	Not classified.
	Alluvium	The deposits are predominantly silt and clays with some sand, pebbles and cobbles. Groundwater storage and movement typically limited by small regional extent of this unit. Local differences in thickness, material type and its sorting can cause a considerable range in hydraulic conductivity. Commonly in hydraulic continuity with nearby watercourses and can support locally important potable water supplies.	Intergranular Flow Moderate to High Productivity
Neoproterozoic	Findlater Flag Formation, Keith Intrusions and Cairnfield Calcareous Flag Formation	Generally, without groundwater except at shallow depths. Hard rocks with limited groundwater in near surface weathered zone and secondary fractures or rare springs.	Fracture Flow Low to Very Low Productivity

Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being the most vulnerable. Review of **Figure 10.7** shows that the potential groundwater vulnerability in the uppermost aquifer beneath the proposed development has a vulnerability of Class 4 and 5. Higher vulnerabilities (Class 5) are noted on the hill tops locally within the Site, where no superficial deposits are recorded on the BGS maps. The high vulnerability is likely to represent the limited cover of superficial deposits and the potential presence of shallow groundwater in the upper weathered surface of the bedrock.

Groundwater Levels and Quality

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

- steeper topographic gradients will result in rainfall forming surface water runoff;
- the 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.

SEPA does 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 limited groundwater

will be present as perched groundwater within the more permeable horizons of the alluvial deposits and within weathered zone, fractures or faults within the bedrock deposits.

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.

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 identify two groundwater bodies beneath the Site:

- Keith (SEPA ID: 150656) groundwater body which underlies the southern extent of the Site and was classified in 2020 (last reporting cycle) with an Overall Status of Good; and
- Banff (SEPA ID: 150632) groundwater body which underlies the northern extent of the Site and was classified in 2020 (again the last reporting cycle) with an Overall Status of Good.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

A National Vegetation Classification (NVC) habitat mapping exercise was conducted in August - September 2021 and in August 2022 as part of the ecology baseline assessment and this has been used to identify potential GWDTE within the Site. The methodology and results of the NVC habitat mapping exercise are discussed in detail within **Chapter 8: Ecology and Biodiversity**. With reference to SEPA's LUPS-31 guidance[11], areas of potential GWDTE are shown on **Figure 10.8**.

Review of **Figure 10.8** confirms that few potential GWDTE habitats are located within 100m or 250m (the buffers specified in SEPA's guidance) of the proposed development infrastructure.

The location of potential GWDTE and their likely dependency on groundwater is discussed in **Table 10-6**.

Table 10-6: Groundwater Dependent Terrestrial Ecosystems

NVC Community	GWDTE Potential	Location and Distribution at Site
M6	High	M6 polygons are located on ground near the Burn of Aultmore. which is underlain by low permeability glacial till deposits which will facilitate the local water logging of soils in response to rainfall. Groundwater decency is considered low.
M15	Moderate	M15 polygons are generally located on sloped ground which is underlain by peat or glacial till or on sloped ground near or adjacent to watercourses, including the Stripe of Gateside and the Burn of Aultmore. Again, a consequence of the low permeability of the geology and habitat distribution, considered to be sustained by surface water and rainfall rather than groundwater.
M23	High	M23 polygons (including polygons which also include MG9) are generally located adjacent to watercourses or existing drainage ditches, particularly the Burn of Aultmore and within the upper reaches of the Burn of Ryeriggs. M23 polygons are shown to be underlain by glacial till, peat, and alluvium deposits. There distribution is typical of that sustained by surface water rather than emergent groundwater.
M25	Moderate	M25 is recorded in a small area located within the western extent of the Site near the existing railway embankment, within the upper reaches of the Burn of Ryeriggs. The area is shown to be underlain by glacial till deposits, and gain is unlikely to be sustained by groundwater.

[11] SEPA (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, September 2017

NVC Community	GWDTE Potential	Location and Distribution at Site
MG9	Moderate (classified as High on Figure 10.8 due to presence of M23)	MG9 polygons (which also include M23) are generally located on sloped ground within the western extent of the Site near the upper reaches of the Burn of Ryeriggs. MG9 polygons are shown to be underlain by glacial till deposits. Their distribution is not typical of an emergent groundwater (e.g. a spring or spring line).
MG10	Moderate	MG10 polygons are located outside of the site boundary on sloped ground within the upper reaches of the Burn of Ryeriggs and Burn of Tynet. MG10 polygons are shown to be underlain by glacial till deposits. They are not considered to be groundwater dependent and lie beyond buffers specified in SEPA guidance.
W1	Moderate	W1 and W2 polygons are located within the western extent of the Site near the existing railway embankment, within the upper reaches of the Burn of Ryeriggs. W1 and W2 polygons are shown to be underlain by glacial till deposits and are not considered groundwater dependent.
W2	Moderate	

Review of **Table 10-6** shows that the potential high and moderate GWDTE are located on ground which is underlain by glacial till and peat or on sloped ground upstream or adjacent to watercourses. In addition, no flush features were recorded by the NVC survey, which can be indicative of an emergent groundwater. This distribution is not typical of a habitat sustained by groundwater but rather it is likely to be supported by rainfall, surface water runoff and water logging of soils.

Buffers to areas of potential GWDTE specified in SEPA guidance therefore do not apply, but safeguards to maintain these habitats, and the surface water sources to these habitats will need to be maintained during construction and operation of the proposed development, details of which are included in Section 10.7.

10.5.1.5 Hydrology

Local Hydrology

The Site is located within a number of surface water catchment areas; the River Isla (and tributaries of the River Isla) to the south, Burn of Tynet to the north-west, Burn of Gollachy and Buckie Burn to the north, and the Deskford Burn to the north-east. See **Figure 10.1.**

The majority of the Site is located within the surface water catchment of the River Isla, including three sub catchments of the River Isla:

- Burn of Aultmore: Much of the Site, including turbines T6 to T10 and T12 to T16, substation SS1 and SS2 and borrow pit BP3, are located within the surface water catchment of the Burn of Aultmore which flows generally southwards along the southern boundary of the Site before discharging into the River Isla approximately 3.9km south of the Site. The burn and several of its tributaries rise within the site boundary.
- Crooksmill Burn: The south-western corner of the Site, including turbine T5, is located within the surface water catchment of the Crooksmill Burn, in particular the Burn of Ryeriggs (a tributary of the Crooksmill Burn). The burn and its tributaries flow generally southwards to the south-west of the Site before discharging into the River Isla approximately 4.5km south-west of the Site. The Burn of Ryeriggs rises near the proposed access track off the B9016.
- Burn of Paithnick: The south-eastern corner of the Site, including part of the access road from Balnamoon, is located within the surface water catchment of the Burn of Paithnick. The burn flows generally south-westwards before discharging into the River Isla approximately 4.3km south of the Site.

The Burn of Tynet, Burn of Gollachy, Buckie Burn and Deskford Burn all flow generally northwards away from the Site before discharging into the Moray Firth between 5.5km and 7km north and north-east of the Site.

The north-western extent of the Site, including turbines T1 to T4, is drained by the Burn of Tynet which flows northwards along the north-western boundary of the Site.

Tributaries of the Burn of Gollachy drain part of the northern extent of the Site, however, no development is proposed within this catchment.

The central extent of the northern boundary and part of the north-eastern corner of the Site, including part of the access track and borrow pit BP4, is located within the Buckie Burn surface water catchment.

The eastern boundary and remaining north-eastern corner of the Site is located within the Deskford Burn surface water catchment. Turbine T11 and part of the access track within this area of the Site are located within the Deskford Burn surface water catchment.

None of the catchments which drain the Site have been designated as a Drinking Water Protected Area (DWPA).

As noted within the **Table 10-1**, the River Deveron has been designated as a DWPA which supplies Turriff WTW. The River Isla and its tributaries drain to the River Deveron. The River Deveron is located approximately 10.5km south-east of the Site at its closest extent. The river and DWPA lie beyond the study area. Scottish Water in their consultation responses have confirmed that the proposed development poses a low risk to the DWPA and their water abstraction source. The DWPA is not, therefore, considered at risk and is not assessed further in this Chapter. Measures to safeguard existing surface water flow paths and water quality are discussed in Section 10.7.

Surface Water Quality

SEPA classify larger water catchments as part of its responsibility under the WFD. **Table 10-7** summarises classification data reported in 2020 (last reporting cycle). Smaller watercourses within the Site are not monitored nor classified by SEPA.

Table 10-7: Surface Water Quality

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical Status	Hydromorphology	Pressures
Burn of Aultmore (23176)	Good ecological potential	Poor	Good	Poor	Modifications to bed, banks and shores
Crooksmill Burn (23180)	Moderate ecological potential	Bad	High	Bad	Modifications to bed, banks and shores and water abstractions
Burn of Paithnick (23175)	Good ecological potential	Bad	High	Bad	Modifications to bed, banks and shores
Burn of Tynet (23047)	Good ecological potential	Moderate	High	Moderate	None
Buckie Burn (23048)	Poor	Poor	High	Poor	Unknown pressure on water animals and plants and water abstractions
Deskford Burn (23050)	Moderate	Moderate	High	Good	Unknown pressure on water animals and plants

Fisheries

Fisheries within the southern extent of the Site are managed by the Deveron District Salmon Fisheries Board (DDSFB) and Deveron, Bogie, and Isla River Trust whilst fisheries in catchments in the northern extent of the Site are managed by the Spey District Salmon Fishery Board (SDSFB) and

Spey Foundation. Fisheries interests are discussed and assessed with **Chapter 8: Ecology and Biodiversity**.

Watercourse Crossings

The proposed development has sought to utilise existing tracks and access routes where possible. However, four new crossings and three existing crossings which are scheduled to be upgraded, will be required.

The locations of the proposed crossings are shown on **Figure 10.1** and schedule of these crossing points, which includes photographs and dimensions of each crossing is shown in **Technical Appendix 10.4: Schedule of Watercourse Crossings.**

Flood Risk

SEPA has developed national flood maps 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. The flood risk from each of these potential sources is discussed in **Table 10-8**.

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 in 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.

Table 10-8: Flood Risk Evaluation

Potential Source	Potential Risk to Site	Justification
Coastal Flooding	No	The Site is remote from the coast and situated at an elevation of at least 160m AOD.
Fluvial Flooding	No	SEPA flood maps confirm that the majority of the Site is not at risk from fluvial flooding, with the exception of a small area along the banks of the Burn of Aultmore. It is noted that the SEPA flood maps are unlikely to show flooding of the smaller watercourses within the Site, however, floodplains associated with the watercourses are likely to be limited and confided to the watercourse corridors. With the exception of watercourse crossings, no development is proposed within 50m of the watercourses. It is therefore considered that the Site is not at risk from fluvial flooding.
Surface Water Flooding	Yes (minor)	SEPA has identified several areas of surface water flood risk across the Site which generally coincide with watercourse corridors and forest rides. Flood extents are shown to be small, localised areas, never forming large, linked areas or flow paths. Therefore, surface water is not considered a development constraint.
Groundwater Flooding	No	Review of SEPA groundwater flood map confirms that the study area is not at risk from groundwater flooding. This concurs with the desk-based assessment whereby limited groundwater is expected.
Flood Defence Breach (Failure)	No	SEPA has produced reservoir inundation maps for those sites currently regulated under the Reservoirs Act 1975. Review of the SEPA mapping highlights that there is no risk of reservoir inundation within the proposed development. Flooding from this source is not considered further.

Potential Source	Potential Risk to Site	Justification
Flooding from Artificial Drainage Systems	No	The proposed development is located within a remote area and no significant flood defences are recorded within the study area.

SEPA also publish potential future flood extents (2050) which account for the potential upfit in rainfall depths and intensities as a consequence of climate change. An extract of this mapping is show on **Figure 10.1** and confirms, no element of the proposed development is located within the predicted floodplain extents.

10.5.1.6 Private Water Supplies and Licenced Sites

Consultation with MC and SEPA has been undertaken to gather details of private and licenced water abstractions within the study area.

SEPA has provided information of Controlled Activity Regulation (CAR) authorisations within the study area. Five authorisations are recorded, all of which permit the discharges of private sewage. No licenced abstractions are recorded within the study area.

Following public consultation and a site visit, details of the water source for two local distilleries were provided and the following assessments made:

- Aultmore Distillery uses two springs, approximately 850m south from the closest extent of the proposed development. The springs are located downstream of the nearest turbine however no development is proposed within 250m of the springs. Therefore, with reference to SEPA's LUPS-31 guidance[12], and subject to safeguards to protect water quality, the water supply for the distillery is not considered to be at risk, and it is not considered further.
- Inchgower Distillery utilises water from a reservoir on the bank of the Ault Kittoch in the Menduff Hills. The source is located approximately 1.2km north of the proposed development, at its closest extent. No development is proposed upstream of the reservoir and therefore the water supply for the distillery is not considered to be at risk, and it is not considered further.

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

The risk that the proposed development poses to PWS has been considered as part of this assessment and is presented in **Technical Appendix 10.3: PWSRA**. It confirms that:

- three PWS sources are potentially at risk from the proposed development;
- the distribution pipework associated with two PWS source is potentially at risk from the proposed development;
- 23 PWS sources are not at risk from the proposed development;
- there were three PWS sources where it was not possible to confirm their source; and
- three properties have been confirmed to be on mains.

Technical Appendix 10.3: PWSRA confirms the measures that are required to safeguard these PWS and presents a monitoring schedule which can be used to confirm that the PWS are not impaired should the proposed development be granted planning permission.

[12] SEPA (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, September 2017

10.5.1.7 Receptor Sensitivity

Table 10-9 confirms the receptors identified by the baseline study and from the field investigation programme, and their sensitivity based upon the criteria contained in **Table 10-2**. These receptors form the basis of the assessment and are used in conjunction with an estimate of the magnitude of an impact to determine the significance of any potential effect.

Table 10-9: Receptor Sensitivity

Receptor	Sensitivity	Reasons for Sensitivity
Water Dependent Designated Sites	Not sensitive	No designated sites within the study area. They are not considered further in this assessment.
Soils and Geology	High - Peat	Class 1 peatland and carbon rich soils have been recorded within the Site. With the exception of peat, the superficial and bedrock geology is not rare and is not considered sensitive. Superficial and bedrock geology is therefore not considered further in this assessment.
Hydrogeology	High	Groundwater beneath the study area has been classified as Good water quality.
Hydrology	High	Surface water catchments have generally been classified as Poor to Good overall status. As a "worst case" all surface waters are considered to have a Good overall status.
Flooding	Moderate	No or very little 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.
Private Water Supplies	High	Several private water supplies have been confirmed within the study area which could be at risk from the proposed development.
Licenced Abstractions	Not sensitive	No licenced abstractions are recorded within the proposed study area.
GWDTE	High	Areas of potential GWDTE have been identified by NVC mapping. It has been shown that the habitats are not sustained by groundwater but by surface water. Measures will be required to sustain existing surface water flow paths to these habitats.

10.5.2 Future Baseline

Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside higher average temperatures. This is likely to increase pressures on water supplies and lower water levels in summer months in the future.

Summer storms are also predicted to be of greater intensity. Peak fluvial flows associated with more extreme summer storm events and wetter winters will increase the volume and velocity of runoff.

These potential changes are considered in the assessment of effects.

10.6 Assessment of Potential Effects

The assessment of effects is based on the proposed development description outlined in **Chapter 2: Proposed Development Description** and is structured as follows:

- details of embedded mitigations included in the development design;
- construction effects of the proposed development;
- operational effects of the proposed development; and
- decommissioning effects of the proposed development.

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.

10.6.1 Embedded Mitigation

10.6.1.1 Design Iterations

The proposed development has undergone design iterations and evolution in response to the geological, hydrological, and hydrogeological constraints identified as part of the baseline studies and field studies so to avoid and/or minimise likely effects on receptors where possible. This has included areas of deep peat or potential peat instability, watercourse locations, areas of potential flooding, PWS and GWDTE.

The layout of the access track was designed to minimise the requirement of watercourse crossings.

10.6.1.2 Peat Occurrence and Avoidance

The 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, the design has tried to avoid areas of deeper peat (>1m) and where possible limited development to areas of peat less than 1m or where peat is absent.

10.6.1.3 Buffer to Watercourses

In accordance with wind farm construction best practice guidelines and SEPA consultation advice, a 50m buffer has been applied to watercourses (shown on OS 1:25,000 mapping) and any proposed construction activities or infrastructure has been located outside of this buffer (see **Figure 10.1**).

The layout of the access track was also designed to minimise the requirement for watercourse crossings.

10.6.1.4 Groundwater Dependent Habitats

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

It has been shown that areas identified as being potentially highly or moderately groundwater dependent are likely to be sustained by incident rainfall and local surface water runoff rather than by groundwater. Accordingly, the buffers proposed in SEPAs GWDTE guidance need not apply.

Measures, such as permeable access tracks and regular cross track drains, have been proposed to safeguard existing water flow paths and maintain existing water quality. It is considered therefore that the water dependent habitats identified by the NVC mapping can be sustained. This would be confirmed, in accordance with good practice, by the Environmental Clerk of Works (ECoW) at the time of the construction who would ensure existing surface water flow paths and water flushes are maintained.

10.6.2 Good Practice Methods

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 would be outlined within the CEMP or by an appropriately worded condition post determination, as required.

10.6.2.1 Peat Safeguarding and Management

The peat depth probing data 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 Outline Peat Management Plan, or PMP, (see **Technical Appendix 10.2: Outline PMP**) which details the volume of acrotelmic and catotelmic peat which would be disturbed and how this would 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 8: Ecology and Biodiversity** and **Technical Assessment 8.5: Biodiversity Enhancement and Restoration Plan**.

As shown in **Technical Appendix 10.1: PLHRA** and **Technical Appendix 10.2: Outline PMP** measures have been proposed to ensure the stability of peat and carbon rich soils and that peat and soils that would 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

A detailed review of the distribution and depth of peat at the Site is contained in **Technical Appendix 10.2: Outline PMP**. The Site design has largely avoided areas of deep peat and where peat would be encountered by the proposed development it can be readily managed and accommodated within the Site layout without significant environmental impact. No surplus peat would be generated and the volumes of peat / peaty soil generated from the proposed excavations would be used to reinstate track verges, turbine bases, crane hardstandings and restoration of onsite borrow pits.

Peat Landslide Hazard

The site specific PLHRA (**Technical Appendix 10.1: PLHRA**) 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.

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

Good construction practice and methodologies to prevent peat instability within areas that contain peat deposits are identified in **Technical Appendix 10.1: PLHRA**. 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 would be required;
- careful micrositing 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 would require minimal maintenance; and
- developing drainage systems that would not create areas of concentrated flow or cause over/under-saturation of peat habitats.

Notwithstanding any of the above good construction practices and methodologies, detailed design and construction practices would 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 would be appointed as a supervisor, to provide advice during the setting out, micrositing and construction phases of the proposed development.

10.6.2.2 Good Practice Methods

Good practice measures would be applied in relation to pollution risk, and management of surface runoff rates and volumes. This would form part of the final CEMP to be implemented for the proposed development.

Key good practice measures are stated below and the assessment incorporates these measures as part of the proposed development. 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 and operation phases.

General Measures

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, details of which are given below.

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.

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.

The final CEMP would 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 environmental incidents.

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.

Roles would be assigned to different engineering / construction / supervising personnel and the inspection and maintenance regimes of sediment and runoff control measures would be adopted during these periods. In extreme cases, the above protocol would dictate that work onsite may have to be temporarily suspended until weather/ground conditions allow.

Water Quality Monitoring

Water quality monitoring during the construction phase would be undertaken for the surface water catchments that drain from the proposed development 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.

Monitoring would continue throughout the construction phase and immediately post construction. Monitoring would be used to allow a rapid response to any pollution incident as well as assess the efficacy of good practice or remedial measures. Monitoring frequency would increase during the construction phase if remedial measures to improve water quality were implemented. Detailed water quality monitoring plans would be developed during detailed design. Scottish Water, MC, SEPA, NatureScot, Marine Science Scotland, and local fisheries boards would be consulted on the plans and would be contained within the final CEMP.

The performance of the good practice measures would be kept under constant review by the water monitoring schedule, based on a comparison of data taken during construction with a baseline data set, sampled prior to the construction period.

Private Water Supplies may also be monitored as part of the Water Quality Monitoring programme, if deemed necessary.

Protection of Scottish Water Distribution Pipework

Scottish Water, through their scoping response have confirmed that the development may impact on existing Scottish Water assets, although no detail of the assets has been provided at the time of reporting in response to a request from SLR. As part of the detailed design stage of the project the location of the pipework at these locations will be confirmed and necessary protection agreed with Scottish Water to ensure the integrity of their infrastructure is maintained.

Pollution Risk

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

- refuelling would take place at least 50m from watercourses and would not occur when there is risk that oil from a spill could directly enter the water environment;
- foul water generated onsite would be managed in accordance with best practice and be drained to a sealed tank and routinely removed from the Site;
- a vehicle management plan and speed limit would be strictly enforced onsite to minimise the potential for accidents to occur;
- drip trays would be placed under vehicles which could potentially leak fuel/oils when parked;
- areas would be designated for washout of vehicles which are a minimum distance of 50m from a watercourse;
- washout water would also be stored in the washout area before being treated and disposed of;
- if any water is contaminated with silt or chemicals, run-off would not enter a watercourse directly or indirectly without treatment;
- 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.

Site investigation (e.g., trial pitting and/or boreholes) would be undertaken prior to any construction works where excavation would be required to establish the wind farm and it would inform detailed design and construction methods to ensure pollution risk is further considered prior to construction. These methods would be specified in the final CEMP.

Erosion and Sedimentation

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

- all stockpiled materials would be located out with a 50m buffer from watercourses, including on up-gradient sides of tracks and battered to limit instability and erosion;
- stockpiled material would either be seeded or appropriately covered, minimising the area of exposed bare ground;
- 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 this is not possible, water that enters excavations would pass through a number of silt/sediment traps to remove silt prior to discharge into the surrounding drainage system.

Detailed assessment of ground conditions would be required to identify locations where settlement lagoons would be feasible;

- clean and dirty water on-site would be separated, and dirty water would be filtered before entering the stream network;
- 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;
- 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.

Fluvial Flood Risk

Sustainable Drainage Systems (SuDS) shall be incorporated as part of the proposed development.

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 the 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, section specific drainage plans would be developed and construction personnel made familiar with the implementation of these.

Water Abstractions

Any water abstraction would only be made with authorisation from SEPA and in accordance with the CAR. Good practice that would be followed in addition to the CAR Licence 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 would be controlled to prevent significant water depletion in a source.

Watercourse Crossings

Four new watercourse crossings and three existing crossings which are scheduled to be upgraded are required for the Proposed Development as detailed within **Technical Appendix 10.4: Schedule of Watercourse Crossings** and shown on **Figure 10.1.**

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 and MC as part of the final CEMP.

10.6.3 Construction Effects

10.6.3.1 Peat and Soils

It has been shown (see **Technical Appendix 10.1: PLHRA, Technical Appendix 10.2: PMP** and 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 safeguarded.

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

10.6.3.2 Pollution Risks

During the construction phase, there is the potential for a pollution event to affect surface waterbodies impacting on their quality. This would have a negative impact on the receptor, potentially resulting in degradation of the water quality which would impact on any aquatic life and any PWS abstracting from the watercourses.

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

The risk of a pollution incident occurring would be managed using industry standard good practice measures. 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.

The baseline assessment has shown that the watercourses surrounding the proposed development and groundwater beneath the proposed development are considered High sensitivity receptors.

The Good Practice Measures (to be set out in the CEMP) would minimise the risk of a pollution event occurring to negligible and there are measures which would be put in place 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**.

10.6.3.3 Erosion and Sedimentation

Site traffic during the construction phase has the potential to cause erosion and increase sedimentation loading during earthworks, and due to increased areas of hardstanding and such features as stockpiles, tracks and excavations etc., which could be washed by rainfall into surface water features. The has the potential to reduce surface water quality, increase turbidity levels, reduce light and oxygen levels and affect ecology including fish populations.

Excavation of borrow pits, construction of hardstanding, 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.

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

With use of the identified good practice measures, the magnitude of impact associated with erosion and sedimentation is assessed as negligible. Peat, surface water dependent habitat, groundwater and surface water are considered high sensitivity receptors. The level of effect is therefore assessed as **negligible** and **not significant**.

10.6.3.4 Fluvial Flood Risk

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

Adherence to good practice measures including appropriate drainage design and compliance with the final CEMP would limit potential impacts to being local and short duration and so of negligible magnitude.

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 or surface water network adjacent to the excavation.

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'.

The potential level of effect on flood risk, which is considered to have a moderate sensitivity, is therefore assessed as being **negligible** and **not significant**.

The magnitude of the increase in 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.

10.6.3.5 Infrastructure and Man-made Drainage

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

Dewatering associated with construction of turbine foundations is temporary and would not be required post construction and during the operational life of the proposed development. 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.

The design of the proposed development has avoided areas of high ecological or habitat interest, including GWDTE, wherever possible.

Location specific good practice measures will form part of the final CEMP and would be used to minimise the potential for drainage and dewatering effects. However, as discussed in the hydrogeological characteristics of the Baseline Conditions text the geology at site has a low bulk hydraulic conductivity which means the extent of any dewatering would be very small when compared to surface and groundwater catchments and the potential magnitude of temporary groundwater ingress would be small.

The sensitivity of the receptor (groundwater and habitat that may be dependent on groundwater) has been assessed as being High. Without mitigation the magnitude of impact is assessed as negligible and therefore the potential significance of effect of changing groundwater levels and flow due to dewatering is assessed as **negligible** and **not significant**.

10.6.3.6 Water Abstraction

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 of water and mitigation required would be regulated through a CAR abstraction licence which would be agreed with SEPA. The magnitude of impact on groundwater-surface water interactions is considered negligible. The significance of effect is therefore **negligible**, and **not significant**.

10.6.4 Operational Effects

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.

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 along with the measures in the final CEMP to avoid potential effects.

10.6.4.1 Peat and Soils

No excavation, movement or storage of peat or soils is anticipated during the operational site life.

Peat is a high sensitivity receptor. The potential impact on deposits of soil and peat is therefore assessed as **negligible** and **not significant**. No additional mitigation is required.

10.6.4.2 Pollution Risk

The possibility of a pollution event occurring during operation is unlikely. There would be a limited number of vehicles required onsite for routine maintenance and for the operation of the proposed development. Storage of fuels/oils onsite for turbine maintenance would be limited to the hydraulic oil required in turbine gearboxes and this would be bunded to prevent fluid escaping.

The proposed BESS would be installed and operated in accordance with manufacturers and SEPA guidelines. As part of the detailed site design drainage of the BESS, and measures that would be used to control and manage storm water runoff, during routine operation would be agreed with SEPA and NatureScot. In addition, the drainage design would consider the necessary controls required to manage spills or firewater in the unlikely event of an accident occurring during operation of the BESS.

The Good Practice Measures (to be set out in the outline CEMP) would minimise the risk of a pollution event occurring to negligible and there are measures which would be put in place in the case of an accident occurring to mitigate pollution risk. The magnitude of impact associated with a pollution event during the operational phase of the Proposed Development is assessed negligible, as no detectable change will likely occur. Therefore, the level of effect of a pollution event during the operational phase of the proposed development is predicted to be **negligible** and **not significant**.

10.6.4.3 Erosion and Sedimentation

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.

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, 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.

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**.

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 the good practice measures as detailed for the construction phase would be required on a case-by-case basis. Extensive work at water crossings/adjacent to the water environment may require approval from SEPA under the CAR (depending upon the nature of the activity).

10.6.4.4 Fluvial Flood Risk

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

10.6.4.5 Infrastructure and Man-made Drainage

Operation of the proposed development would require limited activities relative to the construction phase.

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

10.6.5 Decommissioning Effects

Potential decommissioning effects are expected to be the 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.

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**.

10.7 Mitigation

As there are no predicted significant effects under the terms of the EIA Regulations, other than the good practice measures that the developer would implement as standard (and as described above), no additional specific mitigation during construction is required.

It has been recognised in this assessment that a programme of water monitoring would be required prior to any construction activity and during construction of the proposed development. The monitoring programme would be agreed with Scottish Water, SEPA, NatureScot, MC, Marine Science Scotland, and local fisheries boards and it is expected to include monitoring of the watercourses which drain from the Site.

As detailed in **Technical Appendix 10.1: PLHRA**, it is proposed a geotechnical risk register is maintained during the construction and post-construction phase of the proposed development. It is expected that this would be maintained by the developer, and again, secured by an appropriately worded predevelopment condition of consent.

As detailed in **Technical Appendix 10.2: PMP** during and following construction the drainage measures deployed at the Site (temporary and permanent) the works would be subject to routine

inspection by the dedicated Site ECoW and developer. This would be specified in a site-specific CEMP and would be secured by an appropriately worded predevelopment condition of consent.

10.8 Assessment of Cumulative Effects

The following operational and consented wind farms that are within 5km and in the same water catchments as the proposed development include:

- Lurg Hill (consented) in the Deskford Burn surface water catchment;
- Balnamoon (operational) in the Burn of Paithnick surface water catchment;
- Followsters (operational) in the Crooksmill Burn surface water catchment;
- Killiesmont* (operational) in the Crooksmill Burn surface water catchment;
- Linnet Hill* (operational) in the Burn of Aultmore surface water catchment;
- Loanhead* (operational) in the Crooksmill Burn surface water catchment;
- Myreton Crossroads (operational) in the Burn of Paithnick surface water catchment;
- Netherton of Windyhills Grange Crossroads (operational) in the Deskford Burn and Burn of Paithnick surface water catchments;
- Newtack* (operational) in the Burn of Aultmore surface water catchment; and
- Shielmuir* (operational) in the Deskford Burn surface water catchment.

* denotes micro scale turbines i.e. those under 20m in height.

These developments have been developed recently and therefore adopted current industry standard guidelines and be managed in accordance with best practice, industry standards and relevant legislation, planning policy and guidance regulated by statutory consultees. These standards ensure, with respect to soils, geology and the water environment, potential impacts are mitigated and controlled at source.

The magnitude of cumulative impact is therefore considered negligible and the potential effect on identified receptors is **negligible** and **not significant**.

10.9 Summary

An assessment has been carried out of the likely impacts of the proposed development on the hydrological, hydrogeological, geological environment. The assessment has considered site preparation, construction and operation of the proposed development.

The potential effects have considered:

- Peat and soils;
- Pollution Risks;
- Erosion and sedimentation;
- Fluvial Flood Risk
- Infrastructure and Man Made Drainage; and
- Water Abstraction.

Following the identification and assessment of the key receptors, taking into account the potential effects listed above, a comprehensive suite of embedded mitigation and good practice measures has been incorporated into the design, including extensive buffer areas. In addition, a site-specific 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. An outline version of the CEMP supports this application in **Technical**

Appendix 2.1: Outline CEMP which will be built upon as more site-specific information and ground investigation results are provided post-consent.

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 the significance of effects on all receptors to be of no significance. **Table 10.10** summarises the likely significant environmental effects of the proposed development.

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, MC and other engaged stakeholders, will result in a risk that is considered to be not significant in terms of the EIA Regulations.

Table 10.10 Summary of Residual Effects

Potential Effect	Mitigation	Means of Implementation	Residual Effect
Degradation of Peat and Carbon Rich Soils	Mitigation by design and good practice measures	Final CEMP to be submitted for the written approval of MLC, SEPA and NatureScot prior to construction commencing. Geotechnical Risk Register. Implementation of PMP and PLHRA.	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 MLC, SEPA and NatureScot prior to construction commencing. Confirmatory water quality monitoring which will be agreed with Scottish Water, SEPA, NatureScot, MLC, FRT and FDSFB 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 MLC, 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 MLC, SEPA and NatureScot prior to construction commencing.	Not significant

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