Chapter 8

Geology, Peat, Hydrology & Hydrogeology

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8.1 Executive Summary

8.1.1 A combination of desk study and field survey work was undertaken to identify and characterise the geological, hydrological and hydrogeological receptors which could be subject to impacts from construction, operation and decommissioning of the Proposed Development.

8.1.2 The site is located within the catchments of the Glengavel Water and the Greenock Water, the watercourses of the Glengavel Water and the Greenock Water are classified in accordance with the EU Water Framework Directive (WFD) to be of 'Poor' and 'High' overall status respectively in 2023.

8.1.3 The bedrock beneath the northern development area is largely Silurian sedimentary rocks of the Plewland Sandstone Formation and Middlefield Conglomerate Formation of the Dungavel Group. The southern development area is underlain by Devonian and Carboniferous sedimentary formations of the Inverclyde Group in the west, and Silurian sedimentary formations of the Hagshaw Group in the centre and east. Both the northern development area and southern development area are heavily faulted. Superficial deposits comprise largely peat and till, which are typically lower permeability, with alluvium and glaciofluvial deposits present along watercourses. The peatland identified is predominantly Class 5 and Class 4, with isolated areas of Class 1 present within the northern development area, according to NatureScot's Carbon and Peatlands Map, 2016. The southern development area primarily comprises mineral soils, with isolated areas of Class 4 and Class 5 peatland.

8.1.4 Detailed peat depth surveys found extensive deposits of peat within the eastern extent of the northern development area, which have, where possible, been avoided through design iterations. There are limited peat deposits present in the southern development area. The peat depth probing found an average depth across the site of 0.7 m, with 77.4% of probe depths <1.0 m, which is not classified as deep peat.

8.1.5 A Peat Landslide and Hazard Risk Assessment (PLHRA) has identified that there is negligible to low likelihood of a peat landslide at the proposed turbine locations and associated infrastructure.

8.1.6 Potential construction and operational effects include changes to surface water quality and flow, potential impacts to hydrologically connected receptors (designated sites and Private Water Supplies (PWS)), and excavation and removal of peat.

8.1.7 The mitigation measures set out in this chapter will be included within a Construction Environmental Management Plan (CEMP) prior to the commencement of construction activities. An outline CEMP is provided as **Appendix 3.1**. These mitigation measures are considered to be robust and implementable and will reduce the potential impacts on peat, watercourses and groundwater.

8.1.8 Additionally, an area of c. 56 ha of 'forest to bog' peatland restoration is proposed in the Dungavel Forest part of the site, in areas of poor timber growth and deep peat as identified through field surveys.. Restoration works will be undertaken by a qualified and experienced peat restoration contractor with a robust aftercare and monitoring programme to ensure successful establishment. Further information is provided in the outline Habitat Management and Enhancement Plan (HMEP) in **Technical Appendix 7.5**.

8.1.9 The significance of residual effects on geology, peat, hydrology and hydrogeology receptors following the implementation of these mitigation measures ranges from **minor adverse** (**not significant**) to **negligible adverse** (**not significant**).

8.2 Introduction

8.2.1 This chapter assesses the potential impacts of the Proposed Development on hydrological, hydrogeological, and geological resources, including peat. This includes potential impacts on surface watercourses, groundwater, water abstractions, designated receptors and flood risk within the local area.

8.2.2 The specific objectives of the chapter are to:

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

8.2.3 All staff contributing to this chapter have undergraduate and/or postgraduate degrees in relevant subjects, have extensive professional geological and hydrological impact assessment experience, and hold professional membership of the Geological Society or Chartered Institute of Water and Environmental Management.

8.2.4 This chapter is supported by the following figures and Technical Appendices :

- Figure 8.1: Site and Study Area;
- Figure 8.2: Hydrological Features;
- Figure 8.3: Superficial Geology;
- Figure 8.4: Peat Classification;
- Figure 8.5: Peat Depth;
- Figure 8.6: Bedrock Geology;
- Figure 8.7: Hydrogeological Features;
- Figure 8.8: Watercourse Crossings;
- Figure 8.9: Private Water Supplies;
- Figure 8.10: Groundwater Dependent Terrestrial Ecosystems (GWDTE);
- Technical Appendix 8.1: Watercourse Crossing Schedule (WCS);
- Technical Appendix 8.2: Private Water Supply Risk Assessment (PWSRA);
- Technical Appendix 8.3: Groundwater Dependent Terrestrial Ecosystems Risk Assessment (GWDTERA);
- Technical Appendix 8.4: Outline Peat Management Plan (PMP);
- Technical Appendix 8.5: Peat Landslide Hazard Risk Assessment (PLHRA);
- Technical Appendix 8.6: Borrow Pit Appraisal (BPA); and
- Technical Appendix 8.7: Carbon Calculator.

8.3 Legislation, Policy and Guidelines

8.3.1 Relevant legislation and guidance documents have been reviewed and taken into account as part of this assessment.

Legislation

8.3.2 The European Union (EU) Water Framework Directive (WFD) has been implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003. The act introduced a regulatory system with the Scottish Environment Protection Agency (SEPA) as the lead authority, to establish a framework for co-ordinated controls on activities with the potential to negatively impact the water environment. Water monitoring and classification systems are maintained by SEPA to provide the data to support the aim of the WFD.

8.3.3 The European Parliament and of the Council (EC) Groundwater Directive (GWD) is implemented in Scotland through the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) (as amended).

8.3.4 Other relevant legislation includes:

- The Water Environment (Controlled Activities) (Scotland) Amended 2021;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Water Resources (Scotland) Act 2013;
- The Private Water Supplies (Scotland) Regulations 2006, amended 2015;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017;
- Flood Risk Management (Scotland) Act 2009;
- The Conservation (Natural Habitats, & c.) Amendment (Scotland) Regulations 2019;
- Environmental Protection Act 1990;
- Environment Act 1995; (EU Exit) (Scotland) (Amendment etc.) Regulations 2019;
- The Contaminated Land (Scotland) Regulations 2000 (as amended 2005); and
- The Conservation (Natural Habitats, & c.) Regulations 1994, (as amended in Scotland 2019).

Planning Policy

8.3.5 The Planning Statement associated with this Section 36 application sets out the planning policy framework that is relevant to the environmental impact assessment (EIA).

8.3.6 Local strategies are considered within the South Lanarkshire Local Development Plan 2 (SLLDP2) and the East Ayrshire Local Development Plan 2 (EALDP2), which set out policies on development and land use within respective council areas.

8.3.7 This section considers the relevant aspects of National Planning Framework 4 (NPF4), Planning Advice Notes (PAN), SLLDP2 and EALDP2, and other relevant guidance. Of relevance to the geology, hydrology and peat assessment presented within this chapter are the following policies and advice notes:

- NPF4: Policy 5 Soils;
- NPF4: Policy 22 Flood Risk and Water Management ;
- NPF4: Policy 33 Minerals
- PAN 51: Planning, Environmental Protection and Regulation (Scottish Executive, 2006);
- PAN 79: Water and Drainage (Scottish Executive, 2006); and
- Flood Risk: Planning Advice (Scottish Government, 2015).
- SLLDP2: Policy 2 Climate Change;
- SLLDP2: Policy 5 Development Management and Placemaking;

- SLLDP2: Policy 14 Natural and Historic Environment;
- SLLDP2: Policy 16 Water Environment and Flooding;
- SLLDP2: Policy 17 Waste;
- SLLDP2: Policy 18 Renewable Energy;
- SLLDP2: Policy SDCC2 Flood Risk;
- SLLDP2: Policy SDCC3 Sustainable Drainage Systems;
- SLLDP2: Policy NHE8 National Nature Reserves and Sites of Special Scientific Interest;
- SLLDP2: Policy NHE10 Prime Agricultural Land;
- SLLDP2: Policy NHE11 Peatland and Carbon Rich Soils;
- SLLDP2: Policy NHE12 Water Environment and Biodiversity;
- SLLDP2: Policy NHE21 Geodiversity;
- SLLDP2: Policy RE1 Renewable Energy;
- EALDP2: Policy SS1 Climate Change;
- EALDP2: Policy NE5 Protection of Areas of Nature Conservation Interest;
- EALDP2: Policy NE7 Geodiversity and Geological Interest;
- EALDP2: Policy NE10: Protection of Agricultural Land;
- EALDP2: Policy NE11: Soils;
- EALDP2: Policy NE12: Water, air, light and noise pollution;
- EALDP2: Policy NE13: Contaminated Land;
- EALDP2: Policy RE1: Renewable Energy;
- EALDP2: Policy MIN7: Borrow pits; and
- EALDP2: Policy CR1: Flood Risk Management.

Guidance

8.3.8 The Guidance for Pollution Prevention (GPPs) series provide guidance on responsibilities and good practice to prevent pollution from a range of development activities. SEPA's environmental regulatory guidance applies to Scotland. Recognisance has been taken of the following best practice guidelines/guidance etc:

- GPP1: Understanding your environmental responsibilities – good environmental practices (2021);
- GPP2: Above ground oil storage tanks (2021);
- GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (2021);
- GPP5: Works and maintenance in or near water (2018);
- GPP6: Working at construction and demolition sites (2023);
- GPP8: Safe storage and disposal of used oils (2021);
- GPP13: Vehicle washing and cleaning (2021);

- GPP21: Pollution incident response planning (2021); and
- GPP22: Dealing with spills (2018).

8.3.9 The following relevant guidance from SEPA has been considered as part of the assessment of geology, peat, hydrology and hydrogeology:

- Land Use Planning System Guidance Note 31 (LUPS-GU31) Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (SEPA, 2017);
- Land Use Planning System Guidance Note 2a (LUPS-DM-GU2a) Development Management Guidance on Flood Risk (SEPA, 2018);
- Guidance on Assessing the Impacts of Developments on Groundwater Dependent Terrestrial Ecosystems (SEPA, 2024);
- Guidance on Assessing the Impacts of Developments on Groundwater Abstractions (SEPA, 2024);
- Supporting Guidance (WAT-SG-75) Sector Specific Guidance: Water Run-Off from Construction Sites (SEPA, 2021);
- Technical Flood Risk Guidance for Stakeholders, Version 13 (SEPA, 2022);
- Developments on Peat and Off-Site Uses of Waste Peat (SEPA, 2017);
- Guidance on Developments on Peatland (Scottish Government, SNH and SEPA, 2017);
- Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (Scottish Renewables and SEPA, 2012); and
- Groundwater Protection Policy for Scotland, Version 3 (SEPA, 2009).

8.3.10 The following relevant guidance has also been considered:

- CIRIA C532: 'Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors' (CIRIA, 2001);
- CIRIA C811: Environmental Good Practice on Site guide (Fifth edition) (CIRIA 2021);
- Good Practice During Wind Farm Construction, Fifth edition (NatureScot, 2024);
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (ECU Scottish Government, 2017);
- The Scottish Soil Framework (Scottish Government, 2009);
- Advising on Peatland, Carbon-Rich Soils and Priority Peatland Habitats in Development Management (NatureScot, 2023); and
- BS 5930:2015+A1:2020 Code of practice for ground investigations (British Standards Institute, 2020).

8.4 Consultation

8.4.1 **Table 8.1** provides details of consultations undertaken with regulatory bodies, together with action undertaken by the Applicant in response to consultation feedback.

Table 8.1 – Consultation Relevant to Geology, Peat, Hydrology and Hydrogeology

Consultee	Key-Consultee Comments	Applicant Action
Mining Remediation Authority (Coal Mining Authority) Scoping Update Response 05 March 2024	Our records do not indicate the presence of any coal mining features at surface or shallow depth in the area identified above by the updated red line boundary. The authors of the revised Scoping Report state that while coal bearing bedrocks are present in the surrounding area, and correspond with a Development High Risk Area, these are not present underlying the Proposed Development site. On this basis further consideration of the potential risks posed by recorded coal mining features, on the site identified by the updated red line boundary, will not be necessary.	A review of desk-based resources was undertaken to identify any coal mining reporting areas within the site boundary. As noted by the Mining Remediation Authority there are no coal mining features within the site and the site is not located within a Development High Risk Area. Details regarding this are outlined in **Section 8.6.**
Scottish Water Scoping Update Response 06 March 2024	A review of our records indicates that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the Proposed Development.	A review of desk-based resources was undertaken to identify any Drinking Water Protected Areas (DWPAs), and as noted by Scottish Water, none were recorded. Details regarding public water supplies are outlined in **Section 8.6.**
East Ayrshire Council Scoping Response 25 October 2022	Any potential for the release of water from peat excavation should be considered as a potential cause of flooding. There is some flood risk in various locations throughout the site based on SEPA's flood mapping, though the nature of this is likely to be capable of being avoided through appropriate siting and design.	The outline CEMP (**Technical Appendix 3.1**) and **Section 8.9** provide information on best practice measures for design and management of surface water drainage. The outline CEMP also includes best practice measures with regards to peat and soil management, including excavating, rewetting and stockpiling. Specific measures relating to peat excavation are also outlined within the outline Peat Management Plan (PMP) (**Technical Appendix 8.4**). Information on the limited flood risk found on-site is detailed in **Section 8.6**.
	The EIA Report should include information on the location, size and nature of these borrow pits, including details of the depth of the borrow pit floor and an indicative borrow pit final reinstated profile. The impact of such features (including dust, blasting and impacts on hydrology) should be appraised as part of the overall impact of the proposal. Information on the proposed depth of excavations compared to the actual topography, the proposed restoration profile, proposed drainage and settlement traps, turf and overburden removal and storage for reinstatement should be included within the EIA Report. The Council's Minerals Local Development	The Borrow Pit Appraisal (**Technical Appendix 8.6**) includes an overview of mining and quarrying close to the site, aggregate requirements and quality for all potential borrow pits, including an overview of borrow pit design and suitable environmental management during excavation and restoration of borrow pits. Review of the EALDP2 has been undertaken, including Policy MIN7 regarding borrow pits.

Consultee	Key-Consultee Comments	Applicant Action
	Plan includes a policy on borrow pits and information to address the requirements set out within that policy should form part of the EIA Report.	
	The relevant fisheries boards should be consulted to discuss their expectations and requirements regarding the extent of hydrological assessment required to inform the assessment of hydrological impacts, including water quality impacts / monitoring, which also links to the potential ecological impacts on aquatic life.	A response from Fisheries Management Scotland (FMS) was received in 2024 to the most recent Scoping request. The assessment has been undertaken in line with FMS and Marine Scotland Science (MSS) guidance, and consultation will be undertaken with Ayr District Salmon Fishery Board prior to construction to confirm approach to any required monitoring.
	Private Water Supplies (PWS) if it is found that any such PWS are located within the study area or likely to be drawing from the same catchment as proposed infrastructure is located, then these PWS will require to be risk assessed. It is expected that the PWS Risk Assessment be undertaken and not only the PWS source should be identified, but also the pathway from source to receptor / PWS user should be mapped as this is the only way of ensuring that a full understanding of any potential impacts of proposed infrastructure / construction activity can be ascertained. Details of any mitigation and/or contingency measures that may be required should be detailed within the EIA Report. The Council's Environmental Health Service should be contacted to assist in the identification of any PWS in and around the site, though site investigations will also be required to address any risk where a PWS exists which is not up to date on the Council's record. It would also be appropriate to contact relevant neighbouring authorities with respect to any potential PWS in their area or sourced from within / with a pathway through the application site.	A FOI request was submitted to South Lanarkshire Council (SLC) and East Ayrshire Council (EAC) for records of PWS located within a study area of 2 km from the site. Following this a desk-based review of AddressBase data and OS maps was undertaken to identify any additional properties that may not be on the council record. Identified properties were scoped into consultation with residents to confirm PWS supply type and location. This is outlined within Private Water Supply Risk Assessment (PWSRA) **Technical Appendix 8.2**. Following consultation, fourteen PWS were identified and confirmed, as shown in **Figure 8.9**. Of these, three were scoped into further risk assessment, which includes a detailed assessment of any potential impacts from the Proposed Development.
	The application site features areas identified within the Coal Authority Mining Risk Assessment and the Coal Authority should be consulted to ascertain the scope of methodology and assessment required to address any potential risks for reporting in the EIA Report. The Planning Authority would also rely on detailed comments on such matters from NatureScot, SEPA and the Scottish Government's advisors on peat, Ironside Farrar Ltd. These bodies would be able to advise further on the appropriateness of the methodologies reported.	A review of the Mining Remediation Authority (Coal Authority) Map Viewer (**Section 8.6.**) shows that the southern development area is partly located within a Coal Mining Reporting Area. As noted within the Scoping Opinion response from the Mining Remediation Authority, there are no coal mining features within the site, and the site is not located within a Development High Risk Area.

Consultee	Key-Consultee Comments	Applicant Action
East Ayrshire Council Scoping Update Response 13 March 2024	The Planning Authority would note that NPF4 now has Policy 33 for Minerals with specific reference to borrow pits and the matters that will need to be assessed / considered in such proposals. The Applicant is advised to take this into account.	As outlined in **Section 8.3,** NPF4 Policy 33 Minerals has been used to inform this assessment, including the Borrow Pit Appraisal (**Technical Appendix 8.7**).
NatureScot Scoping Response 15 November 2022	Large parts of the site are mapped as 'Class 1' on the Carbon & Peatland Map 2016. We welcome that the applicant has undertaken Phase 1 peat probing at the site and will supplement the information gained from this through more detailed Phase 2 probing carried out in accordance with current best practice guidelines, extended National Vegetation Classification survey and an assessment of blanket bog condition. We recommend early engagement with SEPA with regard to proposals for excavated peat reuse and disposal. The final siting and design of the proposed development and how this may affect peatland, including a supporting habitat for Special Protection Area (SPA) qualifying interests and as a notified Site of Special Scientific Interest (SSSI) feature, must be fully described and assessed in the EIA report.	Noted, a review of the Carbon & Peatland Map 2016 has been undertaken and outlined in **Section 8.6**. Additional peat depth surveys have been undertaken as outlined in **Section 8.5**, with ongoing consultation with SEPA informing design iterations and the outline PMP. An assessment of hydrologically connected designated sites is also included in **Section 8.6**.
NatureScot Scoping Update Response 20 March 2024	The findings from work undertaken to date, including Phase 1 and Phase 2 peat survey and National Vegetation Classification survey, should be used to inform the iterative evolution of the layout and design of the Proposed Development. The final siting and design of the Proposed Development, how this will affect peatland and how compliance with the mitigation hierarchy detailed in NPF4 has been achieved must be fully described and assessed in the EIA Report.	**Chapter 3** of this EIAR outlines the design iteration process and how peat surveys have informed this. This includes an iterative process with regular consultation with SEPA and NatureScot on changes, informed by NPF4.
	The Applicant should refer to our updated standard pre-application guidance and our specific guidance on Advising on peatland, carbon-rich soils and priority peatland habitats on development management for our standing advice.	Noted, as outlined in **Section 8.3,** NatureScot specific guidance has been used to inform this assessment.
	Development should endeavour to avoid undoing previous restoration, compensation or enhancement work where possible, and new habitat management proposals should seek to build on existing management commitments.	Noted, peat surveys have informed the design iteration process, as outlined in **Chapter 3**. Strategies within the Habitat Management and Enhancement Plan (HMEP) will seek to follow on from previous restoration work where practicable. Refer to the outline HMEP in **Technical Appendix 7.5**.

Consultee	Key-Consultee Comments	Applicant Action
SEPA Scoping Response 07 November 2022	Based on the phase 1 peat probing (fig 10.4) there appears to be deep peat across much of the site. All peat above 1 meter (m) depth is considered deep peat and all reasonable efforts must be made to avoid both pristine, near-natural peatland and > 1 m deep peat. In this case, where much of the site is on peat, we expect the application to be supported by a comprehensive site-specific Peat Management Plan.	Noted, a review of desk-based information and peat depth surveys was undertaken to determine areas of peat and deep peat in accordance with guidance. Specific measures relating to peat excavation are also outlined within the outline PMP (**Technical Appendix 8.4**).
	We note that, following the "design chill", phase 2 peat probing will be undertaken. We would welcome the opportunity to engage on this as the layout and design progresses, to avoid delay and potential objection at a later stage. In this case, we would recommend the developer consider widening the phase 2 peat probing to include the micrositing tolerance as this may be helpful in demonstrating that the impacts on peat have been minimised.	Peat depth surveys have been undertaken as outlined in **Section 8.5**. This has included widening the area of peat depth probing around areas of Proposed Development infrastructure. Regular consultation has been undertaken with SEPA regarding design iterations.
	In terms of restoration, as set out above, avoidance must be considered as the first principle. We note in section 10.2.4 that reference is made to peatland restoration that has already been carried out. The restored area must be avoided. If additional restoration is required, we would expect the area of restoration to more than compensate for area lost.	Areas of previously restored peatland have been avoided through design iterations. The excavation and reuse of peat proposed is outlined within the outline PMP. Areas of additional peatland restoration are outlined within the outline HMEP (**Technical Appendix 7.5**).
	The site is partially situated on or near designated areas including for blanket bog. It is proposed to scope in GWDTEs into the EIA, which we agree with. A map should be included in the EIA report, showing GWDTE with all proposed infrastructure overlaid.	An assessment of potential GWDTEs, is included in **Technical Appendix 8.3**. Potential GWDTEs with the Proposed Development infrastructure is included in **Figure 8.10**.
	A significant proportion of the site drains to important spawning tributaries on the River Ayr and Douglas Water catchments. The sites are generally boggy, wet and poorly drained, we would therefore highlight there is the potential for water quality impacts from the construction works. Given the sensitivities of the catchment area as a whole, we would recommend that monitoring probes are installed to monitor water quality during construction and detailed baseline water quality/fisheries data is obtained in advance of construction commencing.	An assessment of potential impacts to water quality within the study area is included in **Section 8.8**. It is proposed to undertake water quality monitoring during pre-construction, construction and post-construction phases of the Proposed Development. Prior to construction the requirement for any electrofishing and macroinvertebrate surveys will be confirmed.
	All infrastructure (except watercourse crossings and tracks leading up to them) should be at least 50 m from the top of the banks of watercourses, including smaller scale watercourses. If infrastructure is proposed to be located within the 50 m	Noted, this 50 m watercourse buffer has been included as part of embedded mitigation, outlined in **Section 8.7**. Infrastructure is largely located outwith these embedded

Consultee	Key-Consultee Comments	Applicant Action
	watercourse buffer (including small scale watercourses) then we would expect detailed design and robust mitigation information to be provided and agreed prior to any development commencing on site.	buffers, excepting temporary construction compound, part of the temporary hardstanding of T7, and parts of the access tracks to T4, T9, and T17. Embedded mitigation measures to ensure appropriate protection of watercourses during construction are discussed in **Section 8.7** and **Paragraph 8.8.2**. Solar PV modules, due to their limited impact, have been sited outwith 10 m from surface watercourses.
	The watercourse crossings should be appropriate to the watercourse sensitivity but oversized bottomless arched culverts or traditional style bridges should be installed where migratory fish populations are present.	Noted, an overview of identified watercourse crossings is outlined in **Technical Appendix 8.1**.
	If former surface mine backfill is identified on the site (to be clarified at EIAR) then we will recommend additional mitigation measures should be outlined in a CEMP. These are required to prevent potential water quality impacts from backfill leachates or run-off derived from excavated backfill material. Although stabilisation of any mine workings on site is not currently proposed in the Scoping Report, as it is reported that there may be past mining on the site, The developer should refer to Appendix 2 of this letter relating to stabilisation of mine workings with PFA grouts	Noted, as outlined within **Section 8.6** and consultation with the Mining Remediation Authority, historical mine workings are not predicted on-site. If surface mine backfill or mine workings are identified during Ground Investigation (GI) works prior to construction, then these will be investigated further.
SEPA Scoping Update Response 27 March 2024	The indicative location of the 4 turbines newly positioned in the northwest of Dungavel Forest appear to be on 0.5 – 1 m depth peat, where there appear to be shallower peaty soils nearby. Where there is scope to do so, design amendments to move these turbines onto shallower peat should be implemented to minimise peat disturbance as much as possible. The locations of turbines in the east and south of the Dungavel Forest area where the peat depths appear to be greater than 1 metre should be reviewed. The locations of the borrow pits should also be reviewed to reduce peat depth affected – in particular the location to the east of the Dungavel Forest. Where the track crosses deeper peat seek to amend the layout to reduce the depth of peat affected, or adopt floating construction methods; for example, between T19 and T25, in the vicinity of T21 and of T23. We would recommend the developer consider widening the phase 2 peat probing to include the micrositing	Extensive detailed phase 2 peat depth surveys have been undertaken across the site which has informed the design iteration process outlined in **Chapter 3**. This iterative design process included careful consideration of peat depth when siting turbines and other infrastructure. The Proposed Development underlain by peat depth is shown in **Figure 8.5**, which demonstrates that peat depths between 0.5 m to 1.0 m have been avoided where practicable. The outline PMP (**Technical Appendix 8.4**) details an assessment of impact on peat and carbon rich soils and

Consultee	Key-Consultee Comments	Applicant Action
	tolerance as this may be helpful in demonstrating that the impacts on peat have been minimised.	includes excavation volumes, temporary storage and re-use methods.
	In terms of restoration, as set out above, avoidance must be considered as the first principle. Incursion of infrastructure into previously restored peatland areas must be minimised. Despite discussions regarding this at the April 2023 meeting, the proposed habitat management area in Dungavel Forest has not been modified to include the greatest depth of the peat deposit in the area. The EIA report must include explanation of the rationale for the habitat management area site location and extent. The submission should also consider how to mitigate the effects in the habitat management area due to drainage and forestry on the underlying peat which is adjacent to and continuous with the habitat management area. The provided habitat mapping is sufficient for scoping stage; however, we will expect this to be updated after felling has taken place and as additional information on likely groundwater dependency of wetlands becomes available. This must include further ecological detail in the habitat management area of Dungavel Forest and must include full coverage of the habitat management area to the west of the Netherwood southern development area.	Noted, the outline HMEP (**Technical Appendix 7.5**) provides proposed measures and mitigation to enhance the condition and extent of habitats on-site, including peatland habitats. The proposed areas have been modified slightly within Dungavel Forest due to some of these areas (*e.g*. the area of deeper peat) being part of the Dungavel Wind Farm HMP committed areas, and also were found to have viable commercial crop present. These further areas were therefore not included within the forest-to-bog proposals. The outline HMEP (**Technical Appendix 7.5**) currently proposes a restoration area more than 10 times the anticipated area of impact on peatland habitats.
	The site layout should be designed to minimise watercourse crossings and avoid other direct impacts on water features. The submission must include a map showing: a. All proposed temporary or permanent infrastructure overlain with all lochs and watercourses. b. A minimum buffer of 50m around each loch or watercourse. If this minimum buffer cannot be achieved each breach must be numbered on a plan with an associated photograph of the location, dimensions of the loch or watercourse and drawings of what is proposed in terms of engineering works. Measures should be put in place to protect any downstream sensitive receptor. Crossings must be designed to accommodate the 0.5% Annual Exceedance Probability flows (with an appropriate allowance for climate change), or information provided to justify smaller structures. If it is considered the Proposed Development could result in an increased risk of flooding to a nearby receptor then a Flood Risk Assessment (FRA) must be submitted.	**Section 8.7** of this EIAR details embedded mitigation, this includes maintaining a 50 m buffer around all surface watercourses and waterbodies identified in OS 1:25k mapping, except where tracks are required to cross watercourses and solar PV modules, as shown in **Figure 8.2.** The WCS (**Technical Appendix 8.1**) outlines proposed watercourse crossing locations, crossing types and photographs of watercourses. Watercourse crossings have been designed to maintain hydrological connectivity following relevant guidance. At detailed design stages these crossing types will be confirmed and designed to accommodate 0.5% AEP flows. Information on the limited flood risk found on-site is detailed in **Section 8.6**.

Consultee	Key-Consultee Comments	Applicant Action
	Where proposals are on peatland or carbon rich soils the following should be submitted to address the requirements of NPF4 Policy 5: a. layout plans showing all permanent and temporary infrastructure, with extent of excavation required, which clearly demonstrates how the mitigation hierarchy outlined in NPF4 has been applied. These plans should be overlaid on: i. peat depth survey (showing peat probe locations, colour coded using distinct colours for each depth category and annotated at a usable scale); ii. peat depth survey showing interpolated peat depths; iii. peatland condition mapping; iv. National Vegetation Classification survey (NVC) habitat mapping. b. an outline Peat Management Plan (PMP); c. an outline Habitat Management Plan (HMP) In order to protect peatland and limit carbon emissions from carbon rich soils, the submission should demonstrate that proposals: • Avoid peatland in near natural condition, as this has the lowest greenhouse gas emissions of all peatland condition categories; • Minimise the total area and volume of peat disturbance. Clearly demonstrate how the infrastructure layout design has targeted areas where carbon rich soils are absent or the shallowest peat reasonably practicable. Avoid peat > 1m depth; • Minimise impact on local hydrology; and • Include adequate peat probing information to inform the site layout and demonstrate that the above has been achieved.	A detailed peat depth survey has been undertaken in line with guidance outlined within NPF4 with assessment methodology detailed in **Section 8.5**. The interpolation results of the peat depth survey are shown in, **Figure 8.5** with all permanent and temporary infrastructure overlain. A NVC survey was undertaken and results of this are outlined within **Technical Appendix 7.1** and **Figure 7.3**. The outline PMP (**Technical Appendix 8.4**) details an assessment of impact on peat and carbon rich soils and includes excavation volumes, temporary storage and re-use methods. An outline HMEP (**Technical Appendix 7.5**) details proposed measures and mitigation to enhance the condition and extent of habitats on-site, including peatland habitats.
	The Peatland Condition Assessment photographic guide lists the criteria for each condition category and illustrates how to identify each condition category. This should be used to identify peatland in near natural condition and can be helpful in identifying areas where peatland restoration could be carried out. In line with the requirements of Policy 5d of NPF4, the development proposal should include plans to restore and/or enhance the site into a functioning peatland system capable of achieving carbon sequestration	A detailed peat depth survey has been undertaken in line with guidance outlined within NPF4 with assessment methodology detailed in **Section 8.5**. An outline HMEP (**Technical Appendix 7.5**) details proposed measures and mitigation to enhance the condition and extent of habitats on-site, including peatland habitats.

Consultee	Key-Consultee Comments	Applicant Action
	In line with the requirements of Policy 5d of NPF4, the development proposal should include plans to restore and/or enhance the site into a functioning peatland system capable of achieving carbon sequestration. b. The outline PMP should also include: • Information on peatland condition; • Information demonstrating avoidance and minimisation of peat disturbance; • Excavation volumes of acrotelmic, catotelmic and amorphous peat. These should include a contingency factor to consider variables such as bulking and uncertainties in the estimation of peat volumes; • Proposals for temporary storage and handling; • Reuse volumes in different elements of site reinstatement and restoration	The outline PMP (**Technical Appendix 8.4**) details an assessment of impact on peat and carbon rich soils and includes excavation volumes, temporary storage and re-use methods. An outline HMEP (**Technical Appendix 7.5**) details proposed measures and mitigation to enhance the condition and extent of habitats on-site, including peatland habitats.
	Handling and temporary storage of peat should be minimised. Catotelmic peat should be kept wet, covered by vegetated turves and re-used in its final location immediately after excavation. It is not suitable for use in verge reinstatement, re-profiling/landscaping, spreading, mixing with Mineral soils or use in bunds. Disposal of peat is not acceptable. It should be clearly demonstrated that all peat disturbed by the development can be used in site reinstatement (making good areas which have been disturbed by the development) or peatland restoration (using disturbed peat for habitat restoration or improvement works in areas not directly impacted by the Proposed Development, which may need to include locations outwith the development boundary). The faces of cut batters, especially in peat over 1m, should be sealed to reduce water loss of the surrounding peat habitats, which will lead to indirect loss of habitat and release of greenhouse gases. This may be achieved by compression of the peat to create an impermeable subsurface barrier, or where slope angle is sufficiently low, by revegetation of the cut surface.	The outline PMP (**Technical Appendix 8.4**) details an assessment of impact on peat and carbon rich soils and includes excavation volumes, temporary storage and re-use methods. These also include measures for best practice temporary storage and handling of peat, in addition to slope angle of cut batters in peat. The outline PMP has been written in accordance with requirements outlined within NPF4.
	The outline HMP should include: • Proposals for reuse of disturbed peat in habitat restoration, if relevant; • Details of restoration to compensate for the area of peatland habitat directly and indirectly impacted by the Proposed Development;	The outline HMEP (**Technical Appendix 7.5**) details proposed measures and mitigation to enhance the condition and extent of habitats on-site, including peatland habitats. This will include proposals for peatland

Consultee	Key-Consultee Comments	Applicant Action
	• Outline proposals for peatland enhancement in other areas of the site; • Monitoring proposals.	enhancement and the efficacy of restoration measures will be judged through proposed monitoring.
	To support the principle of peat reuse in restoration the applicant should demonstrate that they have identified locations where the addition of excavated peat will enhance the wider site into a functional peatland system capable of achieving carbon sequestration. The following information is required: • Location plan of the proposed peatland re-use restoration area(s), clearly showing the size of individual areas and the total area to be restored; • Photographs, aerial imagery, or surveys to demonstrate that the area identified is appropriate for peat re-use and can support carbon sequestration. This should include consideration of an appropriate hydrological setting and baseline peatland condition. In addition, if any proposed re-use restoration areas are outwith the ownership of the applicant, information should be provided to demonstrate agreement in principle with the landowner, including agreed timescales for commencement of the works, and proposed management measures to ensure the restored areas can be safeguarded in perpetuity as a peatland.	Reuse of peat onsite has been identified as part of the outline PMP (**Technical Appendix 8.4**). The outline PMP includes a plan of proposed restoration areas and photographs of identified areas.
	Excavations and other construction works can disrupt groundwater flow and impact on GWDTE and existing groundwater abstractions. The layout and design of the development must avoid impacts on such areas. A National Vegetation Classification survey which includes the following information should be submitted: a. A map demonstrating all GWDTE and existing groundwater abstractions are outwith a 100m radius of all excavations shallower than 1m and outwith 250m of all excavations deeper than 1m and proposed groundwater abstractions. The survey needs to extend beyond the site boundary where the distances require it. b. If the minimum buffers cannot be achieved, a detailed site specific qualitative and/or quantitative risk assessment will be required.	A detailed NVC survey was completed as outlined in **Chapter 7** and **Technical Appendix 7.1**. Following this, all potential GWDTE identified were assessed using a combination of desk-based assessment and hydrological surveys to determine groundwater dependency and potential impact. **Technical Appendix 8.3** and, additionally, **Figure 8.10** detail all GWDTEs scoped into the assessment overlain with the Proposed Development and relevant excavation buffers.

Consultee	Key-Consultee Comments	Applicant Action
	If forestry is present on the site, we prefer a site layout which avoids large scale felling as this can result in large amounts of waste material and a peak in release of nutrients which can affect local water quality.	Design iterations and micrositing have where possible, resulted in existing infrastructure being used, such as tracks, to minimise impact on forestry to avoid the need for felling. The site is located within an area of commercial forestry with felling being undertaken as part of the land use baseline. Assessment of potential impacts to water quality from felling is undertaken in **Section 8.8**.
	The following information should also be submitted for each borrow pit: a. A map showing the location, size, depths and dimensions; b. A map showing any stocks of rock, overburden, soils and temporary and permanent infrastructure including tracks, buildings, oil storage, pipes and drainage, overlain with all lochs and watercourses to a distance of 250 m. You need to demonstrate that a site-specific proportionate buffer can be achieved. On this map, a site-specific buffer must be drawn around each loch or watercourse proportionate to the depth of excavations and at least 10 m from access tracks; c. Sections and plans detailing how restoration will be progressed including the phasing, profiles, depths and types of material to be used.	The Borrow Pit Appraisal (**Technical Appendix 8.6**) includes an overview of mining and quarrying close to the site, aggregate requirements and quality for all potential borrow pits, including an overview of borrow pit design and how this will reduce potential impacts of receptors such as surface and groundwater.
	A schedule of mitigation supported by the above site-specific maps and plans must be submitted. These must include reference to best practice pollution prevention and construction techniques (for example, limiting the maximum area to be stripped of soils at any one time) and regulatory requirements. They should set out the daily responsibilities of Ecological Clerk of Works, how site inspections will be recorded and acted upon and proposals for a planning monitoring enforcement officer. Please refer to the Guidance for Pollution Prevention (GPPs) and our water run-off from construction sites webpage for more information.	**Chapter 16** provides a schedule of mitigation. Additionally, as part of this EIA Report, an outline CEMP has been included (**Technical Appendix 3.1**) which details all best practice guidance and mitigation measures that will be employed on-site to protect sensitive receptors. This has included reference to GPPs. The outline CEMP also summarises a proposed programme of water quality monitoring and works that will be inspected by the on-site Environmental Clerk of Works (EnvCoW).
South Lanarkshire Council Scoping Response	Should the design be unable to completely avoid areas of peat, a site-specific Stage 1 PMP would be prepared to assess the potential volumes of peat excavation required and identify opportunities for re-use.	The design of the proposed development has been iterative, to avoid areas of peat as far as practicable. Potential excavation and re-use of peat on-site is included in the outline PMP, **Technical Appendix 8.4**.

Consultee	Key-Consultee Comments	Applicant Action
30 January 2023	The Council's Developer Design Guidance: Flood Risk Assessments and Sustainable Drainage Systems (May 2020) highlights requirements in respect of Flood Risk Assessment and Drainage Strategy. The Council's Flood Risk Management Team would be able to provide advice on their requirements for information in support of the current application, including proposals for future maintenance access and responsibilities. Notwithstanding the above comments, any works associated with formation of the site access off the B743 shall be designed to prevent surface water discharging onto the public road. This can be examined as the detail comes forward.	An assessment of potential flood risk in the study area is outlined in **Section 8.6**. Detailed design of surface water drainage will be undertaken prior to construction, and will account for prevention of surface water discharge onto the public road B743.
Fisheries Management Scotland Scoping Response 07 March 2024	The Proposed Development falls within the district of the Ayr District Salmon Fishery Board (DSFB), and the catchment relating to the Ayrshire Rivers Trust and Clyde River Foundation. It is important that the proposals are conducted in full consultation with these organisations. We have also copied this response to these organisations. Due to the potential for such developments to impact on migratory fish species and the fisheries they support, FMS have developed, in conjunction with MSS, advice for DSFBs and Trusts in dealing with planning applications. We would strongly recommend that these guidelines are fully considered throughout the planning, construction and monitoring phases of the proposed development.	The assessment of potential impacts to water quality and quantity is undertaken in **Section 8.8**. An assessment of hydrologically connected designated sites, which have potential to be impacted has also been included, which include fish as designated features. A detailed ecological assessment of fish is undertaken in **Chapter 7**. Prior to construction, in accordance with FMS and MSS guidance, the requirement for electrofishing and macroinvertebrate monitoring for the pre-construction, construction and post-construction phases of the Proposed Development will be confirmed with Ayr DSFB, Ayrshire Rivers Trust and Clyde River Foundation.
SEPA Consultation Meeting 25 April 2023	An overview was provided on surveys undertaken on-site, including phase 1peat depth surveys. The iterative design layout avoided deep peat across the site where practicable with few exceptions. Further work planned included phase 1 & 2 peat depth surveys, peat coring to assess condition and micro-siting of infrastructure in line with findings. SEPA noted some areas of the layout raised queries, with infrastructure sited on areas of deeper peat where there were shallower areas nearby. These are examples where SEPA would question the layout design and require further information as to the reasoning behind the design.	It was discussed that these areas would be reviewed against the other constraints at the site and amended where possible to shallower areas. It is also noted that the current peat map was based only on the phase 1 survey grid and that the phase 2 surveys would present a clearer picture of the peat depths in and around the proposed infrastructure footprint. The team would then look to micro-site the design to avoid the deepest areas of peat. This further survey work and consideration of findings in design iteration work was then undertaken, as discussed in **Chapter 2**.

Consultee	Key-Consultee Comments	Applicant Action
	SEPA noted that it would be useful to see the site condition assessment, particularly across the Peatland Action areas to see what improvements/changes there have been in the area.	
SEPA Consultation Meeting 25 July 2024	SEPA commented on the Proposed Development layout, including locations of several turbines, a borrow pit, and some access track sections. SEPA noted that expectations are for peat probing to be done according to their guidance on the layout presented within any application.	Noted that the Proposed Development design takes account of recorded peat depth together with other environmental constraints limiting design, including slope, watercourses and the committed Dungavel Wind Farm Habitat Management Areas. Following comments from SEPA, further design iterations were undertaken to accommodate proposed amendments where practicable. It was noted that extensive peat probing across the site had already been undertaken but some further probes may be required where final amendments to the design were being made. It was noted that this would be done where practicable, given the terrain and dense conifer plantation forestry, with justification provided for any deviations. Additional peat survey work was subsequently undertaken as outlined in **Section 8.5**, and taken into account in design iteration.
	SEPA were consulted regarding appropriate buffer distances required between Private Water Supplies (PWS) and solar PV modules with piling foundations. Following the meeting SEPA advised that within final draft 'Guidance on Assessing the Impacts of Developments on Groundwater Abstractions' piling would fall under stage 1a) 'all activities' which would require a 10 m buffer, with works to be compliant with GBR16 of Controlled Activities Regulations (CAR).	Issued guidance note 'Guidance on Assessing the Impacts of Developments on Groundwater Abstractions' has been reviewed with all solar PV modules located outwith 10 m from PWS sources, as outlined within **Technical Appendix 8.2**.

8.5 Assessment Methodology and Significance Criteria

Study Area

8.5.1 The study area for assessment of hydrological and hydrogeological receptors, including designated sites with hydrological reasons for designation (**Figure 8.1**), incorporates the area within the site and up to 10 km from the site boundary. Potential effects to PWS are considered within 2 km from the site. The study area for assessment of geological receptors is the site itself.

8.5.2 These study areas are based on professional judgement and experience assessing similar developments, with due consideration of relevant guidance on hydrological and geological assessment. It is considered that in excess of these distances due to attenuation and dilution, the Proposed Development is unlikely to have an effect.

Desk Study

8.5.3 Baseline conditions have been established primarily through desk-based assessment which has included:

- consultation with relevant bodies and collation of data;
- identification of surface watercourses and waterbodies, including WFD classifications;
- identification of hydrogeological receptors, including aquifers;
- identification of underlying bedrock and superficial geology, including assessment of peat depth contours;
- assessment of topography, land use and climate conditions to inform drainage patterns;
- identification of any PWS and DWPAs;
- identification of potential GWDTEs, including review of NVC survey data; and
- assessment of flood risk.

8.5.4 The following information sources have been reviewed to inform the desk study:

- The Ordnance Survey (OS) Mapping (1:50,000 and 1:25,000);
- British Geological Survey (BGS) GeoIndex Online Map Viewer;
- BGS Geological Survey of Scotland 23 Hamilton 1979 Solid Map (1:63,360);
- BGS Geological Survey of Scotland 23 Hamilton 1951 Drift Map (1:63,360);
- BGS Geological Survey of Scotland 15 Sanquhar 1976 Solid Map (1:63,360);
- BGS Geological Survey of Scotland 15 Sanquhar 1950 Drift Map (1:63,360);
- National Soils Map of Scotland;
- The James Hutton Institute Soil Classification;
- NatureScot Carbon and Peatland 2016 Map;
- NVC survey data and report (refer to **Technical Appendix 7.1**);
- SEPA Online Flood Maps;
- SEPA Waste Site and Capacity Data Tool;
- Scotland's Environment Map;
- SEPA and BGS Open Report 'Scotland's aquifers and groundwater bodies';

- National River Flow Archive (NRFA); and
- Meteorological Office Rainfall Data.

Site Visit

Peat Depth Surveys

8.5.5 Phase I peat depth surveys were carried out by SLR Consulting Limited (SLR) in two stages, June 2022 and May 2023 for the northern development area. Peat depths were measured on a 100 m grid across the site, where this was not possible due to accessibility issues probes were collected along forestry rides to achieve suitable coverage. In addition to the 100 m grid, supplementary peat depth measurements were taken in locations that were being considered in early design iterations for wind turbine placement. The surveys were carried out following best practice guidance for development on peatland. This data was used to inform the iterative design process, with phase 2 surveys initially carried out by SLR on a preferred design in December 2022 and January 2023.

8.5.6 Following the initial phase 2 survey, additional probing was undertaken throughout the design iteration process to account for changes in infrastructure location. Detailed phase 2 surveys involved probing at the 18 proposed turbine locations and ancillary infrastructure areas of the Proposed Development, and was carried out using the following pattern:

- Probe turbine centre and every 10 m to the north, east, south, and west, out to 50 m from the centre;
- Probe points every 50 m along the proposed access tracks, with staggered, offset probes 10 m either side of the access track centre line, and at turning heads (allowing for coverage of any micrositing allowance); and
- Other infrastructure locations were probed to an approximate 25 m grid, with increased density (up to 10 m) where peat was identified.

8.5.7 In addition to peat depth survey, peat cores were taken at locations across the site. Peat cores were extracted using a 'Russian auger.' The peat augering locations were taken at locations across the site, including at a number of turbine locations, considered to be a representative cross section, characteristic of peat conditions at the site. The detailed peat depth and outline condition survey informed the final design and ensured coverage of peat depth measurements extended to the final layout. This data also informed the outline PMP and the PLHRA provided in **Technical Appendix8.4** and **Technical Appendix 8.5**.

Hydrological Walkover

8.5.8 A hydrological walkover of the site was undertaken in April 2024. Site observations included topography, habitats, ground conditions and features of watercourses and waterbodies. The walkover also allowed ground-truthing of receptors identified during the desk study and identification of further hydrological receptors.

8.5.9 A visit to residents as part of the PWS assessment was undertaken in May and September 2024 to confirm the source locations and source type.

8.5.10 Habitat survey work, including mapping of NVC communities, was undertaken by Whittock Ecology in 2022, with update ecology walkover survey work undertaken by RPS in 2024. This included the identification of habitats which had the potential to be GWDTE. Further details of this are provided in **Chapter 7** and **Technical Appendix 7.1**. Review of the potential GWDTEs was undertaken on-site as part of the hydrological walkover to determine whether any potential GWDTEs are likely to be dependent on groundwater.

Assessment of Potential Effect Significance

Sensitivity of Receptor

8.5.11 The sensitivity characteristics of geological, peat, hydrological and hydrogeological resources have been guided by the descriptions presented in **Table 8.2** below. These criteria for sensitivity have been developed based on a hierarchy of factors, following experience and professional judgement and in line with appropriate guidance, legislation and best practice.

Table 8.2 – Sensitivity of Receptors Criteria

Sensitivity	Description
High	• Highly sensitive land use including raised or blanket bog, carbon-rich or peat soils (Class 1 or 2 priority peatland). • Highly permeable superficial deposits, allowing storage and transport of contaminants. • Designated receptor present protected under national or international legislation, including National Parks, SSSI, Special Area of Conservation (SAC)s and SPA. • A waterbody with a SEPA WFD Overall or Ecological classification of 'High' or 'Good'. • An aquifer, classified by BGS as a 'highly productive aquifer' or 'moderately productive aquifer', or that is of regional importance. • Extensive areas of 'High Likelihood' or 'Moderate Likelihood' of river, surface water or coastal flooding which acts as an active floodplain. • Public Water Supplies or PWS that abstract from a hydrological receptor underlying or connected to the site. • Potential GWDTE identified through NVC survey classified as groundwater dependent with minimal degradation, that are found to have site-specific groundwater dependency and are not ombrotrophic.
Medium	• Moderately sensitive land use including carbon-rich or peat soils (Class 3 or 4 priority peatland). • Moderately permeable superficial deposits, allowing limited storage and transport of contaminants. • Designated Receptors of regional importance, including Regionally Important Geological and Geomorphological Sites (RIGS), or receptors of local importance. • A waterbody with a SEPA WFD Overall or Ecological classification of 'Moderate'. • An aquifer, classified by BGS as a 'low productivity aquifer' that does not support abstractions. • Isolated areas of 'High Likelihood' or 'Moderate Likelihood' of surface water flooding or river or coastal flooding that is confined to waterbody extents and is not an active floodplain. • Potential GWDTE identified through NVC survey classified by SEPA to be 'highly groundwater dependent' with extensive degradation, that are found to have site specific groundwater dependency and are not ombrotrophic. • Potential GWDTE identified through NVC survey classified as groundwater dependent which have become degraded, that are found to have site-specific groundwater dependency and are not ombrotrophic.
Low	• Low sensitive land use that do not include carbon-rich or peat soils (Class 5 or 0). • Geological or hydrological features not currently protected and not considered worthy of protection.

Sensitivity	Description
	• Low permeability superficial deposits likely to inhibit the transport of contaminants. • A waterbody with a SEPA WFD Overall or Ecological classification of 'Poor' or 'Bad', or no classification. • A non-aquifer, classified by BGS as a 'Rocks with essentially no groundwater'. • Areas of 'Low Likelihood' of surface water, river or coastal flooding. • Public Water Supplies or PWS are not supported by hydrological receptor underlying or connected to the site. • Potential GWDTE identified through NVC survey classified by SEPA to be groundwater dependent, that are not found to be groundwater dependent and are instead ombrotrophic.

Magnitude of Change

8.5.12 The magnitude of change criteria that apply to the baseline sensitivities of the identified receptors are set out in **Table 8.3.** Similar to criteria for sensitivity, these have been developed based professional judgement and appropriate guidance, legislation and best practice.

Table 8.3- Magnitude of Change Criteria

Sensitivity	Description
High	Total loss of, or alteration to key features of the baseline resource such that post development characteristics or quality would be fundamentally and irreversibly changed, for example, extensive excavation of peatland or watercourse realignment.
Medium	Loss of, or alteration to key features of the baseline resource such that post development characteristics or quality would be partially changed, for example, in-stream permanent bridge supports or partial excavation of peatland.
Low	Small changes to the baseline resource, which are detectable, but the underlying characteristics or quality of the baseline situation would be similar to pre-development conditions *e.g.*, culverting of very small watercourses/drains.

Significance of Effect

8.5.13 The significance of the predicted effects has been assessed in relation to the sensitivities of the baseline resource. A matrix of significance, based on the combination of magnitude of change and sensitivity of the receptor, was developed to provide a consistent framework for evaluation, shown in **Table 8.4** below.

Table 8.4 – Significance of Effects

Sensitivity of Receptor	Magnitude of Impact			
	High	**Medium**	**Low**	**Negligible**
High	**Major**	**Major**	**Moderate**	Minor
Medium	**Major**	**Moderate**	Minor	Negligible
Low	**Moderate**	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

8.5.14 The guideline criteria for the categories of significance of effect are provided in **Table 8.5** below.

Table 8.5 – Significance of Effect Criteria

Significance	Definition	Guidance Criteria
Major	A fundamental change to the environment	Changes in water quality or quantity affecting widespread catchments or groundwater reserves of strategic significance, or changes resulting in substantial loss of conservation value to geological or aquatic habitats and designations.
Moderate	A large, but non-fundamental change to the environment	Changes in water quality or quantity affecting part of a catchment or groundwaters of moderate vulnerability, or changes resulting in loss of conservation values to geological or aquatic habitats or designated areas.
Minor	A small but detectable change to the environment	Localised changes resulting in minor and/or reversible effects on soils, surface and groundwater quality or habitats.
Negligible	No detectable change to the environment	Essentially no effects on geological resources, drainage patterns, surface and groundwater quality or aquatic habitats.

8.5.15 In the above classification, fundamental changes are those which are permanent, either adverse or beneficial, and would result in widespread change to the baseline environment. For the purposes of this assessment, those effects identified as being major or moderate have been evaluated as significant environmental effects.

8.5.16 These matrices have been used to guide the assessment, though they have been applied with a degree of flexibility, since the evaluation of effects will always be subject to location-specific characteristics which must be considered. For this reason, the evaluation of the significance of effects will not always correlate exactly with the cells in the relevant matrix, especially where professional judgement and knowledge of local conditions may result in a slightly different interpretation of the impact concerned.

Requirements for Mitigation

8.5.17 Depending on the potential impact predicted to sensitive receptors, committed embedded and additional mitigation measure are presented within this chapter. Wherever possible, mitigation has been embedded and incorporated into the design of the Proposed Development. Additional mitigation has been outlined in **Section 8.9** of this chapter and those measures to be implemented during the construction phase are included within the outline CEMP (**Technical Appendix 3.1**).

Assessment of Residual Effect Significance

8.5.18 An assessment of any predicted significant residual effects on sensitive geological, hydrological or hydrogeological receptors is presented within this chapter (**Section 8.10**). The assessment considers effects throughout the construction, operational and decommissioning phases of the Proposed Development.

Assessment of Cumulative Effects

8.5.19 An assessment of any predicted cumulative effects on sensitive geological, hydrological or hydrogeological receptors is presented within this chapter (**Section 8.11**). This section details predicted effects from proposed or consented developments within 10 km of the site with potential cumulative effects identified.

Limitations to Assessment

8.5.20 Other than peat depth survey work, no intrusive investigations, nor any water quality monitoring have been undertaken. This is not considered to represent a significant limitation to the assessment of effects, as detailed intrusive site investigation works, and water quality monitoring would be

undertaken prior to and during construction to inform detailed engineering design, micro-siting and environmental protection and control measures to be implemented.

8.6 Baseline Conditions

Land Use and Topography

8.6.1 The Proposed Development site comprises a total area of c.965 hectares (ha), split into two main development areas. The northern development area primarily comprises commercial forestry with a series of summits which include Dungavel Hill (458 m, Above Ordnance Datum (AOD)), Auchengilloch (462 m AOD), Brown Hill (313 m AOD) and Regal Hill (428 m AOD). The southern development area is located on the south facing lower slopes of Middlefield Law (466 m AOD), comprising primarily agricultural fields.

Climate

8.6.2 The nearest National River Flow Archive (NRFA) monitoring station to the site which rainfall is recorded for is Ayr at Wellwood (ID 83011) approximately 2.4 km from the southern development area. It records an average annual rainfall in the standard period (1961 – 1990) of 1,353 mm.

8.6.3 The closest Meteorological Office climate station is Saughall, which records an annual average rainfall in the climate period (1991 – 2020) of 1,413.12 mm.

Bedrock Geology

8.6.4 BGS Onshore GeoIndex Mapping indicates that the northern development area is predominantly underlain by Silurian Plewland Sandstone Formation and Middlefield Conglomerate Formation of the Dungavel Group, with a small, isolated, South of Scotland Granitic Suite intrusion of the Caledonian Supersuite, as shown in **Figure 8.6**. The Logan Formation, consisting of sandstone, siltstone and mudstone, of the Waterhead Group underlies the north-east and Swanshaw Sandstone Formation of the Lanark Group underlies the north-west of the northern development area. The northern development area is heavily faulted with 11 inferred faults mapped.

8.6.5 The west of the southern development area is underlain by Devonian Kinnesswood Formation, consisting of sandstone, and Carboniferous Ballagan Formation, consisting of argillaceous rock, dolostone and sandstone, within the Inverclyde group. The east of the site is predominantly underlain by Silurian Ponesk Burn Formation, with Patrick Burn Formation, Castle Formation, Blaeberry Formation and Dunside Formation in the north, all of the Hagshaw Group, consisting of greywackes, sandstones, siltstones and mudstones. The southern development area is also heavily faulted with eight inferred faults mapped.

Superficial Geology

8.6.6 BGS Onshore GeoIndex Mapping indicates that the majority of the northern development area is underlain by peat, as shown in **Figure 8.3.** Devensian till deposits are mapped in the west of the northern development area and along the Powbrone Burn and its tributaries. Alluvium and glaciofluvial deposits are also associated with Powbrone burn and its tributaries.

8.6.7 The southern development area is primarily underlain by Devensian till deposits with alluvium and glaciofluvial deposits associated with on-site watercourses.

Soils

8.6.8 The National Soil Map of Scotland indicates the northern development area to be largely underlain by dystrophic blanket peat in the centre and east, and peaty gleys with dystrophic blanket peat, and humus-iron podzols with peaty gleyed podzols in the west. Dystrophic blanket peat is an organic soil which is largely rain fed and mineral poor. Peaty gleys are described as wet soils with an organic (peaty) surface layer, often found in depressions and foothills with gentle slopes. The mineral podzols are humus-iron podzols with peaty gleyed podzols, associated with undulating uplands with strong slopes.

8.6.9 The southern development area is mapped as predominantly underlain by non-calcareous gleys with a central area of dystrophic blanket peat. Non-calcareous gleys are defined as a mineral topsoil over a thin weakly developed subsoil or on to bedrock with no free calcium within mineral topsoil.

Peat

8.6.10 Published priority peatland mapping by NatureScot, Carbon and Peatland Map 2016, indicates that the northern development area primarily comprises Class 5 peatland in the centre and east, and Class 4 peatland in the west, as shown in **Figure 8.4**. Isolated areas of Class 1 is present in the east associated with Dungavel Hill, and mineral soils are shown in the south. Mapping indicates that the southern development area primarily comprises mineral soil, with isolated areas of Class 4 and Class 5 peatland.

8.6.11 Class 1 peatlands are considered to be 'nationally important carbon-rich soils, deep peat and priority peatland habitat'. Class 5 peatlands are defined as areas with no peatland habitats recorded but may include areas of bare soil, carbon-rich soils and deep peat. Class 4 peatlands are defined as areas unlikely to support peatland habitats or carbon-rich soils.

8.6.12 Phase I and phase II peat surveys have been undertaken as described in **Section 8.5**, with results of peat depth survey shown in **Figure 8.5**. Of the probes recorded, 42.1% of probe depths are <0.5 m. There are significant areas of deep peat present within the northern development area, with 22.5% of probe depths recording >1.0 m. The deepest probe on-site reached a depth of 2.9 m in the south-west of the northern development area. Overall, the results of probing show the average depth across the site to be 0.7 m, with 77.4% of probe depth <1.0 m, which is not classified as deep peat. Peat is not present within the southern development area.

8.6.13 An outline peat condition assessment was undertaken, confirming that the peatland on-site is in a modified or drained condition (heavily impacted by commercial forestry). There are no areas of near natural peatland within the Proposed Development site.

8.6.14 Peat coring was undertaken at six locations across the northern development area (refer to **Technical Appendix 8.4 Figure 4**).

8.6.15 Of the potential peat deposits that may be excavated as a result of the Proposed Development, all of it can be reused within the site as detailed in the Outline PMP in **Technical Appendix 8.4**. **Technical Appendix 8.5** details the PLHRA for the site, with the likelihood of a peat landslide occurring deemed to be negligible to low across the site.

Borrow Pit Search Areas

8.6.16 There are four potential locations for borrow pits that have been identified. SLR visited the borrow pit search areas when undertaking the phase 2 peat depth survey. The proposed borrow pit search areas have been predominantly selected due to their location, where mapping indicates bedrock is likely to occur close to surface. Other factors included environmental impacts, morphology, and orientation. Limited superficial soils are expected at these locations. The borrow pit locations are located a minimum of 50 m from watercourses.

8.6.17 An approximate volume of excavated materials has been calculated for the proposed borrow pit locations, this volume is based on initial calculations and assumptions that would be verified by detailed intrusive investigation post-consent. Further information is provided within the outline Borrow Pit Appraisal (**Technical Appendix 8.6**).

Contaminated Land

8.6.18 According to BGS GeoIndex Onshore, there are two small areas of artificial ground recorded immediately to the north of the southern development area. These isolated areas are classed as made ground (undivided).

8.6.19 A review of the SEPA Waste Site and Capacity Tool was undertaken, and no landfill or waste sites were recorded within the site. A landfill is recorded in the surrounding area, approx. 2.7 km north-west of the northern development area. The landfill is operated by Avonside (Permit or Licence No. WML/W/0000156), located at Avonside Landfill, Drumclog, Strathaven. The site is currently not

operational and was licensed for household, commercial and industrial waste. Additional waste sites in the study area include a metal recycler and civic amenity/recycling centre near Strathaven, and an additional metal recycler near Cumnock.

8.6.20 In accordance with the Scottish Pollutant Release Inventory (SPRI) by SEPA, there are several Waste Transfers (WT) and Waste Water Releases (WWR) recorded in the study area. This includes WT and WWR from Snabe Quarry, Auldhouseburn Farm and Ponesk/Spireslack Opencast Coal Site (OCCS). Release of pollutants recorded by SPRI in the study area, include releases to air from mineral industry and intensive livestock production.

Mining

8.6.21 A review of the Mining Remediation Authority (formerly Coal Authority) map shows that the southern development area is located within a Coal Mining Reporting Area, however there are no historic coal mining features within the site boundary. In their scoping response the Mining Remediation Authority (formerly Coal Authority) indicated that *"records do not indicate the presence of any coal mining features at surface or shallow depth in the area identified above by the updated red line boundary."*

Hydrogeology

8.6.22 Silurian Rocks (Undifferentiated) bedrock aquifer underlies the majority of the site, with the Inverclyde Group bedrock aquifer underlying the west of the southern development area, as shown in **Figure 8.7**. The Scottish Environment Web Map defines the Silurian Rocks (Undifferentiated) bedrock aquifer as a low productivity Class 2C aquifers. The Inverclyde Group bedrock aquifer is classified as a moderately productive, Class 2B aquifer. Groundwater flow within both aquifers is defined as *'virtually all flow occurs through fractures and discontinuities'*.

8.6.23 In accordance with BGS and SEPA Open Report (OR/15/028), the Silurian-Ordovician bedrock underlying the majority of the site form low productivity aquifers with groundwater flow largely through fractures (refer to **Figure 8.7**). Flow paths typically follow surface water catchments with flow path lengths between 0.1 km to 1 km. The Inverclyde Group is described within the Carboniferous bedrock by BGS and SEPA, which is noted to be extensively mined. The Carboniferous bedrock is noted to form moderately productive aquifers, with groundwater flow largely in fractures, or through intergranular space and mineral voids. Flow paths are dominated by historical mining with flow path lengths between 1 km to 10 km.

8.6.24 The SEPA Water Classification Hub shows the bedrock aquifers underlying the site to be within the North Glengavel (ID: 150575) groundwater body in the northern development area, and South Glengavel (ID: 150514) and Ayr (ID: 150669) groundwater bodies in the southern development area. North Glengavel and South Glengavel are noted to have an overall status and water quality of 'Good', while Ayr is classified as 'Poor' in 2023.

8.6.25 Groundwater in the entirety of Scotland is protected as a Drinking Water Protected Areas (DWPA) (Ground). The groundwater underlying the site is also therefore a DWPA (Ground).

Hydrology

8.6.26 The site lies within the wider surface water catchments of the Glengavel Water and the Greenock Water, which underlie the northern development area and southern development area respectively, as shown in **Figure 8.2(a to c)**.

8.6.27 The northern development area is within the catchment of the Glengavel Water, with the Glengavel Water and Glengavel Reservoir located to the immediate south and west of the site, flowing north. The Powbrone Burn and its tributaries, Dead Grain, Little Grain, Middle Grain and Self Grain drain the centre and east of the northern development area. The Powbrone Burn flows south-west and confluences with the Glengavel Water (ID: 10408) at BNG 267625, 633494, approx., 100 m south of the northern development area. The Patrick Burn and the Bught Burn flow south-west within the west of the northern development area and confluence with the Glengavel Water at BNG 267038, 633989 approx., 200 m, and at BNG 266162, 635092 approx., 300 m south of the northern development area respectively.

8.6.28 The southern development area is located within the Greenock Water catchment. The southern development area is drained by tributaries of the Greenock Water (ID: 10718) which is located immediately south of the site boundary, flowing to the west. The Lamon Burn, and three unnamed tributaries drain the centre and east of the southern development area, with the Harwood Burn, Back Burn and Netherwood Burn draining the west of the site. All tributaries draining the southern development area confluence with the Greenock Water immediately south of the site boundary.

8.6.29 In accordance with the SEPA Classification Hub, the Glengavel Water and Greenock Water are classified as having 'Poor' and 'High' overall status respectively in 2023. The condition of the Glengavel Water is a result of it being heavily modified, which 'cannot be addressed without a significant impact on the drainage of agricultural land'.

8.6.30 A Watercourse Crossing Survey was carried out in November 2024, with the watercourse observations detailed in **Figure 8.8** and **Technical Appendix 8.1**.

Flooding

8.6.31 A review of the SEPA Flood Maps showed that there is a high likelihood of fluvial flooding (10% annual probability of flooding) in the northern development area along the main channel of the Powbrone Burn. The extent of fluvial flooding is largely confined to the river channel and is not widespread across the northern development area. There is a high likelihood of fluvial flooding along the Glengavel Water and Glengavel Reservoir to the south and west of the northern development area.

8.6.32 There is a high likelihood of fluvial flooding along the Greenock Water to the within the south-east and to the immediate south of the southern development area. This is primarily confined to the river channel excepting the south-east where it encroaches into the site, within an area of forestry.

8.6.33 SEPA Flood Maps show very small, highly localised areas at high risk of pluvial flooding on-site, however, these are largely found along the banks of surface watercourses. There is no risk of coastal flooding on-site.

Public Water Supplies

8.6.34 Following a desk-based review it was found that there are two Drinking Water Protected Areas (DWPAs) within 10 km of the site. These comprise the Glengavel Water and the Kype Water. The site is hydrologically connected to the Glengavel Water.

8.6.35 In their scoping responses, Scottish Water confirmed that *"there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas (DWPA) under the Water Framework Directive, in the area that may be affected by the proposed activity".*

Private Water Supplies

8.6.36 A review of Scotland's Environment online map was undertaken to confirm the nature of Controlled Activity Regulations[1] (CAR) authorisations within 2 km of the site. CAR authorisations regulate activities which may affect Scotland's water environment and are intended to control impacts on the water environment, including mitigating the effects on other water users.

8.6.37 A review of online data confirmed there are 40 CAR Authorised Sites (registration, simple or complex) within 2 km. The CAR Authorised Sites identified were for activities which include primarily private sewage, and also sheep dip, bridging or engineering culvert, public sewage and combined sewer overflow. A CAR simple licence for other effluent, mining and quarrying was recorded at Hillhouse Quarry Group, approx. 1.85 km from the southern development area. Additionally, a CAR simple licence held by Ayrshire Rivers Trust for the activity of installation of croys, groynes and flow deflectors is sited immediately upstream of the southern development area on the Greenock Water. No water abstraction licences were recorded within 2 km of the site.

[1] *The Water Environment (Controlled Activities) (Scotland) Regulations 2011 – more commonly known as the Controlled Activity Regulations (CAR)*

8.6.38 Consultation was undertaken with SLC and EAC Environmental Health Officers (EHOs) to identify all PWS registered within the 2 km PWS study area. A desk-based review of these sources was then undertaken, with consideration to potential hydrological and hydrogeological connectivity to the site. Additional properties were scoped in from a review of AddressBase and OS maps where considered to be potentially supplied by PWS. From this, 27 properties potentially supplied by PWS were contacted for initial consultation, to confirm source type and location.

8.6.39 Once responses were received, site visits to the PWS were undertaken to confirm source type, details and location with residents. From this, three sources were confirmed to be located within SEPA groundwater abstraction buffers from the Proposed Development, and requiring further assessment:

- PWS03 Linburn;
- PWS08 Glengavel; and
- PWS13 Laigh Hall.

8.6.40 A detailed assessment of these sources is included in **Technical Appendix 8.2**. The PWSRA includes each source location, potential source catchments, and proximity to the Proposed Development to determine any potential effects and recommended additional mitigation measures and monitoring where required.

8.6.41 Following the detailed assessment of these PWS, the supply pipework for PWS03, PWS08 and PWS13 have been determined to be potentially at risk from effects from the Proposed Development and included in the assessment presented in **Section 8.8**.

Designated Sites

8.6.42 Designated sites within the 10 km study area have been identified within **Table 8.6**.

Table 8.6 – Designated Sites

Site	Distance	Features	Connected to Site?
Muirkirk and North Lowther Uplands SPA, Muirkirk Uplands SSSI	Adjacent to the east of northern development area, and adjacent to the southern development area.	Hen Harrier, breeding and non-breeding, and Golden plover, breeding (Unfavourable Declining). Merlin, breeding, and Peregrine, breeding (Unfavourable No change). Short-eared Owl, breeding, (Favourable Maintained), Breeding Bird Assemblage, Upland Assemblage, and Silurian-Devonian Chordata (Favourable Maintained). Blanket bog (Unfavourable No change).	Yes, located on-site at (existing) access road.
Blood Moss and Slot Burn SSSI	Adjacent to southern development area and (existing) access road. 1.2 km south of northern development area, located upslope of access road.	Blanket bog (Unfavourable No change), Arthropoda (Favourable Maintained), Silurian-Devonian Chordata (Favourable Maintained).	Yes, located on-site at (existing) access road.
Airds Moss SAC	2.3 km south-west of southern development area	Blanket bog (Unfavourable No change).	No, disconnected by Greenock Water.

Site	Distance	Features	Connected to Site?
Birk Knowes SSSI	2.4 km east of northern development area	Llandovery, Silurian-Devonian Chordata (Favourable Maintained).	No, disconnected by topography and located in Logan Water catchment.
Greenock Mains SSSI	2.4 km west of southern development area	Quaternary of Scotland (Favourable Maintained).	Yes, hydrologically connected by Greenock Water.
Garpel Water SSSI	2.9 km south of southern development area	Lower Carboniferous (Favourable Maintained).	No, disconnected by Greenock Water and River Ayr.
Dunside SSSI	3.8 km east of northern development area	Arthropoda (Favourable Maintained).	No, disconnected by topography and located in Logan Water catchment.
Birkenhead Burn SSSI	5.1 km east of northern development area	Silurian-Devonian Chordata (Favourable Maintained).	No, disconnected by topography and located in Logan Water catchment.
Ree Burn and Glenbuck Loch SSSI	6.2 km south-east of southern development area	Wenlock (Favourable Maintained).	No, disconnected by Greenock Water and River Ayr.
Shiel Burn SSSI	7.6 km east of southern development area	Silurian-Devonian Chordata (Favourable Maintained).	No, disconnected by topography and the Greenock Water.
Kennox Water SSSI	9.0 km south-east of southern development area	Lower Carboniferous (Favourable Maintained).	No, disconnected by topography and the Greenock Water.
Lugar Sill SSSI	9.1 km south-west of southern development area	Carboniferous - Permian Igneous (Favourable Maintained).	No, disconnected by topography and the Greenock Water.
North Lowther Uplands SSSI	9.9 km south of southern development area	Mineralogy of Scotland (Favourable Maintained). Breeding bird assemblage, Hen harrier, breeding (Unfavourable No change). Upland assemblage (Unfavourable Recovering).	No, disconnected by topography and the Greenock Water.

8.6.43 There are 14 Geological Conservation Receptor (GCR) sites that have been identified within the wider 10 km study area. As these geological receptors are not located within the site boundary, they will not be impacted by the Proposed Development and are therefore scoped out of further assessment.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

8.6.44 A detailed NVC survey was completed, as outlined in **Chapter 7** and reported in **Technical Appendix 7.1**. The survey methodology for this is outlined in **Chapter 7**. From the NVC survey data, communities have been identified that have the potential to be groundwater dependent in accordance with SEPA Guidance Note, Guidance on Assessing the Impacts of Developments on Groundwater Dependent Terrestrial Ecosystems.

8.6.45 The following potential GWDTE communities were identified, as shown in **Figure 8.10**:

- M4;
- M6;
- M23a, M23b;
- MG9a;
- MG10, MG10a;
- W4b; and
- W7a.

8.6.46 A review of the baseline features including topography, underlying geology and surface water features, was undertaken to determine the groundwater dependency. This is outlined in the GWDTE Risk Assessment (**Technical Appendix 8.3**) where further assessment of GWDTEs was undertaken. All of the communities noted in **Figure 8.10** were assessed as having low groundwater dependency.

8.6.47 Polygons were assessed to be of low groundwater dependency based on characteristics that disconnect them from underlying groundwater or show the habitat to be likely dependent on surface water or ombrogenous. The underlying bedrock aquifers are largely noted to have minimal groundwater present in fractures and near-surface weathered zone. Disconnection from groundwater in the underlying bedrock aquifers would occur from an impermeable superficial deposit, either till or peat. These have been identified from BGS GeoIndex mapping and results of peat probing to be present across the site, particularly the northern development area. Areas which are potentially fed by surface water have also been identified, these include areas around surface watercourses, or downslope of ombrogenous habitats such as blanket bog where high surface water runoff and collection is likely. Most potential GWDTEs were identified downslope of ombrogenous habitats, along watercourses or overlying impermeable peat.

8.7 Scope of the Assessment

Spatial Scope

8.7.1 The assessment includes hydrological, hydrogeological, geological and peat receptors located within the site boundary with the potential to be impacted by the Proposed Development. Additionally, hydrological and hydrogeological receptors have been assessed up to 10 km from the site boundary within a wider study area. Assessment of PWS is undertaken within a 2 km study area.

8.7.2 These study areas are based on professional judgement and experience assessing similar developments, with due consideration of relevant guidance on hydrological and geological assessment. It is considered that in excess of these distances due to attenuation and dilution, the Proposed Development is unlikely to have an effect.

Temporal Scope

8.7.3 An assessment of any potential significant effects on hydrological, hydrogeological, geological and peat receptors is presented within this chapter (**Section 8.8**). The assessment considers effects throughout the construction, operational and decommissioning phases of the Proposed Development.

Receptors Requiring Assessment

8.7.4 A summary of receptors being carried forward for assessment is outlined in **Table 8.7.** Receptors with a High or Medium sensitivity have been brought forward for assessment. Those with a Low sensitivity will not require further assessment following the application of the embedded mitigation.

Table 8.7- Receptors Scoped into Assessment

Receptor	Description	Sensitivity
Superficial Geology	Moderately permeable superficial deposits, allowing limited storage and transport of contaminants.	Medium
Peat	Highly sensitive land use including isolated areas of Class 1 priority peatland present.	High
Groundwater	The Inverclyde Group bedrock aquifer, classified by BGS as a 'moderate productivity aquifer'.	High
Surface Water	WFD watercourse Greenock Water with 'High' classification.	High
Flooding	Isolated areas of 'High Likelihood' or 'Moderate Likelihood' of fluvial flooding that is largely confined to watercourse channel of Greenock Water, is not widespread across the site.	Medium
Private Water Supplies	PWS supply pipework located on-site.	High
Designated Sites	Site hydrologically connected to Muirkirk and North Lowther Uplands SPA, Muirkirk Uplands SSSI, Blood Moss and Slot Burn SSSI, and Greenock Mains (SSSI).	High

8.7.5 The following receptors have been scoped out of further assessment:

- Potential GWDTEs, as on-site these are found to not be groundwater dependent.
- GCRs are not present on-site, therefore there will be no direct or indirect impacts to protected geological receptors.
- Public water supplies, as Scottish Water confirmed no DWPAs or assets located on-site.

Environmental Measures Embedded into the Development Proposals

8.7.6 Embedded mitigation proposals are those mitigation measures that are inherent to the Proposed Development. Embedded mitigation includes all mitigation usually assumed to be in place during construction, operation and decommissioning, and is generally regarded as industry standard or best practice. Construction and environmental management plans are introduced in **Chapter 3**, with an outline CEMP provided in **Technical Appendix 3.1**.

8.7.7 The following considerations have been taken into account in the iterative design of the Proposed Development, considered as embedded mitigation.

- Existing tracks are being used where possible and as far as practicable in order to reduce the footprint of the Proposed Development and to limit the number of new watercourse crossings.
- A 50 m buffer has been maintained around all surface watercourses and waterbodies identified in OS 1:10k mapping, except where tracks are required to cross watercourses and where it was proved unavoidable through design iterations due to constraints. The watercourse buffer is intruded by the temporary hardstand of T7, temporary construction compound, and the access tracks to T4, T9 and T17. Intrusions into the watercourse buffer has been minimised as far as practicable while taking account of other technical and environmental constraints. Due to low level of potential impacts, solar PV modules have been located a minimum of 10 m from watercourses.
- The presence of extensive deep peat deposits across the northern development area has heavily constrained the Proposed Development. Following several design iterations, as far as possible the Proposed Development infrastructure has mostly kept outwith areas of deep peat. The average peat depth is greater than 1.0 m (therefore defined as deep peat) at four turbine locations (T12 (1.14 m), T13 (1.02 m), T17 (1.52 m) and T18 (1.06 m)), and two permanent

hardstand locations (T13 (1.14 m), T17 (1.52 m)). The temporary hardstanding areas associated with two turbines (T14 (1.07 m), T17 (1.09 m)) are located on deep peat. This was unavoidable due to the extent of peat present and in consideration of other constraints such as: topography; sensitive habitat; and watercourse buffers. Proposed new tracks are to be floated across areas of peat where peat depth exceeds 0.8 m and where topographical conditions allow. Existing access roads have been reused as far as practicable.

- Proposed Development infrastructure has generally been sited outwith areas of increased likelihood of peat landslide risk, and in areas of negligible to low likelihood. Where areas of medium likelihood have been identified, a qualitative impact assessment has been undertaken, and accounting for mitigation, these locations have a revised ranking of negligible and low, discussed further in **Technical Appendix 8.5**.

Committed Mitigation

8.7.8 In undertaking the assessment of potential effects from the Proposed Development, good practice measures to be implemented as part of the CEMP and other proposed management plans will be considered as committed mitigation.

Pre-Construction

8.7.9 Prior to construction being undertaken, relevant detailed site investigations would be conducted. This could include investigations of underlying deposits, in particular where proposed infrastructure is sited, to inform detailed design and suitable micrositing of the turbines, solar panels and associated infrastructure.

8.7.10 If there are assessed to be potential effects to surface watercourses or groundwater, baseline water quality monitoring will be undertaken as required. A Water Quality Monitoring Plan will be prepared and agreed with SLC and EAC, in consultation with SEPA, prior to commencement of construction. It is anticipated that this will include a programme of pre-construction monitoring, over a period to be set out in the plan.

Construction

8.7.11 Following review of best practice outlined in relevant guidance and legislation a CEMP will be compiled which will be based on the outline CEMP attached as **Technical Appendix 3.1**, as well as any environmental planning and licensing conditions, including a borrow pit management plan. The EPC Contractor will develop the detailed CEMP and will implement measures set out in the CEMP, to be agreed with relevant consultees. This will also include a construction method statement, which would account for best practice measures to prevent sedimentation pollution and erosion, including:

- All earthworks will be carried out in accordance with BSI Code of Practice for Earth Works BS6031:2009;
- Stockpiles will be placed at least 50 m from watercourses. The height and maximum slope angle will be in accordance with BSI guidance. Where there are stockpiles of peat, re-wetting will occur to prevent peat drying out. Sediment pollution mitigation measures, including drains will be implemented at the base of stockpiles.
- Sediment pollution mitigation measures will be emplaced across the Proposed Development, this may include: drainage; silt fencing; settlement lagoons; and check dams.
- Plant movements will be minimised through management measures. Measures to prevent sediment on public roads may include wheel washing or road sweeping at the site entrance.
- Any CAR licences required for site discharges or watercourse crossings will be applied to from SEPA prior to construction.

- A 'wet weather policy' will be in place where the Principal Contractor would reduce or suspend works during periods of significant rainfall at the site. The policy will include that site management checks local weather forecast daily, regularly checks and maintains pollution control system and suspends work during adverse conditions.
- Where topography dictates that working platforms are needed, these would be formed to ensure that surface water drains away from watercourses.
- To avoid unnecessary compaction and disturbance to site soils, working areas and corridors would be established and demarcated, with construction operatives appropriately inducted and trained to avoid work outside the designated work areas.

8.7.12 Best practice measures to prevent chemical pollution include:

- Sufficient and continued dewatering at the turbine foundation excavation until the concrete is cured, to prevent leaching.
- Dewatering at the turbine will be minimised through careful management and reducing the time the excavation is open, including concrete pouring.
- A method statement to address the transport, transfer, handling and pouring of liquid concrete at foundations will be undertaken by the Principal Contractor.
- Cement, grout and unset concrete will not be allowed to enter the water environment. No operations involving concrete transfer will take place within 50 m of watercourses.
- There will be no washing out of vehicles used for concrete delivery or washing of vehicles within 50 m of watercourses.
- Fuel and chemicals will be stored in impermeable bunded containers at least 110% of the volume stored. All fuelling on-site will occur in a designated location, at least 50 m from watercourses.
- Spill kits will be stored across the site and within all vehicles and plant. On-site toolbox talks with construction staff will include to report all on-site spills and the correct implementation of spill kits.
- All vehicles and plant will be checked regularly with regular maintenance undertaken as required.

8.7.13 Best practice measures to enable surface water drainage management include:

- A suitable surface water drainage strategy with detailed drainage design will be prepared and agreed prior to construction, but the following outline measures will be included.
- Identified watercourse crossings in **Technical Appendix 8.1** will be designed to convey flows of 0.5 %AEP (1:200 yr) plus climate change, to prevent exacerbating downstream flood risk.
- Trackside drainage ditches will be designed to ensure separation of clean water drainage from potentially contaminated drainage.
- Check dams will be employed to slow down the flow of water and decrease erosion within drainage ditches.
- Sumps and settlement lagoons will be used to treat and slow down the flow of water during periods of high rainfall. This will be employed at drainage outlets prior to reaching watercourses.
- Areas of excavation and earthworks will have drainage designed to drain to a sump to prevent pollution and increase surface water run-off.

- Hydrological connectivity between upslope and downslope will be maintained through cross-drainage and culverts.

Operation

8.7.14 Peatland habitat enhancement is proposed as part of the outline HMEP (refer to **Technical Appendix 7.5**). An area of c. 56 ha of 'forest to bog' peatland restoration is proposed in the Dungavel Forest part of the site (northern development area), in areas of poor timber growth and deep peat as identified through field surveys. This work will be undertaken by a qualified and experienced peat restoration contractor with a robust aftercare and monitoring programme overseen by the HMEP Manager to ensure successful establishment.

8.8 Assessment of Potential Effects

Construction

Impacts on Surface Water Quality

8.8.1 Surface water runoff containing silt and other sediments, particularly during and after rainfall events, has the potential to enter the watercourses and field drains on and adjacent to the site. Silt and sediment-laden surface water runoff is predicted to arise from excavations, exposed ground, and any temporary stockpiles. This has the potential to temporarily impact on the water quality and hydrological and ecological function of the receiving watercourse at and downstream of the works in the absence of any mitigation. Additionally, if appropriate controls are not enacted, pollutants such as oils, fuel and cement may be mobilised through mechanical leaks or spillage and carried in surface drainage.

8.8.2 As noted previously, a minimum buffer of 50 m around all watercourses was embedded as part of the design of the Proposed Development, excepting areas where watercourse crossings are required. In a few locations in the northern development area, due to the design being heavily constrained by slope, ecology constraints, and peat, infrastructure has been sited within 50 m watercourse buffers. The watercourse buffer is intruded by the temporary hardstand of T7, temporary construction compound, and the access tracks to T4, T9 and T17. In these areas, best practice mitigation measures for during construction will be set out within the CEMP and fully implemented to minimise the risk of pollution to surface watercourses.

8.8.3 In the southern development area, in areas solar PV modules were sited within 50 m of minor watercourses, not visible on OS 1:50k mapping. This is in consideration of the lower potential effects from installation of solar PV modules, rather than excavations required for hardstanding or foundations. A minimum of 10 m watercourse buffer has been maintained for solar PV modules to ensure area for implementation of sediment mitigation measures for any surface water run-off. The solar PV modules are sited in either flat lying or gently sloping areas where surface water run-off will be slower than on higher gradient slopes.

8.8.4 Taking account of embedded and best practice mitigation, the magnitude of impact is considered to be negligible, on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, short-term effect of **minor** adverse significance. The effect is therefore found to be **not significant** in terms of the EIA Regulations.

Impacts on Surface Water Flow

8.8.5 The access tracks and turbine hardstands could result in an increased rate of surface water run-off from the site. This could potentially increase sedimentation and erosion in watercourses and risk of flooding downstream. It can also result in the diversion of surface water flows.

8.8.6 Runoff from permanent infrastructure will be controlled through suitable construction drainage provision, the outline principles of which are noted in **Section 8.7** and in the **Outline CEMP (Technical Appendix 3.1),** with the detailed design to be developed and agreed with SLC, EAC and SEPA prior to construction. Hydrological connectivity and maintenance of existing drainage pathways will be undertaken through installation of trackside and cross drainage.

8.8.7 As outlined in the WCS (**Technical Appendix 8.1**), there are 16 watercourse crossings required across the site, the outline solutions of which include bottomless arch or closed culverts. The number of watercourse crossings have been limited where possible (refer to **Chapter 2**) and measures outlined within the WCS and the outline CEMP will prevent constricting and increase in flow and will be regularly checked and maintained during operation.

8.8.8 Prior to construction there will be further detailed design of the watercourse crossings. Watercourse crossings will be subject to appropriate SEPA CAR authorisation and will be designed to allow the conveyance of a 0.5% annual probability (200 year) flow event plus an allowance for climate change and freeboard. New watercourse crossing designs will also ensure fish passage is possible.

8.8.9 The magnitude of impact is therefore considered to be negligible, on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, short-term effect of **minor** adverse significance, this is considered to be **not significant** in terms of the EIA Regulations.

Impacts on Groundwater Quality

8.8.10 As previously outlined, the geology underlying the Proposed Development is largely characterised by the low permeability bedrock aquifer of Silurian Rocks (Undifferentiated). Groundwater in these aquifers is largely found in fractures and in the near-surface weathered zone. Part of the southern development area is underlain by the moderately productive bedrock aquifer of Inverclyde Group.

8.8.11 The installation of the turbine foundations in the northern development area has the potential to impact groundwater quality because of alkaline leachate from concrete foundations. Due to the characteristics of the underlying geology, the spatial impact of any alkaline leachate is therefore likely to be limited to the localised area at the turbine foundation. Other forms of chemical pollution that may occur across the site include spills of fuels and chemicals stored on-site at temporary construction compounds or from vehicle and plant spills.

8.8.12 Committed mitigation measures will be included within the CEMP to secure sufficient and continued dewatering at the turbine foundation excavation until the concrete is cured, to prevent leaching. To prevent pollution to groundwater, the CEMP will detail mitigation which includes appropriate management measures for transfer of concrete and minimising the duration of concrete pouring. Other measures will include appropriate storage of fuels and chemicals, refuelling of plant and vehicles at designated locations and distributing spill kits throughout the site and within all plant and vehicles.

8.8.13 The magnitude of impact is therefore considered to be negligible, on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, short-term effect of **minor** adverse significance, this is considered to be **not significant** in terms of the EIA Regulations.

Impacts on Groundwater Flow

8.8.14 In the northern development area, the installation of turbine foundations and permanent access tracks can result in the diversion of groundwater flows within underlying geology by creating a barrier. If dewatering occurs at turbine foundations during construction, this could locally reduce groundwater quantity.

8.8.15 As outlined in **Section 8.6**, superficial deposits are present across much of the site, primarily consisting of peat and till deposits. Peat and till are typically of low permeability, while the bedrock underlying most of the site is described as having low productivity, with limited near-surface groundwater, therefore there is likely to be limited groundwater flow in the northern development area.

8.8.16 The spatial impacts of drawdown from dewatering will be a localised area at each turbine foundation. It is also considered to be a short-term impact, with localised groundwater levels anticipated to restore relatively quickly following the cessation of dewatering activities due to relatively high and frequent average rainfall. Mitigation measures will be implemented as part of the CEMP to prevent impacts to groundwater, which will include completing excavation and

dewatering as quickly as practicable. Any water from dewatering will be discharged to ground in the area surrounding the turbine foundation to promote recharge.

8.8.17 In the southern development area, permanent access tracks are also present, which may divert groundwater flows, as above, following mitigation measures, groundwater levels are anticipated to restore quickly following high rainfall. Additionally, drainage will be utilised to maintain hydrological connectivity upslope and downslope of access tracks.

8.8.18 The Long Duration Energy Storage, Short Duration Energy Storage and Substations will require areas of hardstanding, which may also divert groundwater flows within the near-surface. Detailed drainage design would be undertaken in these areas prior to construction to ensure connectivity between upslope and downslope, with groundwater in these areas likely to recharge quickly.

8.8.19 Installation of piling required for solar PV modules is likely to have minimal impact on groundwater flows due to the minimal depth and area required at each pile, and the short duration for installation.

8.8.20 The magnitude of impact is considered to be negligible on a high sensitivity receptor. Therefore, there is potential for a direct, temporary, short-term effect of **minor** adverse significance, this is considered to be **not significant** in terms of the EIA Regulations.

Removal and Impacts on Peat

8.8.21 As discussed, there are extensive peat deposits present on-site, within the northern development area. As outlined in embedded mitigation measures and in **Chapter 2**, proposed turbines and infrastructure have been sited to minimise the excavation of peat as far as practicable, taking account of other constraints, including, watercourse buffers, slope and ecological constraints.

8.8.22 Approximately 92,052 m^3 of peat and peaty soils are proposed to be excavated as part of the Proposed Development. All peat can be appropriately reused on-site, with no surplus materials (waste). Further information is included within the outline PMP (**Technical Appendix 8.4**).

8.8.23 Good practice mitigation measures outlined in this EIA Report, the outline PMP, and the outline CEMP (**Technical Appendix 3.1**) will be implemented by the Principal Contractor, to reduce the potential effects on peat during construction. Peat will be reinstated/restored at the earliest opportunity following excavation, to minimise multiple handling, and prevent longer term storage. Where this is not possible, residual peat storage measures, to prevent drying out of peat in stockpiles and enable the peat to be successfully restored, where practicable, are described in the Outline CEMP (**Technical Appendix 3.1**).

8.8.24 The presence of turbine foundations, hardstands and other infrastructure elements have the potential to interrupt groundwater flow by acting as barriers to flow, drying out of surrounding peat deposits. There may be impacts to peat immediately surrounding areas excavated during construction for hardstand and foundations, however, as it is considered that these are likely to be localised to the immediate areas around excavations, they are unlikely to produce long-term effects and water levels are likely to rebound quickly following construction. Furthermore, as outlined in **Technical Appendix 7.5** (outline HMEP), restoration of a substantial area of peatland habitat – more than 10 times the area of peatland habitat anticipated to be lost – is to be implemented post-construction, with aftercare and monitoring to ensure successful establishment.

8.8.25 The magnitude of impact is considered to be negligible, on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, long-term effect of **minor** adverse significance, this is considered to be **not significant** in terms of the EIA Regulations.

Peat Landslide Impact on Watercourses

8.8.26 Construction on peat soils can result in destabilisation of peat deposits on slopes and lead to slope failure. This can result in peat and debris reaching watercourses, potentially resulting in sedimentation and changes to flow and fluvial geomorphology. Peat landslides can also pose a threat to life in certain circumstances.

8.8.27 A detailed assessment of peat landslide risk has been undertaken as presented in **Technical Appendix 8.5**. This has identified the risk of peat landslides at the proposed turbines, hardstand and other infrastructure, to downslope receptors. Mitigation measures proposed include avoiding construction in areas of increased likelihood, committed measures including best practice construction methods. During construction a geotechnical risk register would be implemented by the geotechnical engineer to monitor any areas identified as a risk.

8.8.28 Based on the findings of **Technical Appendix 8.5** the potential magnitude of impact from peat landslides is assessed to be negligible on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for an indirect, temporary, short-term effect of **minor** adverse significance, this is considered to be **not significant** in terms of the EIA Regulations.

Compaction of Soils

8.8.29 As part of the Proposed Development there will be a requirement for construction of permanent access tracks and hardstand. During construction there will also be movement of vehicles and plant. There is therefore potential for this to result in soil compaction, leading to reduced permeability, increasing the potential for surface water runoff. Reduced permeability could also reduce the flood storage capacity within the site and could potentially lead to localised flooding incidents.

8.8.30 As discussed previously, superficial deposits that are present across the site are primarily low permeability. There is unlikely to be a significant change in flood storage capacity between low permeability till and peat superficial deposits to low permeability hardstand. In addition, the area of hardstand of the Proposed Development has been minimised as far as practicable, as part of the embedded design measures.

8.8.31 The magnitude of impact is considered to be negligible, on a medium sensitivity receptor. Therefore, there is potential for a direct, temporary, short-term effect of **negligible** significance, this is considered to be **not significant** in terms of the EIA Regulations.

Impacts to PWS

8.8.32 Construction of the Proposed Development has the potential to affect the quality and quantity of three PWS identified within the 2 km study area. As outlined within the PWSRA (**Technical Appendix 8.2**), prior to any additional mitigation, there is considered to be potential for significant effects to PWS03, PWS08 and PWS13. This is due to the supply infrastructure associated with each PWS located within the site and may underlie Proposed Development infrastructure.

8.8.33 Additionally, PWS08 is sourced from near-surface groundwater and is located within 250 m of turbine T2. Therefore, further assessment of PWS08, including a Conceptual Site Model, has been undertaken in accordance with SEPA guidance, outlined within **Technical Appendix 8.2**. Following this detailed assessment, the PWS source is not considered to be at potential impact from highly localised drawdown of groundwater at turbine excavations, due to groundwater flow being within near-surface and largely following localised flow within hydrology catchments, and the source being located approx. 220 m upslope. The sources of PWS03 and PWS13 are located outwith groundwater abstraction infrastructure buffers as recommended by SEPA guidance.

8.8.34 The magnitude of impact prior to any additional mitigation and monitoring of PWS03, PWS08 and PWS13, is considered to be low, on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, short-term effect of **moderate** adverse significance, this is considered to be **significant** in terms of the EIA Regulations.

Impacts to Designated Sites

8.8.35 Following a review of the Proposed Development, the following designated sites were found to be underlying or hydrologically connected to the site:

- Muirkirk and North Lowther Uplands (SPA);
- Muirkirk Uplands (SSSI);

- Blood Moss and Slot Burn (SSSI); and
- Greenock Mains (SSSI).

8.8.36 The Muirkirk and North Lowther Uplands (SPA), Muirkirk Uplands (SSSI), and Blood Moss and Slot Burn (SSSI) are located underlying the connecting public access road between the northern development area and southern development area. These designated sites are also located upslope of the Proposed Development infrastructure, to the east of the northern development area, and north of the southern development area. In respect of the Muirkirk and North Lowther Uplands SPA/Muirkirk Uplands SSSI, the nearest proposed infrastructure elements which involve any substantial excavation work (e.g. turbine foundations) are T18, T14 and T13, which are approximately 120 m, 175 m and 185 m from the SPA/SSSI boundary. The underlying Silurian Rocks (Undifferentiated) bedrock aquifer is defined as being low productivity with limited groundwater in the near-surface weathered zone, where groundwater flow paths typically follow surface water catchments. All three turbines and their associated hardstandings and tracks are down-gradient from the SPA/SSSI, draining towards tributaries of the Powbrone Burn, Self Grain and Dead Grain watercourses, away from the designated sites. Taking account of this and the above-noted distances, there is not considered to be any potential for significant hydrological effects such as localised and temporary water table drawdown affecting the designated sites.

8.8.37 While the designated sites underlie part of the site, the construction works within this area include underground cabling between the northern development area and southern development area, and movement of vehicles and plant. The underground cabling will occur within the tarmac surface of the existing public road and will not result in any direct disturbance to the verges. Potential effects are therefore limited to increase in road traffic, with potential effects to surface water quality from sediment runoff, sediment being tracked off-site, or any chemical or fuel spills.

8.8.38 During construction, silt management measures will be included within the CEMP to follow best practice, to minimise risk of pollution to surface watercourses and downstream designated sites. The CEMP will also include for surface water monitoring during construction, regular visual checks by the EnvCoW, and an emergency procedure plan in the event of a chemical spill within these catchments.

8.8.39 The Greenock Mains (SSSI) is located along the banks of the Greenock Water, approx. 2.4 km from the southern development area. The designated feature for this SSSI is the Quaternary of Scotland (representative exposures in glacial deposits).

8.8.40 Infrastructure within the Greenock Water catchment, include Proposed Development infrastructure of the southern development area. All infrastructure, except watercourse crossings and solar PV modules, have been sited outwith 50 m from surface watercourses, which has been embedded into the design. All solar PV modules have been located a minimum of 10 m from surface watercourses, to allow for pollution prevention mitigation measures. As outlined above, silt management measures will be included within the CEMP to follow best practice to minimise risk of pollution to surface watercourses and downstream designated sites, with regular water quality and visual monitoring undertaken.

8.8.41 The magnitude of impact prior to any additional mitigation, is considered to be negligible, on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, short-term effect of **minor** adverse significance, this is considered to be **not significant** in terms of the EIA Regulations.

Operation

Impacts on Surface Water Flow

8.8.42 The access tracks and turbine hardstandings could result in an increased rate of surface water runoff from the site. This could potentially increase sedimentation and erosion in watercourses and risk of flooding downstream. Permanent hardstandings can also alter natural drainage pathways.

8.8.43 The reinstatement of temporary construction areas will reduce exposed ground and hardstand areas during the operational phase as compared to the construction phase. Measures to manage

drainage of surface water will be implemented during the construction phase and continue during the operational phase.

8.8.44 The magnitude of impact is considered to be negligible, on a high sensitivity receptor. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for a direct, temporary, long-term effect of **minor** adverse significance, this is considered to be **not significant** in terms of the EIA Regulations.

Impacts on Fluvial Geomorphology

8.8.45 The WCS (**Technical Appendix 8.1**) details the 16 watercourse crossings required and suggested crossing types to ensure maintenance of suitable flow and therefore heterogeneity. These crossings should be maintained and kept free of debris from watercourses. Any damage to watercourse crossings during operation should be repaired or replaced as required.

8.8.46 The magnitude of impact on a high sensitivity receptor is assessed to be negligible. This is considered to be an indirect, long-term effect of **minor** adverse significance, in the absence of additional mitigation and enhancement measures, and is considered to be **not significant** in terms of the EIA Regulations.

Impacts on Groundwater Flow and Drying Out of Peat

8.8.47 As outlined previously, hardstand and track infrastructure can interrupt existing groundwater flow paths, which can result in drying out of peat downslope. As water levels will likely return to baseline during the operational phase, there is considered to be limited potential for long term effects.

8.8.48 Proposed peatland restoration as part of the HMEP (**Technical Appendix 7.5**) will rewet and revegetate large areas, increasing water residence times over the medium to long term, improving peatland resilience to water stress.

8.8.49 As outlined in **Technical Appendix 8.1**, watercourse crossings will be used to maintain hydrological connectivity across the site. The detailed drainage design will include measures designed to maintain groundwater connectivity, which will also include regular cross-drainage.

8.8.50 Taking account of embedded mitigation measures, the magnitude of impact is assessed as negligible, on high sensitivity receptors. Therefore, in the absence of additional mitigation and enhancement measures, there is potential for an indirect, temporary, long-term effect of **minor** adverse significance, which is considered to be **not significant** in terms of the EIA Regulations.

Impacts on Surface Water and Groundwater Quality from Chemical Pollution and Sedimentation

8.8.51 As outlined during the construction phase, surface water and groundwater quality can be impacted by polluted run-off from the site. Following the construction phase, there will be less disturbance to sediments during the operational phase. Many of the activities that may have resulted in chemical pollution including refuelling and cement pouring, will not occur during the operational phase.

8.8.52 Activities which may result in chemical pollution during the operational phase would be from fuel spills from on-site vehicles. Best practice measures to mitigate potential chemical pollution including spill kits to be present within each vehicle will continue within the operational phase. Additional best practice measures, to be outlined within an Operational Environmental Management Plan (OEMP), will be implemented to prevent impacts to surface water and groundwater quality from the Proposed Development. A Pollution Prevention Plan (PPP) will also outline mitigation including inspection and maintenance of vehicles, rapid response actions in the event of a spill, and person responsible for implementation.

8.8.53 Battery storage facilities are planned as part of the Proposed Development. In the event of a battery fire at the site, polluted waters can be produced where water is introduced to the system to cool the batteries. This will therefore only become a risk during the operational phase when the battery storage is connected. Mitigation measures to prevent the release of polluted waters to the hydrological receptors will be included within the OEMP. These will include an emergency plan in the event of a fire, consultation with local fire services and appropriate treatment and disposal of the polluted waters.

8.8.54 Impact on surface water and groundwater quality is assessed to be of negligible magnitude of impact on high sensitivity receptors. This is assessed to be a direct, temporary, short-term effect of **minor** adverse significance, in the absence of additional mitigation and enhancement measures, and considered to be **not significant** in terms of the EIA Regulations.

Decommissioning

8.8.55 The potential effects of the decommissioning phase will be similar to during construction. Due to reduced site activity, impacts are predicted to be of the same or lesser magnitude, with resultant effects being the same or lesser significance to construction phase effects.

8.8.56 A Decommissioning Environmental Management Plan (DEMP) will be approved prior to decommissioning and secured by condition.

8.9 Additional Mitigation

8.9.1 As noted above, no significant potential construction, operational or decommissioning phase environmental effects were identified, taking account of embedded and committed good practice mitigation, excepting potential impacts to PWS. All effects are considered to be of minor or negligible significance and are considered to be Not Significant in terms of the EIA Regulations, excepting effects to PWS which are assessed to be moderate.

Mitigation for PWS

8.9.2 To ensure the continued water quantity at the supply, during construction of the Proposed Development infrastructure, a watching brief will be employed at the supply pipework of PWS03, PWS08 and PWS13, with excavation to be closely monitored by the onsite EnvCoW. If pipework associated with the PWS is identified this will be marked and a detailed design strategy prepared. This strategy may involve laying the supply pipework beneath access tracks or to redirect the pipework to maintain supply.

8.9.3 To ensure the continued water quality at the supply during installation of Proposed Development infrastructure, water quality monitoring will be undertaken at PWS03, PWS08 and PWS13. A Water Quality Monitoring Plan (WQMP) will be prepared and agreed with EAC and SLC in consultation with SEPA, prior to commencement of construction. The following sampling frequency is proposed in line with updated SEPA guidance and will be fully outlined within the WQMP:

- monthly for 12 months prior to construction phase works in proximity to the PWS supply pipework;
- fortnightly during construction phase works in proximity to the PWS supply pipework; and
- monthly for 12 months following construction in proximity to PWS supply pipework.

8.9.4 Following the pre-construction monitoring, a baseline monitoring report will be produced and maximum and minimum thresholds for parameters agreed with EAC, SLC and SEPA. Monthly reports will be produced following monitoring throughout the construction phase, including where any exceedances above or below thresholds are noted.

8.9.5 Advance warning of construction works will be provided to PWS03, PWS08 and PWS13.

8.10 Residual Effects

Construction

8.10.1 As noted above, no significant potential construction phase environmental effects were identified, taking account of embedded and committed good practice mitigation, except effects on PWS.

8.10.2 Following implementation of additional mitigation measures with accompanying WQMP, the magnitude of impact is considered to be negligible on high sensitivity PWS receptors. This is considered to result in a residual **minor** adverse effect which is **not significant**.

Operation

8.10.3 As noted above, no significant potential operational phase environmental effects were identified, taking account of embedded and good practice mitigation.

Decommissioning

8.10.4 The residual effects of the decommissioning phase will be similar to construction, however, due to reduced site activity, these will be of lesser magnitude. Embedded and committed mitigation will be implemented in accordance with an approved DEMP.

8.11 Cumulative Assessment

8.11.1 Cumulative developments have been considered where they are located within the study area of 10 km from the site. These developments are listed below in **Table 8.8.**

8.11.2 As noted in **Chapter 3**, there are no other relevant large solar or BESS developments in planning, nor consented/under construction, within close proximity of the Proposed Development at the time of assessment. The closest relevant development is Carlisle Road Battery Energy Storage System, a 200 MW BESS development, located approximately 9.8 km east of the site boundary. Due to this development's distance from the Proposed Development, with the Hagshaw Energy Cluster and large areas of forestry located between, it is not considered that it could give rise to any significant cumulative effects, and it is therefore not considered in the cumulative assessment. Therefore the cumulative developments listed in **Table 8.8** below include only wind energy developments.

8.11.3 Operational developments are scoped out of consideration from cumulative effects. This is due to impacts to receptors being of greatest magnitude during the construction phase. Operational wind energy developments or those currently under construction within 10 km include:

- Whitelee Wind Farm;
- West Browncastle Wind Farm;
- Calder Water Wind Farm;
- Dungavel Wind Farm;
- Kype Muir Wind Farm;
- Kype Muir Extension Wind Farm;
- Bankend Rig Wind Farm;
- Auchrobert Wind Farm;
- Cumberhead Wind Farm;
- Cumberhead West Wind Farm;
- Nutberry Wind Farm;
- Dalquhandy Wind Farm;
- Douglas West Wind Farm;
- Douglas West Extension Wind Farm;
- Galawhistle Wind Farm;
- Hagshaw Hill and Extension Wind Farm;
- Hagshaw Hill Repowering Wind Farm; and
- Kennoxhead Wind Farm.

Table 8.8 – Cumulative Development Considered in the Assessment

Development	Status	Distance from Proposed Development Infrastructure (approx. km)	Surface Water Catchment
Bankend Rig III Wind Farm	Application	0.0	Glengavel Water, Greenock Water, Whitehaugh Water.
Hallsburn Farm Wind Farm	Approved	0.025	Glengavel Water
Hawkwood Hill Wind Farm	Application	1.0	Avon Water, Lochar Water
West Dykehead Wind Farm	Application	1.7	Avon Water, Lochar Water
Mill Rig Wind Farm	Approved	2.0	Avon Water, Glengavel Water

Development	Status	Distance from Proposed Development Infrastructure (approx. km)	Surface Water Catchment
Bankend Rig II Wind Farm	Approved	2.6	Avon Water, Glengavel Water
Hare Craig Wind Farm	Approved	2.8	River Ayr
Low Drumclog Wind Farm	Application	3.0	Avon Water
East Merkland Wind Farm	Application	4.0	Avon Water, Lochar Water
Mossmulloch Wind Farm	Application	4.5	Avon Water, Calder Water
South Brownhill Wind Farm	Application	5.3	Avon Water, Calder Water
Kennoxhead Extension II Wind Farm	Approved	6.0	Duneaton Water, Garpel Water, Glenmuir Water
The Drum Wind Farm	Application	6.1	Glenmuir Water, Bellow Water
Kennoxhead Extension I Wind Farm	Approved	7.2	Douglas Water

8.11.4 Developments that are located within the same sub-catchments as the Proposed Development include:

- Bankend Rig III Wind Farm;
- Hallsburn Farm Wind Farm;
- Mill Rig Wind Farm; and
- Bankend Rig II Wind Farm.

8.11.5 The remaining developments are hydrologically connected, located within the same wider catchments of the Avon Water, River Clyde and River Ayr.

8.11.6 EIAs have already been completed for these developments, each including a hydrology, hydrogeology, geology and peat chapter which provides an assessment of potential impacts to surface water and groundwater receptors. Based on a review of the EIA Reports for these cumulative developments, the potential effects were all minor to negligible and found to be not significant. The EIAs for all of the above-noted developments include commitments to implement a suitable CEMP.

8.11.7 Additionally, developments Hallburn Farm Wind Farm, Mill Rig Wind Farm, and Bankend Rig II Wind Farm, are currently approved. These developments will likely be constructed at different times to the Proposed Development and the construction phases would be unlikely to overlap, which is where potential of cumulative effects is at highest risk.

8.11.8 It is considered that the cumulative effects on surface water and groundwater receptors will be no greater than **minor** and therefore **not significant** in terms of the EIA Regulations.

8.12 Summary

8.12.1 Significant design iteration and inclusion of embedded and good practice mitigation measures has resulted in few potentially significant effects on geology, hydrology, peat and hydrogeology receptors being identified. The assessment did identify potential construction and operational effects including effects to PWS receptors.

8.12.2 Three PWS (supply infrastructure) were scoped into further assessment due to being located within the site. Following implementation of guidance and best practice measures, additional mitigation and monitoring, including implementation of a WQMP, there is considered to be minimised potential risk from the Proposed Development.

8.12.3 A PLHRA has identified that the majority of Proposed Development infrastructure is located in areas of negligible or low likelihood of a peat slide occurring. Where medium likelihood locations were identified, an impact assessment was undertaken, and locations have been revised to negligible and low as outlined in **Technical Appendix 8.5**.

8.12.4 The mitigation measures set out in this chapter will be included within a detailed CEMP prior to commencement of construction activities, based on the outline CEMP provided as **Technical Appendix 3.1**. These mitigation measures are considered to be robust and implementable and will reduce the potential impacts on hydrological, hydrogeological and geological receptors. A programme of water quality monitoring would also be implemented.

8.12.5 Additionally, a HMEP will be implemented, including restoration of a substantial area of peatland habitat, with aftercare and monitoring to ensure successful establishment.

8.12.6 The significance of residual effects on geology, peat, hydrology and hydrogeology receptors following the implementation of these mitigation measures are considered to range from **minor** adverse (**not significant**) to **negligible** adverse (**not significant**). Potential effects, mitigation measures and residual effects are summarised in **Table 8.9**.

Table 8.9 – Summary Table

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
During Construction & Decommissioning					
Impacts on Surface Water Quality	Minor	Adverse	Embedded mitigation, including minimum buffers from watercourses. Use of existing infrastructure as far as practicable. Minimising requirement for watercourse crossings. Implementation of mitigation measures outlined in CEMP. Includes committed best practice measures. Will be implemented by Principal Contractor. Best practice will be verified by on-site EnvCoW. Drainage strategy to be implemented. Detailed final design of watercourse crossings to be implemented. Dewatering undertaken for as short a time as practicable. Siting infrastructure to minimise peat excavation requirements. Management and storage of peat in line with the PMP. Application of additional peat excavation/re-use protocol and hierarchy to minimise temporary storage time. Pre-construction ground investigation works. WQMP to be agreed and implemented.	Minor	Adverse
Impacts on Surface Water Flow	Minor	Adverse		Minor	Adverse
Impacts to Groundwater Quality	Minor	Adverse		Minor	Adverse
Impacts to Groundwater Flow	Minor	Adverse		Minor	Adverse
Removal and Impact on Peat	Minor	Adverse		Minor	Adverse
Peat Landslide Impact on Watercourses	Minor	Adverse		Minor	Adverse
Compaction of Soils	Negligible	Adverse		Negligible	Adverse
Impacts to Designated Sites (Muirkirk and North Lowther Uplands (SPA); Muirkirk Uplands (SSSI); Blood Moss and Slot Burn (SSSI); and Greenock Mains (SSSI)).	Minor	Adverse		Minor	Adverse
Impacts to PWS (PWS03, PWS08, PWS13)	Moderate	Adverse	Watching brief will be employed, with excavation monitored by the on-site EnvCoW. If pipework identified this will be marked and a detailed design strategy prepared, may include laying the supply pipework beneath infrastructure or redirect.	Minor	Adverse

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
			Advance warning of construction works will be provided to properties. WQMP to be agreed and implemented.		
During Operation					
Impacts on Surface Water Flow	Minor	Adverse	Embedded design and committed good practice mitigation. Implement best practice and correct storage of fuels and management plans in the event of spills. Best practice to be outlined within OEMP and implemented by operation and maintenance contractor. Implementation of a Drainage Strategy, to include trackside and cross-drainage. Regulation of watercourse crossings by CAR, to include maintenance and removing any blockages. WQMP to be agreed and implemented. Implementation of HMEP, including c.50 ha of peatland restoration, with aftercare and monitoring.	Minor	Adverse
Impacts on Fluvial Geomorphology	Minor	Adverse		Minor	Adverse
Impacts to Groundwater Flow and Drying out of Peat	Minor	Adverse		Minor	Adverse
Impacts on Surface Water and Groundwater Quality from Chemical Pollution and Sedimentation	Minor	Adverse		Minor	Adverse
Cumulative Effects					
Impacts to Surface Water Quality and Flow	Minor	Adverse	Embedded design and committed good practice mitigation. Implementation of mitigation measures as outlined in CEMPs.	Minor	Adverse
Impacts to Groundwater Quality and Flow	Minor	Adverse		Minor	Adverse

8.13 References

BGS (2015) Scotland's Aquifers and Groundwater Bodies. Available at: https://nora.nerc.ac.uk/id/eprint/511413/1/OR15028.pdf Accessed on 14 February 2025

BGS (2020) Online GeoIndex Map Viewer. Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html. Accessed on: 14 February 2025.

British Standards Institute (2015). BS5930:2015 Code of Practice for Site Investigation.

CIRIA. (2001). C532 Control of water pollution from construction sites: guidance for consultants and contractors. CIRIA, London.

CIRIA. (2015). C741 Environmental Good Practice on Site guide. 4th Edition. CIRIA, London.

East Ayrshire Council (2024) Adopted Local Development Plan 2. Available at: *https://www.east-ayrshire.gov.uk/PlanningAndTheEnvironment/development-plans-and-policies/ldp2/ldp2-information.aspx* Accessed on 12 February 2025.

James Hutton Institute (2024) Soil Classification. Available at: https://www.hutton.ac.uk/soil-maps/ Accessed on 14 February 2025.

NatureScot. (2024). Good practice during wind farm construction, 5th edition. Available at: https://www.nature.scot/doc/good-practice-during-wind-farm-construction. Accessed on: 23 October 2024.

NatureScot (2024) SiteLink Map Search. Available at: https://sitelink.nature.scot/map. Accessed on: Accessed on: 17 February 2025.

Scotland's Soils (2024) Carbon and Peatland Map 2016. Available at: https://map.environment.gov.scot/Soil_maps/?layer=1# Accessed on: 17 February 2025.

Scotland's Soils (2024) National Soil Map of Scotland. Available at: https://map.environment.gov.scot/Soil_maps/?layer=1# Accessed on: 17 February 2025.

Scottish Government (2006). The Private Water Supplies (Scotland) Regulations 2006. Available at: https://www.legislation.gov.uk/ssi/2006/209/contents/made Accessed on: 14 February 2025.

Scottish Government (2009). Flood Risk Management (Scotland) Act 2009. Available at: https://www.legislation.gov.uk/asp/2009/6/contents Accessed on: 14 February 2025.

Scottish Government (2009). The Contaminated Land (Scotland) Regulations 2000 (as amended). Available at: https://www.legislation.gov.uk/ssi/2000/178/contents/made Accessed on: 12 February 2025.

Scottish Government (2009). The Scottish Soil Framework. Available at: https://www.gov.scot/publications/scottish-soil-framework/ Accessed on: 18 February 2025.

Scottish Government (2011). The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Available at: https://www.legislation.gov.uk/ssi/2011/209/contents/made Accessed on: 12 February 2025.

Scottish Government (2011). Water Environment and Water Services (Scotland) Act 2003. Available at: https://www.legislation.gov.uk/asp/2003/3/contents Accessed on: 12 February 2025.

Scottish Government (2013). The Water Resources (Scotland) Act 2013. Available at: https://www.legislation.gov.uk/asp/2013/5/enacted Accessed on: 12 February 2025.

Scottish Government (2017). The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. Available at: https://www.legislation.gov.uk/ssi/2017/101/contents/made Accessed on: 12 February 2025.

Scottish Government, SNH, SEPA (2017). Guidance on Developments on Peatland. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/12/peatland-survey-guidance/documents/peatland-survey-guidance-2017/peatland-survey-guidance-2017/govscot:document/Guidance+on+developments+on+peatland+-+peatland+survey+-+2017.pdf Accessed on: 12 February 2025.

Scottish Government (2017). Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments. Available at: https://www.gov.scot/publications/peat-landslide-hazard-risk-assessments-best-practice-guide-proposed-electricity/documents/ Accessed on: 12 February 2025.

Scottish Government (2017). The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017. Available at: https://www.legislation.gov.uk/ssi/2017/282/contents/made Accessed on: 12 February 2025

Scottish Government (2020). Scottish Planning Policy. 2020. Available at: https://www.gov.scot/publications/scottish-planning-policy/ Accessed on: 12 February 2025.

Scottish Government. (2022). Planning Advice Notes. Available at: https://www.gov.scot/collections/planning-advice-notes-pans/ Accessed on: 12 February 2025.

Scottish Government (2022) National Planning Framework 4: revised draft. Available at: https://www.gov.scot/publications/national-planning-framework-4/ Accessed on 12 February 2025.

SEPA (2012). Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste. Available at: https://www.gov.scot/publications/assessment-of-peat-volumes-reuse-of-excavated-peat-and-minimisation-of-waste-guidance/ Accessed on: 12 February 2025.

SEPA. (2009). Groundwater Protection Policy for Scotland, Version 3 Environmental Policy Number 19. Available at: https://www.sepa.org.uk/media/34371/groundwater-protection-policy-for-scotland-v3-november-2009.pdf Accessed on: 12 February 2025.

SEPA (2017) Developments on Peat and Off-Site Uses of Waste Peat. Available at: https://www.sepa.org.uk/media/287064/wst-g-052-developments-on-peat-and-off-site-uses-of-waste-peat.pdf Accessed on: 12 February 2025.

SEPA. (2017). Land Use Planning System SEPA Guidance Note 31 Available at the following link (must be copied and pasted to web browser): https://www.sepa.org.uk/media/143868/lupsgu31_planning_guidance_on_groundwater_abstractions.pdf Accessed on: 12 February 2025.

SEPA (2019) Technical Flood Risk Guidance for Stakeholders. Available at: https://www.sepa.org.uk/media/162602/ss-nfr-p-002-technical-flood-risk-guidance-for-stakeholders.pdf Accessed on: 12 February 2025.

SEPA. (2020). Online Water Environment Hub and Classification Hub. Available at: https://www.sepa.org.uk/data-visualisation/water-environment-hub/ Accessed on: 18 February 2025.

SEPA. (2021). Supporting Guidance (WAT-SG-75) – Sector Specific Guidance: Construction Sites. Available at: https://www.sepa.org.uk/media/340359/wat-sg-75.pdf Accessed on: 12 February 2025

SEPA (2022) Flood Maps. Available at: https://map.sepa.org.uk/floodmaps Accessed on: 18 February 2025

SEPA (2022). Guidance for Pollution Prevention. Available at: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/ Accessed on: 12 February 2025.

SEPA (2022) Scotland's Environment Map. Available at: https://www.environment.gov.scot/maps/scotlands-environment-map/ . Accessed on: 14 February 2025.

SEPA. (2022). The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide, Version 10.1. Available at https://www.sepa.org.uk/regulations/water/ Accessed on: 12 February 2025.

SEPA (2023) Waste Sites and Capacity Tool. Available at: https://www.sepa.org.uk/data-visualisation/waste-sites-and-capacity-tool/ . Accessed on 18 February 2025.

SEPA (2024) Guidance on Assessing the Impacts of Developments on Groundwater Dependent Terrestrial Ecosystems. Available at: https://www.sepa.org.uk/environment/land/planning/guidance-and-advice-notes/ Accessed on: 25 February 2025.

SEPA (2024) Guidance on Assessing the Impacts of Developments on Groundwater Abstractions. Available at: https://www.sepa.org.uk/environment/land/planning/guidance-and-advice-notes/ Accessed on: 25 February 2025.

South Lanarkshire Council (2021) Local Development Plan 2. Available at: *https://www.southlanarkshire.gov.uk/developmentplan2* Accessed on 12 February 2025.

UK Government (1990). Environmental Protection Act 1990. Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents Accessed on: 12 February 2025

UK Government (1994). The Conservation (Natural Habitats, & c.) Regulations (1994, as amended Scotland). Available at: https://www.legislation.gov.uk/uksi/1994/2716/contents/made Accessed on 12 February 2025.

UK Government (1995). Environment Act 1995. Available at: https://www.legislation.gov.uk/ukpga/1995/25/contents Accessed on: 12 February 2025.