VOLUME 1: CHAPTER 9: SOILS, GEOLOGY AND WATER

Figures (Volume 2 of this EIA Report)

Appendices (Volume 4 of this EIA Report)

This page is intentionally blank.

9. SOILS, GEOLOGY AND WATER

9.1 Executive Summary

9.1.1 An assessment has been undertaken of the potential effects on geology (including soils and peat) and the water environment (hydrology and hydrogeology) during the construction and operational phases of the Proposed Development with the Proposed Alignment (hereafter referred to as 'the Proposed Alignment'). The Proposed Development with the Alternative Alignment is assessed in **Volume 5: Chapter 7: Soils, Geology and Water – Alternative Alignment** and its supporting appendices.

9.1.2 Information for the Study Area was compiled using baseline information from a desk study, which was verified by an extensive programme of field work. The site and the immediate area have been subject to much previous investigation and assessment and this information has also been used to characterise baseline conditions. The assessment undertaken considered the sensitivity of receptors identified during the baseline study and mitigation measures incorporated in the development design. It has also considered potential future changes to baseline conditions.

9.1.3 The scope of the assessment was informed by existing nearby assessments, pre-application advice and scoping and consultation responses received during the route and alignment selection stages of the Proposed Development.

9.1.4 The assessment is supported by Appendices that consider potential effects on carbon rich soils and peat (outline peat management plan), peat stability (peat landslide hazard risk assessment) and peatland condition. A schedule of proposed watercourse crossings associated with the Proposed Alignment is also presented as an Appendix.

9.1.5 A detailed peatland condition assessment has been completed which has considered key hydrological, ecological and land-use based indicators of peatland condition. In summary it confirms that overall the remaining fragments of peatland appear to be hydrologically compromised by longstanding drainage, peat extraction and grazing leading to a high prevalence of vascular plants and low diversity. This has fundamentally reduced the resilience of the peatlands within this landscape as evidenced by the high severity and enduring impacts of a wildfire in 2019. The highly degraded nature of peatland and heath means that development along the Proposed Alignment, subject to use of common industry safeguards, will not impair peatland along its route.

9.1.6 Subject to the adoption of best practice construction techniques and a site-specific Construction Environmental Management Plan (CEMP), no significant adverse effects on geology (including soils and peat) and the water environment have been identified. The CEMP would include provision for drainage management plans which would be agreed with statutory consultees, including Scottish Environment Protection Agency (SEPA) and NatureScot, and which would be used to safeguard existing surface water and groundwater flow paths, water resources and manage flood risk. A commitment to deploy Sustainable Drainage Systems (SuDS) in these plans has been made. The CEMP would also include provision of a Pollution Prevention Plan which would also be agreed with statutory consultees including SEPA and NatureScot prior to any construction works being undertaken.

9.1.7 The design of the Proposed Alignment has been informed by a detailed programme of peat depth probing as required by National Planning Framework 4 (NPF4) and it has been shown that wherever possible areas of deep peat have been avoided. The assessment of peat and carbon rich soils has considered all of the proposed infrastructure, including temporary and permanent access tracks. A project specific outline peat management plan has been prepared which confirms the soils disturbed by the development are limited in volume and that these soils can be readily and beneficially reused in restoration works.

9.1.8 Notwithstanding these safeguards, a programme of baseline and construction phase water quality monitoring is proposed which would be used to confirm that the Proposed Alignment does not have a significant effect on the water environment. Further, additional site investigation is proposed as part of the detailed design stage of the project to ensure ground stability risk is not increased as a consequence of the Proposed Development. A geotechnical risk register and monitoring is proposed. It is proposed that the monitoring programmes are agreed with statutory consultees.

9.2 Introduction

9.2.1 This Chapter considers the potential effects of the Proposed Development with the Proposed Alignment on geology (including soils and peat) and the water environment (hydrology and hydrogeology) during construction and operation, and the dismantling of the existing 132 kV trident 'H' wood pole overhead line (OHL). Where likely significant effects are predicted appropriate mitigation measures are proposed, and the significance of predicted residual effects are assessed.

9.2.2 The assessment should be read in conjunction with **Volume 1: Chapter 7 – Ecology** as information contained in that Chapter and assessment are used to complete the assessment of habitats (such as peat and Groundwater Dependent Terrestrial Ecosystems (GWDTEs)) and ecological receptors (such as designated sites) that are sustained by water.

9.2.3 Further, as part of this Chapter, site specific peat depth probing and a peatland condition assessment has been undertaken, the findings of which are presented in the following Appendices:

- **Volume 4: Appendix V1-9.1**: Peat Landslide Hazard Risk Assessment (PLHRA)
- **Volume 4: Appendix V1-9.2**: Outline Peat Management Plan (PMP)
- **Volume 4: Appendix V1-9.4:** Detailed Peatland Condition Assessment (PCA)

9.2.4 The findings of these detailed assessments are summarised in this Chapter.

9.2.5 The Proposed Development with the Alternative Alignment is assessed in **Volume 5: Chapter 7: Soils, Geology and Water – Alternative Alignment** and its supporting appendices.

Statement of Qualifications

9.2.6 This assessment has been conducted by SLR Consulting Ltd (SLR) and overseen and reviewed by Gordon Robb (BSc, MSc, MBA, C.WEM, FCIWEM). Gordon is a Technical Director (Hydrology and Hydrogeology) and has more than 30 years' experience assessing renewable energy and electrical infrastructure projects and specifically their potential effects on soils, geology and the water environment. He is based in Scotland and has worked throughout Scotland, including on sites in similar environments to the Proposed Development. He has also prepared and given expert witness testimony for renewable and electrical infrastructure projects. A table presenting relevant qualifications and experience of key staff involved in the preparation of this Chapter is included in **Volume 4: Appendix 5.1: EIA Team Details**.

9.2.7 The peatland condition assessment has been prepared by Dr. Chris Marshall, a Principal Consultant at SLR Consulting Limited. Chris holds a BSc (Hons) Environmental Geology, an MSc in Geochemistry and a PhD in Earth Sciences, with 10 years of experience in peatland condition and restoration monitoring and assessment including peer reviewed scientific papers, policy documents, governmental reports and membership of scientific and technical advisory groups. He has conducted surveys of Peatland Condition and Fire Impact at the Proposed Development site since 2018.

9.3 Scope of Assessment

Study Area

9.3.1 The Study Area encompasses the area over which all desk-based and field data were gathered to inform the assessment presented in this Chapter. This includes a buffer of 500 m to all the proposed works and access tracks that would be used during construction and operation of the Proposed Alignment, and the section of existing OHL which would be dismantled.

9.3.2

9.4 Consultation

9.4.1 To inform the scope of the assessment for the Proposed Development, consultation was undertaken with statutory and non-statutory bodies through a formal EIA scoping process. Full details of the consultation process and responses are included in **Volume 1: Chapter 4 - Scope and Consultation** and associated appendices.

9.4.2 Specific responses relating to soils, geology and the water environment for the Proposed Alignment are included in **Table V1-9.1**.

Table V1-9.1: Scoping Responses

Organisation & Date	Summary of Consultation Response	EIA/Design Response to Consultee
Energy Consents Unit (ECU) **Scoping Response** 11th June 2024	Scottish Ministers are satisfied with the scope of the EIA set out in Section 3 to Section 11 of the Scoping Report.	Noted.
	Scottish Water provided information on whether there are any drinking water protected areas or Scottish Water assets on which the development could have any significant effect. Scottish Ministers request that the company makes further enquires to confirm whether there any Scottish Water assets which may be affected by the development and includes details in the EIA report of any relevant mitigation measures to be provided.	Scottish Water has confirmed that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the Proposed Development. Assessments of potential impacts on the water environment, including Scottish Water assets and Drinking Water Protected Areas, is included in Section 9.7 and Section 9.8 of this Chapter and includes assessment of water quality and quantity. The location of Scottish Water assets in the Study Area are shown on **Volume 2: Figure V1-9.1**.
	[Scottish Ministers] request that the Company investigates the presence of any private water supplies which may be impacted by the development. The EIA report should include details of any supplies identified by this investigation, and if any supplies are identified, the Company should provide an assessment of the potential impacts, risks, and any mitigation which would be provided.	Assessment of potential impacts on private water supplies are discussed within Section 9.7 of this Chapter.
	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.	A site specific PLHRA is presented as **Volume 4: Appendix V1-9.1**.

Organisation & Date	Summary of Consultation Response	EIA/Design Response to Consultee
	The Proposed [and Alternative] OHL routes pass through the Caithness and Sutherland Peatlands Special Protection Area (SPA), Special Area of Conservation (SAC) and Ramsar site and the West Halladale Site of Special Scientific Interest (SSSI). The routes are also adjacent to the East Halladale SSSI and within connectivity distance to qualifying features of the Caithness Lochs SPA.	Assessment of the direct and indirect impacts on the Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the West Halladale SSSI is presented in **Volume 1: Chapter 7** (see also **Volume 4: Appendix V1-7.6: Shadow Habitats Regulations Assessment for the Caithness and Sutherland SAC / Ramsar**). Potential impacts on the Caithness and Sutherland Peatlands SPA ornithology features are assessed in **Volume 1: Chapter 8: Ornithology** (see also **Volume 4: Appendix V1-8.3: Shadow HRA for European Sites of Ornithological Importance**). The assessments include consideration of potential cumulative impacts.
SEPA **Scoping Response** 12th April 2024	Figure 12 [of the Scoping Report] indicates that there will be peat or peaty soils over all of the route and therefore from our perspective demonstrating that the proposals meet the requirements of Policy 5 of NPF4 will be of most significance. Peat probing information should be provided so that it is ensured that there is depth information available for all locations where infrastructure – including all temporary construction infrastructure and any borrow pits – is proposed. It should be clearly demonstrated that the cable route corridor, location of individual tower hardstandings and supporting infrastructure such as tracks avoids the areas of deepest peat and any near natural condition habitat. Proposals for peatland compensation / offsetting should be outlined, and in addition proposals for biodiversity gain.	A detailed programme of peat depth probing has been undertaken and has been used to inform the project design and to show compliance with the aims of Policy 5 of NPF4. Potential impacts on peat and proposed safeguards as a result of the Proposed Alignment are summarised in Section 9.7 of this Chapter and presented in full in **Volume 4: Appendix V1-9.1: PLHRA** and **Appendix V1-9.2: Outline PMP**. The condition of the peat is discussed in **Volume 4: Appendix V1-9.4** and an assessment of the potential impacts on the Flow Country World Heritage Site (WHS) is included in **Volume 4: Appendix V1-7.7**. Proposals for habitat restoration and management are presented in **Volume 1: Chapter 7** and **Volume 4: Appendix V1-7.8: Connagill Cluster Outline Habitat Management Plan (HMP)**.
	Please make sure that drawings are submitted at a scale that allows the relationship between baseline information - such as buffers to watercourses, habitat type, peatland condition, peat depth - and the infrastructure to be clearly understood. An overarching plan followed by a series of more detailed drawings usually works well.	See **Volume 2: Figures V1-9.1 to V1-9.8**, and **Volume 4: Appendix V1-9.1: PLHRA** and **Appendix V1-9.2: Outline PMP**.

Organisation & Date	Summary of Consultation Response	EIA/Design Response to Consultee
	The submitted habitat survey (which the text of the report suggests is to National Vegetation Classification Standard – but is a Phase 1 Habitat Survey) indicates that the development will have an impact on habitats that are potentially groundwater dependent. The final submission should provide an assessment of whether the habitats are actually groundwater dependent in the area, and mitigation measures to maintain local hydrology where necessary.	Noted. Potential areas of GWDTE are shown on **Volume 2: Figure V1-9.8** and discussed within Section 9.7 of this Chapter. Where required, measures to safeguard local hydrology and water flow paths are given.
	In view of the comment in section 6.5.1 of the [Scoping] Report we highlight that a buffer of 50 m should be aimed for to protect local water features; we do not consider 10 m suitable.	A buffer of at least 20 m to water features has been used for proposed permanent infrastructure in accordance with the Applicants General Environmental Management Plans (see **Volume 4: Appendix V1-3.4**) which have been agreed with SEPA and NatureScot.
	Please ensure that clear information is provided on the type of access proposed to be used in each area e.g. boards, temporary floating tracks, temporary cut tracks, permanent floating tracks, permanent cut tracks. When there is any doubt, the impact should be assessed based on the poorest environmentally option. Proposals to use existing tracks, or previously disturbed routes is welcome and should be marked on the plans.	Noted. It is confirmed that existing tracks have been used where technically possible. Existing and proposed tracks are shown on **Volume 2: Figure V1-9.1**. It is confirmed that floating stone road or trackway panel construction may be installed in sensitive areas such as over deeper areas of peat. All new tracks would be constructed in accordance with best practice construction methods and with reference to NatureScot's good practice guide on constructing tracks in Scottish uplands.
	To avoid doubt, we defer to NatureScot in relation to advice on impacts on the local designated site.	Noted.
Scottish Water **Scoping Response** 15th April 2024	Scottish Water has no objection to this planning application; however, the applicant should be aware that this does not confirm that the proposed development can currently be serviced.	Noted.
	Scottish Water records indicate that there is live infrastructure in the development area that may impact on existing Scottish Water assets. The applicant must identify any potential conflicts with Scottish Water assets.	Assessments of potential impacts on the water environment, including Scottish Water assets and Drinking Water Protected Areas, is included in Section 9.7 and Section 9.8 of this Chapter and includes assessment of water quality and quantity. The location of Scottish Water assets in the Study Area are shown on **Volume 2: Figure V1-9.1**.

Organisation & Date	Summary of Consultation Response	EIA/Design Response to Consultee
	A review of our records indicates that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas in the area that may be affected by the proposed activity.	Noted.
	For reasons of sustainability and to protect our customers from potential future sewer flooding, Scottish Water will not accept any surface water connections into our combined sewer system.	Noted. It is confirmed that no discharge of water (storm or foul) is proposed to Scottish Water infrastructure.
NatureScot **Scoping Response** 26 April 2024	The key issues to address within the EIA include: • The likely adverse impacts upon the Caithness and Sutherland Peatlands SPA/Ramsar site. • Possible impacts on the Caithness and Sutherland Peatland SAC (e.g. otter and peatland habitats) • Flow Country World Heritage Site • Peatland	Assessment of the direct and indirect impacts on the Caithness and Sutherland Peatlands SAC and Ramsar site and the West Halladale SSSI is presented in **Volume 1: Chapter 7: Ecology**. Potential impacts on the Caithness and Sutherland Peatlands SPA ornithology features are assessed in **Volume 1: Chapter 8: Ornithology**. Assessment of the potential impacts on the Flow Country WHS is included in **Volume 4: Appendix V1-7.7**. Potential impacts on peat and proposed safeguards are summarised in this Chapter and presented in full in **Volume 4: Appendix V1- 9.1: PLHRA** and **Appendix V1-9.2: Outline PMP**. The condition of the peat is discussed in **Volume 4: Appendix V1-9.4: PCA**.
RSPB **Scoping Response** 31 May 2024	The site is part of the wider Flow Country, internationally important for its blanket bog which, when in a healthy condition, naturally sequester and store of carbon. The NatureScot Carbon and Peatland Map 2016, identifies that both the Proposed and the Alternative OHL pass through significant areas of nationally important Class 1 (Nationally important carbon-rich soils, deep peat and priority peatland habitat / areas likely to be of high conservation value) and Class 2 (Nationally important carbon-rich soils, deep peat and priority peatland habitat).	Assessment of the potential impacts on the Flow Country WHS is included in **Volume 4: Appendix V1-7.7.** A detailed and site specific programme of peat depth probing has been completed and been used to inform the design of the Proposed Alignment. Potential impacts on peat and proposed safeguards are summarised in this Chapter and presented in full in **Volume 4: Appendix V1-9.1: PLHRA** and **Appendix V1-9.2: Outline PMP**. The condition of the peat is discussed in **Volume 4: Appendix V1-9.4**.

Organisation & Date	Summary of Consultation Response	EIA/Design Response to Consultee
	We support the following statement in Section 8.5.12 [of the Scoping Report]: *"Regarding peat, in accordance with NPF4, the mitigation hierarchy would be applied so that impacts are avoided, or minimised as far as possible, and where they cannot be avoided appropriate measures would be proposed to safeguard peat and carbon rich soils".* Data from the peat depth survey should be used to inform siting, in order to minimise impacts on peat by helping to avoid areas deeper than 0.5m. Horizontal directional drilling through bedrock should be considered for sensitive peatland habitats that cannot be avoided. Alignment finalisation must consider minimising impacts on peat by appropriate micro-siting or [Horizontal Directional Drilling] HDD. We note that, "*a 100m [limit of deviation] LOD (50 m either side of the centre line of the OHL alignment) would be sought to allow for micro-siting of the OHL during construction*" and "*a 50 m LOD will be sought for the construction of new access tracks*" (section 2.3.2 of the Scoping Report). This should also be considered in assessments.	
	Section 11.6.8 [of the Scoping Report] states that climate change is scoped out of the EIA assessment. Although, we understand that the proposed development, would support the renewable network, an assessment of carbon emissions in line with Policy 5d)iii) of NPF4 which requires, a detailed site specific assessment to identify 'the likely net effects of the development on climate emissions and loss of carbon'.	The potential future effects of climate change are discussed in Section 9.7 of this Chapter and how these may alter baseline conditions are confirmed.
	This site overlaps the candidate Flow Country World Heritage Site. In section 6.3.4 [of the Scoping Report], it is stated that there is a "*small overlap between the Proposed Development footprint and the WHS*". In fact there seems to be what would generally be considered as a large overlap between the WHS and both the Proposed Development (approximately 5 km) and the Alternative (approximately 6.7 km). No proposals have been set out for assessing the impacts on the candidate World Heritage Site. The Highland Council's Flow Country Candidate World Heritage Site Planning Position Statement (April 2023)[4], states that, developments within the WHS, should be assessed utilising the UNESCO Impact Assessment Guidance Toolkit (section 5.14). Therefore, we recommend that this is undertaken alongside the EIA.	Noted. Assessment of the potential impacts on the Flow Country WHS utilising the UNESCO Impact Assessment Guidance Toolkit[1], is included in **Volume 4: Appendix V1-7.7**.

Organisation & Date	Summary of Consultation Response	EIA/Design Response to Consultee
The Highland Council (THC) **Scoping Response** 21st May 2024	The EIAR needs to address the nature of the hydrology and hydrogeology of the site, and of the potential impacts on water courses, water supplies including private supplies, water quality, water quantity and on aquatic flora and fauna. Impacts on watercourses, groundwater, other water features and sensitive receptors, such as water supplies, need to be assessed. Measures to prevent erosion, sedimentation or discolouration will be required, along with monitoring proposals and contingency plans. Assessment will need to recognise periods of high rainfall which will impact on any calculations of run-off, high flow in watercourses and hydrogeological matters.	Assessment of potential impacts on the water environment is included in Section 9.7, 9.8 and 9.9 of this Chapter and includes assessment of water quality and quantity and required contingency measures for periods of high rainfall.
	If culverting should be proposed, then it should be noted that SEPA has a general presumption against modification, diversion or culverting of watercourses. Schemes should be designed to avoid crossing watercourses, and to bridge watercourses where this cannot be avoided. The EIAR will be expected to identify all water crossings and include a systematic table of watercourse crossings or channelising, with detailed justification for any such elements and design to minimise impact. The table should be accompanied by photography of each watercourse affected and include dimensions of the watercourse. It may be useful for the applicant to demonstrate choice of watercourse crossing by means of a decision tree, taking into account factors including catchment size (resultant flows), natural habitat and environmental concerns.	The Proposed Alignment has sought to use existing tracks (and watercourse crossings) where technically feasible. A schedule of proposed watercourse crossings which includes photographs and dimensions of the watercourses at the proposed crossing location is included in **Volume 4: Appendix V1-9.3: Schedule of Watercourse Crossings**. It has been confirmed that the design of required watercourse crossings would be agreed with SEPA as required by the Water Environment (Controlled Activities) (Scotland) Regulations 2011 as part of the detailed design stage of the project.
	The Council's Flood Risk Management Team have confirmed that they have no comments to make at this stage. However there are a number of watercourses and waterbodies on the site and therefore the following applies: • A minimum of a 50 m buffer of all watercourses / bodies and turbines/crane hard-standings, which should be shown on a suitably scaled drawing. • All tracks should be kept a minimum 10m away from any waterbody except water crossings. • Access tracks not acting as preferential pathways for runoff and efforts being made to retain existing natural drainage wherever possible;	It is confirmed that a 20 m buffer from permanent infrastructure to watercourses has been applied where technically possible, as shown on **Volume 2: Figure V1-9.1**. It has been confirmed that watercourse crossings would be sized to pass the 0.5% Annual Exceedance Probability (AEP) event plus an allowance for climate change. A flood risk screening assessment is presented in this Chapter. Required mitigation measures and best practice that would be adopted, including the use of SuDS, is presented in this Chapter. Further information on drainage designs would be provided in the final CEMP at detailed design phase.

Organisation & Date	Summary of Consultation Response	EIA/Design Response to Consultee
	• Natural flood management techniques should be applied to reduce the rate of runoff where possible; use of SuDS to achieve pre-development runoff rates and to minimise erosion on existing watercourses; • Water crossings in the form of culverts or bridges, or upgrades to existing crossings must be designed to accommodate to 1 in 200 year flood event, plus climate change • Land rising within any floodplain to be avoided; if ultimately required, compensatory storage must be provided; and, • The EIAR should be informed by the Council's Flood Risk and Drainage Impact Assessment SG.	
	The drainage strategy for the site should divide up the area into different catchments depending on the risks identified. Drainage from areas of highest risk will be considered as a trade effluent and will need to be contained, treated and disposed of appropriately. Areas of less risk should be provided with SuDS. Proposals must meet the treatment requirements of the Ciria SuDS Manual C753. A site plan showing the proposed SuDS treatment train should be submitted. The Simple Index Approach calculation (Section 26.7.1 of the guidance) must also be submitted in support of the site plan, and the online tool may be used to assist in this.	Noted. Best practice drainage measures are summarised in Section 9.8 of this Chapter. Further information on drainage designs would be provided in the final CEMP at detailed design phase.
	It is anticipated that detailed comments will be provided on impacts on the water environment, in particular on buffers to watercourses, by SEPA. However, please note, SEPA does not consider the water quantity aspects of surface water drainage schemes. Therefore, comments from the Local Authority Roads Department and the Local Authority Flood Prevention Unit should be sought on the drainage strategy in terms of water quantity/flooding and adoption issues.	Noted.
	The need for, and information on, abstractions of water supplies for concrete works or other operations should also be identified. The EIAR should identify whether a public or private source is to be utilised. If a private source is to be utilised, full details on the source and details of abstraction need to be provided.	Noted. Best practice regarding abstraction of water is presented in Section 9.8 of this Chapter.

Organisation & Date	Summary of Consultation Response	EIA/Design Response to Consultee
	The applicant will be required to carry out an investigation to identify any private water supplies, including pipework, which may be adversely affected by the development and to submit details of the measures proposed to prevent contamination or physical disruption. THC has some information on known supplies but it is not definitive. An on-site survey will be required.	Assessment of potential impacts on private water supplies are discussed within Section 9.7 of this Chapter.

Potential Impacts Assessed in Full

9.4.3 The following potential impacts have been assessed in full in relation to the Proposed Development:

- potential impact on areas of peat, including peat stability, during construction and operation;
- pollution risk, including potential impact on surface water and groundwater quality and public and private water supplies during construction and operation;
- erosion and sedimentation which could give rise to potential impact on surface water and groundwater quality, and public and private water supplies during construction and operation;
- fluvial and/or surface water flood risk resulting from changes to runoff volumes and rates and modifications to natural and modified drainage patterns during operation;
- potential impact upon the linkage between groundwater and surface water during construction and operation;
- potential impact on areas of GWDTE during construction and operation;
- potential cumulative impacts during construction and operation; and
- potential impacts as a result of dismantling the existing OHL.

Issues Scoped Out of Assessment

9.4.4 On the basis of the desk based and survey work undertaken, policy, guidance and standards, the professional judgement of the EIA team, feedback from consultees and experience from other relevant projects in similar settings, the following topic areas have been 'scoped out':

- Effects on geology as, with the exception of carbon rich soils and peat, no sensitive geological features have been identified within the Study Area.
- Detailed Flood Risk and Drainage Impact Assessment (DIA). Published mapping confirms that virtually all of the Proposed Development is not located in an area identified as being at flood risk and where flood risk is recorded it is typically small in extent and bounds watercourse corridors. A screening of potential flooding sources (fluvial, coastal, groundwater, infrastructure etc.) is therefore presented in this Chapter, and measures that would be used to control the rate and quality of runoff would be specified in the site-specific CEMP and form part of a DIA which would be prepared as part of the detailed design stage of the Proposed Development.
- Baseline water quality monitoring, as water quality data is published by SEPA and can be used to characterise baseline water quality in this assessment.
- Increased flood risk caused by blockages to flow in watercourses during operation and maintenance of the Proposed Development as any required permanent watercourse crossings would be subject to maintenance requirements under the Water Environment (Controlled Activities) (Scotland) Regulations 2011.

- A Geomorphological Assessment as photographs and records of baseline water features are recorded and presented in **Volume 4: Appendix V1-9.3** and with the safeguards proposed no geomorphological effects are anticipated.
- Decommissioning Effects. If the Proposed Development were to be decommissioned all components of the OHL, inclusive of steel from the towers, conductors and fittings, and CSE compound would be removed from site and either recycled or disposed of appropriately. A method statement would be agreed with THC setting out the detail of the decommissioning process for OHL. Efforts would be made to repurpose the Proposed Development for future connections prior to any decommissioning. Consent to be applied for is therefore in perpetuity. The effects associated with the construction phase can be considered to be representative of worst-case decommissioning effects, and therefore no separate assessment of decommissioning has been undertaken as part of this EIA Report. Dismantling the existing OHL has not been scoped out and is assessed in full as part of this assessment.

9.5 Legislation, Policy and Guidance

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

Legislation

9.5.2 Relevant legislation includes:

- EU Water Framework Directive (2000/60/EC);
- EU Drinking Water Directive (98/83/EC);
- EU The Habitats Directive (92/43/EEC);
- The Conservation of Habitats and Species Regulations 2017;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR);
- Environment Act 1995;
- Reservoirs (Scotland) Act 2011;
- Environmental Protection Act 1990;
- The Water Supply (Water Quality) (Scotland) Regulations 2001;
- Flood Risk Management (Scotland) Act 2009;
- Water Environment and Water Services (Scotland) Act 2003;
- The Private Water Supplies (Scotland) Regulations 2006;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017;
- The Water Environment (Drinking Water Protected Area) (Scotland) Order 2011; and
- The Electricity Act 1989.

Policy

9.5.3 NPF4 provides planning guidance and policies regarding sustainable development, tackling climate change and achieving net zero. Policies relevant to this Chapter include:

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

9.5.4 In addition, THC's Highland-wide Local Development Plan (HwLDP) provides planning guidance on the type and location of development that can take place in the region. The HwLDP presents policies of which the following are relevant to this assessment:

- Policy 53: Minerals;
- Policy 54: Mineral Wastes;
- Policy 55: Peat and Soils;
- Policy 60: Other Important Habitats and Article 10 Features;
- Policy 62: Geo-diversity;
- Policy 63: Water Environment;
- Policy 64: Flood Risk;
- Policy 66: Surface Water Drainage; and
- Policy 69: Electricity Transmission Infrastructure.

Guidance

9.5.5 The following guidance is also applicable to the assessment:

9.5.6 Planning Advice Notes (PANs) are published by the Scottish Government. Applicable PANs include:

- PAN 61 Planning and Sustainable Urban Drainage Systems (SUDS); and
- Online Planning Advice on Flood Risk (which supersedes PAN 69).

9.5.7 SEPA Guidance for Pollution Prevention (GPP):

- GPP01 Understanding your environmental responsibilities – good environmental practices;
- GPP02 Above Ground Oil Storage;
- GPP03 Use and Design of Oil Separators in Surface Water Drainage Systems;
- GPP04 Treatment and Disposal of Wastewater where there is no Connection to the Public Foul Sewer;
- GPP05 Works and Maintenance in or near Water;
- GPP06 Working on Construction and Demolition Sites;
- GPP08 Safe Storage and Disposal of Used Oils;
- GPP13 Vehicle Washing and Cleaning;
- GPP21 Pollution Incident Response Planning; and
- GPP22 Dealing with Spills.

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

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

9.5.9 SEPA Publications (it is noted that several of these documents are currently being reviewed following publication of NPF4):

- The Water Environment (Controlled Activities) (Scotland) Regulations. A Practical Guide v9.4 (July 2024)
- Triage Framework: Guidance for Planning Authorities and SEPA, Version 3 (December 2022);
- Engineering in the Water Environment: Good Practice Guide – River Crossings (2010);

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

9.5.10 Other Guidance:

- The Flow Country Candidate[1] World Heritage Site Impact Assessment Toolkit published by The Highland Council (no date of publication) and The Highland Council's World Heritage Site Planning Position Statement (April 2023);
- Scottish Government, Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (2017);
- Forestry Commission Scotland & Scottish National Heritage, Floating Roads on Peat - Report into Good Practice in Design, Construction and Use of Floating Roads (2010);
- Institute of Civil Engineers, Managing Geotechnical Risk: Improving Productivity in UK Building and Construction (2001);
- Scottish Executive, Scottish Roads Network Landslides Study Summary Report (2005);
- Forestry Commission, Guidelines for the Risk Management of Peat Slips on the Construction of Low Volume/Low Cost Roads on Peat (2006);
- Department of Environment, Food and Rural Affairs (DEFRA) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2011); and
- DEFRA Good Practice Guide for Handling Soils (Ministry of Agriculture, Fisheries and Food (MAFF) 2000).

9.6 Methodology

Desk Study

9.6.1 An initial desk study has been undertaken to determine and confirm the baseline characteristics by reviewing available information relating to geology, soils and water. The following sources of information have been consulted to characterise and assess the baseline conditions within the Study Area:

- Strathy Wood Wind Farm section 36 application and supporting documents (Energy Consent Unit ref.: ECU00005239);
- Melvich Wind Energy Hub, section 36 application and supporting documents (Energy Consent Unit ref.: ECU00004514);
- Kirkton Energy Park, section 36 application and supporting documents (Energy Consent Unit ref.: ECU00003244);
- Strath Halladale to Dallangwell 132 kV Grid Connection, section 37 application and supporting documents (Energy Consents Unit ref: 99/13-14 and 100/13-14);
- Ordnance Survey (OS) 1:50,000 and 1:25,000 scale mapping;
- Natural England MAGIC map;
- NatureScot SiteLink;

[1] It is noted that the Flow County World Heritage Site (WHS) has been formally inscribed since the toolkit was published and is no longer considered a candidate WHS. The toolkit has yet to be updated and therefore the candidate WHS toolkit remains applicable at the time of reporting.

- Scottish Natural Heritage (now NatureScot) Carbon and Peatland 2016 Map;
- James Hutton Institute, The National Soil Map of Scotland (1:250,000);
- British Geological Survey (BGS) Onshore GeoIndex (1:50,000);
- BGS Hydrogeological maps of Scotland (1,100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets);
- Details of private water supplies provided by THC;
- Details of Drinking Water Protected Areas published by the Scottish Government;
- SEPA river and loch waterbody nested catchments;
- SEPA flood maps;
- SEPA reservoir flooding map;
- SEPA Water Classification Hub;
- SEPA Water Environment Hub;
- SEPA rainfall data;
- National River Flow Archive; and
- SEPA environmental data.

Field Survey

9.6.2 The project hydrologists, geologists and ecologists have worked closely on this assessment to ensure that appropriate information is gathered to allow a comprehensive impact assessment to be completed. Detailed site visits and walkover surveys have been undertaken by SLR on the following dates:

- November 2023 – Phase I peat probing and condition assessment; and
- April, May, July and September 2024, and January 2025 – Phase II peat probing, peat condition assessment and watercourse crossing survey.

9.6.3 In addition, site surveys were undertaken by the project ecologists to undertake habitat surveys, National Vegetation Classification (NVC) surveys at the Proposed Development (see **Volume 1: Chapter 7**).

9.6.4 With regard to this Chapter the field work has been undertaken in order to:

- verify the information collected during the desk and baseline study;
- assess peat depths and condition, and undertake geomorphological mapping;
- allow appreciation of the Study Area and undertake visual assessment of the main surface waters;
- identify drainage patterns, areas vulnerable to erosion or sedimentation deposition and any pollution risks; and
- visit proposed watercourse crossings and prepare a schedule of these.

Assessment of Effects

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

9.6.6 This approach provides a mechanism for identifying the areas where mitigation measures are required and for identifying mitigation measures appropriate to the significance of likely effects presented by the Proposed Development.

9.6.7 Criteria for determining the significance of effect are provided in **Table V1-9.2, Table V1-9.3,** and **Table V1-9.4**.

Sensitivity / Importance

9.6.8 The sensitivity of the receiving environment (i.e. the baseline quality of the receiving environment) is defined as its ability to absorb an effect without a detectable change and can be considered through a combination of professional judgement and a set of pre-defined criteria which is set out in **Table V1-9.2**.

9.6.9 Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at the associated level of sensitivity.

Table V1-9.2: Criteria for Assessing Sensitivity of Receptors

Sensitivity	Definition
High	• soil type and associated land use is highly sensitive (e.g. unmodified blanket bog or peatland); • SEPA Water Framework Directive Water Body Classification: High-Good or is close to the boundary of a classification: Moderate to Good or Good to High; • receptor is of high ecological importance or National or International value (e.g. Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), habitat for protected species) which may be dependent upon the hydrology of the site; • receptor is at high risk from flooding in the future (to the year 2080) and / or water body acts as an active floodplain or flood defence; • receptor is used for public and/or private water supply (including Drinking Water Protected Areas); • groundwater vulnerability is classified as High; and • if a Groundwater Dependent Terrestrial Ecosystem or Geological Conservation Review site is present and identified as being of high sensitivity.
Moderate	• soil type and associated land use is moderately sensitive (e.g. arable, commercial forestry); • SEPA Water Framework Directive Water Body Classification: Moderate or is close to the boundary of a classification: Low to Moderate; and • moderate classification of groundwater aquifer vulnerability.
Low	• soil type and associated land use not sensitive to change in hydrological regime and associated land use (e.g. intensive grazing of sheep and cattle); • SEPA Water Framework Directive Water Body Classification: Poor or Bad; • receptor is not at risk of flooding in the future (to the year 2080); and • receptor not used for water supplies (public or private).
Not Sensitive	• receptor would not be affected by the Proposed Development e.g. lies within a different and unconnected hydrological / hydrogeological catchment.

Magnitude of Impact

9.6.10 The potential magnitude of impact would depend upon whether the potential impact would cause a fundamental, material or detectable change. In addition, the timing, scale, size and duration of the potential impact resulting from the Proposed Development are also determining factors. The criteria that have been used to assess the magnitude of impact are defined in **Table V1-9.3**.

Table V1-9.3: Criteria for Assessing Magnitude of Impact

Magnitude of Impact	Criteria	Definition
Major	Results in loss of attribute	Long term or permanent changes to the baseline geology, hydrology, hydrogeology and water quality such as:

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

Significance of Effect

9.6.11 The sensitivity of the receiving environment together with the magnitude of the impact determines the significance of the effect, which can be categorised into levels of significance as identified in **Table V1-9.4**.

9.6.12 **Table V1-9.4** provides a guide to assist in decision making. However, it should not be considered as a substitute for professional judgment and interpretation. In some cases, the potential sensitivity of the receiving environment or the magnitude of potential impact cannot be quantified with certainty and, therefore, professional judgement remains the most robust method for identifying the predicted significance of a potential effect.

Table V1-9.4: Criteria for Assessing Significance of Effect

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

9.6.13 Effects of 'Major' and 'Moderate' significance are considered to be 'significant' in terms of the EIA Regulations.

Cumulative Assessment

9.6.14 The assessment considers the potential cumulative effects associated with other material developments within 5 km from the nearest element of the Proposed Development infrastructure and within the same surface water catchment as the Proposed Development. A cumulative effect is considered to be the effect on a hydrological, hydrogeological or geological receptor arising from the Proposed Development in combination with other developments. A 5 km buffer is used as beyond this any potential effects are unlikely to be demonstrable.

Limitations to the Assessment

9.6.15 The assessment uses site investigation, survey data and publicly available data sources, including but not limited to SEPA, THC and commercial data supply companies, as well as additional information collected in support of nearby developments and supplied by stakeholders during the scoping and consultation stages.

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

9.7 Baseline Conditions

9.7.1 This section outlines the baseline soils (including peat), geology and water environment conditions within the Study Area. The Study Area is shown on **Volume 2: Figures V1-9.1 to V1-9.8**.

Designations

9.7.2 Review of NatureScot Sitelink confirms that approximately 250 m of Proposed Alignment is located within the western edge of West Halladale SSSI which is also part of the larger Caithness and Sutherland Peatlands SAC, SPA and Ramsar site, as shown on **Volume 2: Figure V1-9.1**. The SSSI, SAC, SPA and Ramsar site have been designated for breeding bird assemblage, otters, marsh saxifrage and various freshwater and upland habitats including blanket bog habitats. The qualifying or notified features of the designated sites are sensitive to changes in peat and water quality.

9.7.3 As discussed in **Table V1-9.1**, the Proposed Alignment is located in the northern extent of the Flow Country WHS (see **Volume 2: Figure V1-9.1**). The Outstanding Universal Value (OUV) of the WHS includes:

- most extensive near continuous example of natural, actively accumulating blanket bog ecosystem found globally;
- bog macroform diversity;
- carbon sequestration and storage;
- ongoing scientific and educational use;
- water filtration and the impact on water quality of associated riverine habitats; and
- diverse and genetic range of biodiversity, birds and plants associated with the blanket bog habitats.

9.7.4 It is evident that the habitats within the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and Flow Country WHS are highly regarded and protected at national and international level. Blanket bog and peat habitats are present and are water dependent. Therefore, the Caithness and Sutherland Peatlands SAC, SPA and Ramsar sites (including the West Halladale SSSI) and the Flow Country WHS have been considered further in this assessment. Potential effects as a consequence of the Proposed Alignment on the designated sites are also considered in **Volume 1: Chapter 7 - Ecology**.

9.7.5 The Strathy Coast SSSI at Portskerra abuts the northern boundary of the Study Area and is designated for a range of coastal habitats and its vascular plant assemblage. Whilst the SSSI is downstream of the Proposed Alignment no intrusive works are proposed within 500 m of the SSSI and given the size and extent of the Pentland Firth compared to the scale of the Proposed Development, any potential effects on the SSSI would not be discernible and it is not considered further in this assessment.

9.7.6 No other designated sites are recorded within the Study Area.

Soils and Geology

Soils and Made Ground

9.7.7 An extract of the 1:250,000 National Soil Map of Scotland is presented as **Volume 2: Figure V1-9.2**, which indicates that the Proposed Alignment is underlain by peat gleys and peaty podzols to the north, east, and west, and dystrophic blanket bog (peat) to the south and centre. Mineral podzols are recorded to bound the Halladale River.

9.7.8 THC record the presence of an historic landfill (Melvich Landfill) to the immediate west of an existing access track south between watercourse crossings WX03 and WX04 (see **Volume 2: Figure V1-9.1).** The landfill is no longer used and is likely to have been used to restore small historic mineral workings. The materials within the landfill are unknown. No development is proposed within the landfill footprint.

Superficial Deposits (including Peat)

9.7.9 An extract of BGS superficial deposit mapping is presented as **Volume 2: Figure V1-9.3**.

9.7.10 Superficial geological mapping shows that the western extent and very eastern extent of the Proposed Alignment, near the River Strathy and the Halladale River, is underlain by glaciofluvial deposits. The remainder of the Proposed Alignment is shown to be underlain by peat and hummocky glacial deposit which comprise of sand gravel and boulders.

9.7.11 Peatland classification mapping (refer to **Volume 2: Figure V1-9.4**) indicates that most of the Proposed Alignment and Study Area is located within Class 1 and Class 2 peatland. Class 1 and Class 2 peatlands are considered nationally important carbon rich soils, deep peat and priority peatland habitats with high conservation and restoration value. Most of the proposed access tracks (except the access tracks near Kirkton Road) and towers 19, 20, 22, 26, 29 to 32, 35 to 39, 41 to 49, and 54 are located in mapped Class 1 peatland. The cable sealing end (CSE) compound, underground cable (UGC) and towers 23 to 25, 27, 28, 33, 34, 51, 55 to 61, and 64 are located in mapped Class 2 peatland.

9.7.12 With the exception of the River Halladale valley, **Volume 2: Figure V1-9.4** shows the remainder of the Proposed Alignment is mapped as being underlain by Class 5 peat, whereby soil information takes precedence over vegetation data. In the east adjacent to the Halladale River mineral soil is recorded.

9.7.13 As part of the baseline assessment a comprehensive peat probing and characterisation exercise has been undertaken, the results of which are presented in full in **Volume 4: Appendix V1-9.1** and **Appendix V1-9.2** of this EIA Report. In summary the investigations undertaken have confirmed:

- more than 10,700 peat probes were advanced (to the full depth of the soil / peat);
- approximately 80% of the probe locations recorded a peat depth of <1m;
- approximately 60% of the peat probes recorded a peat / soils depth of <0.5m;
- where present, the peat was recorded as fibrous to pseudo fibrous;
- amorphous peat was rare; and
- the peat was sampled (using an auger) at four locations – logs and photographs are presented in **Volume 4: Appendix V1-9.1**.

9.7.14 There are localised deep peat deposits situated across the Proposed Alignment. However, these deposits are generally situated across flatter expanses and in minor topographic lows. Extensive deep peat is rare, generally confined by topography and rarely situated across slopes. Specifically:

- Within the central areas of the Proposed Alignment, deep peat of up to 2 m was recorded within the area of Towers 32 – 35, with most peat depths ranging from 1 to 1.5 m. Deep peat up to 2.5 m was encountered within the area of Tower 41 with a shallowing of peat depths towards Tower 39 where steeper slopes are present.
- Towards the eastern extent of the Proposed Alignment peat depths of over 2 m were recorded at Towers 43 and 44 as these towers are within flatter expanses. Towers 47, 48 and 49 are also positioned within flatter expanses and peat depths up to 3 m were recorded. Further to the south-east deep peat up to 2.5 m is recorded at Tower 61.
- The western areas of the Proposed Alignment do not feature many areas of deep peat. There is localised deep peat of up to 2 m at Tower 19 in the south-west.
- No areas of instability relating to peat deposits was observed across the Proposed Alignment.

9.7.15 Artificial drainage and peat cuttings were frequently observed on review of aerial photography and during site visits.

9.7.16 Artificial drainage across the Proposed Alignment is generally associated with existing tracks in the east and west of the Proposed Alignment. In addition, historic peat cuttings were witnessed, predominantly in northern areas near Towers 28 and 29 and between Towers 36 and 44. Peat cuttings are also present in the west near to Tower 19.

9.7.17 A detailed peatland condition assessment has been completed (see **Volume 4: Appendix V1-9.4)** which considered hydrological, ecological and land-use based indicators of peatland condition. The peat depth has been proven to be low with patchy deep peat surrounded by very shallow organic rich soils and mineral soils indicating that the soils and peat beneath the Proposed Alignment is marginal for peat formation and favours dry heath. This has been exacerbated by extensive peat extraction and drainage which has further reduced peat depths often leading to complete extraction in many places. As a consequence, dense and dry peat across dominates with only isolated areas of softer peat present to the west indicating extensive subsidence and compaction.

9.7.18 Across the Proposed Alignment there is also clear evidence of grazing by sheep and deer which has led to further deterioration of peatland condition. To the east of the Proposed Alignment, heath and isolated peat bodies have been converted to rough and improved grazing or targeted for native and plantation forestry planting leading to drainage, fertilisation and disruption of peat structure as well as favouring non-peatland species.

9.7.19 The 2019 Flow Country Fire impacted the area severely with evidence of extremely limited recovery within the central and western parts of the Proposed Alignment. Charcoal and evidence of smouldering are frequently observed with the peat surface showing clear hydrophobicity as a response to burning. Vegetation recovery has been slow with Calluna vulgaris being the primary coloniser at the expense of other peatland species although this appears in many areas to be stunted. Evidence of sphagnum and other mosses prior to the fire are present however colonisation along the Proposed Alignment is highly compromised making sphagnum in most places now absent or rare. Due to the lack of groundcover species bare peat between stunted heather is now the primary groundcover. In a few wetter locations (T44-47) sphagnum persists and should be avoided through micro siting within the Limit of Deviation (LoD).

9.7.20 Overall the fragments of peatland appear to be hydrologically compromised by longstanding drainage, extraction and grazing leading to a high prevalence of vascular plants and low diversity. This has fundamentally reduced the resilience of the peatlands within this landscape as evidenced by the high severity and enduring impacts of the 2019 fire whilst other areas within the fire footprint in better condition have recovered. Further it is likely that this area has breached a tipping point and is likely to be on a trajectory towards long term decline and colonisation by low diversity dry heath and scrub and the loss of peat resource within this area. The highly degraded nature of peatland and heath means that development along the Proposed Alignment is unlikely to impair peatland along its route, with the adoption of common industry best practice and safeguards regarding management of water and soil.

Bedrock Geology

9.7.21 An extract of BGS bedrock and linear features geology mapping is presented as **Volume 2: Figure V1-9.5**.

9.7.22 From west to east the Proposed Alignment is underlain by; metamorphic bedrocks of the Kirtomy Gneisses which comprises semipelites and gneissose; sedimentary bedrocks of the Bighouse Formation which comprises sandstone, conglomerate and argillaceous rocks; the Lower Old Red Sandstone Group which comprises interbedded conglomerate and sandstone; igneous bedrocks of the Strath Halladale Granite which comprises granite and biotite; metamorphic rocks of the Portskerra Psammite Formation which comprises migmatitic psammite with migmatitic semipelite; and finally igneous bedrocks of the Badanloch Granite Sheets which comprises granite and foliated-biotite.

9.7.23 Several inferred faults, trending north to south, and south west to north east, are recorded within the Study Area, see **Volume 2: Figure V1-9.5**.

Hydrogeology

Groundwater Levels and Flow

9.7.24 Review of SEPA's environmental data website indicates that no groundwater level monitoring is undertaken within the Study Area.

9.7.25 An extract of the BGS 1:625,000 scale Hydrogeological Map of Scotland and 1:100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets are presented in **Volume 2: Figure V1-9.6** and **Figure V1-9.7,** respectively.

9.7.26 **Volume 2: Figure V1-9.6** confirms that the majority of the Proposed Alignment is underlain by rocks classified as a low productivity aquifer whereby small amounts of groundwater are expected in near surface weathered zones and secondary fractures. The sedimentary rocks beneath the Proposed Alignment are classified as moderately productive aquifer whereby flow is virtually all through fractures and other discontinuities, providing a locally important multi-layered aquifer.

9.7.27 The Aquifer Productivity and Groundwater Vulnerability dataset classifies the underlying aquifer (superficial and bedrock) according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity. Review of **Volume 2: Figure V1-9.7** indicates that the metamorphic bedrock underneath the Proposed Alignment is considered to be a low or very low productivity aquifer generally without groundwater except at shallow depths and with flow almost entirely through fractures and other discontinuities. The sedimentary bedrock is recorded as a moderate productivity aquifer.

9.7.28 The peat and hummocky glacial superficial deposits within the Study Area are not considered significant aquifers. The glaciofluvial deposits in the River Strathy and Halladale River valleys, are moderate to high productivity aquifers with intergranular flow; groundwater within these deposits are likely to be in hydraulic conductivity with adjacent watercourses.

9.7.29 Groundwater vulnerability is divided by the BGS into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable. The Proposed Alignment is shown to be underlain by groundwater vulnerability Classes 5, 4a and 4b (**Volume 2: Figure V1-9.7**). The highest vulnerability is noted where no or shallow superficial deposits are recorded, and thus little attenuation of potential pollutants prior to entry to groundwater. Groundwater is less vulnerable where overlain by superficial deposits.

Groundwater Quality

9.7.30 All of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas (DWPA) under the Water Environment (Drinking Water Protected Area) (Scotland) Order 2011 and require protection for their current use or future potential as drinking water resources.

9.7.31 SEPA has identified that the Proposed Alignment is underlain by the Northern Highlands groundwater body (SEPA ID: 150701) which in 2022 (the latest reporting cycle) was classified with a "Good" overall status and no pressures have been identified.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

9.7.32 A NVC habitat mapping exercise was conducted as part of the ecology baseline assessment, and this has been used to identify potential areas of GWDTE. The methodology and results of the NVC habitat mapping exercise are discussed in detail within **Volume 1: Chapter 7** and **Volume 4: Appendix V1-7.3: Habitat Technical Report**. Areas of potential GWDTE are shown on **Volume 2: Figure V1-9.8**.

9.7.33 The location and potential GWDTE and their likely dependency on groundwater is discussed in **Table V1-9.5**.

Table V1-9.5: Site Specific Groundwater Dependent Terrestrial Ecosystem Assessment

NVC Community	GWDTE Potential	Location and Distribution on Site, and Assessment of Potential Groundwater Dependency
M15	Moderate	M15 dominant polygons are recorded across the Study Area. The habitat is underlain by several geological deposits including; peat, river terrace deposits, hummocky glacial deposits, glaciofluvial deposits and metamorphic bedrock. These deposits are either characterised by a low bulk permeability or likely to be in hydraulic conductivity with the River Strathy. It is noted that small amounts of groundwater may be present within the upper weathered surface of the bedrock. The habitat is not rare and is present across large areas of Scotland. This distribution is not typical of that by emergent groundwater but rather by surface water runoff and water logging of soils.
M23	High	M23 dominant polygons are noted in linear polygons adjacent to the banks of watercourses within the centre of the Study Area or located near the banks of the River Strathy and the Halladale River and underlain by alluvium, river terrace and glaciofluvial deposits. Groundwater within these deposits would likely be in hydraulic conductivity with the adjacent rivers and sustained by water in the rivers. It is therefore considered that the habitats are sustained by surface water and waterlogging of soils, rather than groundwater.
M25	Moderate	M25 dominant polygons are located along the banks of a tributary of the River Strathy with the western extent of the Study Area and near tributaries of the Allt na h-Eaglaise within the eastern extent of the site. The polygon within the eastern extent of the Study Area is also underlain by hummocky glacial superficial deposits. The low permeability hummocky glacial deposits would facilitate local water logging of soils in response to rainfall. Given this distribution, it is considered that these habitats are sustained by rainfall, surface water runoff and waterlogging of soils rather than by groundwater.
M6	High	M6 dominant polygons are generally recorded in small linear polygons across the Study Area along the banks of watercourses. A larger polygon is noted within the eastern extent of the Study Area, near the Halladale River, which is underlain by several geologies including, igneous bedrock and glaciofluvial and river terrace deposits adjacent to the Halladale River. The habitat is either located adjacent to watercourses, underlain by low permeability deposits or underlain by superficial deposits where groundwater would be in hydraulic conductivity with the adjacent river. It is therefore considered that the M6 habitats are predominately sustained by surface water, runoff and waterlogging of soils rather than by groundwater.
MG9	Moderate	An MG9 dominant polygon is recorded along the banks of a tributary of the Allt na h-Eaglaise within the eastern extent of the Study Area. The habitat is also underlain by peat. Given this distribution it is considered that the MG9 habitat is sustained by rainfall, surface water runoff and waterlogging of soils rather than by groundwater.

NVC Community	GWDTE Potential	Location and Distribution on Site, and Assessment of Potential Groundwater Dependency
MG10	Moderate	MG10 dominant polygons are either recorded in linear polygons within the northern extent of the Study Area, along the banks of watercourses, bounding the A836 or within the western extent near the Halladale River. The habitat in the northern extent of the Study Area is underlain by peat and hummocky glacial deposits whilst the habitat in the eastern extent is underlain by alluvium, river terrace and glaciofluvial deposits. The low permeability peat and hummocky glacial deposits would facilitate local water logging of soils in response to rainfall. Groundwater within the alluvium, river terrace and glaciofluvial deposits would be hydraulically connected to the Halladale River. It is therefore considered that these habitats are sustained by rainfall, surface water runoff and waterlogging of soils rather than by groundwater.
W1	Moderate	W1 dominant polygons are noted within the southwestern extent of the Study Area, near the banks of the Uidh nan Con Luatha (a tributary of the River Strathy). It is therefore considered that the W1 habitats are predominately sustained by surface water, runoff and waterlogging of soils rather than by groundwater.
W4	High	W4 dominant polygons are noted near banks of a tributary of the River Strathy within the southwestern extent of the Study Area. The habitat is underlain by glaciofluvial and river terrace deposits whereby groundwater will be in hydraulic connectivity with the River Strathy. It is therefore considered that the W4 habitats are predominantly sustained by surface water rather than by groundwater.

9.7.34 Review of **Table V1-9.5** shows that the potential high and moderate GWDTE are located on ground which is underlain by low bulk permeability deposits, adjacent to watercourses or underlain by geological deposits which are hydraulically connected to the adjacent watercourse. This distribution is not typical of a habitat sustained by groundwater but rather it is likely to be supported by rainfall, surface water runoff and water logging of soils.

9.7.35 Buffers to areas of potential GWDTE specified in SEPA guidance therefore do not apply, but safeguards to maintain these habitats, and the surface water sources to these habitats would need to be maintained during construction and operation of the Proposed Alignment, details of which are included in Section 9.8.

Hydrology

Local Hydrology

9.7.36 The local hydrology is shown on **Volume 2: Figure V1-9.1**.

9.7.37 The Proposed Alignment is located within three main surface water catchments: the River Strathy to the west, the Halladale River surface water catchment to the east, and the Tongue Coastal catchment to the north.

9.7.38 The River Strathy flows northwards within the western extent of the Study Area before discharging to the sea at Strathy Bay, approximately 1.4 km north of the Study Area. The Proposed Alignment would not cross the River Strathy. The Halladale River flows northwards within the eastern extent of the Study Area before discharging to the sea at Melvich Bay, approximately 2.7 km north of the Study Area. Only conductors associated with the Proposed Alignment would cross over the Halladale River at NGR NC 90159 59579 (between towers 63 and 64, no track crossing of the river is proposed). The Proposed Alignment crosses a number of smaller, unnamed watercourses that drain northwards to the coast.

9.7.39 The Study Area is drained by the following sub catchments:

- Bowside Burn sub catchment of the River Strathy which drains a small area to the south-west of the Study Area. The burn flows generally westwards before discharging into the River Strathy approximately 420 m downstream of the Proposed Alignment. The Proposed Alignment would cross the burn at NGR NC 83133 60994 (between towers 21 and 22 (no track is proposed to cross the burn) and poles associated with the section of existing 132 kV OHL that would be dismantled within this catchment; and,
- Allt na n Eaglaise sub catchment of the Halladale River which drains a large area to the south and southeast of the Study Area. Allt na n Eaglaise flows generally northwards, through the eastern extent of the Study Area, before discharging into the Halladale River approximately 680 m downstream of the Study Area. The Proposed Alignment would cross Allt na n Eaglaise at NGR NC 88565 60876 (between towers 53 and 54). There are several tributaries of Allt na n Eaglaise within the Study Area.

9.7.40 The surface water catchment of the Bowside Burn has been designated as a Drinking Water Protected Area (DWPA), as shown on **Volume 2: Figure V1-9.1**. Tower 21, 54 m of permanent access track, 60 m of an existing track which is proposed to be upgraded and one pole associated with the section of existing 132 kV OHL which would be dismantled are the only elements of the Proposed Alignment within this catchment. It is understood that the DWPA was identified to safeguard water abstraction used to provide a water supply to Bowside Cottage (Gamekeepers Cottage), The Bothy and Bowside Lodge. Best practice measures to safeguard the quantity and quality of the watershed to the Bowside Burn are presented in Section 9.8.

9.7.41 The Proposed Alignment crosses Scottish Water infrastructure at seven locations (see **Volume 2: Figure V1-9.1**) including:

- two points associated with the proposed UGC;
- two points where an existing track which would be upgraded, one location at a proposed new permanent track and one location at a proposed temporary track; and
- adjacent to an existing pole which would be dismantled as part of the Proposed Development.

Rainfall and Surface Water Flow

9.7.42 SEPA has provided precipitation data for Strathy Bridge rainfall gauge (station number 234319) which is located approximately 860 m north of the Study Area. In 2023 an annual rainfall of 972 mm was recorded.

9.7.43 The National Flow Archive records stream flow in the River Strathy at Strathy Bridge, downstream of the Study Area (located at NGR NC 835 651, approximately 800 m north of the Study Area) and reports a mean flow of 2.63 m^3/s. It also records stream flow data in the Halladale River at Halladale, upstream of the Study Area (located at NGR NC 891 560, approximately 3.2 km north of the Study Area) and reports a mean flow of 4.97 m^3/s.

Surface Water Quality

9.7.44 The River Strathy, the Halladale River, and Allt na n Eaglaise are all monitored by SEPA and were classified in 2022 (the latest reporting cycle). A summary of the SEPA classifications is shown in **Table V1-9.6**.

Table V1-9.6: SEPA Surface Waterbody Classifications (2022)

Waterbody ID (SEPA ID)	Overall Status	Overall Ecology	Physico-Chemical	Hydromorphology	Pressures
River Strathy – The Uair to sea (20610)	Good	Good	High	Good	None

Waterbody ID (SEPA ID)	Overall Status	Overall Ecology	Physico-Chemical	Hydromorphology	Pressures
Halladale River - d/s Forsinain Burn (20614)	Good Ecological Potential	Poor	Good	Poor	Heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on the drainage of agricultural land.
Allt na n Eaglaise (20616)	Good Ecological Potential	Moderate	High	Moderate	

Flood Risk

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

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

9.7.46 SEPA has also produced reservoir inundation maps for those sites currently regulated under the Reservoir Act 1975.

9.7.47 A summary of the potential sources of flooding and a review of the potential risks posed by each source is presented in **Table V1-9.7**.

Table V1-9.7: Flood Risk Screening Assessment

Potential Source	Potential Flood Risk to Proposed Alignment	Justification
Coastal Flooding	No	SEPA coastal flood mapping highlights that there is low to high likelihood of flooding along the Halladale River and downstream reach of the Allt na n Eaglaise to the east of the Study Area. With the exception of existing access tracks to be upgraded, the Proposed Alignment is located out with coastal floodplain. It is therefore considered that the Proposed Alignment is not at risk from coastal flooding.
River Flooding	No	SEPA river flood mapping highlights that there is low to high likelihood of flooding along the River Strathy, the Halladale River, Allt na n Eaglaise, and Allt na Clèite within the Study Area. The area delineated as being at risk of flooding is wider than the immediate river channels particularly within the eastern extent of the Study Area. With the exception of existing access tracks to be upgraded, the Proposed Alignment is located out with the floodplain.

Potential Source	Potential Flood Risk to Proposed Alignment	Justification
		SEPA flood maps do not show flooding associated with smaller watercourses within the Study Area, however, floodplains associated with these are likely to be limited and confined to the watercourse corridors. With the exception of watercourse crossings no permanent development has been proposed within 20 m of watercourses. It is therefore considered that the Proposed Alignment is not at risk from fluvial flooding.
Surface Water Flooding	Yes (minor)	SEPA records several small, isolated areas at risk of surface water flooding across the Study Area, especially to the east of the Study Area on land adjacent to the Halladale River. It is noted that the mapped flood risk is small and localised and does not form large, linked areas or flood flow paths, unless associated with watercourse corridors. Surface water flooding is not considered to present a development constraint, and potential effects can be mitigated by good site design.
Groundwater Flooding	No	SEPA groundwater flood mapping highlights the Study Area is not at risk of groundwater flooding.
Flooding due to dam or reservoir failure	No	SEPA has produced reservoir inundation maps for those sites currently regulated under the Reservoirs Act 1975. Review of the SEPA Inundation Mapping highlights that the eastern extent of the Study Area, along the corridor of the Halladale River is at risk of flooding associated with the potential failure of three reservoirs: Loch Nam Breac (NGR NC 82634 47957), Loch Saird (NGR NC 94563 51958), and Loch Sainn (NGR NC 93029 52607). Loch Saird and Loch Sainn have a risk designation of High, whilst Loch Nam Breac has a risk designation of Medium. With the exception of existing access tracks to be upgraded, the Proposed Alignment is located out with the indicated inundation area. Given the safeguards provided by the Reservoirs Act, the Proposed Alignment and use of the access tracks are not considered at flood risk.
Flood Defence Breach (failure)	No	The Proposed Alignment is remote from any flood defences.
Flooding from artificial drainage systems	No	No significant artificial drainage systems are present near to the Proposed Alignment.

9.7.48 SEPA also publish potential future flood extents which account for the potential uplift in rainfall depths and intensities, and sea levels as a consequence of climate change (based on projections for a single future scenario for the 2080s). An extract of this mapping is shown on **Volume 2: Figure V1-9.1** and confirms that with the exception of existing access tracks to be upgraded, the Proposed Alignment is not located within the predicted floodplain extents.

Watercourse Crossings

9.7.49 The proposed OHL and the section of existing OHL which would be dismantled would cross several watercourses however associated construction activities would not be required within or near watercourses as the OHL conductors (e.g. not tracks) would span the crossings.

9.7.50 The Proposed Development has sought to use existing tracks and access routes wherever possible. However, one temporary crossing, four new permanent watercourse crossings, 16 existing crossings on tracks which are scheduled to be upgraded, and two crossings for the UGC would be required. The locations of the proposed crossings are shown on **Volume 2: Figure V1-9.1** and a schedule of these crossing points, which includes photographs and dimensions of each crossing, is presented in **Volume 4: Appendix V1-9.3**.

Private Water Supplies and Licensed Sites (Abstractions / Discharges / Waste)

9.7.51 Consultation with THC and SEPA has been conducted regarding records of registered and licensed water abstractions and discharges. Recorded private water supplies (PWS) and SEPA Controlled Activity Regulation (CAR) registrations / licenses are shown on **Volume 2: Figure V1-9.1** and are discussed below.

9.7.52 Review of SEPA and THC data and assessments completed in support of neighbouring developments indicates that there are two PWS's within the Study Area:

- Bowside. The PWS is sourced from Bowside Burn, approximately 125 m upstream of the Proposed Alignment. Abstracted water is used to supply three holiday lets (Bowside Cottage, The Bothy and Bowside Lodge); classified as a commercial (<100 m^2) PWS. At this location, the only element of the Proposed Alignment within 50 m of Bowside Burn is the OHL, which would span the watercourse above ground. As such, there is no potential impact pathway which could impact the PWS source. Therefore, this PWS is not considered further in the assessment.
- Kirkton Farm. The PWS is sourced from a surface watercourse, with abstracted water used to supply Kirkton Farm, Kirkton Cottage and Ar Dachaidh. The abstraction is taken from the watercourse which discharges from Lochan Coulbackie. The exact location of the PWS abstraction is unknown however it is thought to be located west of the existing commercial forestry in this area, which is noted upstream of the Proposed Alignment. The OHL and an existing track which is scheduled to be upgraded would cross the watercourse and therefore it is considered that the pipework between the PWS source and the properties might be affected by the Proposed Alignment. Mitigation measures are provided in Section 9.8.

9.7.53 Eleven CAR authorisations under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) have been identified at eight locations, within the Study Area:

- one point source discharge of other effluent, one discharge for new sewage treatment to land, and three discharges for private sewage disposal; and
- six engineering activities for culverts, bridges, green bank reinforcement and pipeline cable crossings.

Future Baseline

9.7.54 Due to consent being sought in perpetuity, the temporal scope requires the consideration of the potential for climate change to impact on future baseline conditions. Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside higher average temperatures. This suggests that there is likely to be greater pressures on water supplies and water levels in summer months in the future. In addition, summer storms are predicted to be of greater intensity. Therefore, peak fluvial flows associated with extreme storm events may also increase in volume and velocity.

Summary of Sensitive Receptors

9.7.55 **Table V1-9.8** outlines the receptors identified as part of the baseline study, and their sensitivity based upon the criteria contained in **Table V1-9.2**. These receptors form the basis of the assessment, and as per the previously introduced methodology, are used in conjunction with an estimate of the magnitude of an effect to determine significance.

Table V1-9.8: Sensitivity of Receptors

Receptor	Sensitivity	Reason for Sensitivity
Water Dependent or Geological Statutory Designated Sites	High	The Proposed Alignment is located within part of the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS, which include qualifying features that are water dependent.
Peat and Carbon Rich Soils	High	Presence of peat and carbon rich soils have been confirmed by site investigation and are also considered nationally and internationally important deposits. These are important carbon stores and need to be safeguarded.
Superficial and Bedrock Geology	Not sensitive	Deposits have been shown to be common regionally and have no rarity value. No geological designated sites are recorded within the Study Area.
Groundwater	High	Groundwater has been classified by SEPA as “Good” and vulnerability is classified as “Moderate to High”.
GWDTE	High	Areas of potential GWDTE have been identified by NVC mapping. It has been shown that these habitats are not sustained by groundwater but by surface water. Measures would be required to sustain existing surface water flow paths to these habitats.
Surface Water	High	The principal watercourses which drain the catchments in which the Proposed Alignment is located have been classified by SEPA with “Good” overall status.
Flooding	Moderate	Floodplains have been identified adjacent to the larger watercourses, particularly the River Strathy and the Halladale River.
Drinking Water Protected Areas	High	There is a DWPA associated with the Bowside Burn located in the west of the Proposed Alignment and measures would be required to safeguard water quality and flows in this surface water catchment.
Private Water Supplies	High	It has been confirmed in the west that the Bowside Burn provides a PWS source and in the east the PWS pipework to Kirkton Farm (and associated properties) would be crossed by the Proposed Alignment.
Authorised Sites	Not sensitive	Eleven third-party licensed abstractions have been identified within the Study Area. However, the licensed sites are related to engineering activities and private sewage discharges which are not at risk from the Proposed Alignment.

9.8 Embedded Mitigation and Mitigation by Design

9.8.1 Mitigation has been developed as the project design has progressed through the route and alignment selection, and EIA stages of the project. The impact assessment and mitigation process has been iterative and therefore mitigation has been developed for the design to be as specific as possible and as an assumed part of the OHL and associated infrastructure. This process has included, for example, using existing access tracks where possible, siting infrastructure generally in areas that avoid ecologically and hydrologically sensitive areas where practicable. In addition to the mitigation embodied in the design and routeing of the project, best practice construction measures have also been developed to ensure that disturbance and pollution during construction is avoided.

9.8.2 A description of all elements of the Proposed Development in combination with the Proposed Alignment is given in **Volume 1: Chapter 3 - The Proposed Development**. Embedded mitigation and mitigation by design relevant to soils, geology and the water environment is presented below.

Good Practice Measures

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

9.8.4 The Proposed Development would be constructed in accordance with good practice guidance, including UK and Scottish guidance on good practice for construction projects as detailed in Section 9.5 of this Chapter.

9.8.5 In addition, the Applicant has established best practice construction techniques and procedures that have been agreed with statutory consultees, including SEPA and NatureScot. These are set out within the Applicant's General Environmental Management Plans (GEMPs), included in **Volume 4: Appendix V1-3.4**. The Proposed Development (dismantling and construction works) would be completed in accordance with these plans.

Construction and Environmental Management Plan

9.8.6 A contractual management requirement of the successful Principal Contractor would be the development and implementation of a comprehensive and site-specific CEMP. This document would detail how the successful Principal Contractor would manage the works in accordance with all commitments and mitigation detailed in the EIA Report, Applicant's GEMPs, statutory consents and authorisations, and industry best practice and guidance, including pollution prevention guidance.

9.8.7 The CEMP would also outline measures to ensure that the works minimise the risk to soils (including peat), groundwater, surface water and water dependent designated sites.

9.8.8 It is expected that the following would be included within the CEMP and would ensure the works are undertaken in accordance with good practice guidance, which includes, but is not limited to the following:

- any above ground on-site fuel and chemical storage would be bunded;
- emergency spill response kits would be maintained during the construction works;
- a vehicle management system would be put in place wherever possible to reduce the potential conflicts between vehicles and thereby reduce the risk of collision;
- suitable access routes would be chosen which minimise the potential requirement for either new access tracks or for tracking across open land which could contribute to the generation of suspended solids;
- a speed limit would be used to reduce the likelihood and significance of any collisions;
- drip trays would be placed under vehicles which could potentially leak fuel / oils;
- any temporary construction / storage compounds required would be located remote from any sensitive surface water receptors or private water supplies and would be constructed to manage surface water run-off in accordance with best practice - details of which would be provided by the Principal Contractor and agreed with regulators as required by the Controlled Activity Regulations;
- any water contaminated with silt or chemicals would not be discharged directly or indirectly to a watercourse without prior treatment; and
- water for temporary site welfare facilities would be brought to site, and foul water would be collected in a tank and collected for offsite disposal at an appropriately licensed facility.

9.8.9 A wet weather protocol would be developed. This would detail the procedures to be adopted by all staff during periods of heavy rainfall. Tool box talks would be given to engineering / construction / supervising personnel. Roles would be assigned and the inspection and maintenance regimes of sediment and runoff control measures would be adopted during these periods.

9.8.10 In extreme cases, the above protocol would dictate that work on-site may have to be temporarily suspended until weather / ground conditions allow.

Environmental Clerk of Works

9.8.11 To ensure all reasonable precautions are taken to avoid negative effects on the water environment, a suitably qualified Environmental Clerk of Works (EnvCoW) would be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on all ecological and hydrological matters. The EnvCoW would be required to be present on-site during the construction phase and would conduct monitoring of works and briefings with regards to any ecological and hydrological sensitivities on the site to the relevant staff of the Principal Contractor and subcontractors.

9.8.12 With respect to the water environment, the EnvCoW would also have responsibility to ensure water flow paths and quality to water dependent habitat are sustained during all phases of the Proposed Development.

Safeguarding of Carbon Rich Soils and Peat

9.8.13 As required by NPF4, a detailed review of the distribution, condition and depth of peat at the site is contained in **Volume 4: Appendix V1-7.3**, **Appendix V1-9.1** and **Appendix V1-9.2**. The Proposed Alignment design has applied the mitigation hierarchy detailed in Policy 5 of NPF4 and specifically avoided areas of deep peat wherever technically feasible. It is shown in **Volume 4: Appendix V1-9.2** that disturbed soils and peat can be readily managed and accommodated and would be safeguarded. No surplus peat would be generated.

9.8.14 A Design and Geotechnical Risk Register would be compiled to include risks relating to peat instability.

9.8.15 Good construction practice and methodologies to prevent peat instability within areas that contain peat deposits are identified in **Volume 4: Appendix V1- 9.1**. These include:

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

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

Buffer to Water Features

9.8.17 As part of the Proposed Development design, a buffer of 20 m has been applied to watercourses and water features such as lochs and ponds, where technically and practically possible. All the proposed towers have been designed to be out with the 20 m watercourse buffer however the temporary working areas (in some locations) may be a minimum of 10 m from watercourses and water features. These areas would be demarked, and necessary additional safeguards agreed with the site EnvCoW prior to construction works commencing. A 10 m buffer is specified in SSEN Transmissions GEMP Working in or Near Water (Revision 1.02, March 2024) and has been previously agreed with NatureScot and SEPA. This buffer is typical for developments of this nature and provides a standoff to watercourses and water features that, in combination with industry good practice, minimises the risk to water bodies.

Water Quality Monitoring

9.8.18 Water quality monitoring would be used to ensure that the quality and / or quantity of water within the Study Area is not significantly impacted by the Proposed Development. Monitoring would be undertaken throughout the construction phase and immediately post construction. Monitoring would be used to allow a rapid response to any pollution incident and also to assess the impact of good practice or remedial measures. Monitoring frequency would increase during the construction phase if remedial measures to improve water quality were implemented. Water quality monitoring plans would be developed during the detailed design stage of the project (Scottish Water, SEPA, THC and appropriate local fishery board would be consulted on the plans) and would be contained within the CEMP.

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

Pollution Risk

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

- refuelling would take place at least 30 m from watercourses and where possible it would not occur when there is risk that oil from a spill could directly enter the water environment. For example, periods of heavy rainfall or when standing water is present would be avoided;
- foul water generated onsite would be managed in accordance with GPP04;
- areas would be designated for washout of vehicles which are a minimum distance of 30 m from a watercourse;
- washout water would also be stored in the washout area before being treated and disposed of;
- a vehicle management plan and speed limit would be strictly enforced onsite to minimise the potential for accidents to occur;
- if any water is contaminated with silt or chemicals, runoff would not enter a watercourse directly or indirectly prior to treatment;
- water would be prevented, as far as possible, from entering excavations such as tower foundations;
- procedures would be adhered to for storage of fuels and other potentially contaminative materials in line with CAR, to minimise the potential for accidental spillage; and
- a plan for dealing with spillage incidents would be designed prior to construction, and this would be adhered to should any incident occur, reducing the effect as far as practicable. This would be included in the final CEMP for the Proposed Development.

Erosion and Sedimentation

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

- all stockpiled materials would be located out with a minimum 20 m buffer from watercourses;
- water would be prevented, as far as possible, from entering excavations such as tower foundations through the use of appropriate cut-off drainage;
- where the above is not possible, water would pass through a number of settlement areas and silt / sediment traps to remove silt prior to discharge into the surrounding drainage system;
- clean and dirty water on-site would be separated and dirty water would be filtered before entering the water environment;
- if the material is stockpiled on a slope, silt fences would be located at the toe of the slope to reduce sediment transport;
- the amount of ground exposed, and time period during which it is exposed, would be kept to a minimum;
- silt / sediment traps, single size aggregate, geotextiles or straw bales would be used to filter any coarse material and prevent increased levels of sediment. Further to this, activities involving the movement or use of fine sediment would avoid periods of heavy rainfall where possible; and
- SSEN Transmission's construction personnel and the Principal Contractor would conduct regular visual inspections of watercourses to check for suspended solids in watercourses downstream of work areas.

Surface Water Flood Risk

9.8.22 It is proposed to adopt Sustainable Drainage Systems (SuDS) as part of the Proposed Development. SuDS techniques aim to mimic pre-development runoff conditions and balance or throttle flows to the rate of runoff that might have been experienced prior to development. Good practice in relation to the management of surface water runoff rates and volumes where new tracks or temporary compounds and laydown areas are proposed would include the following:

- drainage systems would be designed to ensure that any sediment, pollutants or foreign materials which may cause blockages are removed before water is discharged into a watercourse;
- on-site drainage would be subject to routine checks to ensure that there is no build-up of sediment or foreign materials which may reduce the efficiency of the original drainage design causing localised flooding; and
- appropriate drainage would attenuate runoff rates and reduce runoff volumes to ensure minimal effect upon flood risk.

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

Water Abstraction

9.8.24 Abstraction of water for construction activities is not anticipated. If, however, a source of water is required for construction, an application for the appropriate authorisation(s) under CAR would be made to SEPA and managed through the regulation of the CAR authorisation(s). Should a suitable source not be identified, a water bowser would be used.

9.8.25 Good practice that would be followed in addition to CAR and/or any conditions of the relevant CAR authorisation(s) includes:

- water use would be planned so as to minimise abstraction volumes;
- water would be re-used where possible;
- abstraction volumes would be recorded; and
- abstraction rates would be controlled to prevent significant water depletion in a source.

Access Tracks

9.8.26 In general, proposed construction site access would be taken via the existing public road network and would use existing access tracks where possible. New permanent and temporary tracks are required where there are no existing tracks.

9.8.27 All new tracks would be constructed in accordance with best practice construction methods, and with reference to NatureScot's good practice guide on constructing tracks in Scottish uplands[2]. The design of new tracks would be confirmed as part of the detailed design stage of the project and floating track construction techniques would be used where possible. SuDS drainage measures (as detailed above) would be used to collect, treat and attenuate runoff from tracks and maintain existing surface water flow paths.

9.8.28 Upgrades to existing tracks would typically involve surface dressing to provide a suitable running surface for access vehicles. In some locations it may be necessary to undertake limited widening of the track or improvement of existing drainage measures. All upgrade works would also be undertaken in accordance with best practice construction methods, and with reference to NatureScot's good practice guide on constructing tracks in Scottish uplands.

9.8.29 Where temporary watercourse crossings are required, the following methodology would be applied:

- Fording would be used where an appropriate crossing point is already in place (on current tracks) with a suitable bed for crossing (where necessary the bed would be protected by the installation of bog mats or similar for running on). Fording would only be used where limited traffic is expected and impacts on the bed and crossing point generally would be monitored with appropriate mitigation being implemented if required in accordance with CAR and as directed by the project EnvCoW.
- For watercourses less than 2 m wide, General Binding Rules (GBRs) (as set out in CAR) would be adhered to. Bog mats, or similar, would be positioned across the watercourse to enable access, where necessary, side rails would be installed with silt mitigation at either end and / or across if required to ensure that silt impacts from vehicles crossing are controlled at all times. Crossings would be cleaned at the end of the day if required.
- Where possible large water crossings would be avoided by works being accessed and undertaken on either side of the watercourse. Appropriate protection measures (trestles and tables, pilot lines and supports etc.) would be implemented for conductor works to ensure that the conductor does not enter the watercourse.

9.8.30 Once access routes have been confirmed, water crossing requirements would be assessed in advance of works with regards to compliance with the CAR and any required authorisations would be gained prior to works progressing – at this time it is expected that all works would be able to be completed under appropriate GBRs.

9.8.31 All proposed crossing locations and methodologies would be reviewed and approved by the EnvCoW, prior to any works being undertaken.

Permanent Steel Lattice Tower Foundation Construction

9.8.32 The following measures are proposed to mitigate the effects of tower foundation construction on the water environment:

- tower foundations would be located and excavated wherever possible in the driest locations with well consolidated superficial geology, and wetland areas such as deep peat would be avoided. Wherever technically feasible, towers would not be located within 20 m of waterbodies;

[2] https://www.nature.scot/doc/planning-and-development-presentation-good-practice-track-construction

- wherever possible and technically feasible, towers have and would be located out with the floodplain to reduce potential effects on flooding;
- where excavations for tower foundations encounter localised limited quantities of groundwater or become flooded due to surface water runoff or heavy rainfall, appropriate treatment of dewatering would be instigated under direction of the site EnvCoW;
- no dewatering discharge would be permitted directly adjacent to watercourses;
- unless directed otherwise by the site EnvCoW, dewatering discharge would drain across buffer areas of vegetation (e.g. grassland, heather) of at least 10 m width, which would provide for natural attenuation and dispersal of the flow and removal of silt;
- where no suitable vegetation is available for natural treatment of dewatering, the discharge would be passed through on-site settling tanks / lagoons prior to discharge by soakaway or to a watercourse;
- the requirement for dewatering would be minimised in all locations by timely and efficient excavation of the foundation void and subsequent concrete pouring and backfilling;
- excavated soils would be used to restore foundations and be placed in the order they were removed from the foundation when excavated;
- turves would be used to dress the restored foundations;
- all procedures for dewatering would be agreed by the Principal Contractor with SEPA, THC and NatureScot and detailed within the CEMP; and
- the Principal Contractor would develop a method statement to address the transport, transfer, handling and pouring of liquid concrete at tower foundation sites.

Dismantling the Existing Overhead Transmission Line

9.8.33 To dismantle the existing 132 kV wood pole OHL, access to each pole would be required. The Applicant intends to use the same access arrangements that were used during construction of the wood pole OHL. New permanent and temporary access tracks proposed as part of the Proposed Development would also be available to be used during dismantling works. Where existing and proposed tracks do not extend to each individual pole location, the use of tracked vehicles may also be required. It is not anticipated that any new access tracks would be required to facilitate dismantling.

9.8.34 Measures detailed above for the control and prevention of pollution, erosion and sedimentation apply to the use of tracks during the proposed dismantling works.

9.8.35 Wood pole foundations are made up of the poles themselves plus some additional steel and timber below ground level. The extraction method for these is to dig down, remove the poles and backfill with soils as detailed in the peat management plan.

9.8.36 Removal of conductors from the existing OHL would be undertaken with minimum disturbance to watercourses. Where conductors need to be pulled across watercourses, this operation would be undertaken swiftly and with minimum disturbance to riparian habitats or stream beds.

9.8.37 All dismantling works would be supervised by the project EnvCoW.

Installation of Underground Cables

9.8.38 Underground cable ducts would be installed progressively. The length of time the cable trench would remain open would be minimised. The cable trench would be opened using a tracked excavator. Arisings from the trench would be temporarily stored adjacent to the trench ready for use to restore the trench. No storage would occur within 10 m or upstream of any watercourse.

9.8.39 Arisings would be stored so that the potential for erosion and sedimentation is minimised (see above). Silt fences, cut-off drains and temporary cover of the stockpiles would be deployed as directed by the EnvCoW.

9.8.40 Vegetation turves would be stored separately to the spoil arisings. Once the cable has been installed in the cable trench arisings would be used to restore the trench and backfilled in the same order that the material was excavated from the trench. Turves would then be replaced on the backfilled trench.

9.8.41 If directed by the EnvCoW, low permeability barriers would be installed in the trench to prevent the trench forming a preferential water flow path. Where ground conditions are saturated a geotextile wrap would be used within the trench to ensure there is no loss of the sand cable surround to adjacent ground.

9.8.42 Where required localised temporary pumping of water from the cable trench would be undertaken to maintain safe working conditions and to facilitate cable duct installation. Pumping arrangements would be agreed and supervised by the site EnvCoW. Pumping would cease once the cable duct has been installed.

9.8.43 Following completion of installation of a cable duct a cable team would install (pull) the cables through the ducts. Safeguards used to control pollution, runoff, erosion and sedimentation presented above would be deployed as required.

9.8.44 Where the cable trench is required to pass beneath a watercourse it would also be constructed using an open trench technique. The construction works would be isolated from the watercourse channel (using a temporary dam) and water in the watercourse over-pumped to the watercourse downstream of the trenching works. Prior to works commencing the working areas would be assessed by the project EnvCoW and location specific safeguards and control measures agreed with the Principal Contractor. The works would then be supervised by the EnvCoW and be undertaken in accordance with SEPA guidance. A construction watercourse bed / bank and restoration method statement would form part of the final project CEMP. The duration of the works would be minimised.

Concrete Batching, Transport and Pouring

9.8.45 In relation to works involving concrete batching, transport and pouring, the following mitigation would be adopted:

- where concrete transfers are required, measures would be adopted at the point of concrete transfer to prevent accidental spillage of liquid concrete and no transfers would be undertaken in proximity to watercourses or areas of standing water;
- there would be no wash-out of concrete carrying vehicles at tower foundation sites (except the concrete chute) with wash-out undertaken at the nearest compounds where suitably bunded / protected facilities would be provided. Chutes would be washed out to a suitable container, allowed to settle and disposed at suitably licensed facilities;
- excess concrete or wash-out liquid would not be discharged to drains or watercourses. Drainage from washout facilities would be collected and treated or removed to an appropriate treatment point / licensed disposal site; and
- vehicles and plant working at tower foundations would be confined to the area required for safe working only to prevent compaction, rutting and habitat damage to adjacent areas of land. Working areas would be clearly marked out and temporary fencing used where risk assessments indicate a requirement. Similar procedures would be adopted to demarcate areas where plant access is required for conductor stringing and tensioning works.

Forest and Woodland Felling

9.8.46 Felling required to establish an appropriate operational corridor for the construction and safe operation of the OHL including the creation of access tracks would be undertaken in accordance with best practice guidance that would be detailed within the CEMP and overseen by the project EnvCoW.

Protection of Scottish Water and PWS Distribution Pipework

9.8.47 It has been confirmed that the Proposed Alignment would cross Scottish Water infrastructure at seven locations and is also likely to cross the PWS distribution pipework at Kirton Farm (and associated properties). As part of the detailed design stage for the Proposed Development, the location of the pipework at these locations would be confirmed and clearly marked. If necessary, protection measures would be agreed with Scottish Water and the properties at Kirkton to ensure the integrity of their infrastructure is maintained.

9.9 Potential Effects

9.9.1 The assessment of effects is based on the Proposed Alignment description outlined in **Volume 1: Chapter 3** and is structured as follows:

- construction effects of the Proposed Alignment (which includes dismantling of a section of the existing 132kV OHL); and
- operational effects of the Proposed Alignment.

Construction Effects

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

9.9.3 During the construction phase the Proposed Development has the potential to result in the following effects without appropriate controls or mitigation:

- adverse effects on carbon rich soils and peat through inappropriate handling and safeguarding;
- an adverse effect on surface water or groundwater quality from pollution, fuel, oil, concrete or other hazardous substances;
- potential adverse change of surface and groundwater flow paths and contribution to areas of peat and GWDTE and water dependent habitats (including designated sites); and
- increased flood risk to areas downstream of the site through increased surface water runoff.

Peat and Carbon Rich Soils

9.9.4 The outline peat management plan (see **Volume 4: Appendix V1-9.2**) and peat landslide hazard risk assessment (see **Volume 4: Appendix V1-9.1**) present the result of a detailed programme of site investigation and show that areas of deeper peat and organic soils have generally been avoided by the design of the Proposed Alignment.

9.9.5 Further the proposed infrastructure has targeted where technically feasible areas of past peat cutting and drainage where large amounts of negative indicators of peatland condition, and few, if any, positive condition indicators are recorded. As detailed in the PCA (see **Volume 4: Appendix V1-9.4)** remaining fragments of peatland are hydrologically compromised by longstanding drainage, extraction and grazing leading to a high prevalence of vascular plants and low diversity.

9.9.6 This 'embedded mitigation' set out in Section 9.8 greatly reduces the potential adverse effect on peat and carbon rich soils.

9.9.7 Best practice measures to maintain the integrity and structure of peat and organic soils are set out in Section 9.8. Peat and organic soils are considered highly sensitive receptors. The Proposed Alignment and proposed safeguards embedded in its design reduce the magnitude of potential impact to negligible during the construction phase. The significance of effect is therefore assessed as **Negligible** and not significant. No additional mitigation, over and above that detailed in the outline peat management plan (see **Volume 4: Appendix V1-9.2**) and peat landslide hazard risk assessment (see **Volume 4: Appendix V1-9.1**) is required.

9.9.8 The safeguards included in the Proposed Alignment design and committed best practice construction techniques would also safeguard the peat deposits which form part of the designated interests of the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS.

Surface Water and Groundwater Quality

9.9.9 As stated above, the works would be undertaken in accordance with the Applicant's GEMPs (see **Volume 4: Appendix V1-3.4**) and relevant technical guidance, GPPs and other codes of best practice, to limit the potential for contamination of both ground and surface waters. In addition, a site-specific CEMP (see **Volume 4: Appendix V1-3.8**) would be prepared by the Principal Contractor and include a surface and groundwater quality management plan.

9.9.10 The above measures would significantly reduce the likelihood of pollutants, including suspended solids, being discharged to nearby watercourses or groundwater.

9.9.11 The safeguards included in the Proposed Alignment design and the committed best practice construction techniques would also safeguard the quality of water which sustains water dependant designated sites, including the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS.

9.9.12 Surface water, groundwater and designated sites are considered highly sensitive receptors. The Proposed Alignment and proposed safeguards embedded in its design reduce the magnitude of potential impact to negligible during the construction phase. The significance of effect is therefore assessed as **Negligible** and not significant. No additional mitigation, over and above confirmatory monitoring, is therefore required.

Surface and Groundwater Flow

9.9.13 No significant deep or expansive earthworks are proposed when compared to surface and groundwater catchments at any location of the Proposed Alignment and therefore there would be no significant impact on catchment scale surface water or groundwater flows. Notwithstanding this, the best practice measures listed above would be included in the CEMP and would be used to control and manage surface and groundwater flows and maintain existing water flow paths at a local scale and be used to ensure water flow paths to water dependent habitat would be maintained.

9.9.14 Surface and groundwater are highly sensitive receptors. With these safeguards, the potential impact on ground and surface water flows is assessed as negligible and thus the resultant significance of effect is **Negligible** and not significant. No additional mitigation, over and above confirmatory monitoring, is required.

Flood Risk

9.9.15 Areas of flood risk are considered to have a moderate sensitivity. As part of the detailed site design the Principal Contractor would prepare a detailed construction method statement which would have regard to areas of known and potential flood risk. This would ensure no new permanent features which are sensitive to flooding are located within the floodplain. Moreover, as the base of the proposed steel lattice towers are water compatible and they would not be considered to be at risk of fluvial flooding nor would they increase flood risk should they be required to be located in the floodplain due to technical constraints.

9.9.16 It is proposed that access to the Proposed Alignment would use existing tracks and existing watercourse crossings wherever possible. Where watercourse crossings or works to existing crossings are required, the following measures would be implemented to protect surface water and groundwater quality as well as to mitigate a potential increase in flood risk:

- silt traps / check dams would be used to capture suspended solids generated during construction;
- construction would be conducted in accordance with appropriate SEPA and CIRIA guidance; and
- the design and capacity of the watercourse crossings would be agreed by the Principal Contractor and the project EnvCoW, and, if required, in consultation with SEPA as part of the detailed design.

9.9.17 With these safeguards the magnitude of potential impact is assessed as negligible and the resultant significance of effect is assessed as **Negligible** and not significant. No additional mitigation is required.

Designated Sites within Hydraulic Connection to the Proposed Alignment

9.9.18 The baseline assessment has confirmed that the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS are hydraulically connected to the Proposed Alignment. These designated sites are highly sensitive receptors.

9.9.19 The controls which would be adopted at site in accordance with best practice and discussed above would be used to ensure water resources and qualifying features of the designated sites are not impaired and significant erosion and sedimentation does not occur. This would ensure, with regard to soils, geology and water, that the magnitude of potential impact on the designated sites is negligible and thus the significance of effect is **Negligible** and not significant. No additional mitigation, over and above confirmatory monitoring and mitigation measures outlined in the peat management plan (see **Volume 4: Appendix V1-9.2)**, is required.

Operational Effects

9.9.20 During the operational phase of the Proposed Alignment, it is anticipated that routine maintenance of infrastructure and tracks would be occasionally required.

9.9.21 The operational phase, the Proposed Alignment has the potential to result in the following effects without appropriate controls or mitigation:

- adverse changes to surface water flow paths, watercourse discharge rates and volumes, and alteration of watercourse geomorphology;
- as a result of an alteration of groundwater and surface water flow paths, an adverse effect on water abstractions and water dependent habitat;
- an adverse effect on surface water or groundwater quality from pollution, fuel, oil, concrete or other hazardous substances from site traffic associated with maintenance activities; and
- increased flood risk through increased surface water runoff from new impermeable areas.

9.9.22 Should any maintenance be required onsite which would involve construction activities, method statements would be developed and used which would adopt the best practices agreed with regulators as part of the construction phase CEMP.

Peat and Carbon Rich Soils

9.9.23 During the operational phase there would be no requirement to undertake earthworks which could impair peat or carbon rich soils. In an unlikely event where earthworks are required, these would be undertaken using the same controls and safeguards which would be used during the construction phase.

9.9.24 The likelihood, magnitude of impact and duration of works which have the potential to impair peat or carbon rich soils would be negligible following adherence to good practice measures. Therefore, the potential significance of effect on peat and carbon rich soils is **Negligible** and not significant. No mitigation is therefore required.

Surface Water and Groundwater Quality

9.9.25 The possibility of a pollution event, resulting in impairment of surface water or groundwater impairment, occurring during operation is very unlikely as there would be a limited number of vehicles required on-site for routine maintenance.

9.9.26 Any maintenance activities would be undertaken using the same controls agreed with statutory consultees and deployed during the construction phase, including adherence to a CEMP, and supervision of all works. Further, the scope of works which might be undertaken are no different to the work which would be undertaken during the construction phase.

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

9.9.28 An outline site restoration plan is presented as **Volume 4: Appendix V1-3.6: Outline Site Restoration Plan** and would be undertaken in accordance with the best practice and safeguards detailed in this Chapter.

9.9.29 Based upon this, the potential risk associated with frequency, duration and likelihood of a pollution event is low. It is, therefore, anticipated that the magnitude of a potential impact on surface water or groundwater during the operational phase of the Proposed Alignment would be negligible, as no detectable change would likely occur. Therefore, the significance of effect during the operational phase of the Proposed Alignment is predicted to be **Negligible** and not significant on surface water and groundwater. No further or additional mitigation is therefore required.

Surface and Groundwater Flow

9.9.30 During the operation of the Proposed Development, it is not anticipated that there would be any excavation or need to stockpile large volumes of soils, reducing the potential for effects on surface and groundwater flows. Should any excavation be required, this is likely to be limited and required for maintenance of tracks etc. Any excavation, handling and placement of material would be subject to the same safeguards that would be used during the construction phase of the project.

9.9.31 Should any non-routine maintenance be required at the sections of track crossing wet areas (defined visually on-site by a contractor or operational personnel) then the good practice measures as detailed for the construction phase would be required on a case-by-case basis. Extensive work adjacent to the water environment may require approval from SEPA under the CAR (depending upon the nature of the activity).

9.9.32 The likelihood, magnitude and duration of works which have the potential to alter surface and groundwater flow paths would be negligible following adherence to good practice measures. Therefore, the potential significance of effect on surface and groundwater is **Negligible** and not significant. No mitigation is, therefore, required.

Flood Risk

9.9.33 Culverts beneath permanent access tracks could become blocked without routine inspection or maintenance. Any reduction in conveyance could locally increase flood risk.

9.9.34 In accordance with the Applicant's GEMPs, proposed infrastructure would be subject to routine inspection, and, if required, maintenance. Where identified, any remedial works would be undertaken using the same controls and authorisations detailed above and would be deployed during the construction phase of the project.

9.9.35 The likelihood, magnitude of impact and duration of works which have the potential to alter surface and groundwater flow paths would be negligible following adherence to good practice measures. Therefore, the potential significance of effect on surface and groundwater is **Negligible** and not significant. No mitigation is therefore required.

Designated Sites within Hydraulic Connection to the Proposed Alignment

9.9.36 The controls which would be adopted at site during the operational phase, and which are in accordance with best practice, would safeguard surface water and groundwater quality, surface water and groundwater flows, and mitigate flood risk. They would ensure that the potential impact of the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS is negligible and thus the significance of effect is **Negligible** and not significant. No additional mitigation is required.

9.10 Cumulative Effects

9.10.1 The following developments that are within 5 km and in the same water catchments as the Proposed Alignment include:

- Wind Farms
  - Strathy North Wind Farm (operational) in the River Strathy surface water catchment (including the Allt nan Clach sub catchment);
  - Strathy Wood Wind Farm (consented) in the River Strathy surface water catchment (including the Allt nan Clach and the Uair sub catchments);
  - Strathy South Wind Farm (including on-site substation) (consented) in the River Strathy surface water catchment; and
  - Kirkton Energy Park (including on-site substation) (proposed) in the Halladale River surface water catchment (including Allt na h-Eaglaise sub catchment).
- Grid Infrastructure
  - Strathy Wood Wind Farm Grid Connection (proposed) in the River Strathy surface water catchment;
  - Kirkton Energy Park Grid Connection (pre-scoping) in the Halladale River surface water catchment (including Allt na h-Eaglaise sub catchment); and
  - Strathy Switching Station (pre-scoping) in the River Strathy surface water catchment.

9.10.2 These developments have been constructed recently or could be constructed in coming years and therefore have / would be expected to adopt current industry standard guidelines and be managed in accordance with best practice, industry standards and relevant legalisation, planning policy and guidance regulated by statutory consultees. These standards ensure, with respect to the soils, geology and water environment, that potential impacts are mitigated and controlled at source.

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

9.11 Mitigation

9.11.1 As there are no predicted likely significant effects as defined by the EIA Regulations, other than the good practice measures that the Applicant implements as standard, no specific mitigation is required.

9.12 Residual Effects

9.12.1 No significant residual effects on soils (including peat), geology, surface water or groundwater receptors including designated water dependent sites are predicted during the construction and operation of the Proposed Alignment.

9.13 Summary and Conclusions

9.13.1 Existing soils, geological, hydrogeological and hydrological conditions have been identified and used to assess the potential effects that the Proposed Alignment may have on geology, soils and the water environment.

9.13.2 Best practice construction techniques that would safeguard soils, geology and the water environment and would be incorporated in the detailed design of the works have been identified. Subject to the adoption of the best practice, peat resources, soils, geology, and the water environment can be safeguarded during and following development.

9.13.3 Specifically, the assessment has shown, with regard to soils, (including peat), geology and the water environment, that the potential effect of the Proposed Alignment on the West Halladale SSSI, Caithness and Sutherland Peatlands SAC, SPA and Ramsar site and the Flow Country WHS is negligible and not significant.

9.13.4 A summary of assessed effects and identified mitigation measures required to reduce the potential effects to acceptable levels are identified in **Table V1-9.9**.

Table V1-9.9: Summary of Effects and Proposed Mitigation Measures

Potential Effect	Proposed Mitigation / Enhancements	Resultant Significance of Effect
Construction Phase		
• Adverse effect on carbon rich soils and peat. • Alteration of surface water or groundwater flow. • Impairment of surface water or groundwater quality. • Increase in flood risk. • Adverse effect on water dependent designated sites.	• Mitigation by design • Protection of water supply pipework • Site investigation and use of a geotechnical risk register	Negligible and not significant

Potential Effect	Proposed Mitigation / Enhancements	Resultant Significance of Effect
	• Good practice construction techniques to be included in the final CEMP • Confirmatory water quality monitoring • Peat Management Plan; and • Outline Habitat Management Plan	
Operational Phase		
No additional effects or mitigation / enhancements identified		
Cumulative Effects		
No additional effects or mitigation / enhancements identified		

9.14 References

British Geological Survey (BGS). *Onshore GeoIndex*. Available online from: http://mapapps2.bgs.ac.uk/geoindex/home.html [Accessed January 2025]

BGS. *Hydrogeological Map of Scotland. 1:100,000 scale*. Available online from https://www.bgs.ac.uk/datasets/hydrogeological-maps-of-scotland/ [Accessed January 2025]

Construction Industry Research and Information Association (CIRIA). (2001) *Control of Water Pollution from Construction Sites.* C532

CIRIA. (2006). *Control of Water Pollution from Linear Construction Projects – Technical Guidance.* C648.

CIRIA. (2015). *Environmental Good Practice on Site*. C741.

CIRIA. (2015). *The SUDS Manual*. C753.

CIRIA. (1997). *Ground Engineering Spoil: Good Management Practice*. R179

Department of Environment, Food and Rural Affairs (DEFRA). (2011). *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*

DEFRA. (2000). *Good Practice Guide for Handling Soils*

Forestry Commission Scotland and Scottish National Heritage (now NatureScot). (2010). *Floating Roads on Peat - Report into Good Practice in Design, Construction and Use of Floating Roads*

Forestry Commission Scotland. (2006). *Guidelines for the Risk Management of Peat Slips on the Construction of Low Volume/Low Cost Roads on Peat*

Institute of Civil Engineers. (2001). *Managing Geotechnical Risk: Improving Productivity in UK Building and Construction*.

James Hutton Institute. *The National soil map of Scotland (1:250,000)*. Available online from: https://soils.environment.gov.scot/maps/soil-maps/national-soil-map-of-scotland/ [Accessed January 2025].

NatureScot *SiteLink*. Available online from https://sitelink.nature.scot/home [Accessed January 2025]

NetRegs and SEPA. *Guidance for Pollution Prevention (GPP) documents*. Available online from https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/ [Accessed January 2025].

RWE (2015) *Strathy Wood Wind Farm*. Planning application and supporting documents (ECU Ref EC00005239).

Scottish Environment Protection Agency (SEPA). (2009). *Groundwater Protection Policy for Scotland*. Version 3.

SEPA. (2010) *Engineering in the Water Environment: Good Practice Guide – River Crossings*.

SEPA. (2010) *Engineering in the Water Environment: Good Practice Guide – Sediment Management*.

SEPA. (2010). *SEPA Regulatory Position Statement - Developments on Peat*.

SEPA. (2018). *Land Use Planning System – SEPA Guidance Note 2a: Development Plan Guidance on Flood Risk*. Version 4.

SEPA. (2015). *Land Use Planning System – SEPA Guidance Note 2e: Development Plan Guidance on Soils*. Version 1.

SEPA. (2017). *Land Use Planning System – SEPA Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems.* Version 3.

SEPA (2015) *Position Statement – Culverting of Watercourses*. Version 2.

SEPA. *Environmental Data*. Available online from https://www.sepa.org.uk/environment/environmental-data/ [Accessed January 2025]

SEPA. *Flood maps*. Available online from https://beta.sepa.scot/flooding/flood-maps/ [Accessed January 2025]

SEPA. *Rainfall Data for Scotland*. Available online from https://www2.sepa.org.uk/rainfall/ [Accessed January 2025].

SEPA. *Reservoir Inundation Map*. Available online from https://map.sepa.org.uk/reservoirsfloodmap/Map.htm [Accessed January 2025]

SEPA. *River and loch waterbody nested catchments*. Available to download from https://www.sepa.org.uk/environment/environmental-data/ [Accessed January 2025]

SEPA. (2022) *Triage Framework: Guidance for Planning Authorities and SEPA*, Version 3.

SEPA. *Water Classification Hub*. Available online from https://www.sepa.org.uk/data-visualisation/water-classification-hub [accessed January 2025].

Scottish Executive. (2005). *Scottish Roads Network Landslides Study Summary Reports.*

Scottish Government (2015) *Online Planning Advice on Flood Risk* (which supersedes PAN 69).

Scottish Government (2001) *PAN 61: Planning and Sustainable Urban Drainage Systems (SUDS)*.

Scottish Government (2017) *Proposed electricity generation developments: peat landslide hazard best practice guide.*

Scottish Government (2023) *National Planning Framework 4 (NPF4).*

Scottish Government and SEPA. *Drinking Water Protected Areas.* Available online from https://www.gov.scot/publications/drinking-water-protected-areas-scotland-river-basin-district-maps/ and https://www.sepa.org.uk/environment/environmental-data/ [Accessed January 2025]

Scottish Natural Heritage (now NatureScot) *Carbon and Peatland 2016 Map*. Available online from https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/ [Accessed January 2025]

Scottish Natural Heritage (now NatureScot) (2013) Constructed Tracks in Scottish Uplands, 2nd Edition

Scottish Renewables and SEPA (2012) Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste.

Scottish Renewables, SNH, SEPA, Forestry Commission Scotland, Historic Environment Scotland and Marine Scotland Science (2019) Good Practice during Windfarm Construction. 4th Edition.

Scottish Hydro Electric Transmission plc (2013) *Strath Halladale to Dallangwell 132 kV Grid Connection*. Section 37 application and supporting documents (THC ref SHG26769).

The Highland Council (2012) *Highland wide Development Plan*.

The Highland Council (2023) *World Heritage Site Planning Position Statement.*

The Highland Council *World Heritage Site Impact Assessment Toolkit*. Available online from https://www.highland.gov.uk/downloads/file/28012/flow_country_candidate_world_heritage_site_impact_assessment_toolkit [Accessed January 2025].

UK Centre for Ecology and Hydrology. *Flood Estimation Handbook Web Service*. Available online from: https://fehweb.ceh.ac.uk/ [accessed January 2025]

UK Centre for Ecology and Hydrology. *National Flow River Archive*. Available online from https://nrfa.ceh.ac.uk/data/search [Accessed January 2025]