Chapter 8: Hydrology, Hydrogeology, Geology and Peat

Chapter 8
Hydrology, Hydrogeology, Geology and Peat

Introduction

8.1 This chapter presents the findings of the assessment of likely significant effects with respect to the geology, hydrology, hydrogeology and peat environment associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- Describe the baseline;
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
- Describe the potential effects, including cumulative effects;
- Describe the mitigation measures proposed to address likely significant effects (if required); and
- Assess the residual effects remaining following the implementation of mitigation (if required).

8.2 This chapter is supported by the following figures and appendices which are referenced throughout the text:

- **EIA Report Volume 3a: Figures**
  - **Figure 8.1: Site location, showing hydrological features, topography, private water supplies and abstractions**
  - **Figure 8.2: Watercourses, buffers, main catchments and watercourse crossings**
  - **Figure 8.3: Ground Water Dependent Terrestrial Ecosystems (GWDTE), groundwater abstractions and private water supplies**
  - **Figure 8.4: Solid Geology and Superficial Geology**
  - **Figure 8.5: Soils**
  - **Figure 8.6: Carbon and Peatlands Classification**
  - **Figure 8.7: Peat Depths (combined Phase 1 and Phase 2)**
- **EIA Report Volume 4: Appendices**
  - **Appendix 8.1: Watercourse Crossings (Kaya Consulting Limited)**
  - **Appendix 8.2: Peat Survey Report (Kaya Consulting Limited)**
  - **Appendix 8.3: Peat Management Plan (East Point Geo)**
  - **Appendix 8.4: Peat Landslide Hazard and Risk Assessment (East Point Geo)**
  - **Appendix 8.5: Outline Drainage Strategy (Pell Frischmann)**
  - **Appendix 8.6: Groundwater Dependent Terrestrial Ecosystem Assessment (GWDTE).**

Methodology

Effects Scoped In to the Assessment

8.3 This assessment concentrates on the effects of construction and operation of the Proposed Development upon receptors identified during the review of desk-based information and field surveys (the extents of the study areas are set out in the Method of Baseline Characterisation section below). Effects upon the following features are assessed:

- Surface and ground water quality;
- Public and private water supplies (PWS);
- Groundwater Dependent Terrestrial Ecosystems (GWDTEs);
- Hydrology (Flood Risk);
- Peat.

8.4 The following potential effects were identified for consideration in this assessment:

- Direct effects during construction on:
  - surface and ground water quality,
  - public and private water supplies,
  - GWDTEs,
  - Hydrology (flood risk),
  - channel morphology, and
  - peat.
- Direct effects during operation on hydrology (flood risk);
- Cumulative effects during construction on surface and ground water quality, hydrology and peat; and
- Decommissioning effects.

Effects Scoped Out of the Assessment

8.5 On the basis of the desk-based and field survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, and feedback received from consultees, the following topic areas have been 'scoped out' of detailed assessment:

- Effects on bedrock geology during both construction and operation; and
- Operational effects on surface water quality and quantity, public and private water supplies and peat.

Consultation

8.6 In undertaking the assessment, consideration has been given to the Scoping Responses and other consultation which has been undertaken as detailed in **Table 8.1**.

Table 8.1: Consultation responses

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
East Lothian Council (ELC)	Formal Scoping Consultation	ELC note that it would be helpful if the East Lothian/Scottish Borders Council (SBC) boundary could be shown on mapping so it is clear where a receptor is located.	The Council boundary is shown in **Figure 8.1.**

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
8 April 2022		ELC note that the Site may be suitable for peatland restoration; if so there could be considerable potential for carbon sequestration here. The baseline should include a description of the potential for peatland restoration, if any.	The potential for peatland restoration on the Site is discussed in this chapter and **Appendix 6.6: Outline Restoration and Enhancement Plan (OREP)**.
		ELC note that an area within East Lothian (at Killpallet) drains towards the Site and may contain peat. Changes to one part of a peatland, as well as changes to drainage, can have effects on peat elsewhere. ELC therefore considers that the study area for peat should include land surrounding the Site where peat habitat and soil may be connected hydrologically with the Site. The potential for impacts of the Proposed Development on peat as a whole, including at Killpallet, should be considered, not just on the Site.	The study area for peat has been extended to include land surrounding the Site where peat habitat and soil may be connected hydrologically with the Site. This will include the Killpallet area to the north. It is noted that no peat probing or surveys of land outside the Site boundary has been undertaken, but the potential for effects on peat as a whole (including the Killpallet area to the north of the Site) have been considered in the chapter.
		ELC has a Phase 1 habitat survey from 1997 which may help identify land which is potentially peat on the East Lothian side of the boundary	The Phase 1 habitat survey was obtained from ELC and is referred to in the baseline assessment.
		ELC note that if there are impacts on streams within the SBC area there could be impacts on mobile biodiversity such as otters. ELC therefore supports the proposed mitigation (in the Scoping Report) of a 50 metres (m) buffer from watercourses to minimise the risk of potential impacts due to changes in runoff, sedimentation or water quality.	Noted. A 50 m buffer from watercourses was included in the early design.
		ELC request that a Peatland Condition Assessment should be prepared in line with NatureScot guidance to evaluate the condition of peat as a precursor to restoration. The Scottish Government has also produced guidance on peat survey and the survey should be carried out in line with this.	Noted, an overview peatland condition assessment was included in the peat surveys and is reported in **Appendix 8.2**. Peat surveys were carried out following the Scottish Government guidance[1]. A Peatland Condition Assessment is provided as **Appendix 6.8**.
East Lothian Council, 5 August 2022	Post Scoping Consultation / Data Request	ELC provided Phase 1 1997 habitat data for area north of the Site. ELC confirmed that there are no PWS within the PWS search area on the ELC register. The PWS search area include the Site and a 1 kilometre (km) buffer from the Site boundary.	Data used to inform baseline assessment.
Crown Estate Scotland 8 April 2022	Formal Scoping Consultation	No specific issues with the proposed scope of the EIA however, CES note that impact on fisheries has been scoped out. If the RTC (River Tweed Commission which is also a consultee) have asked that this be changed they would support them in that regard.	RTC comments related to fisheries issues have been addressed in **Chapter 6: Ecology**.

[1] Scottish Government, Scottish Natural Heritage & SEPA (2017) Peatland Survey - Guidance on Developments on Peatland.

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
River Tweed Commission (RTC) 5 April 2022	Formal Scoping Consultation	RTC support the detailed survey of peat deposits present within the Site to ascertain the risk of peat slide during construction. All construction should avoid areas of deep peat and where this is not possible appropriate mitigation measures should be put in place. Natural peat drainage channels should be preserved throughout the development; excavated material should not be stock piled in areas of unstable peat; concentrated water flows onto peat slopes should also be avoided.	Noted. Deeper peat has been avoided (see **Appendix 8.2**) and the comments are covered in **Appendix 8.3**, and **Appendix 8.4.**
		RTC recommended that construction avoids water bodies wherever possible. If construction is to be carried out near watercourses, a buffer zone of at least 50 m should be established. The potential for sediment transport and deposition should be carefully considered and the installation of appropriate siltation controls should be employed. Where river crossings are proposed SEPA's Engineering in the Water Environment Good Practice Guide should be consulted. The use of 'clear span bridge crossings' is encouraged wherever possible.	New watercourse crossings were avoided, by using existing tracks where possible. The Proposed Development requires four new watercourse crossings (including two upgraded existing crossings) and 19 existing crossings (**Appendix 8.1**). Scottish Environment Protection Agency (SEPA) guidance has been followed for crossing design. A 50 m buffer from Ordnance Survey watercourses was included at early design stage.
		RTC note that where water abstraction is proposed, the developer should ensure that they comply with The Salmon (Fish Passes and Screens) (Scotland) Regulation 1994 which states that screens, at the point of water abstraction, should serve to prevent the entry and injury of salmon.	There is no water abstraction proposed for the Proposed Development. EDF Energy Renewables Ltd (the Applicant) expects to share the existing water arrangements with Fallago Rig, which have private abstractions (documented in **Table 8.5**).
		RTC note that surface water runoff must be discharged in such a way to minimise the risk of pollution of the water environment. The Water Environment (Controlled Activities) (Scotland) (CAR) Regulations 2011 require any activity that is liable to cause water pollution to be authorised by SEPA. This includes point source pollution and diffuse pollution (fuel, concrete spills, sediment discharge) all of which can be detrimental to the survival of fish. SEPA has produced guidelines for the prevention of pollution.	Noted. SEPA guidance and Controlled Activity Regulations (CAR) have been followed and pollution prevention measures and mitigation are discussed in this chapter.
		RTC notes that the Applicant needs to assess the potential impacts of tree felling on the aquatic environment including nutrient release, increased acidification risk, loss of habitat, impacts on hydrology, increased fine sediment transport and deposition. The Forest and Water Guidelines should be consulted for further information.	There is no tree felling proposed.

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
Scottish Water 25 March 2022	Formal Scoping Consultation	Scottish Water has no objection to this planning application; however, the Applicant should be aware that this does not confirm that the Proposed Development can currently be serviced.	Noted. The Proposed Development does not require to be serviced by Scottish Water.
		Scottish Water indicates that the proposed activity falls within a drinking water catchment where a Scottish Water abstraction is located. The abstractions are designated as Drinking Water Protected Areas (DWPA) under Article 7 of the Water Framework Directive. Dye Water supplies Rawburn Water Treatment Works (WTW) and it is essential that water quality and water quantity in the area are protected. The proposed activity is a sufficient distance from the intake, however there is likely to be some risk and care should be taken and water quality protection measures must be implemented. In the event of an incident occurring that could affect Scottish Water we should be notified immediately. The fact that this area is located within a drinking water catchment should be noted in documentation. Also anyone working onsite should be made aware of this during site inductions and we would also like to take the opportunity, to request that in advance of any works commencing onsite, Scottish Water is notified at protectedwsources@scottishwater.co.uk so we can make our operational teams aware there will be activity taking place in the catchment.	This will be included in the baseline assessment in this chapter. The Rawburn WTW is approximately 3.7 km downstream of the Site in the Watch Water catchment. Water quality and pollution prevention measures are proposed to account for the sensitive receptor. Scottish Water will be kept informed should any incidents occur; this and the fact that the Site is in a drinking water catchment is documented in **Appendix 3.1: Outline Construction Environmental Management Plan** (**CEMP**)
		Scottish Water wish to be further notified as the application progresses and to have the grid reference of each of the 20 turbine locations and access tracks.	Grid references of the turbine locations were provided to Scottish Water on 16 August 2022.
		Scottish Water will not accept any surface water connections into our combined sewer system.	No connections into Scottish Water system are proposed.
		Scottish Water note that all Proposed Developments require a Pre-Development Enquiry (PDE) Form to be submitted directly to Scottish Water prior to any formal Technical Application being submitted.	The Proposed Development does not need a water or waste water connection. On this basis, a PDE Form is not required to be submitted.
		Scottish Water note that certain discharges from non-domestic premises may constitute a trade effluent in terms of the Sewerage (Scotland) Act 1968.	Noted, however it is understood that there will be no wastewater or trade effluent generated during operation of the wind farm. Wastewater generated during construction (e.g. construction staff

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
			welfare arrangements) will be taken offsite.
Scottish Water 17 August 2022	Post Scoping Consultation	The Applicant provided grid references of proposed turbines. Scottish Water confirmed by return email that there are no Scottish Water assets near these areas. However, Scottish Water recommend that the Applicant purchases their asset plans from Site Investigation Services (UK) Ltd to make sure.	Scottish Water asset plans covering the Site and surrounds were purchased and used to inform the baseline assessment.
SEPA 11 April 2022	Scoping Consultation	SEPA consider that the following key issues must be addressed in the Environmental Impact Assessment process. To avoid delay and potential objection, the information outlined below (and detailed further in the appendix of the response from SEPA) must be submitted in support of the application:	The information requested is provided in this EIA Report, as described below (with justification for any exclusions at this stage):
		a) Map and assessment of all engineering works within and near the water environment including buffers, details of any flood risk assessment and details of any related CAR applications.	a) Map of all engineering activities is provided in **Figure 8.1**. The map shows all water environment features and proposed buffers. A flood risk assessment was not required for the Proposed Development; however, flood risk is described in the baseline and assessment. CAR requirements are also covered in the assessment.
		b) Map and assessment of impacts upon Groundwater Dependent Terrestrial Ecosystems and buffers.	b) A map and assessment of impacts upon GWDTE and buffers is included in **Figure 8.3** and discussed in **Appendix 8.6** and the effects assessment.
		c) Map and assessment of impacts upon groundwater abstractions and buffers.	c) A map and assessment of impacts upon groundwater abstractions and buffers are included in **Figure 8.3** and discussed in the effects assessment.
		d) Peat depth survey and table detailing re-use proposals.	d) A peat depth survey is provided in **Appendix 8.2** and reuse proposals described in **Appendix 8.3**.
		e) Map and table detailing forest removal.	e) There is no forest removal required for the Proposed Development.
		f) Map and site layout of borrow pits.	f) Borrow pits are shown in **Figures 8.1, 8.2 and 8.3**.
		g) Schedule of mitigation including pollution prevention measures.	g) Pollution prevention measures are described in the Mitigation section within this chapter and summarised in **Appendix 3.5: Schedule of Mitigation, Good Practice, Enhancement and Monitoring**.

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
		h) Borrow Pit Site Management Plan of pollution prevention measures.	h) A Borrow Pit Site Management Plan will support the Construction Environmental Management Plan (CEMP). An outline CEMP is provided in **Appendix 3.1** with regards to pollution prevention measures.
		i) Map of proposed waste water drainage layout.	i) The Proposed Development will not generate waste water and therefore no waste water layout is provided.
		j) Map of proposed surface water drainage layout.	j) An outline surface water drainage layout is provided in **Appendix 8.5**.
		k) Map of proposed water abstractions including details of the proposed operating regime.	k) There is no water abstraction proposed for the Proposed Development. The Applicant expects to share the existing water arrangements with Fallago Rig, which has private abstractions (documented in **Table 8.5**).
		l) Decommissioning statement.	l) Decommissioning is discussed in **Chapter 3: Development Description**. A decommissioning strategy will be submitted by the Applicant to SBC for agreement prior to the decommissioning works taking place, and this is likely to form a condition to the consent.
		SEPA agrees with the proposed peat probing methodology, however SEPA finds it disappointing that peat probing was not carried out at Scoping stage. SEPA strongly encourage the Applicant to conduct Phase 1 probing at an early stage and to share this with SEPA so that further advice can be provided about how the layout can be designed to minimise impacts. More probing will be required in areas of deep peat, so that the data can be used to move infrastructure to shallower peat areas.	Phase 1 peat survey was carried out in March 2022. The Phase 1 Peat Survey report was submitted to SEPA on 3 August 2022. The data was used to inform the design to avoid deeper peat.
		SEPA are satisfied with the proposed approach to mitigation as long as this commitment is conveyed to construction staff as a priority to protect the water quality in the upper Tweed catchment.	Noted. This will be conveyed to the contractor and construction staff via the CEMP and Schedule of Mitigation.
		SEPA welcome the commitment to include a 50 m buffer around all watercourses which form part of River Tweed SAC. We note that “where possible” a 50 m buffer between turbines and watercourses/bodies shown on 1:50,000 scale will also be included. We would highlight that we would expect to see a 50 m buffer applied to all watercourses, not just those on the 1:50k map.	A 50 m buffer was applied to all watercourses, including those identified in the field. Locations where the 50 m water feature buffer is encroached are identified and justified in **Appendix 8.1**. Site specific additional mitigation, if required, is outlined in the appendix and also in the schedule of mitigation.

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
		If a minimum buffer of 50 m 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.	
		SEPA recommend that all small-scale watercourse crossings should be designed as oversized bottomless arched culverts or traditional style bridges. In the case of larger scale watercourse crossings, including any crossings of the Dye Water, a single span bridge is preferred.	Noted and will feed into design and EIA Report. There are no proposed new crossings on larger watercourses such as the Dye Water.
		SEPA note the following Regulatory Requirements: • Proposed engineering works within the water environment will require authorisation under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). • Management of surplus peat or soils may require an exemption under The Waste Management Licensing (Scotland) Regulations 2011. • Proposed crushing or screening will require a permit under The Pollution Prevention and Control (Scotland) Regulations 2012. • Consider if other environmental licences may be required for any installations or processes.	Engineering in the water environment has been minimised. **Appendix 8.1** and **Figure 8.1** provides information on new and existing watercourse crossings and comments on the level of CAR authorisation required. A Peat Management Plan (**Appendix 8.3**) has been prepared which identifies the volumes of peat to be excavated in association with proposed infrastructure and which provides suitable reuse recommendations and mitigation measures. Relevant permits for the proposed crushing or screening (at the borrow pits) will be sought when required. A CAR Construction Site Licence (CSL) will be required for the Proposed Development. This will be applied for in advance of construction in line with SEPA's Sector Specific Guidance: Construction Sites (WAT-SG-75).
SEPA 17 August 2022	Post Scoping Consultation	SEPA welcomed the Phase 1 peat report, which was issued to SEPA on 3 August 2022. SEPA requested a detailed map of peat depths, with individual probing points shown (not only interpolated) and all infrastructure overlain to show how peat depth has informed layout. SEPA note that peat deeper than 1 m is classed as deep peat and all peat over this depth must be avoided where possible. Applicants must investigate minimising excavation through micrositing the infrastructure off deep peat, the use of floating tracks and temporary geotextile surfaces for blade storage etc. to reduce the total amount of peat excavated. Where this cannot be achieved, turbines should be removed from the plan unless sufficient justification can be provided.	**Figures 2a-d** in **Appendix 8.2** show the infrastructure with peat depths on top. The figures use a suitable scale to clearly illustrate the probed depth category. Deeper peat was avoided where possible, based on feedback from the Phase 1 peat survey. The Outline Peat Management Plan (PMP) (**Appendix 8.3**) describes how excavation is minimised and other mitigation used (e.g. floating tracks).

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
SEPA 16 January 2023	Post Scoping Consultation/ Data Request	SEPA provided data of eight CAR abstraction licences within a 7 km radius from the Site Centre.	The data has been used to inform the baseline and assessment on groundwater abstractions in this chapter.
Nature Scot 9 May 2022	Scoping Consultation	The River Tweed Special Area of Conservation (SAC) is located within the application boundary and the watercourses within the Site have connectivity with the SAC. NatureScot advise that consideration should be given to the potential effects the Proposed Development in relation to the qualifying interests of the SAC (including proposed access tracks). The SAC interests are sensitive to disturbance to the river habitat, including silt and sediment entering the watercourse and smothering gravel beds, suspended solids in the water column, pollution events, and changes in water quality and in water chemistry.	Noted. The Special Area of Conservation (SAC) is within and downstream of the Site and is considered a highly sensitive receptor. Potential effects of hydrology and surface water quality are addressed in this Chapter.
		If the surveys/assessment identify that the proposal may impact nationally important Class 1 and/or Class 2 peatland then we advise that opportunities to mitigate impacts through siting, design and other measures should be fully considered within the EIA Report.	Noted, the proposals will not impact nationally important Class 1 and/or Class 2 peatland (see Effects Assessment section below).
Scottish Borders Council (SBC) May 2022		SBC note that flood risk is manageable given the size of the Site and they would have no objection to this proposal in terms of flood risk. However, SBC would require that the following is adhered to; • The formation of any newly formed hard surfaces such as access roads should be attenuated to at least existing Greenfield runoff rates so that there is no increased effect on downstream receptors. Likewise, any discharges from Sustainable Drainage Systems (SuDS) and other drainage should be kept to existing Greenfield runoff rates. • If there are to be any culverts, watercourse crossings or alterations to crossings, these must not reduce the flow conveyance of the watercourse. • Details of the silt traps and any other functions that the Applicant proposes to minimise the amount of sediment entering the watercourse should be submitted. • A buffer zone between the watercourse and infrastructure (e.g. turbines).	Noted. The drainage design, including SuDS, has been designed to attenuate flows to Greenfield runoff rates. New watercourse crossings have been designed to maintain the flow conveyance of the watercourse. Construction SuDS, including silt traps, are described in the CEMP and mitigation sections within this chapter. A minimum 50 m buffer has been applied to all watercourses and there is no infrastructure within flood risk areas. There are three locations where the 50 m buffer could not be achieved, these are detailed and assessed in **Appendix 8.1**. Flood risk is discussed in the baseline assessment within the chapter.

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
		SBC note that the Scoping Report states that there will be a 50 m buffer zone between turbines and watercourses to reduce impacts on runoff and water quality. It is also stated that all components of the development, and watercourse crossings will be kept outwith the 1 in 200 year SEPA fluvial flood extents. SBC agree that these are appropriate steps to mitigate flood risk and I would encourage these to be incorporated within the full application.	
SBC 8 April 2022	Post Scoping Data Request	SBC provided their PWS Register for the Applicant to review and identify the PWSs accordingly. SBC note that information pertaining to the source locations (grid references) may not be accurate, and the data really only confirms the premises likely to have their sources close by and potentially within the search area. As such, SBC strongly recommend that an approach be made to the premises' owners directly, to confirm the exact locations of their PWS sources. There may also be other premises within the area that SBC do not have recorded on their register but which may be served by PWS, and therefore should be considered accordingly.	The PWS Register was reviewed and used to inform the baseline assessment. Based on a review of Ordnance Survey maps it is considered unlikely that there are other PWS not captured by the data provided by consultation with SBC, ELC and SEPA.
Energy Consents Unit (ECU) May 2022	Scoping Opinion	Scottish Ministers request that the Company investigates the presence of any PWS which may be impacted by the development. Details should be provided if any are identified.	SBC and ELC were both contacted and provided PWS data. Potential impacts on PWS are discussed and assessed in the chapter.
		Scottish Ministers consider that where there is a demonstrable requirement for peat landslide hazard and risk assessment (PLHRA), the assessment should be undertaken as part of the EIA process to provide Ministers with a clear understanding of whether the risks are acceptable and capable of being controlled by mitigation measures. The Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (2017 Second Edition), should be followed in the preparation of the EIA Report.	A peat landslide hazard and risk assessment is included (**Appendix 8.4)**, and has been prepared following the recommended 2017 guidance.
Marine Scotland Science	Scoping Response Standing Advice on	MSS recommends that a water quality and fish population monitoring programme is carried out to ensure that the proposed mitigation measures are effective. A robust, strategically designed and site specific monitoring programme	Construction methods in the Outline CEMP will include monitoring pre, during and post construction in line with best practice[2]. Operational monitoring of watercourses will also be implemented.

[2] Scottish Government. Monitoring Watercourses in Relation to Onshore Wind Farm Developments -Generic Monitoring Programme. Available at: https://www.gov.scot/publications/monitoring-watercourses-in-relation-to-onshore-wind-farm-developments-generic-monitoring-programme/) [Accessed April 2023]

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
April 2022	freshwater and diadromous fish and fisheries in relation to onshore wind farm developments, updated April 2022	conducted before, during and after construction can help to identify any changes, should they occur, and assist in implementing rapid remediation before long term ecological impacts occur.	This approach is standard practice on projects of this scale, nature and geographic location.
		"*MSS advises that planning conditions are drawn up to ensure appropriate provision for mitigation measures and monitoring programmes, should the development be given consent.* *We recommend, where required, that a Water Quality Monitoring Programme, Fisheries Monitoring Programme and the appointment of an Ecological Clerk of Works, specifically in overseeing the above monitoring programmes, is outlined within these conditions and that MSS is consulted on these programmes."*	An Environmental Clerk of Works (ECoW) will be present during construction and the activities described will be covered by this role.
SEPA 2 March 2023	Gate check Consultation	SEPA note that no information was provided regarding underpinning site surveys, site constraints and intended buffers zones from sensitive receptors so they cannot offer any comments on the appropriateness of the Site design at this stage. SEPA are happy to be reconsulted if this is provided. Otherwise SEPA will consider their position during the formal consultation process. SEPA advise to see their Scoping Response for issues to be addressed.	Site surveys, constraints and buffer zones are provided in the **Figures 8.1 to 8.7** within the chapter. The issues raised in the Scoping Response have been addressed where possible. Locations where SEPA's recommended buffers are encroached are identified and justified in the chapter and **Appendix 8.1**.
ELC 14 April 2023	Gate check Consultation	ELC note that no probing outwith the Site itself is proposed. ELC hope the desk study and probing of the Site will allow enough information to be gathered, but if not this might need to be reconsidered.	Noted. The desk study and probing within the Site is considered suitable to assess potential effects on peat outwith the Site boundary (i.e. in ELC).

Committed Design Considerations

Project Design Assumptions, Good Practice Measures and Embedded Design

8.7 A 50 m infrastructure buffer from all blue-line watercourses and water features shown on 1:25,000 Ordnance survey maps was applied at the early project design phase. Ordnance Survey water feature data was obtained for the Site area and buffered accordingly. Smaller watercourses and drains identified during the survey work were considered and buffered wherever possible. Locations where the recommended buffers could not be met are assessed in **Appendix 8.1** and summarised in the Effects Assessment within this chapter.

8.8 From the outset of the project, deeper areas of peat (>1 m) have been treated as a key constraint to siting wind farm infrastructure. Through a series of design workshops, the overlap of infrastructure with the deepest peat deposits have been minimised. Details of the iterative design approach are provided in **Chapter 2: Site Selection and Design Strategy** of the EIA Report and form the first tier of the peat management strategy ('prevent') at the Proposed Development. The second tier of the strategy is to reuse excavated peat, and the approach to reuse is described in the Peat Management Plan (**Appendix 8.3**). No need has been identified for recycling or disposal of excavated materials.

8.9 Through careful design, including consideration of early PLHRA likelihood results, the vast majority of proposed infrastructure has been sited or routed away from areas of Moderate peat landslide likelihood or Factor of Safety <1.4 (using best estimate parameters).

8.10 Watercourse crossings were avoided and minimised as much as possible during early iterations of the turbine and track layouts.

8.11 A 100 m buffer was maintained where possible between all GWDTE from the track and turbine layouts where excavation was to be over 1 m deep. Where excavation was to be over 2.5 m depth (e.g. turbine foundations) a buffer of 250 m from GWDTE was applied where possible. A detailed GWDTE Assessment is included as **Appendix 8.6**, for the two locations where the recommended buffers were encroached.

8.12 A number of good practice pollution prevention and control measures will be put in place during the construction phase. These will be embedded into the project design and reflect best practice guidance and recognised industry standards, as well as the Applicant's experience of constructing wind farms. Many of the measures mitigate several potential effects (e.g. mitigation to minimise sedimentation and pollution such as SuDS which can also serve to attenuate surface water runoff and minimise flood risk). Embedded mitigation measures are described in **Chapter 3** and CEMP in **Appendix 3.1** and include:

- SuDS to minimise/attenuate surface runoff from new hardstanding and tracks;
- SuDS to reduce sedimentation and erosion;
- SuDS to reduce pollution and accidental spillage;
- Pollution control measures to be put in place at watercourse crossings; and
- Peat management measures.

8.13 Drainage measures for new access tracks and infrastructure include (but are not limited to):

- Appropriately sized culverts passing under the tracks that do not restrict flow and allow small watercourses, intercepted field drains and ephemeral streams/surface water flow pathways to pass under the tracks.
- Interceptor drainage ditches on the upgradient side of all proposed infrastructure to intercept and divert 'clean' surface water runoff draining towards the construction areas.
- Installation and maintenance of swales and track drains to intercept, collect and treat runoff from access tracks and hardstanding areas of the Site and channel runoff to stilling ponds for sediment settling.

8.14 As a minimum, the contractor will be required to follow the guidance contained in SEPA Guidance for Pollution Prevention (GPPs) and to follow the SEPA's general binding rules (GBR) under the Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended (CAR Regulations).

8.15 A concrete batching plant is proposed within construction compound 3 to reduce concrete transport on access and public roads for foundation pours. As concrete batching is proposed onsite, specific measures will be put in place to manage runoff from these operations, which is highly alkaline and can cause pollution if it gets into watercourses. Good practice, as described in SEPA WAT-SG-75 guidance[3], will be followed to isolate, collect, reuse and dispose of runoff from concrete operations. Concrete wash water and waste will be sent offsite to a licensed facility for treatment and/or disposal, in accordance with the Duty of Care for Waste.

8.16 In terms of watercourse crossings, engineering activities on minor watercourses do not normally require authorisation under the SEPA CAR Regulations. SEPA defines minor watercourses as those not shown on the 1:50,000 scale Ordnance Survey maps. One of the new crossings (Crossing ID1) required for the Proposed Development is over a minor watercourse and therefore falls under GBR 6 and GBR 9. This crossing will not require registration or a licence under CAR; however, the work will follow general good construction practice and GBR 6 and GBR 9.

8.17 Two of the proposed new crossings will require either registration or a simple licence under CAR and will require specific mitigation measures. Bridging solutions will be designed to avoid affecting the bed and banks of watercourses. Fording of

[3] SEPA (2021) Supporting Guidance (WAT-SG-75) Sector Specific Guidance: Water Run-Off from Construction Sites September 2021

watercourse will be avoided. Design and implementation of crossings will follow best practice, including recommendations by SEPA (2010)[4], Scottish Renewables et al. (2019)[5] and SNH (2015)[6].

8.18 During construction, temporary construction SuDS will be put in place at each watercourse crossing to ensure no sedimentation from construction works or pollution from plant or machinery can enter the watercourse. The temporary construction SuDS could be a series of settlement ponds or settlement tanks and silt fences.

8.19 A CSL will be obtained from SEPA under the CAR Regulations in advance of the construction works. This will include a detailed Pollution Prevention Plan (PPP) to ensure that any discharges of water runoff from the Site to the water environment do not cause pollution. This will be prepared in advance of construction and authorisation from SEPA is required before construction commences.

8.20 Prior to construction and on completion of ground investigations and micrositing, a site waste management plan shall be produced; including site soil and peat management good practice. Any excavated peat will be appropriately managed and re-used. This is detailed further in the Peat Management Plan (**Appendix 8.3**).

8.21 A detailed CEMP will be developed and agreed with SBC and SEPA in advance of the works. An outline CEMP is provided as **Appendix 3.1**. The CEMP will establish a framework to ensure that health and safety and environmental best practice are adopted throughout the works and will include:

- A Surface Water Management Plan, or similar, which will detail proposed surface drainage measures to treat and deal with all the surface runoff from the Site, will be designed in accordance with SuDS principles and all best practice guides and recognised industry standards.
- The approved PPP, which will detail the proposed mitigation measures to address each identified pollution risk.
- A plan to monitor and plan the timing of works to avoid construction during periods of heavy rainfall.
- A plan to detail emergency procedures in the event of spillages or any other breach.
- A plan to detail monitoring and inspections of the water quantity and quality of sensitive GWDTE and watercourses. All actions will be recorded.
- A Site Waste Management Plan to detail proposals for managing the extraction and storage of waste.
- A Peat Management Plan (see **Appendix 8.3**)

8.22 The assessment of effects is undertaken assuming that good practice and embedded mitigation is an integral part of project design. Additional mitigation is identified during the assessment to address localised site or issue specific likely significant adverse effects and is described within the 'Proposed Mitigation' section.

Micrositing

8.23 A 100 m micrositing allowance will be used for the Proposed Development's infrastructure (refer to **Chapter 3**), i.e. a 100 m radius from infrastructure. However, it should be noted that micrositing of infrastructure closer to watercourses or GWDTEs, within the watercourse and GWDTE buffers will not be undertaken. Where micrositing is required, it will move infrastructure further away from sensitive water features, GWDTE and deeper peat, where possible.

Method of Baseline Characterisation

Extent of the Study Area

8.24 The study area for the hydrology and hydrogeology assessment comprises the Site itself and watercourses/waterbodies downstream (**Figure 8.1**). The study area for geology and peat comprises the locations of proposed infrastructure within the Site and the adjacent area known as Killpallet to the north of the Site boundary, part of which drains towards the Site.

[4] SEPA (2010) Engineering in the Water Environment Good Practice Guide - River Crossings
[5] Scottish Renewables et al. (2019) Good Practice during Windfarm Construction
[6] SNH (2015) Constructed tracks in the Scottish Uplands

8.25 The study area for detailed assessment of groundwater abstractions, including private water supplies and GWDTE, is within a 250 m buffer zone from the permanent infrastructure, as per SEPA guidance. However, a wider search area for private water supplies and groundwater abstractions was undertaken for the assessment.

Desk Study

8.26 The following data sources have informed the assessment:

- Ordnance Survey mapping at 1:25,000 and 1:50,000 scales;
- British Geological Survey (BGS) online digital mapping at 1:50,000 and 1:625,000 scales;
- Scottish Soil mapping at 1:250,000 scale;
- NatureScot (formerly SNH) Carbon and Peatland 2016 mapping at 1:250,000 scale;
- Aerial imagery of the Site and surrounding area;
- The Flood Estimation Handbook (FEH) Web-service[7];
- SEPA Flood Maps[8];
- SEPA Water classification Hub[9];
- Ordnance Survey (OS) Terrain 5 Topographic Data (5 m resolution);
- LiDAR Phase 3 DTM data downloaded from the Scottish Remote Sensing Portal[10];
- Scotland's Environment Website and Interactive Map[11];
- NatureScot Site Link Interactive Map[12];
- Scottish Water Asset Plans of the Site;
- Private Water Supply Data provided by SBC and ELC; and
- Licenced Abstraction Data provided by SEPA.

8.27 This assessment is carried out in accordance with the principles contained within the following legislation:

- The Flood Risk Management (Scotland) Act 2009;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR);
- The Water Framework Directive (2000/60/EC) (WFD), and Water Environment and Water (Scotland) Act (WEWS Act) 2003;
- The Pollution Prevention and Control (Scotland) Regulations 2012;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ('the EIA Regulations');
- The Control of Pollution Act 1974 (as amended) Part II: Pollution of Water;
- The Scotland River Basin District (Standards) Directions 2014;
- The Scotland River Basin District (Status) Directions 2014
- The Public Water Supplies (Scotland) Regulations 2014;
- The European Drinking Water Directive (Council Directive 98/83/EC);

[7] https://fehweb.ceh.ac.uk/Map
[8] https://scottishepa.maps.arcgis.com/
[9] https://www.sepa.org.uk/data-visualisation/water-classification-hub/
[10] https://remotesensingdata.gov.scot/data#/map
[11] https://map.environment.gov.scot/sewebmap/
[12] https://sitelink.nature.scot/map

- The Private Water Supplies (Scotland) Regulations 2006;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017;
- The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013; and
- The Waste Management Licensing (Scotland) Regulations 2011.

8.28 This assessment is carried out in accordance with the principles contained within the following documents:

- The Scottish Environment Protection Agency (SEPA)'s Guidance for Pollution Prevention (GPPs) and Pollution Prevention Guidelines (PPGs), including:
  - GPP1: Understanding your environmental responsibilities – good environmental practices;
  - GPP2: Above ground oil storage tanks;
  - GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer;
  - GPP5: Works and maintenance in or near water;
  - PPG6: Working at construction and demolition Sites;
  - GPP8: Safe storage and disposal of used oils;
  - GPP21: Pollution incident response planning;
  - GPP22: Dealing with spills; and
  - GPP26: Safe storage – drums and intermediate bulk containers.
- Scottish Government Planning Advice Notes (PANs) and Guidance (including PAN 51 Planning, Environmental Protection and Regulation; PAN 1/2013 Environmental Impact Assessment, as amended; and PAN 79 Water and Drainage);
- Scottish Executive: River crossings & migratory fish: Design guidance, 2012;
- SEPA: Technical Flood Risk Guidance for Stakeholders, version 13 (SEPA, June 2022);
- SEPA: Water Environment (Controlled Activities) (Scotland) Regulations 2011 – A Practical Guide, Version 9.2 December 2022;
- SEPA: Position Statement to support the implementation of the Water Environment (Controlled Activities) (Scotland) Regulations 2005, WAT-PS-06-02: Culverting of Watercourses – Position Statement and Supporting Guidance, Version 2, June 2015.
- SEPA: Engineering in the Water Environment Good Practice Guide – River Crossings, WAT-SG-25, 2010;
- SEPA: Engineering in the Water Environment Good Practice Guide – Temporary Construction Methods, WAT-SG-29, 2009;
- SEPA: Sector Specific Guidance: Construction Sites, WAT-SG-75, 2021;
- SEPA: Policy No. 19, Groundwater protection policy for Scotland, 2009;
- SEPA: Special requirements for civil engineering contracts for the prevention of pollution, WAT-SG-31, 2006;
- SEPA: Land Use Planning System, SEPA Guidance Note 31 (LUPS-31): Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, 2017;
- SEPA: Flood Risk and Land Use Vulnerability Guidance, version 4, July 2018;
- SEPA: Climate change allowances for flood risk assessment in land use planning, Land Use Planning System SEPA Guidance. Version 3, 4 April 2023;
- SEPA: Regulatory Position Statement – Developments on Peat, 2010);
- Scottish Water standards and policies, including Sewers for Scotland 3rd edition, 2015 and Water for Scotland 3rd edition, 2015;

- CIRIA: The SuDS Manual (C753) 2015;
- CIRIA: Control of water pollution from construction Sites: Guidance for consultants and contractors (C532) 2001;
- CIRIA: Groundwater Control – design and practice (C515) 2016;
- Scottish Government, Scottish Natural Heritage & SEPA (2017) Peatland Survey – Guidance on Developments on Peatland;
- Scottish Renewables, SNH, SEPA & Forestry Commission Scotland (2019) Good Practice during Windfarm Construction;
- SNH (2015) Constructed tracks in the Scottish Uplands;
- Scottish Government (2017) Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments (Second Edition), Scottish Government;
- DEFRA (2009) Code of Practice for the sustainable use of soils on construction sites; and
- Marine Scotland: Freshwater and diadromous fish and fisheries associated with onshore wind farm and transmission line developments: generic scoping guidelines (Scottish Government, April 2022).

Field Survey

8.29 The following field surveys were carried out to inform the wind farm design and assessment:

- Phase 1 peat survey and initial hydrology walkover – 28 to 31 March 2022 (main area of proposed infrastructure) and 29 September 2022 (area around the existing substation). Peat surveys were carried out following the Scottish Government, Scottish Natural Heritage & SEPA (2017) guidance[13]. Further details of the methodology are described in **Appendix 8.2**. The weather conditions during the Phase 1 surveys were mixed, with dry, sunny weather on the 28 and 29 of March followed by intermittent snow on the 30 and 31 March. Weather on 29 September was dry and overcast.
- Phase 2 peat survey and watercourse crossing assessment – 12, 13, 19, 20 and 21 December 2022 (detailed survey of proposed infrastructure and tracks). The weather conditions during the Phase 2 survey were cold, with snow cover and freezing temperatures on 12 and 13 December, followed by wet and blustery conditions on 19, 20 and 21 December.
- Watercourse crossing assessment – 21 April 2023 of the existing crossings on the Fallago Rig access track. Weather was dry and sunny.
- GWDTE survey – 24 May 2023 to ground truth *potential* GWDTEs identified based on vegetation to assess hydrological setting and actual groundwater dependence. Weather was dry and sunny.
- The weather conditions experienced over the survey periods did not limit the survey quality.

Criteria for the Assessment of Effects

Criteria for Assessing Sensitivity of Receptors

8.30 Sensitivity has been determined on the basis of the criteria shown in **Table 8.2**.

Table 8.2: Criteria to Assess the Sensitivity of Receptor

Sensitivity of Receptor	Typical Indicators
High	Receptor is of national or international value (i.e., Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA), and RAMSAR). Overall water quality classified by SEPA as high and salmonid spawning grounds present. Abstractions for public water supply.

[13] Scottish Government, Scottish Natural Heritage & SEPA (2017) Peatland Survey - Guidance on Developments on Peatland

Sensitivity of Receptor	Typical Indicators
	Groundwater classified under the WFD as 'good' or groundwater resource with numerous sensitive users/receptors. The flooding of property (or land use of great value) that has been susceptible to flooding in the past. Watercourse floodplain/hydrological feature that provides critical flood alleviation benefits. Natural channel and of high morphological diversity. Receptor supports GWTDE confirmed as highly groundwater dependent. Class 1 or 2 priority peatland.
Medium	Receptor is of regional or local value (e.g. Local Nature Reserve). Overall water quality classified by SEPA as good or moderate, salmonid species may be present, and may be locally important for fisheries. Smaller watercourse lying upstream of larger river that is an SSSI, SAC SPA or RAMSAR. May be subject to improvement plans by SEPA. Abstractions for private water supplies. Groundwater resource with sensitive users/receptors. Environmental equilibrium copes well with natural fluctuations but cannot absorb some changes greater than this without altering part of its present character. The flooding of property (or land use of great value) that may be susceptible to flooding. Watercourse/floodplain/hydrological feature that provide some flood alleviation benefits. Semi-natural channel, with morphological diversity. May have some minor morphological constraints. Receptor supports GWTDE confirmed as moderately groundwater dependent. Unmodified active peatland. Deeper peat (>1.0 m depth) unless minor area.
Low	Receptor is of low environmental importance (e.g., water quality classified by SEPA as bad or poor, fish sporadically present or restricted). Not subject to water quality improvement plans by SEPA. Environmental equilibrium is stable and is resilient to changes which are considerably greater than natural fluctuations, without detriment to its present character. No abstractions for public or private water supplies. No significant groundwater resource and no identified sensitive users/receptors. No flooding of property or land use of great value. Watercourse/floodplain/hydrological feature that provides minimal flood alleviation benefits. Heavily engineered or artificially modified and may dry up during summer months. No GWDTE confirmed as either moderately or highly groundwater dependent. No or shallow peat (0.5 m to <1.0 m depth) and/or modified peat.

Criteria for Assessing Magnitude of Change

8.31 Magnitude of change has been assessed based on the criteria presented in **Table 8.3**. These criteria are based on professional judgement and experience of other similar studies.

Table 8.3: Criteria for Estimating the Magnitude of Effect

Magnitude	Description/ Typical Example
Substantial	Fundamental changes to the hydrology, water quality, geology, or hydrogeology (in terms of quantity, quality, and morphology). A >10% change in average or >5% change in flood flows. The extent of flood risk areas (as classified by NPF4 – i.e. land or built form with an annual probability of being flooded of greater than 0.5% including an appropriate allowance for future climate change) will be significantly increased. Change that would render water supply unusable for longer than month. Change resulting in total loss of feature or integrity of feature or use.
Moderate	Material but non-fundamental changes to the hydrology, water quality, geology, or hydrogeology (in terms of quantity, quality, and morphology). A >5% change in average and minimal change in flood flows. Extent of flood high risk areas will be moderately increased/or decreased. Change that would render water supply unusable for days or weeks with no alternative.
Slight	Detectable but non-material changes to the hydrology, water quality, geology, or hydrogeology (in terms of quantity, quality, and morphology). A >1% change in average flows and no increase in flood flows. Change that would render water supply unusable for short period (days) or for longer period if alternative supply put in place.
Negligible	No perceptible changes to the hydrology, water quality, geology, or hydrogeology (in terms of quantity, quality, and morphology). A <1% change in average and no change in flood flows. No change in water supply or minor change (days) where alternative is put in place.
None	No change.

Criteria for Assessing Significance

8.32 The predicted significance of the effect was determined through a standard method of assessment based on professional judgement, considering both sensitivity and magnitude of change as detailed in **Table 8.4** below. Major and Moderate effects are considered significant in the context of the EIA Regulations.

Table 8.4: Significance criteria

Receptor Sensitivity	Magnitude of Change				
	Substantial	Moderate	Slight	Negligible	None
High	Major	Major/Moderate	Minor	Minor	None
Medium	Major/Moderate	Moderate	Minor	Minor/Neutral	None
Low	Moderate/Major	Minor	Minor	Minor/Neutral	None

Limitations and Assumptions

8.33 The assessment was based on existing, available data, supplemented by hydrology and peat depth surveys of the Site. It is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant environmental effects on geology, hydrology, hydrogeology and peat.

8.34 It is noted that following the Phase 2 peat survey there were several minor design changes to the final layout. Areas of the Proposed Development which are not covered by detailed Phase 2 peat data are described in **Appendix 8.2**. There is Phase 1 peat data in these locations, and it is considered that there is sufficient data to inform the assessment.

Baseline Conditions

Existing Baseline Conditions

Climate

8.35 The average annual temperature in this part of eastern Scotland is between 6°C and 8°C (Met Office website[14]). The average annual rainfall on the Site is approximately 953 mm (FEH webservice[5]).

Topography

8.36 The Site is located in a varied topographic setting of managed open moorland. The Site contains numerous river valleys, steeply sloping hillsides and gently sloping hilltop areas; predominantly draining into the Dye Water catchment. The Site is within the Lammermuir Hills. Notable hills within the Site include: Meikle Law (468 m Above Ordnance Datum (AOD)) in the north-west; Byrecleugh Ridge (440 m AOD) in the north, Dunside Hill (437 m AOD) in the south-east, and Wedder Lairs (486 m AOD) in the west. The topography of the Site is shown in **Figure 8.1**.

Watercourses, Surface Water and Existing Site Drainage

8.37 The Dye Water flows in an easterly direction through the centre of the Site. The Dye Water valley is surrounded by adjacent summits which comprise a series of rounded hilltops aligned roughly from west to east, producing pronounced undulating topography along each side of the valley. Numerous small named and unnamed watercourses (e.g., Burn betwixt the Laws, Kersons Cleugh, Green Cleugh, Foul Cleugh, Wood Cleugh and Hall Cleugh) flow from these hills towards the Dye Water, resulting in several defined hill spurs on either side of the valley. Key watercourses and waterbodies within and downstream of the Site are shown in **Figure 8.1**. A typical watercourse within the Site is shown in **Image 8.1.**

[14] https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcvurvzxs

Image 8.1: Typical Watercourse within the Site – The Dye Water, looking upstream towards Fallago Rig

8.38 Most of the Proposed Development (turbines T1-T8, T10-13 and T15, associated infrastructure and access track) is located within the Dye Water catchment (**Figure 8.2**). The Dye Water is a tributary of the Whiteadder Water; entering the Whiteadder Water approximately 7 km downstream of the Site. The Whiteadder Water is a tributary of the River Tweed.

8.39 The southern part of the Site, south and west of Dunside Hill, drains southwards into the Watch Water catchment, a headwater stream that flows into Watch Water reservoir. There are several small watercourses within the Site that flow into the Watch Water (e.g., Bell Burn, Wester Grain, Easter Grain and Sheil Burn). The existing Fallago Rig access track crosses the Watch Water approximately 800 m upstream of the reservoir. Downstream of the reservoir, the Watch Water joins the Dye Water close to the village of Longformacus. Only a small part of the Proposed Development (Turbine T14 and associated tracks and part of the access track) is located within the Watch Water catchment.

8.40 A small part of the Site in the south, just east of Wedder Lairs, drains southwards into the Wester Burn, a tributary of the Leader Water, which is also within the River Tweed catchment. Turbine T9 and part of construction compound 3 is located within the Wester Burn catchment (**Figure 8.2**).

8.41 There are no surface water bodies, lochs, or reservoirs within the Site. However, the Watch Water reservoir is located approximately 600 m east of the access track. The reservoir is a drinking-water reservoir. Additionally, it is understood that the reservoir is also used for sports fishing and is stocked with brown and rainbow trout[15]. The area of the Site that currently drains to the reservoir is shown on **Figure 8.2**.

8.42 A flow pathway analysis was undertaken using the LiDAR DTM topographic data. The analysis was supplemented by observations made during field surveys to assess potential overland flow routes within the Site. As described above most of the Proposed Development drains towards the Dye Water, via the numerous watercourses that dissect the Site. The southern part of the main Site area and part of the existing Fallago Rig access track drains towards the Watch Water. The southern part of the access track drains towards the Blackadder Water, which enters the Whiteadder Water near to Allanton, some 30 km downstream of the Site before its confluence with the River Tweed. Catchment areas of the main watercourses are shown on **Figure 8.2**.

[15] http://www.thewatchwaterfishery.co.uk/

Watercourse Crossings

8.43 New watercourse crossings were reduced as far as practicable by using existing tracks where possible and minimising the number of crossings during initial design iterations. The Proposed Development will use 19 existing crossings and proposes four new crossings; this includes small watercourse crossings mapped in the field and watercourses shown on Ordnance Survey maps. Details and photographs of all watercourse crossings (existing and proposed) are provided in **Appendix 8.1** with the locations shown on **Figure 8.2**.

8.44 There are a number of tracks already onsite, including the existing access track for the construction and maintenance of the Fallago Rig Wind Farm. Access for this track is taken from the south of main Site off the B6456, to the east of Westruther. The Proposed Development will share the access track created for Fallago Rig, utilising existing crossings. There are some upgrades and repairs proposed to the access track, but no proposed upgrades or widening proposed at the existing crossings. There are 14 existing crossings on the access track, including bridges across the Dye Water, Watch Water and Blackadder Water.

8.45 There are several existing wind farm tracks within the Fallago Rig Wind Farm which will be utilised during construction of the Proposed Development. No upgrades of these tracks are proposed other than general repair and maintenance to support construction traffic. There are five existing watercourse crossings on the Fallago Rig wind farm tracks (**Appendix 8.1** with locations shown on **Figure 8.2**).

8.46 There are four new watercourse crossings required for the Proposed Development (**Appendix 8.1**). There is an unnamed drain immediately east of the Fallago Rig turbines (crossing ID1) that will require to be crossed by new wind farm tracks. There is an old existing track that runs alongside the electricity pylons that pass through Fallago Rig wind farm where the proposed wind farm track crosses two small watercourses (crossing ID2a and ID2b). These crossings will require to be upgraded as part of the Proposed Development. A proposed light vehicle track crosses Kersons Cleugh (crossing ID3), which will require a new light vehicle track crossing. At this crossing it is necessary to facilitate the wind farm cabling to cross the watercourse at the same location (within the track).

8.47 Catchment areas upstream of new watercourse crossings were calculated based on watershed analysis using the available topographic data, supplemented by field observations. The catchment areas at new crossing locations range from 0.06 km^2 to 1.25 km^2, with the largest catchment at the crossing ID3.

Hydrology and Flood Risk

8.48 The SEPA flood maps[8] show the likely extent of flooding for high, medium, and low likelihood for fluvial (river), pluvial (surface water) and tidal flows.

8.49 The SEPA flood maps indicates that there are some areas identified to be at risk of fluvial flooding for a 1 in 200-year event within the Proposed Development site. The areas identified as being at fluvial flood risk are constrained along the banks of the Dye Water, including close to the access track. There is no proposed infrastructure within the predicted fluvial floodplain extent.

8.50 The SEPA flood maps predicts very small areas of the Site are noted to be at medium to high risk of pluvial (surface water) flooding. The areas identified as being at pluvial flood risk are located on the low-lying ground along the routes of some of the small watercourses within the Site. No development is proposed within the predicted pluvial flooding extent.

Water Supplies, Discharges, Abstractions and Services

8.51 The Proposed Development is within a drinking water catchment where a Scottish Water abstraction is located. Scottish Water asset plans show a number of assets and pipework associated with the Rawburn Water Treatment Works (WTW) located at NGR 367750 656370, downstream of the Watch Water Reservoir (**Figure 8.1**). Consultation with Scottish Water confirms that an abstraction from the Dye Water supplies the WTW. There is a Scottish Water mains pipe (raw supply) running south parallel to the eastern side of the access track, transferring abstracted water from the pumping station on the Dye Water (at NGR 364590 657880) to the Watch Water, upstream of Watch Water Reservoir. Scottish Water drawings show that the pipe is approximately 10 – 15 m east of the access track for most of its length. The pipe is underground. The locations and depths of the pipework and Scottish Water assets will be further defined in a site investigation exercise and considered in detail in advance of construction.

8.52 SEPA provided data on eight licenced abstractions (details of the four that are within 1 km of the Site boundary are provided in **Table 8.5**). The other four abstractions are over 1.5 km from the Site Boundary and within a different catchment area from the Proposed Development and will not be impacted. Abstractions that are close to the Proposed Development and could potentially be impacted are shown in **Table 8.5** and are all associated with the operational Fallago Rig Wind Farm.

Table 8.5: SEPA CAR Licensed Abstractions within 1 km of the Site Boundary

Ref Number, Name and Date of Authorisation	NGR	Type	Abstraction Volume (m^3 per day)	Comment
CAR/R/1092390 Fallago Rig Wind Farm 12 April 2011	NT 6496 5804 and; NT 5917 5881	Surface water abstraction from Dye Water watercourse at two locations	50 m^3 per day	These abstractions are located within the Site boundary.
CAR/R/1101734 Fallago Rig Wind Farm NT 5825 5920 20 April 2012	NT 5825 5920	Groundwater abstraction	30 m^3 per day	Abstraction close to the existing Fallago Rig substation and within 100 m of the proposed substation extension as part of the Proposed Development.
CAR/R/1101731 Fallago Rig Wind Farm 20 April 2012	NT 6120 5877	Surface water abstraction from Dye Water watercourse at one location:	50 m^3 per day	This abstraction is located within the Site boundary.
CAR/R/1101732 Fallago Rig Wind Farm 20 April 2012	NT 5909 5955	Groundwater abstraction	50 m^3 per day	This within 100 m of proposed construction compound 4.

8.53 SBC provided their PWS database, which was searched and plotted in the GIS. There is one PWS within the Site itself (Dunside PWS) and 11 within 1 km of the Site boundary (**Table 8.6**). Consultation with ELC confirmed that there are no PWS within 1 km of the Site boundary in the ELC council area. The locations of PWS with respect to the Proposed Development are shown in **Figure 8.1** and **Figure 8.3**.

Table 8.6: Private Water Supplies (PWS) within 1 km of the Site Boundary

PWS Source Name	Easting	Northing	Source Type	Number of Properties Supplied	Supplied Property Names	Distance from Proposed Infrastructure
Byrecleugh	364550	658614	Groundwater – Spring(s)	3	Keepers House, Shepherds Cottage Byrecleugh Farmhouse	826 m north-east of Borrow Pit 1 725 m north-east of access track
Trottingshaw House	364692	658462	Groundwater – Spring(s)	3	Trottingshaw Lodge Trottingshaw Cottage	853 m north-east of Borrow Pit 1

PWS Source Name	Easting	Northing	Source Type	Number of Properties Supplied	Supplied Property Names	Distance from Proposed Infrastructure
					Dye Cottage	684 m north-east of access track
Trottingshaw	364788	658172	Groundwater – Spring(s)	2	Trottingshaw Dye Cottage	852 m east of Borrow Pit 1 521 m north-east of access track
Dunside	365100	658113	Groundwater – Well	1	Dunside	1.66 km north-east of Borrow Pit 1 552 m north-east of access track
Horseupcleugh Lunch Hut	366000	659000	Groundwater – Spring(s)	1	Horseupcleugh Lunch Hut	2.2 km north-east of Borrow Pit 1 1.8 km north-east of access track
Scarlaw	365265	656476	Groundwater – Spring(s)	1	Scarlaw Farmhouse	486 m east of access track
Flass (Woodheads)	363416	652713	Groundwater – Spring(s)	1	East Woodheads Flass	950 m west of construction compound 1 900 m west of access track
Evelaw	364333	651822	Groundwater – Spring(s)	1	Evelaw	144 m west of access track
Wedderlie	363962	651580	Groundwater – Spring(s)	6	Crawlaw 2 Wedderlie Cottages 3 Wedderlie Cottages 5 Wedderlie Cottages Wedderlie Lodge Wedderlie Farmhouse	437 m west of access track
Wedderlie House	363967	651562	Groundwater – Borehole	6	Wedderlie House Wedderlie Cottage The Hayloft The Cabin Gamekeepers Cabin The Stables	430 m west of access track
Cammerlaws	365597	650486	Groundwater – Spring(s)	4	Cammerlaws Farmhouse No 1 Cottage No 2 Cottage	939 m east of access track

PWS Source Name	Easting	Northing	Source Type	Number of Properties Supplied	Supplied Property Names	Distance from Proposed Infrastructure
					No 3 Cottage	

Source: SBC, PWS Database

Water Quality and Protected Areas

8.54 SEPA has characterised surface water quality status under the terms of the Water Framework Directive. Classification by SEPA considers water quality, hydromorphology, biological elements including fish, plant life and invertebrates, and specific pollutants known to be problematic. The classification grades through High, Good, Moderate, Poor, and Bad status. This provides a holistic assessment of ecological health. There are three watercourses within the Site which are large enough to be classified by SEPA[9].

- The Dye Water (Waterbody ID 5122) was classified as 'Poor Ecological Potential' in 2020.
- The Watch Water (Waterbody ID 5124) was classified as 'Bad Ecological Potential' in 2020. Both the Dye and Watch Water have been designated as heavily modified water bodies on account of physical alterations that cannot be addressed without a significant impact on water storage for public drinking water.
- The Blackadder Water (Waterbody ID 5107) was classified as 'Good Ecological Potential' in 2020. The water body has been designated as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on the drainage of agricultural land.

8.55 The Dye Water and Blackadder Water within the Site boundary are designated within the River Tweed SAC as are all the watercourses downstream of the Site. The River Tweed SAC is designated for biological reasons, including Annex 1 habitats (watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation) and Annex 1 species (Atlantic Salmon and Otter).

8.56 The Fallago Rig Wind Farm is located within the upper headwaters of the Dye Water immediately upstream (west) of the Site and its presence will be considered in the assessment of effects on the Dye Water and downstream watercourses.

Geology and Soils

8.57 The bedrock geology[16] of the Site (**Figure 8.4**) is comprised of deep marine sedimentary rock (Gala Group Wacke). These detrital sedimentary rocks dominate the entirety of the Site, with the exception of a small part of the southern access track which are sandstones of the Stratheden Group and Inverclyde Group. The Gala Group Wacke are derived from deep sea, continental shelf origins, with graded bedding from coarse-grained to fine-grained sedimentary debris slurries.

8.58 Additionally, there are several different intrusive (magmatic), igneous formations within the Site, all of which form dyke suites. These include the North Britiain Siluro-Devonian, Calc-Alakline Dyke Suit (composed of porphyritic microgranodiorite), dykes from the same suite but much less common on site are composed of microdiorite, and lastly the Central Scotland Late Carboniferous Tholeiitic Dyke Swarm (composed of microgabbro).

8.59 The drift deposits[17] within the Site (**Figure 8.4**) are dominated by unconsolidated fluvial Alluvium (silt sand and gravel), with some small pockets of Devensian till with diamicton, which are glaciagenic in origin, which dominate the lower lying ground around the valley floor and the watercourses. The higher ground and hilltops generally have no drift deposits based on the BGS mapping, with the exception of numerous pockets of peat on the summits to either side of the Dye Water valley, from Dunside Hill and Pyatshaw Ridge (eastern part of Site) to Wedder Lairs (western part of Site).

8.60 Scottish Soil mapping[18] (**Figure 8.5**) shows that the Site is underlain by several soil types including:

- Peaty Podzols, which are located on the hillslopes and valleys of the Dye Water and Watch Water.

[16] British Geology Survey: Solid Geology (1:50,000)
[17] British Geology Survey: Surficial Geology (1:50,000)
[18] National Soil Mapping of Scotland, James Hutton Institute (1:250,000)

- Peat, comprising dystrophic blanket peat on the upland areas with gentle slopes.
- Brown soils in the eastern part of the Site and on the access track
- Mineral podzols on a small section of the access track; and
- Mineral gleys on a small section of the access track.

8.61 The NatureScot Carbon and Peatland Map 2016[19] (**Figure 8.6**) indicates that carbon-rich soils and deep peat, are present within the Site, including the following classes:

- Class 4 – Area unlikely to be associated with peatland habitat or wet and acidic type. Area unlikely to include carbon-rich soils. Class 4 covers the lower slopes around the Dye Water.
- Class 5 – Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soils. Soils are carbon-rich and deep peat. Large areas of the upland areas within the Site are Class 5 peatland. The upland area immediately north of the Site (Killpallet Heights) is also Class 5 peatland.
- There are no priority peatlands (Class 1 and 2) within or close to the Site. The lower lying sections of the Site around the base of the river valleys and along most of the access track are classed as mineral soil (Class 0), with no peat indicated.

Peat

8.62 Detailed peat depth surveys were undertaken within the Site. The results of the peat survey are shown in **Figure 8.7** and presented in full in **Appendix 8.2**. Typical peat deposits within the Site are shown in **Image 8.2**.

8.63 A total of 3,088 peat depth probes were collected over the Phase 1 and Phase 2 peat surveys. Of these:

- 38.1% of probes were recorded as having a depth of less than 25 centimetres (cm). These probes are not peat.
- 43.1% of probes were recorded as having a peat depth of between 25 – 50 cm. These probes are classified as organo-mineral soils and not formally considered to be peat.
- 16.2% of probes were recorded as having a peat depth of between 50 – 100 cm.
- 2.7% of the probes were recorded as having a peat depth of over 100 cm.
- The deepest peat depth recorded on the Site was 380 cm.

8.64 Local topography affects the peat distribution, with the hillslopes generally too steep and well drained to support the formation of peat. The tops of the hills throughout the Site are gently rolling, with most of the peat present in poorly drained natural low points on this upland plateau.

8.65 A total of 15 cores were taken across the Site at the locations shown in **Figure 8.7**. The cores are described in detail in **Appendix 8.2**. The coring determined that the acrotelm layer was between 10 cm and 40 cm. Clay was the dominant source of base material across the cored locations.

8.66 Much of the upland peat areas of the Site have been modified by human influences, and muirburn[20] is practiced across much of the Site. The Site is also grazed by sheep. These factors have led to the drying and erosion of much of the peat present across the Site (see **Image 8.2**).

8.67 The results from the Phase 1 peat survey were used to feed into the design (deeper peat was avoided where possible) and the spatial extent of the Phase 2 peat survey. The Phase 1 and Phase 2 peat survey results were used to inform the Peat Management Plan (**Appendix 8.3**) and Peat Landslide Hazard and Risk Assessment (**Appendix 8.4**).

[19] NatureScot (2016) Carbon and Peatland map
[20] Muirburn is the intentional and controlled burning of moorland vegetation to encourage new growth (either heather or grassland) for the management of moorland game and wildlife or for improving the grazing potential of the moorland for livestock or deer.

Image 8.2: Typical Peat Deposits and Ground Conditions within the Site

Groundwater

8.68 The groundwater body underlying the Site is the Cranshaws waterbody, in the Tweed Sub Basin District, which is classified by SEPA as having an overall classification of 'Good'.

8.69 The Site is underlain by highly indurated greywackes, which are classified as having low aquifer productivities. The low productivity aquifer (Class 2C) covers the entirety of the Site, with the exception of the southernmost part of the access track, and it has limited groundwater in the near surface weathered zone and fractures. Flow in a Class 2C aquifer is virtually all through fractures and other discontinuities. The sandstones underlying the southern part of the access track are classified as having moderate aquifer productivities (Class 1B), with significant intergranular flow.

8.70 SEPA groundwater flood maps indicate that the Site is not at risk of groundwater flooding.

Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

8.71 Areas of potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs) were identified during the ecology NVC surveys and are shown and described in **Chapter 6** and **Appendix 6.2: Habitats and Vegetation (including National Vegetation Classification) Survey Report**. A walkover survey of potential GWDTE polygons within 250 m of the proposed infrastructure was undertaken by a team of two hydrologists. Further details of the GWDTEs on site are contained in **Appendix 8.6**.

8.72 Based on field observations, the groundwater contribution of most of the potential GWDTEs were confirmed to be low, and most were predominantly sourced from surface water contributions or associated with peat deposits. Two GWDTEs were considered to have a groundwater contribution that was moderate or high.

8.73 These moderately and highly dependent GWDTEs are shown on **Figure 8.3** with recommended buffers from infrastructure as per SEPA guidance. Those that are within 100 m of the roads, tracks, trenches and compounds (<1 m excavation) or within 250 m of proposed turbines and borrow pits (>1 m excavation) are described and assessed in detail in **Appendix 8.6**.

Future Baseline in the Absence of the Proposed Development

8.74 Without the Proposed Development, the main change to the future baseline would be as a result of climate change.

8.75 The National Planning Framework 4 (NPF4) notes *"Development proposals will be sited and designed to adapt to current and future risks from climate change"*.

8.76 Climate change projections for the area are described in **Chapter 12: Other Issues.** In summary, the projections highlight that in the 2060s summer and winter temperatures are likely to be greater that the current baseline, with winter rainfall increasing and summer rainfall decreasing. Increased rainfall will result in higher peak flows in the watercourses in the future. In addition, there may be more drought periods in the summer months, with drier, hotter conditions predicted resulting in lower flows during the summer months.

8.77 In April 2023, SEPA published new guidance[21] on climate change in Scotland which provides a regional based approach to estimate uplift in future river flows in Scotland. For large river catchments (over 50 km^2), the peak (200-year) design flow should be increased by 59% in the Tweed River Basin to account for projected climate change increases to the year 2100. In addition, the peak rainfall intensity allowance for the Tweed region of Scotland is 35% to the year 2100. Thus, this part of Scotland, which includes the Site, is likely to get wetter with higher peak flows in the watercourses in the future.

8.78 Site drainage and watercourse crossing designs will consider future estimates of increased precipitation and flows and will follow an adaptive approach, as per relevant guidance documents from SEPA and SBC. Based on consultation with SBC (see **Table 8.1**), new or upgrades to watercourse crossings must not reduce the flow conveyance of the watercourse.

Assessment of Likely Significant Effects

8.79 The assessment of effects is based on the project description as outlined in **Chapter 3** and the embedded mitigation by design described in **Chapter 2**. An Outline Construction Environmental Management (CEMP) has also been prepared and is included in **Appendix 3.1**. Unless otherwise stated, potential effects identified are considered to be negative.

Potential Construction Effects

8.80 The following effects have been assessed in full:

- Effects during construction on surface and ground water quality and quantity (including effects on private and public water supplies);
- Effects during construction on runoff rates and flood risk;
- Effects during construction on GWDTEs; and
- Direct and indirect disturbance of peat during construction.

8.81 The sensitivity of receptors has been assessed in **Table 8.7**, using the criteria in **Table 8.2**.

Table 8.7: Sensitivity of Receptors

Receptor	Sensitivity	Comment
Watercourses and waterbodies Dye Water Watch Water Blackadder Water Smaller named and unnamed watercourses within the Site	Water quality – High Flood Risk – Low Morphology – Medium	The Dye Water, Watch Water and Blackadder Water were classified by SEPA as 'poor', 'bad' and 'good' ecological status, respectively. The Dye Water and Watch Water both contribute to the Watch Water reservoir and Rawburn WTW, a public drinking water supply. All watercourses downstream of the Site drain to the River Tweed, which is a SAC. The Dye Water and Blackadder Water within the Site are part of the designated SAC. The majority of watercourses within the Site are natural channels, with morphological diversity, although have

[21] SEPA (2023) Climate change allowances for flood risk assessment in land use planning, Version 3, 4 April 2023

Receptor	Sensitivity	Comment
		been slightly modified at track crossing locations for the existing access and wind farm tracks for Fallago Rig. There are no properties downstream of the project infrastructure that are at currently at flood risk on the named and unnamed watercourses within the Site.
Peat	Low	The Site does not contain any priority peatland habitats (Class 1 or 2 peatland). The peat on site is generally shallow peat (0.5 m to <1.0 m depth) and has been modified by muirburn. Deeper peat (>1m) has been avoided in the design process.
Groundwater	Medium	The Proposed Development is located on low productivity aquifers. The groundwater body is classified by SEPA as 'Good'. There are several abstractions for private water supplies and Fallago Rig wind farm within and close to the Site.
Groundwater Dependent Terrestrial Ecosystems (GWDTE)	Medium to High	The moderately dependent GWDTE is considered to be medium sensitivity and the highly dependent GWDTE is considered high sensitivity (see **Appendix 8.6** for more details)

8.82 The main environmental effects are predicted to occur during construction. The activities that will occur during construction that may have an impact on the water environment and peat, include site clearance; use of heavy plant machinery; increase of hardstanding areas; construction of wind farm tracks and upgrading of access track; watercourse crossings; associated earthworks/excavation/re-profiling and construction traffic on access tracks.

8.83 There are up to 15 turbines (the foundations of which will require excavation of approximately 3.5 m deep over a typical foundation diameter of 25 m), and associated crane hardstandings, four construction compounds, three borrow pits, an extension to the existing Fallago Rig substation and a battery storage area. The vast majority of the 15 turbine permanent hardstandings are located on organic soil (<0.5 m deep, averaging 0.25 m), with c. 750 m^2 of overlap with peat of c. 0.55m depth. Only the temporary hardstandings of Turbines 1, 2, 4, 8 and 15 partially encroach on peat, in all cases <1.0 m. This demonstrates a diligent approach to layout design. There is approximately 15.04 km of proposed wind farm tracks, approximately 1.1 km of proposed light vehicle tracks and the Proposed Development will use approximately 17.5 km of existing access tracks (including some widening/upgrading). Inevitably, due to the rapid steepening of the valley sides, some tracks cross areas of peat, though again, no peat >1.0 m is crossed by track infrastructure. Where gradients have allowed, two sections of floating track have been proposed on the gentle slopes above Upper Knowe.

8.84 During the initial design stage, a buffer of 50 m was applied to all watercourses and water features identified from Ordnance Survey mapping. Watercourses were also identified during the Site walkover survey and where possible a 50 m buffer from these small watercourses was achieved. Therefore, apart from the exceptions below (labelled A-C on **Figure 8.2** and described in detail in **Appendix 8.1**), all infrastructure is at least 50 m away from watercourses and water features:

- A – This is a small watercourse (labelled as Wester Black Burn/Shiel Burn on OS mapping). The proposed battery storage area is located on the other side of the existing wind farm track from the watercourse, close to watercourse crossing ID18, and is at the location of a former borrow pit. A buffer width of 32 m has been achieved. The Wester Black Burn/Shiel Burn enters the Dye Water ~75 m downstream of the battery storage area.
- B – The proposed borrow pit 3 is just north of the access track and within the 50 m buffer of the Dye Water. A buffer width of 31 m has been achieved. The existing Fallago Rig access track is located south of the proposed borrow pit and separates it from watercourse.

- C – The existing Fallago Rig access track requires some upgrades to facilitate the construction of the Proposed Development. Approximately 2.48 km of the proposed upgrades are where the track is within the 50 m buffer of the Dye Water and/or its' tributaries; the locations are shown on **Figure 8.2**.

8.85 Existing access tracks were used as much as possible to avoid new watercourse crossings and land take. However, three new watercourse crossings were unavoidable. Construction of new watercourse crossings could potentially impact channel morphology during construction.

8.86 There are 23 watercourse track crossings required; of which 19 are the existing access and wind farm tracks for the Fallago Rig wind farm. None of the existing wind farm tracks are proposed to be upgraded (aside from localised repair and maintenance during construction) as part of the Proposed Development and four are new crossings (**Appendix 8.1**). One of the proposed new watercourse crossings is a small, minor watercourse/drain and will be covered by SEPA's General Binding Rules. This crossing will not require registration or a licence under CAR; however, the work will follow general good construction practice and GBR 6 and GBR 9. The other three larger watercourses to be crossed, include ID2a – Middle Black Burn, ID2b – Black Burn and ID3 – Kersons Cleugh will require authorisation under the CAR Regulations (either registration or a simple licence depending on the crossing design). Full details of crossings and CAR requirements are provided in **Table 1, Appendix 8.1**.

Effects During Construction on Surface and Ground Water Quality and Quantity (and Public and Private Water Supplies)

8.87 The potential effects on surface water quality during construction are:

- Pollution of surface waters caused by the release of sediment to watercourses from excavated material during construction, heavy plant movement on the existing access tracks and proposed wind farm tracks and construction compounds.
- Pollution of surface water caused by the release of hydrocarbon pollution resulting from accidental oil or fuel leaks or spillages. There is also a risk posed by concrete (and other construction material) spillages during concrete batching and during the formation of hardstanding areas at the turbine bases.
- Pollution/sediment runoff during construction of new watercourse crossings for new wind farm tracks.

8.88 The potential effects on groundwater quality include:

- The risk of hydrocarbon pollution of groundwater resulting from accidental oil or fuel leaks from construction traffic and construction works. There are also potential pollution effects caused by silt and sediment disturbed during construction infiltrating into the groundwater and pollution from concrete batching and concrete spillages.

8.89 Risks to surface water quality will be greatest during construction when works involve the exposure of bare earth which could result in increased erosion and sedimentation. Without mitigation, the increase in sediment concentration in runoff from construction areas and access tracks may result in excessive levels of suspended sediment in watercourses.

8.90 Pollutants can enter the watercourses in the event of accidental spills or leaks from machinery and vehicles and in the event of an accidental release of concrete or other building materials. Pollutants and silt/sediment could enter watercourses directly, or via overland flow pathways. Shallow groundwater could also be affected.

8.91 An assessment of the potential effects on watercourses and water features at locations where the 50 m buffer could not be achieved (**Figure 8.2**) is set out in **Table 2** of **Appendix 8.1** and summarised below:

- A – The Shiels Burn is downgradient (~5 m lower) than the proposed battery storage area. The battery storage area is located at an area of previously disturbed ground (the old Fallago Rig borrow pit). Runoff from the Proposed Development will drain naturally towards the watercourse, however there is an existing wind farm track between the Proposed Development and the watercourse. The Proposed Development is situated ~5 m higher than the burn and is not considered to be at flood risk from the burn. In the event that the culvert crossing was to be become blocked, flood water would flow over the track and back into the burn downstream and would not impact the Proposed Development. The buffer width achieved (32 m from battery storage area) is considered adequate for size of water feature and the hydrological setting, however additional mitigation will be put in place to reduce the risk of sediment/silt runoff during construction. Detailed of additional mitigation is described in the Mitigation section below.

- B – The Dye Water is downgradient of proposed borrow pit no.3 and is ~7 m lower. Flow path analysis indicates that surface water runoff paths are from the infrastructure towards the watercourse, however there is an existing access track between the borrow pit and the watercourse. The Proposed Development is ~7 m higher than the Dye Water and is not considered to be at flood risk. The buffer width achieved (31 m from borrow pit) is considered adequate for size of water feature and the hydrological setting, however additional mitigation will be put in place to reduce the risk of sediment/silt runoff during construction. This is described in the Mitigation section below.
- C – Approximately 2.48 km of the proposed access track upgrades are within the 50 m buffer of the Dye Water and/or its tributaries; the locations are shown on **Figure 8.2**. The Dye Water and tributaries are downgradient of the proposed upgrades and surface water flow paths will flow towards the watercourses. Given the sensitivity of the Dye Water, additional mitigation will be put in place to reduce the risk of sediment/silt runoff during construction at these locations. This is described in the Mitigation section below.

8.92 With the embedded mitigation measures described above in place, including buffers, following good practice construction and site drainage management guidance from relevant bodies (e.g. SEPA, CIRIA), the magnitude of the effect of increased sediment/silt runoff causing a deterioration in surface water quality in waterbodies and watercourses within and downstream of the Site during construction is considered to be Negligible and of short duration. The sensitivity of all downstream receptors is high, with respect to water quality, and the significance of the effect is considered to be Minor.

8.93 Embedded mitigation measures to minimise the risk of pollution and accidental spillage will minimise the likelihood and severity of such incidents happening, however, there is still a residual risk. The magnitude of effect of pollution of surface water and groundwater caused by the release of hydrocarbon pollution and concrete resulting from accidental oil or fuel leaks or spillages is considered to be of short duration and Negligible. However, given the **high sensitivity** of the downstream water environment, the significance of the effect is considered to be Minor.

8.94 There is one PWS within the Site itself (Dunside PWS) and 11 within 1 km of the Site boundary (**Table 8.6**). The PWS source their water either from groundwater springs or surface watercourses. Location of the PWS sources with respect to the Proposed Development is shown in **Figure 8.3**. Given that construction can potentially affect both surface and shallow groundwater quality and quantity, it follows that construction can potentially affect nearby and downgradient PWS.

8.95 An assessment of PWS and groundwater abstractions was carried out based on SEPA Guidance[22] and professional experience. The SEPA guidance recommends all groundwater abstractions within a 250 m buffer zone of excavations deeper than 1 m and a 100 m buffer of excavations less than 1 m be identified and assessed in detail. Excavations deeper than 1 m will be required during construction of the turbine foundations and at borrow pits, with excavations for tracks, trenches and compounds typically less than 1 m. The 100 m and 250 m buffers from proposed infrastructure are shown on **Figure 8.3**. No PWS are within the recommended buffers, hence no detailed assessment is required. However, **Table 8.8** provides an overview of nearby PWS, the distances from proposed infrastructure and an initial assessment.

8.96 Based on analysis of surface water catchments, ground elevations of PWS compared to infrastructure, and distances from infrastructure there is considered to be **no effects on PWS as a result of the Proposed Development**.

Table 8.8: Initial Assessment of Private Water Supplies within 1 km of the Site

PWS Source Name	Source Type	Number of Properties Supplied	Distance from Proposed Infrastructure	Comments and Initial Assessment	Scoped in/out
Byrecleugh	Groundwater – Spring(s)	3	826 m north-east of Borrow Pit 1. 725 m north-east of access track.	Source is located north of Trottingshaw Burn on the other side of the Dye Water valley from the proposed infrastructure. There is no infrastructure upgradient within the catchment of the PWS source and it is not hydrologically connected to	Scoped out

[22] SEPA: Land Use Planning System, SEPA Guidance Note 31 (LUPS-31): Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, 2017

PWS Source Name	Source Type	Number of Properties Supplied	Distance from Proposed Infrastructure	Comments and Initial Assessment	Scoped in/out
				the Proposed Development.	
Trottingshaw House	Groundwater – Spring(s)	3	853 m north-east of Borrow Pit 1. 684 m north-east of access track.	Source is located north of Trottingshaw Burn on the other side of the Dye Water valley from the proposed infrastructure. There is no infrastructure upgradient within the catchment of the PWS source and it is not hydrologically connected to the Proposed Development.	Scoped out
Trottingshaw	Groundwater – Spring(s)	2	852 m east of Borrow Pit 1 521 m north-east of access track	Source is located north of Trottingshaw Burn on the other side of the Dye Water valley from the proposed infrastructure. There is no infrastructure upgradient within the catchment of the PWS source and it is not hydrologically connected to the Proposed Development.	Scoped out
Dunside	Groundwater – Well	1	1.66 km north-east of Borrow Pit 1 552 m north-east of access track	Source is located downgradient of the proposed infrastructure, just south of the Dye Water. However, it is over 1.6 km and 552 m from the borrow pit and access track, respectively. Given the distances, the Proposed Development will not have an impact on the PWS.	Scoped out
Horseupcleugh Lunch Hut	Groundwater – Spring(s)	1	2.2 km north-east of Borrow Pit 1 1.8 km north-east of access track	Source is located north of Yoke Cleugh watercourse on the other side of the Dye Water valley from the Proposed Development. There is no infrastructure upgradient within the catchment of the PWS source and it is not hydrologically connected to the Proposed Development.	Scoped out
Scarlaw	Groundwater – Spring(s)	1	486 m east of access track	Source is located east of Dam Howe watercourse. There is no infrastructure upgradient within the catchment of the PWS source and it is not	Scoped out

PWS Source Name	Source Type	Number of Properties Supplied	Distance from Proposed Infrastructure	Comments and Initial Assessment	Scoped in/out
				hydrologically connected to the Proposed Development.	
Flass (Woodheads)	Groundwater – Spring(s)	1	950 m west of construction compound 1 900 m west of access track	Source is located within the upper catchment of the Blackadder watercourse. There is no infrastructure upgradient within the catchment of the PWS source and it is not hydrologically connected to the Proposed Development.	Scoped out
Evelaw	Groundwater – Spring(s)	1	144 m west of access track	Source is 144 m west of access track where some track upgrades are proposed. The PWS source is upgradient of the nearby section of track to be upgraded and it is considered unlikely that track upgrades will impact the PWS.	Scoped out
Wedderlie	Groundwater – Spring(s)	6	437 m west of access track	Source is over 400 m west of access track where some track upgrades are proposed. The PWS source is upgradient of the track and it is considered unlikely that track upgrades will impact the PWS.	Scoped out
Wedderlie House	Groundwater – Borehole	6	430 m west of access track	Source is over 400 m west of access track where some track upgrades are proposed. The PWS source is upgradient of the track and it is considered unlikely that track upgrades will impact the PWS.	Scoped out
Cammerlaws	Groundwater – Spring(s)	4	939 m east of access track	Source is over 900 m east of access track. There are no upgrades proposed along this section of the track and the Proposed Development will not impact the PWS.	Scoped out

8.97 There are two groundwater abstractions associated with the Fallago Rig wind farm that are within the 100 m and 250 m buffers from the Proposed Development (**Figure 8.3**). The other three abstractions within the buffers are surface water abstractions from the Dye Water; the effects on surface water have been assessed above. An assessment of the effects on the groundwater abstractions is provided in in **Table 8.9**.

Table 8.9: Initial Assessment of Groundwater Abstractions within 1 km of the Site

Groundwater Abstraction	Abstraction Rate	Comments and Initial Assessment	Scoped in/out
Fallago Wind Farm	30 m^3 per day	Abstraction close to the existing Fallago Rig substation and within 100 m of the proposed substation extension as part of the Proposed Development.	Scoped in. The abstraction is downgradient of the proposed substation extension. The Proposed Development could have an impact on the groundwater abstraction.
Fallago Wind Farm	50 m^3 per day	This within 100 m of proposed construction compound 4.	Scoped in. The abstraction is downgradient of the existing construction compound. This will be used during construction of the Proposed Development, although there is not likely to be any excavation required as it is an existing construction compound. However, there is a risk of pollution/sedimentation given the proximity to the compound.

8.98 Given the proximity of the Fallago Rig groundwater abstractions to the Proposed Development (**Table 8.9**), the magnitude of effect on the abstractions is considered to be **slight**, as the works could potentially render the water supply unusable for a temporary period during the construction works. An alternative supply (bowsers or use of abstractions from the Dye Water) will be put in place during the construction works, if required. Given the **medium sensitivity** of the groundwater, the significance of the effect is considered to be Minor.

8.99 The Rawburn WTW is located downstream of the Site. Most of the Proposed Development is within the Dye Water and Watch Water catchments, which are the source catchment for the WTW. With embedded mitigation, including a 50 m buffer from watercourses, and considering the distance from the wind farm infrastructure to the WTW, the magnitude of effect on the public water supply is considered to be Negligible. The sensitivity is **high**, resulting in an effect of **minor** significance.

8.100 Supply pipework runs from the abstraction location on the Dye Water to the Watch Water along the eastern side of the access track. The pipe is approximately 10 – 15 m east of the existing access track for most of its length and it is underground. The access track will be used during construction and will be repaired in places. The locations of the pipework and Scottish Water assets will be considered in detail and avoided in advance of construction. The effect on the SW assets is considered to be of Negligible magnitude and minor significance. Additional mitigation is proposed to avoid effects on the SW assets.

Effects on Channel Morphology (Bank Erosion and Channel Form) During Construction

8.101 For all watercourses, the effect on channel morphology (bank erosion and channel form) during construction is assessed to be of Negligible magnitude, as embedded mitigation measures, including a minimum 50 m buffer zone (where possible) and environmentally sensitive bridge design, have been incorporated into the project design. Locations where the 50 m buffer could not be met are described and assessed in **Appendix 8.1**; none of the locations where the buffer has been encroached will result in effects on channel morphology.

8.102 The watercourses in the Site are considered to be of **medium** sensitivity in terms of morphology. Any impact on channel morphology is considered to be short-lived, localised and of Negligible magnitude and the effect is considered to be of Neutral significance.

Effects During Construction on Runoff Rates, Flood Risk and Ground-Water Levels/Recharge

8.103 In accordance with National Planning Framework 4[23] (NPF4), there should be no new development in flood risk areas. NPF4 defines a flood risk area as one that lies within the 200-year floodplain, including an appropriate allowance for future climate change. There is no proposed infrastructure within SEPA's mapped floodplains of any watercourse. A 50 m buffer from

[23] National Planning Framework 4 (NPF4) is the national spatial strategy for Scotland and replaces NPF3 and Scottish Planning Policy

watercourses and surface water bodies has been achieved for most of the proposed infrastructure, apart from the exceptions described above and in **Table 2** of **Appendix 8.1**.

8.104 New and upgraded watercourse crossings will be designed to maintain and not reduce the existing capacity of the channel. The Site is rural and there are no properties or assets at risk of flooding downstream of the Site. It is considered that this is an appropriate approach to take in an upland environment.

8.105 Compaction of soils and increased areas of hardstanding reduces the infiltration rate and can lead to a greater rate and volume of surface water runoff. Clearance of vegetation can also lead to an increase in surface water runoff rates. This results in a 'flashier' catchment response and could increase flood risk downstream. However, the magnitude of the change will not be anticipated to be great due to the small area of hardstanding or semi-permeable surfaces (**Table 8.10**) compared to the total catchment area.

Table 8.10: Areas of Land take for the Proposed Development within each Main River Catchment (in m^2)

	Dye Water at downstream extent of Site boundary (m^2)	Watch Water at Watch Water reservoir (m^2)	Blackadder downstream of Site (m^2)	Wester Burn downstream of Site (m^2)
Catchment area	30,399,812	7,834,467	17,634,838	6,572,404
Land take within catchment*	234,430	14,061	0	14,420
% of catchment area	0.8%	0.2%	0%	0.2%

* This includes all proposed hardstanding (temporary and permanent), construction compounds, borrow pit, battery storage, substation and proposed track extents.

8.106 The construction of infrastructure, such as tracks, could affect (block or realign) natural flow pathways, resulting in changes to the local runoff rate and volume and potentially resulting in the change in contributing catchment areas. This would also have an effect on the rate and volume of water reaching receiving watercourses and other downstream receptors.

8.107 Changes to the rate and volume of infiltration due to the construction of infrastructure could also affect recharge rates to the groundwater body. Excavations for turbine foundations and in the borrow pits during construction could also result in minor, local changes to groundwater levels, as water would tend to fill up the excavated areas.

8.108 The Proposed Development incorporates SuDS and other embedded good practice mitigation measures to minimise the risk of increased runoff and flood risk (see **Embedded Mitigation Section** above) and the discharge of attenuated surface water runoff from the working areas and access tracks into the watercourses will be limited to greenfield runoff rates entering each watercourse from the Site at present.

8.109 The catchment areas of the main watercourses downstream of the Site are provided in **Table 8.10**. The total area of proposed new hardstanding or semi-permeable surfaces within each catchment ranges from 0 m^2 to 234,430 m^2. This represents between 0 – 0.8% of the total catchment areas.

8.110 Based on the small percentage of the total catchment areas impacted by temporary and permanent hardstanding, the effect of construction on runoff rates and flood risk is considered to be of Negligible magnitude and the significance will be **none** on watercourses and waterbodies downstream of the Proposed Development.

8.111 Excavations for turbine foundations and borrow pits could impact groundwater recharge levels. The effect is considered to be of short duration, localised and reversible and is considered to be of **slight** magnitude and Minor significance on the groundwater body.

Effects During Construction on GWDTEs

8.112 There are two areas of moderately or highly dependent GWDTEs where infrastructure is proposed within the recommended buffers. These are shown in **Figure 8.3** and assessed in detail in **Appendix 8.6**. The assessment methodology and results are summarised below.

8.113 A site-specific qualitative risk assessment of each GWDTE location was carried out based on the available data on local geology, hydrology, ecology and hydrogeological regime at each location. There is no available data on sub-surface flows and in the absence of data, it is considered that the movement of sub-surface water is primarily driven by topography.

8.114 Flow routing analysis was carried out in QGIS software using LiDAR terrain data. In the absence of data on ground water levels and flow paths, analysis of topography and surface water flows paths was used to infer hydrological and hydrogeological connectivity to the project infrastructure.

8.115 The assessment of impact on a groundwater flow path is made with reference to distance, slope, aspect, typical water table levels and features such as watercourses. The assessment is made with imperfect knowledge of the exact extent that a particular impact may have and imperfect knowledge of specific sub-surface flow paths. As such, it takes a precautionary approach using the available information.

8.116 In summary the results of the Site's specific assessments are;

- GWDTE P1, including TN1 and TN2 (flushes, moderately dependent GWDTE)
  - Turbine T4 is 133 m south of the GWDTE and the associated track is 68 m west of the and part of the associated infrastructure drains towards the GWDTE. Based on the detailed assessment (**Appendix 8.6**) it is considered that the Proposed Development could have a temporary, local effect of slight magnitude on the GWDTE. Given the medium sensitivity of the receptor, this effect is considered to be of **minor** significance during construction before additional mitigation.
- GWDTE P2, including TN3 (spring and highly dependent GWDTE)
  - The spring (TN3) upwelling at the top of the GWDTE polygon is on the opposite valley side of the small watercourse (Chapman's Grain) from Turbine T5 and is outwith the 250 m infrastructure buffer. This high dependency GWDTE was buffered during early design iteration. Only a small part of the GWDTE polygon, along the route of Chapman's Grain watercourse, is within the 250 m buffer (**Image 2, Appendix 8.6**). Flow path analysis confirms that surface water flow paths from the proposed infrastructure at T5 are towards the watercourse and will not impact the highly dependent GWDTE. It is noted that the mapped potential GWDTE along the watercourse is not related to the spring source and is mainly surface water fed, due to proximity to the watercourse, and it is considered to have at most a low dependency on groundwater. Thus, the magnitude of effect on the GWDTE is considered to be none, which results in an effect significance of **none**.

Direct and Indirect Disturbance of Peat During Construction

8.117 Construction work on peat has the potential to cause peat instability, which may affect both peat soils (and their inherent carbon stores), peatland habitats and nearby watercourses, infrastructure or land uses. A PLHRA has been undertaken and is documented in **Appendix 8.4**. The PLHRA included detailed site mapping and field walkover, qualitative and quantitative assessment of peat stability, identification of on- an offsite receptors and calculation of risk associated with peat landslides.

8.118 The PLHRA indicates low likelihood of peat landslides across the Site, with only two Moderate likelihood areas intersecting with proposed infrastructure (access tracks in both cases). Runout analysis at these two locations (near Turbines 4 and 14) shows that potential landslide runout, if triggered by construction at the upslope source zones, would be likely to thin to negligible volumes prior to entry to Foul Cleugh and Kersons Cleugh (the two receptor watercourses). Therefore the significance of the effect of peat slides on the water quality of the connected Dye Water is considered to be Neutral.

8.119 The alteration of the geological environment by the excavation of the subsoil and peat required to build the infrastructure such as turbine bases, construction compounds, tracks and borrow pits will result in some alteration of the geological environment. In particular, any underlying topsoil and peat may be temporarily or permanently removed to be re-instated or re-used elsewhere and will need to be stored and managed appropriately.

8.120 Activities, or effects of activities, which have the potential to alter the geological environment include:

- earthworks and site drainage;
- reduction in water table levels resulting in the drying out, oxidation and potential erosion of peat;
- excavation and removal of peat; and

- the disturbance and loading of peat by vehicle tracking.

8.121 The Outline PMP (**Appendix 8.3**) considers the excavation and reuse of peat based on a peat depth model interpolated from Phase 1 and 2 peat depth data across the Site. Excavation calculations have been undertaken for all site infrastructure, including permanent excavations (turbine foundations and the main hardstandings, the main compound with substation, and all tracks of cut and fill construction) and temporary excavations (secondary crane hardstandings and laydowns, the two new construction compounds and borrow pits). Excavation calculations treat all soils ≥0.5 m as peat, with the uppermost 0.3 m as acrotelm, and all soils <0.5 m as organic soils. All peat and soils that are temporarily excavated will be stored locally and directly reinstated at their point of origin following construction. All permanently excavated peat and soils require alternative uses, ideally as restoration materials.

8.122 Based on the approach described above, c. 3,113 m^3 of acrotelmic peat and c. 3,235 m^3 of catotelmic peat (6,348 m^3 total) will be excavated during construction of the Proposed Development. Much of the material that is due to be excavated is thin organic soil (c. 60,494 m^3), of which 27,986 m^3 is due to be directly reinstated, with the remainder (c. 32,508 m^3) to be used in tying in infrastructure in non-peatland areas. Of the excavated peat, 885 m^3 of acrotelm and 847 m^3 of catotelm will be directly reinstated into temporary hardstandings, and the remainder, excavated primarily for construction of cut and fill tracks, will be used to tie the track margins into the wider peat areas (but will not be used in parts of the Site dominated by organic soil). In two locations, larger shoulders of 0.3 m depth will be created contiguous with deeper peat deposits and buttressed by constructed infrastructure. These will be at the highest elevations and on gentle slopes to encourage rewetting. There are otherwise very limited opportunities to reuse peat on site, with no bare floored gullies to infill, no cutover areas in proximity to proposed infrastructure, no borrow pits adjacent to peat areas and no drains sufficiently large in cross-section to block or fill with borrowed peat.

8.123 Based on the calculations described within the Outline PMP, there are sufficient opportunities to reuse peat across the Site without generating a surplus. The effect on peat soils from excavation is therefore considered to be Minor.

8.124 Assuming embedded mitigation measures detailed above are incorporated into project design and are effective, the magnitude of the effect on peat is Minor. Overall, the effect on peat is Minor.

Potential Operational Effects

8.125 Following construction of the Proposed Development, all infrastructure will be left in situ to permit maintenance.

8.126 The potential operational impacts of the Proposed Development are associated with the permanent Site infrastructure, including the tracks, turbine bases, substation and hardstanding areas and any required maintenance work during operation.

8.127 The assessment of operational effects considers that the pollution prevention controls, and permanent drainage installed during construction will remain in place during operation. Hence, the operational effects on peat, hydrogeology, surface water quality and water supplies were scoped out.

8.128 During operation, the increase in hardstanding areas (turbine bases, substation, and tracks) could result in a slight increase in the rate and volume of surface water runoff, leading to an increase in flood risk downstream. However, given the permanent SuDS drainage measures and the size of the areas of hardstanding compared to the catchment areas of the downstream watercourses, the magnitude of the effect on flood risk downstream is considered to be Negligible and thus is assessed to have an effect significance of Neutral.

Potential Cumulative Effects

Potential Cumulative Construction Effects

8.129 There are a number of proposed and completed developments within the surrounding area, the majority of which are in different catchments than the Site, meaning that there is less chance of a cumulative effect occurring. There are two wind farms within the same catchments as the Site. The operational Fallago Rig Wind Farm is within the Dye Water catchment and has been considered as part of the baseline. The proposed Wedderlie Wind Farm is at the early design and Scoping stage. It is located east of the Proposed Development in the Watch Water and Blackadder catchments.

8.130 Assuming that nearby wind farm schemes (i.e., Wedderlie) are designed and constructed in line with NPF4 and national guidelines with respect to SuDS and GPPs, there should be no cumulative effect on the downstream catchments.

8.131 Cumulative effects on peat are not anticipated, given proposed restoration plans and avoidance/minimisation of peat.

Potential Cumulative Operational Effects

8.132 There are no predicted cumulative effects during operation.

Decommissioning

8.133 Decommissioning effects are considered to be of a similar extent, duration and significance as construction effects. However, given the uncertainty around the future conditions at the Site, and exact methods that will be employed at the time, a detailed assessment has not been undertaken of the effects associated with decommissioning of the Proposed Development. Notwithstanding this uncertainty, on the basis that effects will be no greater than construction effects, it is considered that the effect of decommissioning will be of no more than Minor significance. Decommissioning is not considered further in the assessment.

Mitigation

Mitigation During Construction

8.134 With embedded mitigation measures incorporated into project design, including SuDS pollution control and attenuation measures, there are no significant effects (Moderate or Major) on hydrology, water quality, morphology or PWS. Details of the embedded mitigation will be set out in detail prior to construction in the PPP, CEMP and construction method statements. The PPP will require approval by SEPA to obtain a CAR CSL.

8.135 The PPP will also contain details of the location specific additional mitigation for relevant infrastructure and the contractor will be legally obliged to comply with the pollution control and drainage measures agreed in the PPP and CSL. An ECoW will be present onsite during construction to monitor and assess the works and check the mitigations outlined in the PPP are adhered to and function properly. If monitoring or assessment identifies non-compliance, ineffective mitigations, or impacts beyond those predicted in the EIA Report, this will be raised with the Contractor who will be required to demonstrate and deliver compliance.

8.136 Additional mitigation and SuDS (e.g. silt fences, settlement ponds) will be installed around the following working areas, crossings and access tracks during construction to reduce the risk of sediment/silt runoff to the water environment during construction:

- Watercourse crossings of the proposed and existing tracks;
- Buffer encroachment A – proposed battery storage area;
- Buffer encroachment B – proposed borrow pit 3;
- Buffer encroachment C – proposed access track upgrades within the 50 m buffer

8.137 The bed and banks of watercourses adjacent to crossing locations will be restored immediately after construction.

8.138 Dewatering will be avoided where possible and permanent physical cut-offs will be avoided.

8.139 Additional mitigation and monitoring are proposed to minimise the effects on GWDTEs, as follows:

- The track to T4 will be designed to enable subsurface flows to the GWDTE to be maintained. Monitoring will be put in place to assess the quantitative and chemical effect of the infrastructure to ensure that the groundwater flow and quality to the GWDTE (TN1 and TN2) are not statistically significantly changed post construction. Monitoring will be carried out based on SEPA guidance and will comprise groundwater monitoring at the two seeps.

8.140 Safeguarding of the Fallago Rig groundwater abstractions and pipework and avoidance will be required during detailed substation design and during construction works. Monitoring of the abstraction will be undertaken before and during construction and an alternative water supply will be provided, if required.

8.141 Any excavated peat will be stored appropriately nearby and re-used as soon as possible for reinstatement purposes or tying in of infrastructure. Peat restoration described in **Appendix 6.6** will be undertaken primarily through drain blocking using established techniques rather than by using peat generated during wind farm construction.

8.142 Further minimisation of peat landslide risk may be achieved through further micrositing and / or careful construction management and through such mitigation, landslide risks are interpreted to be Negligible post-mitigation.

8.143 Cognisance of Scottish Water services and pipework will be required during detailed design and prior to and during construction works, particularly relating to the pipework suppling water to the Rawburn WTW. Prior to construction works in the vicinity of Scottish Water assets, the Applicant will liaise closely with Scottish Water and conduct services surveys to ensure that pipe locations are accurately mapped, avoided in detailed designs and physically marked out in the vicinity of wind farm works. If required, suitable safeguarding measures would be agreed with Scottish Water to ensure that their infrastructure is protected during construction.

8.144 An ECoW will be on site throughout the construction to monitor the effectiveness of the embedded and additional mitigation measures.

Mitigation During Operation

8.145 No specific mitigation is proposed during operation.

Assessment of Residual Effects

Residual Construction Effects

8.146 With embedded mitigation, additional mitigation, including the peat restoration and enhancement plans, and monitoring described above, the residual construction effects are either Minor, Neutral or None and are summarised in **Table 8.11**.

Residual Operational Effects

8.147 There are no residual operational effects on the water and soil environment.

Residual Cumulative Effects

Residual Cumulative Construction Effects

8.148 There are no predicted residual cumulative effects during construction.

Residual Cumulative Operational Effects

8.149 There are no predicted residual cumulative effects during operation.

Monitoring

8.150 Pre-, during and post-construction fish habitat and watercourse monitoring surveys will be carried out (see **Chapter 6**) and there will be an ECoW involved throughout the construction works to monitor effectiveness of the measures implemented.

8.151 Groundwater monitoring will be put in place to assess the quantitative and chemical effect of the infrastructure to check that the groundwater flow and quality to GWDTEs TN1 and TN2 are not statistically significantly changed post construction. Monitoring will be carried out based on SEPA guidance and will comprise groundwater monitoring at the flushes/seeps and at a series of groundwater monitoring wells. Details of the monitoring will be agreed with SEPA and set out in the CEMP.

8.152 Monitoring of water quality and quantity of the groundwater abstractions for Fallago Rig will be undertaken before, during and after construction to ensure no contamination of the supply. Monitoring will be undertaken by an ECoW (or equivalent) and monitoring locations will be identified in the CEMP.

8.153 If the water quality deteriorates during construction (e.g. discoloured, high sediment content, hydrocarbons) an alternative water supply will be installed, such as portable bowsers, to ensure minimal disruption of supply. The contractors will have a supply of bowsers ready to deploy, if required.

8.154 Mitigation of residual peat instability risks will be supported by good practice construction measures and by monitoring both during and after construction. Further details are provided in **Appendix 8.4, Section 6.3,** and **Section 6.4**.

8.155 Satisfactory implementation of the Outline PMP in order to mitigate peat loss / disturbance will be assured by monitoring both during and after construction. Further details are provided in **Appendix 8.3, Section 7.6**.

8.156 An ECoW (or equivalent) will be on site throughout the construction to monitor the effectiveness of the embedded and additional mitigation measures.

Summary

8.157 Table 8.11 summarises the likely predicted effects of the Proposed Development on Hydrology, Hydrogeology, Geology and Peat. Most of the likely effects prior to mitigation were either None, Neutral or Minor significance, assuming embedded good practice mitigation measures are in place during construction.

8.158 With additional mitigation, the likely residual effects were either of None or Neutral significance.

Glossary/Abbreviations

Table 8.11: Glossary and abbreviations

Term in Full	Abbreviation
Ground Water Dependent Terrestrial Ecosystems	GWDTE
Private Water Supply	PWS
East Lothian Council	ELC
River Tweed Commission	RTC
Scottish Environment Protection Agency	SEPA
Scottish Borders Council	SBC
Controlled Activity Regulations	CAR
Drinking Water Protected Areas	DWPA
Construction Environmental Management Plan	CEMP
Sustainable Drainage Systems	SuDS
Guidance for Pollution Prevention	GPP
Special Area of Conservation	SAC
Environmental Clerk of Works	ECoW
Pollution Prevention Plan	PPP
Construction Site Licence	CSL
Above Ordnance Datum	AOD