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Introduction

6.1 This Chapter assesses the potential impacts of the Proposed Development on soils, geology and the water environment (hydrology and hydrogeology). The assessment of potential impacts has been made on the basis of the Proposed Development layout as fully described in **Chapter 1: Introduction and Project Description** and shown on **Figure 1.6.** It outlines the embedded good practice methods which have been incorporated into the design and would be used during the construction and operation of the Proposed Development to prevent or reduce identified effects and risks. As part of the Proposed Development, it is proposed to restore areas of existing and degraded peatland. The benefits of this, and how it meets the Policy aims of National Planning Framework 4 (NPF4) is discussed in **Chapter 5: Ecology** and the **Planning, Sustainable Design and Access Statement**.

6.2 Mitigation methods to address any potential effects are proposed, where appropriate, and residual effects assessed.

6.3 The scope of the assessment has been determined through a combination of professional judgement, reference to relevant guidance documents and consultation with stakeholders. The assessment has also been cognisant of the previous assessments completed at the site including assessments completed for consented Ben Sca Wind Farm (THC ref. 20/00013/FUL) and Ben Sca Wind Farm Extension (THC ref. 21/05767/FUL).

6.4 In addition, the assessment uses information and findings presented in **Chapter 5: Ecology** to inform the assessment of potential effects on possible areas of Groundwater Dependent Terrestrial Ecosystems (GWDTE) which are presented in this Chapter.

6.5 This Chapter presents summary information from the following Technical Appendices (TA):

- Technical Appendix 6.1: Peat Management Plan (PMP); and
- Technical Appendix 6.2: Peat Landslide Hazard and Risk Assessment (PLHRA).

6.6 This Chapter has been prepared by SLR Consulting Ltd. (SLR), who has also undertaken the assessment.

Legislation, Policy and Guidance

Planning Context

6.7 **Chapter 2: Policy Context** of this Environmental Impact Assessment (EIA) Report provides an overview of the relevant planning policy, and the **Planning, Sustainable Design and Access Statement**, addresses the planning policy position in full and should be referred to. However, in summary, NPF4 adopted by the Scottish Government on 13 February 2023 provides planning guidance and policies regarding sustainable development, tackling climate change and achieving net zero. Policies relevant to this Chapter include:

- Policy 2 (Climate Mitigation and Adaptation);
- Policy 4 (Natural Places);
- Policy 5 (Soils);
- Policy 11 (Energy);

- Policy 20 (Blue and Green Infrastructure); and
- Policy 22 (Flood Risk and Water Management).

6.8 In addition, The Highland Council (THC) Highland-wide Development Plan (HwDP) provides planning guidance on the type and location of the development that can take place in the region. The HwDP presents development policies of which are relevant to this study:

- Policy 53 - Minerals;
- Policy 55 - Peat and Soils;
- Policy 58 - Protected Species;
- Policy 59 - Other Important Species;
- Policy 60 - Other Important Habitats;
- Policy 62 - Geo-diversity;
- Policy 63 - Water Environment;
- Policy 64 - Flood Risk; and
- Policy 72 - Pollution.

Legislation and Guidance

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

Legislation

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

Guidance

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

- PAN 50 Controlling the Environmental Effects of Surface Mineral Workings;

- PAN 61 Planning and Sustainable Urban Drainage Systems; and
- PAN 69 Planning and Building Standards Advice on Flooding.

6.11 Scottish Environment Protection Agency (SEPA) Pollution Prevention Guidance Notes (PPG) and Guidance of Pollution Prevention (GPP):

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

6.12 CIRIA publications:

- C532, 2001, Control of Water Pollution from Construction Sites;
- C741, 2015, Environmental Good Practice on Site; and
- C753, 2015, The SUDS Manual

6.13 SEPA publications:

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

6.14 Other relevant guidance documents:

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

- Scottish Government, 2017, Guidance on Development on Peatland, Peatland Survey;
- A joint publication by Scottish Renewables, Scottish Natural Heritage (now NatureScot), Scottish Environment Protection Agency, Forestry Commission Scotland and Historic Environment Scotland, 2019, Good Practice during Windfarm Construction, Version 4; and
- Scottish Renewables and SEPA, 2012, Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste.

Scope and Consultation

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

Consultation

6.16 Consultation for the Proposed Development was undertaken with statutory and non-statutory bodies as set out in **Chapter 6: Scoping and Consultation**. The outcome of the relevant consultations with regard to soils, geology and the water environment is summarised in **Table 6-1.**

Table 6-1: Consultation Responses

Consultee	Summary	How / Where addressed / Response Received
The Highland Council (THC) Screening Response 17 November 2023	It is considered that an EIA is required for the Proposed Development.	This chapter addresses potential impacts on hydrology, hydrogeology, and soils.
	Potential significant effects on the receiving environment include impacts on peat should be assessed.	Potential impacts on peat and carbon rich soils and proposed mitigation measures are discussed in this chapter and Technical Appendix 6.1: PMP and Technical Appendix 6.2: PLHRA.
Scottish Environmental Protection Agency (SEPA) Scoping Response 30 October 2023	We welcome the proposal to “refresh” the NVC habitat information and highlight the requirement in Section 3.3 of the appendix to the scoping response for the information now to be provided on habitat condition.	Additional NVC habitat surveys are discussed in Chapter 5: Ecology and potential areas of GWDTE is discussed in this Chapter.
	The finalised layout should clearly demonstrate how impacts on the near natural habitat (and deepest areas of peat has been avoided).	Detailed peat depths are presented in Figure 6.1.3.
	We welcome the proposal for update to the Phase 2 peat probing work. Generally, some further peat probing information will be required and it’s not clear that the development avoids deeper peat.	Additional peat probing has been undertaken and potential impacts on peat are discussed in this

Consultee	Summary	How / Where addressed / Response Received
		chapter, Technical Appendix 6.1: PMP and Technical Appendix 6.2: PLHRA.
	If the new development will result in additional disturbance to that already consented, then we would wish to see further habitat compensation and enhancement included in the revised Habitat Management Plan.	Revised habitat management plan is presented as Technical Appendix 5.3: Outline Habitat Management Plan (HMP)
	We are content that a proportional approach can be taken to other issues covered in the appendix to the scoping response.	Noted.
Scottish Water Scoping Response 12 October 2023	Scottish Water has no objection to this planning application; however, the applicant should be aware that this does not confirm that the proposed development can currently be serviced.	Noted.
	A review of our records indicates that there are no Scottish Water drinking water catchments or water abstraction sources which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed activity.	Noted.

Effects Scoped Out

6.17 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 (including the approach taken for the EIAs for the consented Ben Sca Wind Farm (THC ref. 20/00013/FUL) and Ben Sca Wind Farm Extension (THC ref. 21/05767/FUL)), the following topic areas have been 'scoped out':

- potential effects on geology during both construction and operation as there are no protected geological features within the site. Furthermore, the nature of the activities during construction and operation of the Proposed Development would be unlikely to alter the geology of the site. Potential cumulative effects on geology have also been scoped out on this basis. For context, information on the geology of the site is presented in the 'Baseline Conditions' text of this Chapter and **Technical Appendix 6.1: PMP** and **Technical Appendix 6.2: PLHRA**;
- increased flood risk caused by blockages to flow in watercourses during operation and maintenance of the Proposed Development. These crossings would be subject to maintenance requirements under the Controlled Activities Regulations (CAR), flood risk onsite is negligible, and the Proposed Development design ensures no critical infrastructure is located near watercourses;
- changes to public/private water supply yield as a consequence of changes to runoff rates and volumes during operation and maintenance of the Proposed Development, as no significant alterations to runoff rates/infiltration or drawdown of the water table are anticipated during or as a consequence of construction or operation of the Proposed Development; and

- potential effects associated with forest felling on surface water quality and runoff as all forest felling would be undertaken in accordance with good practice guidelines published by Scottish Forestry (formerly Forestry Commission Scotland).

Approach and Methods

6.18 The potential effects from the Proposed Development on soils, geology and the water environment have been assessed by completing an initial desk study followed by an impact assessment.

Study Area

6.19 The study area includes all of the proposed site infrastructure as illustrated on **Figure 6.1.** In addition, details of local water use and quality within a buffer of at least 1km from the proposed infrastructure has been considered.

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

Information and Data Sources

6.21 An initial desk study has been undertaken to determine and confirm the baseline characteristics by reviewing available information on soils, geology, hydrology and hydrogeology, such as: groundwater resources; licensed and unlicensed groundwater and surface water abstractions; public and private water supplies; surface water flows; flooding; rainfall data; and water quality and soil data. This has also included a review of published geological maps, Ordnance Survey (OS) maps, aerial photographs and site-specific data such as site investigation data, geological and hydrogeological reports, digital terrain models (slope plans) and geological literature.

6.22 The following sources of information, including good practice guidance and legislation have been consulted in order to characterise and assess the soils, geology, hydrogeology and hydrology of the area within and surrounding the site:

- Ben Sca Wind Farm EIA Report (January 2020), specifically Chapter 10: Hydrology, Hydrogeology and Soils, Technical Appendix 10.1: PLHRA, Technical Appendix 10.2: PMP and Technical Appendix 10.3: Borrow Pit Assessment;
- Ben Sca Wind Farm Supplementary Information (SI) Report (August 2020), specifically Chapter 10: Hydrology, Hydrogeology and Soils;
- Ben Sca Wind Farm Extension EIA Report (November 2021), specifically Chapter 3: Other Considerations, Technical Appendix D1: Peat Survey and Technical Appendix D2: Carbon Calculator;
- OS 1:50,000 and 1:10,000 scale mapping data;
- UK Centre for Ecology and Hydrology, Flood Estimation Handbook (FEH) web service (available online at https://fehweb.ceh.ac.uk/);
- NatureScot SiteLink (available online at https://sitelink.nature.scot/home);
- James Hutton Institute, National soil map of Scotland (1:250,000) (available online at https://soils.environment.gov.scot/);

- British Geological Survey (BGS) 1:50,000 scale data (available online at http://mapapps2.bgs.ac.uk/geoindex/home.html);
- BGS Hydrogeological Maps of Scotland (groundwater vulnerability and aquifer productivity) 1:100,000 scale (available online at http://mapapps2.bgs.ac.uk/geoindex/home.html);
- SEPA flood maps (available online at https://map.sepa.org.uk/floodmaps and http://map.sepa.org.uk/reservoirsfloodmap/Map.htm); and
- SEPA environmental data (available online at https://www.sepa.org.uk/environment/environmental-data/).

Field Survey

6.23 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.

6.24 Detailed site visits and walkover surveys have been undertaken by SLR, in addition to those undertaken for the consented development, on the following dates:

- September 2023: additional peat depth probing and characterisation survey focusing on the Proposed Development infrastructure; and
- February 2024: additional peat depth probing and watercourse crossing survey.

6.25 The field work has been undertaken in order to:

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

6.26 The desk study and field surveys have been used to identify potential development constraints and have been used as part of the iterative design process. The comprehensive site specific peat probing dataset is reported in **Technical Appendix 6.2: PLHRA** with a summary provided in this Chapter. Working together, the project ecologists and hydrologists have made an assessment of the condition of the peat. This has included details related to the characteristics of the soils, classification of vegetation cover, assessment of current land use impacts, assessment of drainage paths and

channels, evidence of peat erosion and coring to further characterise the peat. This is reported in **Technical Appendix 6.1: PMP**.

6.27 The data obtained as part of the desk study and collected as part of the field work has been processed and interpreted to complete the impact assessment and recommend mitigation measures where appropriate. It has also been used to develop the habitat restoration proposals.

Assessment Methods

6.28 The significance of potential effects of the Proposed Development has been assessed by considering two factors: the sensitivity of the receiving environment and the potential magnitude of impact, should that effect occur. The assessment methodology has also been informed by the assessor's experience of carrying out such assessments for a range of wind farms and other developments, a knowledge of soils, geology and the water environment characteristics in Scotland and cognisance of good practice.

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

6.30 Criteria for determining the significance of effect are provided in **Table 6-2, Table 6-3,** and **Table 6-4**.

Sensitivity of Receptor

6.31 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 6-2**. Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at the associated level of sensitivity.

Table 6-2: Criteria for Assessing Sensitivity of Receptor

Sensitivity	Definition
High	soil type and associated land use is highly sensitive (e.g. unmodified blanket bog peatland); SEPA WFD Water Body Classification: High-Good or is close to the boundary of a classification Moderate to Good or Good to High; receptor is of high ecological importance or national or international value (e.g. Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), habitat for protected species) which may be dependent upon the hydrology of the site; receptor is at risk from flooding in the future (2085) and/or water body acts as a current active floodplain or flood defence; receptor is used for public and/or private water supply (including Drinking Water Protected Areas (DWPA); groundwater vulnerability is classified as high; and if a GWDTE is present and identified as being of high sensitivity.
Moderate	soil type and associated land use is moderately sensitive (e.g. arable, commercial forestry); moderate classification of groundwater aquifer vulnerability.

Sensitivity	Definition
Low	soil type and associated land use not sensitive to change in hydrological regime and associated land use (e.g. intensive grazing of sheep and cattle); SEPA Water Framework Directive Water Body Classification Poor or Bad; receptor is not at risk of flooding in the future (2085); and receptor not used for water supplies (public or private).
Not Sensitive	receptor would not be affected by the proposed development, e.g. lies within a different and unconnected hydrological / hydrogeological catchment.

Magnitude of Impact

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

6.33 Good practice measures implemented and embedded as part of the design and construction of the Proposed Development is taken into account and use of professional judgement is applied where appropriate. Good practice measures (i.e. embedded mitigation) are discussed later in the Chapter.

6.34 The criteria that have been used to assess the magnitude of impact are defined in **Table 6-3**. The characteristics of the impacts are described as: direct/indirect, temporary(reversible) or permanent (irreversible), together with timescales (short, medium and long term).

Table 6-3: Criteria for Assessing Magnitude of Impact

Magnitude	Criteria	Definition
Major	Results in loss of attribute	Long term or permanent changes to the baseline geology, hydrology, hydrogeology and geology such as: permanent degradation and total loss of the soils habitat; loss of important geological structure/features; wholesale changes to watercourse channel, route, hydrology or hydrodynamics; changes to the site resulting in an increase in runoff with flood potential and also significant changes to erosion and sedimentation patterns; major changes to the water chemistry; and major changes to groundwater levels, flow regime and risk of groundwater flooding.
Medium	Results in impact on integrity of attribute or loss of part of attribute	Material and short to medium term changes to baseline geology, hydrology, hydrogeology and water quality, such as: loss of extensive areas of soils and peat habitat, damage to important geological structures/features; some changes to watercourses, hydrology or hydrodynamics; changes to site resulting in an increase in runoff within system capacity; moderate changes to erosion and sedimentation patterns; moderate changes to the water chemistry of surface runoff and groundwater; and

Magnitude	Criteria	Definition
		moderate changes to groundwater levels, flow regime and risk of groundwater flooding.
Low	Results in minor impact on attribute	Detectable but non-material and transitory changes to the baseline geology, hydrology, hydrogeology and water quality, such as: minor or slight loss of soils or slight damage to geological structures/feature; minor or slight changes to the watercourse, hydrology or hydrodynamics; changes to site resulting in slight increase in runoff well within the drainage system capacity; minor changes to erosion and sedimentation patterns; minor changes to the water chemistry of surface runoff and groundwater; and minor changes to groundwater levels, flow regime and risk of groundwater flooding.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use/integrity	No perceptible changes to the baseline soils, geology, hydrology, hydrogeology and water quality such as: no impact or alteration to existing important geological environs; no alteration or very minor changes with no impact to watercourses, hydrology, hydrodynamics, erosion and sedimentation patterns; no pollution or change in water chemistry to either groundwater or surface water; and no alteration to groundwater recharge or flow mechanisms.

Potential Effects

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

- 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 private water supplies during construction and operation;
- fluvial flood risk resulting from changes to runoff volumes and rates and modifications to natural and man-made drainage patterns during operation;
- potential impact upon the linkage between groundwater and surface water during construction and operation;
- potential impact on areas of peat during construction and operation;
- potential impact on areas of GWDTE during construction and operation; and
- potential cumulative impact during construction and operation.

Significance of Effects

6.36 The sensitivity of the receiving environment together with the magnitude of the impact determines the significance of the effect, which can be categorised into level of significance as identified in **Table 6-4.**

6.37 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 6-4: Significance of Effect

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

Cumulative Effects

6.38 The assessment also considers potential cumulative effects associated with other wind farm developments within the same surface water catchments.

6.39 A cumulative effect is considered to be the effect on a hydrological or hydrogeological receptor arising from the Proposed Development in combination with other proposed developments which are likely to affect surface water and groundwater.

6.40 Other proposed wind farm developments within the same catchment as the site and within a distance of 5km from the Proposed Development have been considered.

6.41 Cumulative effects are considered using the same methodology as for effects of the Proposed Development in isolation.

Mitigation

6.42 Potential effects of the Proposed Development on soils, geology and the water environment identified by the assessment have been addressed and mitigated by the conceptual site design and the application of good practice guidance implemented as standard during construction and operation to prevent, reduce or offset effects where possible. As such, a number of measures would form an integral part of the design/construction process and these have been taken into account prior to assessing the likely effects of the Proposed Development. Where appropriate, further tailored mitigation measures have been identified prior to determining the likely significance of residual effects.

6.43 Good practice measures would be applied in relation to pollution risk, sediment management, peat management and management of surface runoff rates and volumes. This would form part of the Construction Environment Management Plan (CEMP) to be implemented for the Proposed Development and would be prepared prior to construction, an outline of which is provided in **Technical Appendix 1.1: Outline Construction Environmental Management Plan (CEMP)**.

6.44 The final CEMP would include details and responsibilities for environmental management onsite for site environmental aspects. It would outline the necessary measures for surface water management, oil and chemical delivery and storage, waste management, traffic and transport management. It would also specify monitoring requirements for wastewater, water supply including an Environmental Incident Response Strategy and all appropriate

method statements and risk assessments for the construction of the Proposed Development.

Residual Effects

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

Statement of Significance

6.46 The hydrology, hydrogeology and soils assessment concludes with a statement of significance associated with the Proposed Development. Effects of 'major' and 'moderate' significance are considered to be 'significant' in terms of the EIA Regulations.

Assumptions, Limitations and Confidence

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

6.48 As a consequence, 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.

Baseline Conditions

Current Baseline

6.49 This section presents information gathered regarding the existing geological, hydrogeological and hydrological conditions at the site and its immediate surrounding.

Site Setting

6.50 The Proposed Development is located approximately 2.5km southwest of Edinbane on the Isle of Skye and is centred at National Grid Reference (NGR) 132800, 848600. The application boundary occupies an area of 429ha, although only a small proportion of this would be occupied by the new infrastructure of the Proposed Development.

6.51 An extract of OS mapping for the site, which shows its setting, is presented on **Figure 6.1**.

6.52 Ground elevations at the site range between approximately 60m Above Ordnance Datum (AOD) in the northwest of the site where access is granted from the A850 public road to 283m AOD at the summit of Ben Sca in the southern extent of the site. Elevations generally fall northwards from Ben Sca towards Loch Greshornish.

6.53 The standard average annual rainfall (SAAR) for the surface water catchments that serve the site, based on data obtained from the Flood Estimation Handbook (FEH) Web Service, confirm a high annual rainfall:

- 1,956mm for the Red Burn catchment; and
- 2,015mm for the Abhainn Choishleadar catchment.

6.54 The existing land use across the Proposed Development includes areas of upland heath and blanket bog with commercial coniferous plantation forestry, managed by Scottish

Woodlands within the north of the site along the access route. Operational Edinbane and Ben Aketil Wind Farms are located immediately east and approximately 300m west of the site respectively.

6.55 The Proposed Development (as was the case with the consented development) has been designed to utilise the existing Ben Aketil Wind Farm access track from the A850 public highway.

Statutory Designated Sites

6.56 Review of the NatureScot Sitelink (Nature Scot, 2024) webpage highlights that the application boundary does not contain statutory designated sites.

6.57 The locations of nearby statutory designated sites are summarised below:

- Loch Snizort (which includes Loch Greshornish) is designated as a shellfish waters protected area (ID; SWPA57) and is located approximately 1.8km north of the site. The overall status of the protected area was designated in 2014 as fair with water quality pressures from rural diffuse sources. The loch receives runoff shed from the site.
- Inner Hebrides and the Minches Special Area of Conservation (SAC), a 1,381,391ha site, exists 3.7km north of the site, in the open water downstream of Loch Greshornish. The SAC is a marine designation for Harbour porpoise (*Phocoena phocoena*). The SAC is considered hydraulically remote from the Proposed Development and is not considered further.
- An Cleireach Site of Special Scientific Interest (SSSI) which has also been designated as part of the An Cleireach Geological Conservation Review Site (GCR), site, is located approximately 2.3km south of the site. The SSSI and GCR qualifying feature is an outcrop of tertiary igneous intrusion with petrogenetic importance. The designated sites are located outside of any of the surface water catchments served by the site, therefore it is not considered to be in hydraulic connectivity with the Proposed Development. The SSSI and GCR are not considered to be at risk from potential ground instability associated with the Proposed Development, as ground instability is mitigated by appropriate site design. The SSSI and GCR are not considered further in this Chapter.

Geology

Soils and Superficial Deposits

6.58 An extract of the 1:250,000 National soil map of Scotland (James Hutton Institute, 2024) mapping is presented as **Figure 6.2**.

6.59 The principal soil types underlying the site are:

- peat across the northern and eastern extent of the site, described by the James Hutton Institute as poorly drained and nutrient poor; and
- peaty gleys derived from basaltic rocks across the western extent of the site, described as wet soils with an organic (peaty) surface layer.

6.60 An extract of the 1:50,000 BGS superficial deposits data is presented as **Figure 6.3**, which shows that the majority of the site is underlain by peat. Small areas of glacial till deposits are noted across the site, associated with minor watercourse channels, and at

lower elevations. An area within the centre of the site, northwards from Ben Sca summit, is shown to absent of any superficial deposits.

6.61 An extract of the peatland classification dataset published by Scottish Natural Heritage (now NatureScot) is shown on **Figure 6.4**. This shows that the all of the site is underlain by Class 1 priority peatland which is considered potentially nationally important carbon rich soils, deep peat and priority peatland habitats, and are likely to be of high conservation value.

6.62 As part of the baseline assessment, a comprehensive peat probing exercise has been conducted, which has informed the proposed infrastructure positioning and alignment. The data collected has informed the assessment presented in **Technical Appendix 6.2: PLHRA.** In summary:

- the presence and depth of peat was assessed at more than 3,000 locations;
- approximately half of the peat probe locations recorded no peat (<0.5m); and
- a hazard impact assessment has been completed, which has concluded that subject to the employment of appropriate mitigation measures, the presence of peat and potential peat slide instability are not development constraints.

Bedrock Geology and Linear Features

6.63 An extract of the 1:50,000 BGS bedrock and linear features data is presented as **Figure 6.5.**

6.64 There are two major bedrock geological units within the site that both belong to the Skye Lava Group:

- Skye Lava Group of basalt and gabbro, an extrusive igneous rock that underlies the majority of the site, including all the proposed turbines; and
- Skye Lava Group of hawaiite and mugearite, an extrusive igneous rock that exists across the southern and eastern extent of the site.

6.65 The BGS has mapped three inferred faults with unknown displacement across the site (shown on **Figure 6.5**). Two of these faults separate the two Skye Lava Group deposits with a northwest to southeast trend. The final fault exists within the eastern extent of the site with a northeast to southwest trend. No development that requires the construction of substantial foundations is proposed near to these inferred faults.

Hydrogeology

Aquifer Characteristics and Groundwater Vulnerability

6.66 The BGS 1:625,000 scale hydrogeology map (**Figure 6.6**) shows that the bedrock geology beneath the site is a low productivity aquifer. The igneous rocks contain small amounts of groundwater in the near surface weathered zone and secondary fractures. These are capable of supporting only small water supplies or springs. There is no groundwater aquifer associated with the superficial deposits at site.

6.67 The BGS groundwater vulnerability mapping (**Figure 6.7**) classifies the underlying aquifer according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity. **Figure 6.7** confirms that the superficial deposits across the site are not considered a significant aquifer whilst the bedrock aquifer is classified as a low productivity aquifer whereby groundwater flow is dominated by fracture flow mechanisms.

6.68 Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable. The vulnerability map shows that the groundwater in the bedrock underlying the site has a high vulnerability (4a, 4b and 5), due to the dominance of fracture flow and thin superficial cover. Groundwater in the centre of the site is of slightly higher vulnerability (Class 5) due to the absence of superficial deposits. Groundwater is therefore vulnerable to pollution.

Groundwater Levels and Quantity

6.69 SEPA has confirmed they hold no information regarding groundwater levels and quality within or near to the site.

6.70 In the absence of published information or data held by SEPA, it is anticipated that limited groundwater will be present as perched groundwater within more permeable horizons (sand and gravels) of the glacial till deposits, and within weathered zones, fractures or fault zones within the bedrock deposits.

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

6.72 The current status of groundwater bodies in Scotland has been classified by SEPA in accordance with the requirements of the Water Framework Directive (WFD). SEPA identifies that the site is located within the Skye North (SEPA ID: 150688) groundwater body which has an overall status of Good in 2022 (the last reporting cycle) with no pressures identified.

Groundwater Dependent Terrestrial Ecosystems

6.73 A national vegetation classification (NVC) habitat mapping exercise was conducted in 2019 and 2021 as part of the ecology baseline assessment for the consented development. The results of the NVC habitat mapping exercise are discussed in detail within **Chapter 5: Ecology** and areas of potential GWDTE are shown on **Figure 6.8.** An assessment of the GWDTE, and in particular whether the habitats are sustained by ground or surface water, is summarised below:

- there is little potential GWDTE recorded at site;
- it has been shown that the site receives a very high annual rainfall, and that the superficial and solid geology has little potential to allow infiltration or significant groundwater storage or movement. Rainfall onto site preferentially forms surface water runoff. This was substantiated by the site surveys which, in dry weather, recorded dry conditions underfoot, rather than waterlogged ground which would be associated with a discharge of groundwater;
- an area of high potential GWDTE is recorded to the east of turbine 9, which is underlain by peat, and also along the banks of small tributaries of the Red Burn to the west of turbine 9. As a consequence of the low permeability of the geology and habitat distribution, it is considered that the habitat is likely to be sustained by surface water and rainfall rather than groundwater;
- small area of high (mosaic) potential GWDTE is recorded on the eastern site boundary and to bound the Abhainn Choishleadar watercourse. No wind farm infrastructure is proposed within 250m of this potential GWDTE and it not therefore considered to be at risk from the Proposed Development, although its distribution,

like that above, is commonly associated with water logging of soils and sustained by surface water;

- areas of moderate (including mosaics) potential GWDTE are noted within the south western extent of the site particularly at Ben Sca near the proposed substation and turbines 1 and 2. This area is shown to be on elevated ground, underlain by peat and igneous bedrock and thus not at a location where groundwater discharge would be anticipated. Again, the site receives a very high annual rainfall and that the superficial and solid geology has little potential to allow infiltration or significant groundwater storage or movement. Rainfall onto site will preferentially form surface water runoff and therefore it is likely that the habitat at this location is sustained by rainfall and local waterlogging of soils rather than groundwater; and
- a number of water flushes are recorded, many of which have been noted to be more than 250m from the proposed wind farm infrastructure. Subject to safeguards such as maintaining existing surface water flow paths (e.g. maintaining the surface water catchments to these flushes), they are not considered at risk from the Proposed Development. Three flushes are noted within 100m of the Proposed Development near turbine 7 and to the southeast of turbine 1 – the flushes are noted upstream of the proposed infrastructure and again are not considered at risk.

6.74 It is concluded that the areas mapped as potential high and moderate GWDTE are not sustained by groundwater but rather are sustained by incident rainfall and surface water runoff. Accordingly, the buffers to potential GWDTE specified in SEPA guidance need not apply. Safeguards would be required, however, to sustain existing surface water flow paths so that incident rainfall can continue to sustain these habitats (see Assessment of Effects and Embedded Measures).

Hydrology

Local Hydrology

6.75 The site is drained by two main catchments: the Red Burn and Abhainn Choishleadar. The Red Burn drains the northern and western extent of the site whilst the Abhainn Choishleadar drains the eastern extent of the site. The catchment areas are shown in **Figure 6.1**, and each described in the following section.

Red Burn Catchment

6.76 The Red Burn has an overall catchment size of 13.2km^2 (of which approximately 2km^2 is located within the site). The burn discharges to the west shores of Loch Greshornish.

6.77 The burn and its tributaries (including Allt Donachaidh and Allt a' Choire) drain the northern and western extent of the site including the proposed access track from the A850, proposed construction compound, proposed borrow pits, turbines 6 to 9, 5 and 3, proposed substation and part of the access track between proposed turbines 3 and 2.

6.78 Much of the catchment comprises commercial forestry as well as areas of open ground at higher elevations (see **Photograph 6.1**).

Photograph 6-1 Red Burn Catchment within Site Boundary

6.79 An existing watercourse crossing (WX-01, see **Figure 6.1**), as shown on 1:50,000 scale mapping, associated with the section of the existing Ben Aketil Wind Farm track will be utilised to access the site. The watercourse crossing has been granted a CAR authorisation (CAR/R/1013618). It is not proposed to modify this crossing as part of the Proposed Development, although maintenance will be undertaken to clear the existing culvert. The existing culvert of twin-wall plastic construction is approximately 0.5m in diameter. The culvert was observed to be partially blocked during the site visit (see **Photograph 6.2**). At the time of the survey Falck (now re-branded as Renantis) were made aware of the partial blockage and arrangements were made to clear the culvert.

6.80 A man-made drainage ditch, located on the western side of the Ben Aketil access track, will also need to be crossed in order to access turbine 9. It is noted that this crossing is not shown on 1:50,000 mapping and therefore will not need to be consented in accordance with the CAR (it will though need to be considered in the site specific drainage plan which is typically a consent of planning).

Photograph 6-2 Existing Watercourse Crossing WX01

Abhainn Choishleadar Catchment

6.81 The Abhainn Choishleadar has an overall catchment size of 12.3km^2 (of which approximately 2.3km^2 is located within the application boundary). It also discharges to Loch Greshornish.

6.82 The Abhainn Choishleadar and its tributaries (Allt Storachan and Allt An Loin Ghuim) drain the eastern extent of the site including proposed turbines 1, 2 and 4.

6.83 The catchment within the site is characterised by open ground (see **Photograph 6-3**).

Photograph 6-3 Abhainn Choishleadar Catchment within Site Boundary

Surface Water Flow

6.84 **Table 6-5** presents catchment areas and the key catchment descriptors from the FEH Web Service for the Red Burn and Abhainn Choishleadar Water catchments, which can be used to describe the catchments' anticipated response to rainfall.

Table 6-5: Surface Water Catchment Descriptors

Watercourse	Downstream Point (NGR)	Area	SAAR (mm)	ALRBAR (mASL)	DPSBAR (m/km)	LDP (km)	BFIHOST (dim)
Red Burn	NG 31450 49100	3.53	1,956	186	88.20	3.67	0.2850
Abhainn Choishleadar	NG 34350 50250	9.09	2,015	158	95.30	4.68	0.2840

Note: Grid reference of downstream maximum extent of catchment as denoted by ether the Proposed Development application boundary or confluence with another watercourse; SAAR – surface average annual rainfall between 1961 and 1990; ALTBAR – mean catchment altitude (metres above sea level); DPSBAR – index of catchment steepness; and LDP – longest drainage path; BFIHOST - base flow index is a measure of catchment responsiveness to precipitation.

Surface Water Quality

6.85 Water quality of the Red Burn and Abhainn Choishleadar is monitored by SEPA and classified annually in accordance with the requirements of the Water Framework Directive (WFD). **Table 6-6** provides summary details of the SEPA classifications reported in 2022 (the last reporting cycle). Smaller watercourses within the Proposed Development are not monitored nor classified by SEPA.

Table 6-6: Surface Water Classification Data

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physico-Chemical Status	Hydromorpholgy
Red Burn (20729)	Good	Good	Good	Good
Abhainn Choishleadar (20730)	Good	Good	Good	Good

6.86 Both watercourses are recorded to have a Good overall status and no pressures are identified by SEPA.

Fisheries

6.87 Fisheries for watercourses that are downstream of the Proposed Development are managed by the Skye and Lochalsh Rivers Trust (SLRT). Fishery interests are discussed and assessed within **Chapter 5**.

Flood Risk

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

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

6.89 The flood risk from each of these potential sources is discussed below.

Flooding from the Sea, or Tidal Flooding

6.90 The SEPA coastal flood maps confirm that the site is distant from coastal flooding extents. The lowest elevations within the Proposed Development are approximately 60m AOD. Flood risk from this source is not considered further.

Flooding from Rivers, or Fluvial Flooding

6.91 SEPA mapping has identified that the floodplain extents within the two catchments that drain the site are local, never extending far from the main watercourses. No development is shown within the published flood extents. As no development is proposed within 50m of these watercourses, flood risk from this source is not considered further.

Flooding from Surface Water

6.92 SEPA mapping indicates that the site is generally not at surface water flood risk. Where surface water flood extents are noted within the site, these are shown to be small areas largely coinciding with watercourse channels. The flood extents are minor and localised, never forming large, linked areas or flow paths. Flooding from this source is not, therefore, considered a development constraint.

Flooding from Groundwater

6.93 The SEPA groundwater flood map illustrates that the site is not at risk from predicted groundwater flooding. This concurs with the desk-based assessment which has shown that there is little potential for significant groundwater at site. Flooding from this source is not considered further.

Flooding from Infrastructure Failure

6.94 SEPA has produced reservoir inundation maps for those sites currently regulated under the Reservoirs Act 1975. Review of the SEPA mapping highlights that there is no risk of reservoir inundation at site. Flooding from this source is not considered further.

Historical Flooding Records

6.95 Consultation with THC, completed for the consented development, has highlighted that there have been no historical flooding events within 5km of the Proposed Development.

6.96 Consultation with SEPA, completed for the consented development, reported one historical pluvial flooding event which occurred downstream of the site in 2015. It was located on the A850 near Edinbane and it is understood to be caused by a blocked culvert which allowed water to flood the road. The recorded instance of flooding does not lie within a catchment which drains from the site.

Private Water Supplies and Licenced Sites

6.97 As part of the assessment completed for the consented development, data requests were made to THC which provided details of 15 properties and PWS sources within 10km of the proposed turbine area. This data was supplemented with data from PWS surveys conducted onsite in April 2019.

6.98 The information requests and site survey have confirmed that there are no PWS sources are located within 1km of the Proposed Development.

6.99 THC private water supply database, which was last updated in January 2024, also confirms that there are no PWS sources within 1km of the site.

6.100 SEPA has confirmed, in response to a date request for the consented development, that they have no records of any licensed water abstractions within 1km of the site.

6.101 SEPA does have records of four Controlled Activity Regulation registrations/licences within 1km of the site (see **Figure 6.1**). All are for engineering activities (one bridge and three bridging culverts) to watercourses.

6.102 SEPA hold no records of registered or licenced abstractions within 1km of the site.

Summary of Sensitive Receptors

6.103 **Table 6-7** outlines the receptors identified as part of the baseline study, and their sensitivity based upon the criteria contained in **Table 6-2**. 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.

6.104 **Table 6-7** outlines the receptors identified as part of the baseline study, together with a description of their sensitivity to potential impacts associated with wind farm development.

Table 6-7: Summary of Identified Receptors

Receptor	Sensitivity	Reason for Sensitivity
Statutory Designated Sites	High	Loch Snizort (which includes Loch Greshornish) is designated as a Shellfish protected area and lies downstream of the site.
Geology	High	Sensitive peat soils have been recorded within the Proposed Development.
Groundwater	High	Groundwater has been classed by SEPA as Good and vulnerability is classified as High. All of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas
Surface water	High	Surface water watercourses have been classified by SEPA as Good.
Flooding	Low	No significant risk of flooding has been identified. It is recognised that the Proposed Development, without appropriate design, could increase flood risk downstream of the site.
Private Water Supplies	Not Sensitive	No Private Water Supply sources have been identified within the study area.
Licenced sites	Not Sensitive	No licenced abstractions or sensitive discharges have been recorded within the study area.
GWDTE	Low	It has been shown that areas of potential GWDTE are sustained by surface water and rainfall rather than by groundwater. Measures would be required to sustain surface water flow paths to maintain these habitats.

Cumulative Situation

6.105 This section considers the potential cumulative hydrological effect of the Proposed Development taking into consideration other wind farm developments within the same hydrological catchments as the Proposed Development and within 5km upstream/downstream of any proposed infrastructure. Any developments which are outwith the cumulative study area are not considered.

6.106 The following operational and consented wind farms that are within 5km and in the same water catchments as the Proposed Development:

- The operational turbines associated with the Ben Aketil and Extension Wind Farm, and proposed turbines associated with Ben Aketil Repowering (application) are located to the southwest and lie within a different surface water catchment to the Proposed Development. The access track to Ben Aketil Wind Farm and the

Proposed Development (which would use the same access track) lie within the Red Burn catchment.

- The northernmost operational turbines of Edinbane Wind Farm and the northernmost proposed turbines of the Edinbane Repowering (in scoping) are located in the catchment of the Abhainn Choishleadar and in the same catchment as the Proposed Development.

6.107 Potential cumulative effects associated with these developments are considered in the sections that follow.

Operational Period Baselines Changes Considered (Future Baseline)

6.108 Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside slightly higher average temperatures. This suggests that there may 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. These potential changes are considered in the assessment of effects.

Assessment of Effects

Embedded Measures

6.109 The Proposed Development has undergone design iterations and evolution in response to the constraints identified as part of the baseline studies and field studies so as to avoid and/or minimise potential effects on receptors where possible. This has included geological, hydrological and hydrogeological constraints which include slope stability, watercourse locations, areas of potential flooding, and groundwater dependent terrestrial ecosystems. Details of the embedded mitigation are given below.

Buffer to Watercourses and Watercourse Crossings

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

6.111 The layout of the access tracks was designed to minimise the number of watercourse crossings across the site. The site access track utilises the existing Ben Aketil Wind Farm access track, which has one existing watercourse crossing (see WX-01, **Figure 6.1**) which benefits from an existing CAR authorisation (CAR/R/1013618). It is not proposed to modify this crossing as part of the Proposed Development, although some sediment clearance work is required (which can be undertaken in accordance with SEPA General Binding Rules).

6.112 A new spur would be taken from the existing access track for the Ben Aketil Wind Farm to provide access to proposed turbine 9. This would require the crossing of an existing man-made drainage ditch located on the western side of the Ben Aketil access track. It is noted that this crossing is not shown on 1:50,000 OS mapping and therefore does need require authorisation in accordance with the CAR. Details of this crossing would however be agreed with SEPA as part of the detailed design stage of the project and secured by the proposed project CEMP.

Peat

6.113 The presence of peat within the site formed a key consideration in the design of the Proposed Development. Informed by the extensive programme of peat probing undertaken across the site, the design has avoided areas of deeper peat (>1m) and, where technically feasible, limited development to areas of peat less than 1m or where peat is absent.

Groundwater Dependent Habitats

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

6.115 This guidance has been used to inform the site design and the proposed turbines and associated infrastructure has been located so as to minimise potential effects on areas of possible GWDTE. A summary of the habitat surveys completed at site is provided in **Chapter 5** along with a detailed NVC habitat plan (**Figure 5.3**). An assessment of GWDTE is presented in this Chapter**. Figure 6.8** shows area of potential GWDTE and the Proposed Development.

6.116 As discussed earlier in this Chapter, it has been concluded that areas of potential moderately or highly GWDTE habitat are likely to be sustained by incident rainfall and local surface water runoff rather than by groundwater.

6.117 Measures have been proposed to safeguard existing water flow paths and maintain existing water quality. It is considered therefore that the water dependent habitats identified by the NVC mapping can be sustained. This would be confirmed, in accordance with good practice, by the Environmental Clerk of Works (EnvCoW) at the time of the construction of the Proposed Development.

Good Practice Measures

6.118 Good practice measures would be applied in relation to pollution risk, sediment management and management of surface runoff rates and volumes. This would form part of the CEMP (an outline of which is provided in **Technical Appendix 1.1**) to be implemented for the Proposed Development.

6.119 The applicant is committed to implementing good practice measures as a matter of course during the construction of the Proposed Development and these are not considered to be mitigation measures but form an integral part of the design/construction process. Key good practice measures are stated below, and the assessment incorporates these measures as part of the Proposed Development. Any further specific mitigation which may be required to reduce the significance of a potential effect is identified in the assessment of likely effects.

General Measures

6.120 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.

6.121 Prior to construction, section specific drainage plans would be produced. These would take into account any existing local drainage which may not be mapped and incorporate any section specific mitigation measures identified during the assessment.

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

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

6.124 A wet weather protocol would be developed. This would detail the procedures to be adopted by all staff during periods of heavy rainfall. Tool box talks would be given to engineering/construction/supervising personnel. Roles would be assigned to site staff and the inspection and maintenance regimes of sediment and runoff control measures would be adopted during these periods. In extreme cases, this protocol would dictate that work onsite may have to be temporarily suspended until weather/ground conditions allow.

Water Quality Monitoring

6.125 The catchments of the Red Burn and Abhainn Choishleadar have been highlighted as being at risk of potential construction effects due to the nature of works within the catchments as well as the high sensitivity of the watercourses. Water quality monitoring before and during the construction phase would be undertaken, to ensure that the tributaries of the main channels at risk from the Proposed Development have no significant impacts to water quality and/or quantity. Monitoring would be carried out at a specified frequency (depending upon the construction phase) on these catchments.

6.126 This monitoring would continue throughout the construction phase and immediately post construction. Monitoring would be used to allow a rapid response to any pollution incident as well as assess the impact of good practice or remedial measures. Monitoring frequency would increase during the construction phase if remedial measures to improve water quality were implemented. Water quality monitoring plans would be developed during detailed design (SEPA, SLRT and THC would be consulted on the plan) and would be contained within the final CEMP.

6.127 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

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

- refuelling would take place at least 50m from watercourses and would not occur when there is risk that oil from a spill could directly enter the water environment;
- foul water generated onsite would be managed in accordance with best practice and be drained to a sealed tank and routinely removed from the site;
- a vehicle management plan and speed limit would be strictly enforced onsite to minimise the potential for accidents to occur;

- drip trays would be placed under vehicles which could potentially leak fuel/oils when parked;
- areas would be designated for washout of vehicles which are a minimum distance of 50m from a watercourse;
- washout water would also be stored in the washout area before being treated and disposed of;
- if any water is contaminated with silt or chemicals, runoff would not enter a watercourse directly or indirectly without treatment, as directed by the EnvCoW;
- water would be prevented as far as possible, from entering excavations;
- procedures would be adhered to for storage of fuels and other potentially contaminative materials in line with the CAR to minimise the potential for accidental spillage; and
- a plan for dealing with spillage incidents would be designed prior to construction, and this would be adhered to should any incident occur, reducing the effect as far as practicable. This would be included in the final CEMP.

Erosion and Sedimentation

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

- all stockpiled materials would be located outwith a 50m buffer from watercourses, including on up-gradient sides of tracks and battered to limit instability and erosion;
- stockpiled material would either be seeded or appropriately covered, minimising the area of exposed bare ground;
- monitoring of stockpiles/excavation areas during rainfall events;
- water would be prevented as far as possible, from entering excavations through the use of appropriate cut-off drainage;
- where this is not possible, water that enters excavations would pass through a number of silt/sediment traps to remove silt prior to discharge into the surrounding drainage system. Detailed assessment of ground conditions would be required to identify locations where settlement lagoons would be feasible;
- clean and dirty water on-site would be separated, and dirty water would be filtered before entering the stream network;
- if the material is stockpiled on a slope, silt fences would be located at the toe of the slope to reduce sediment transport;
- the amount of ground exposed, and time period during which it is exposed, would be kept to a minimum and appropriate drainage would be in place to prevent surface water entering deep excavations;
- a design of drainage systems and associated measures to minimise sedimentation into natural watercourses would be developed - this may include silt traps, check dams and/or diffuse drainage;
- silt/sediment traps, single size aggregate, geotextiles or straw bales would be used to filter any coarse material and prevent increased levels of sediment. Further to this,

activities involving the movement or use of fine sediment would avoid periods of heavy rainfall where possible; and

- construction personnel and the Principal Contractor would carry out regular visual inspections of watercourses to check for suspended solids.

Fluvial Flood Risk

6.130 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 at site prior to development. Good practice in relation to the management of surface water runoff rates and volumes and potential for localised fluvial flood risk would include the following:

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

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

Water Abstractions

6.132 Abstraction of water for construction activities is proposed from a suitable source yet to be identified. An application for a CAR Licence would be made to SEPA and managed through the regulation of the CAR Licence. Should a suitable source not be identified, a water bowser would be used. Good practice that would be followed in addition to the CAR Licence regulations includes:

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

Carbon Rich Soils and Peat Management

6.133 The peat depth probing data has been used to accurately determine the volume of soils and peat which will be disturbed by the Proposed Development. This data has been used to prepare a site specific Peat Management Plan, or PMP, (see **Technical Appendix 6.1: PMP)** which details the volume of acrotelmic and catotelmic peat which would be

disturbed and how this would be safeguarded and reused on site. Further, the condition of the peat, and areas of peat that would potentially benefit from restoration have been identified and are discussed in **Chapter 5: Ecology**.

6.134 As shown in **Technical Appendix 6.1: PMP** and **Technical Appendix 6.2: PLHRA** measures have been proposed to ensure the stability of peat and carbon rich soils and that peat and soils that would be disturbed by the Proposed Development can be safeguarded and beneficially re-used onsite. The Policy aims of NPF4, regarding soils and peat, are therefore met; further details are provided below.

Peat Management

6.135 As shown in **Technical Appendix 6.1: PMP**, the site design has avoided areas of deep peat and only very limited amounts of peat would be encountered by the Proposed Development, which can be readily managed and accommodated within the site layout without significant environmental impact. No surplus peat would be generated, and the limited volumes of peat generated from the proposed excavations would be used to reinstate track verges, turbine bases, crane hardstandings and restoration of onsite borrow pits, as well as a small amount used in the peat restoration areas.

Peat Landslide Hazard

6.136 The site specific PLHRA (**Technical Appendix 6.2: PLHRA**) confirms, regarding peat stability, that there are very few areas of peat instability risk across the Proposed Development site and the hazard impact assessment concluded that, with the employment of appropriate mitigation measures, all of the areas of peat instability can be considered as an insignificant risk.

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

6.138 Good construction practice and methodologies to prevent peat instability within areas that contain peat deposits are identified in the PLHRA. These include:

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

- developing drainage systems that would not create areas of concentrated flow or cause over/under-saturation of peat habitats.

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

Potential Construction Effects

Pollution Risk

6.140 During the construction phase, there is the potential for a pollution event to affect surface water and local groundwater bodies impacting on their water quality. This would have a negative effect on the receptor and the resulting degradation of the water quality.

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

6.142 The risk of a pollution incident occurring would be managed using good practice measures as detailed in the Embedded Mitigation above. Many of these practices are concerned with undertaking construction activities away from watercourses and identifying safe areas for stockpiling or storage of potential pollutants that could otherwise lead to the pollution of watercourses.

6.143 The baseline assessment has shown that the Proposed Development is located in the catchments of Loch Snizort, the Red Burn and Abhainn Choishleadar which are considered sensitive receptors.

6.144 After consideration of good practice measures, the magnitude of impact of a pollution event within the Red Burn and Abhainn Choishleadar catchments, or of impairing water quality in Loch Snizort, is considered negligible following adherence to good practice and site-specific mitigation measures.

6.145 The potential effect of a negligible magnitude impact on those hydrological receptors of high sensitivity would be of negligible significance. No further mitigation measures are therefore required.

6.146 The groundwater bodies extending beyond the study area are very large when compared to the area of Proposed Development. Any effects are judged not to be detectable beyond the study area. Potential pollution events occurring during the construction of the turbines or any hardstanding would have a negligible impact magnitude as they would be controlled by good practice measures and would be subject to some attenuation in the soils before reaching groundwater. Should pollutants reach the groundwater, the scale of the effect would be low in relation to the overall groundwater body. The effect to groundwater, which has been assigned a high sensitivity, is therefore assessed as having negligible significance. No further mitigation measures are required.

Erosion and Sedimentation

6.147 Site traffic during the construction phase has the potential to cause erosion and increase in sedimentation loading during earthworks, and due to increased areas of hardstanding and such features as stockpiles, tracks and borrow pits, etc., which could be washed by rainfall or overwhelm site mitigation, into surface water features. This has the potential to reduce the surface water quality, increase turbidity levels, reduce light and oxygen levels and effect ecology including fish populations.

6.148 Excavation of borrow pits, construction of hardstanding, diversion of drainage channels and use of water crossings are the key sources of sediment generation. Adherence to good practice measures would ensure that any material generated is not transported into nearby watercourses.

6.149 Location specific good practice measures would be in place for sediment control for each of the borrow pits to control the amount of fine sediment that could potentially enter a watercourse if not managed appropriately. These measures would be dependent upon the final borrow pit designs and stone quality, but would potentially include cut-off drainage, sediment traps, sediment lagoons and flocculation stations.

6.150 Similar good practice measures to those applied at the borrow pit locations would be required around the track construction activities.

6.151 After consideration of good practice measures, the magnitude of impact to the receptors is assessed as negligible and therefore with the high sensitivity receptors described above, the significance of effect without mitigation is assessed as negligible and no further mitigation measures are required.

Fluvial Flood Risk

6.152 Construction of hardstanding including the construction compound and turbine bases would create impermeable surface areas. This would lead to a relatively small increase in the total impermeable surface area of the site causing negligible increases in runoff rates and volumes within the Red Burn and Abhainn Choishleadar catchments.

6.153 The permanent effect of the increase in impermeable surface area is assessed during the operational phase to avoid any double counting of effects. The construction phase includes the effects of temporary increases in impermeable area and temporary drainage diversions during the construction phase.

6.154 The drainage design would ensure management of any increase in runoff volumes for a 1 in 200 year return period at the detailed design stage. During the construction phase, the good practice measures would be in place to prevent materials entering watercourses and to ensure that man-made drains and blockages do not lead to bank erosion and localised flooding.

6.155 Adherence with good practice measures including appropriate drainage design and compliance with the final CEMP would limit potential effects to being local and short duration and so of negligible magnitude. Examples of the best practice measures that would be deployed include:

- rainwater and limited groundwater ingress that collects in the turbine excavations during construction would be stored and attenuated prior to controlled discharge to ground adjacent to the excavation.

- attenuation of runoff generated within the proposed turbine excavations would allow settlement of suspended solids within the runoff prior to discharge in accordance with 'site control' component of the SuDS 'management train'.
- where possible, it is proposed to develop the borrow pits with a fall on the floor of the pits which falls away from the edge of the pit. This would ensure that all surface water runoff generated on the floor of the pit during construction would be contained within the pit prior to controlled disposal by pump or gravity (in a cut trench with granular fill) under supervision of the EnvCoW.
- if necessary, a shallow open drain would be developed around the pit rim to prevent surface water inflow to the borrow pits. This drain would route the drainage around the pit and thus maintain the pre-development drainage paths.
- water in the borrow pits would be managed in accordance with SuDS techniques. Attenuating runoff within the borrow pits would provide an opportunity for any suspended solids within the runoff to settle within the pit prior to controlled and pumped discharge from the pit.

6.156 The potential effect of a short term increase in runoff on the hydrological receptors is therefore assessed of negligible significance. No further mitigation is therefore required.

6.157 The magnitude of the increase in impermeable area is not sufficient to have a measurable effect on groundwater levels, therefore, groundwater flood risk is not considered in this assessment.

Infrastructure and Man-made Drainage

6.158 During the construction period, drainage would be required to ensure construction areas are workable and not saturated. In particular, drainage, some of which would be temporary, would be required around turbine working areas, the construction compound and borrow pits to manage surface flows. Excavation of turbine foundations may require temporary de-watering for the period of the foundation build. These drainage activities may lead to temporary changes in the water table surrounding these construction activities (where de-watering is required below the level of the natural water-table).

6.159 As construction of proposed infrastructure is required through the buffers associated with GWDTE, there is potential to disrupt water contributions to these habitats. It has been shown that areas of potential GWDTE are sustained by surface water rather than groundwater and that the construction of the Proposed Development would have no long term effect on any potential GWDTE habitat.

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

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

6.162 The design of the Proposed Development has avoided areas of high ecological or habitat interest wherever possible. Furthermore, the bedrock has little groundwater and therefore limited or little dewatering is likely to be required. There remains potential however, for

local dewatering of soils near cable trenches, turbine bases and borrow pits, without incorporation of mitigation measures.

6.163 The sensitivity of the receptor (groundwater and habitat that may be dependent on groundwater) has been assessed as being high. Without mitigation the magnitude of impact is assessed as negligible and therefore the potential significance of effect of changing groundwater levels and flow due to dewatering is considered negligible significance and requires no further mitigation.

6.164 The potential effect of the Proposed Development on groundwater and areas of GWDTE is not considered to change during the operation of the Proposed Development and therefore has not been considered under operational effects.

Water Abstraction

6.165 During the construction of the Proposed Development, water may be required for uses such as dust suppression and vehicle washing. The volume of water and mitigation required would be regulated through the CAR and therefore the magnitude of an effect on groundwater-surface water interactions is considered negligible. The significance of effect is therefore negligible.

Peat and Soils

6.166 It has been shown (see **Technical Appendix 6.1: PMP**, **Technical Appendix 6.2: PLHRA** and Embedded Mitigation Section) that the disturbance of peat and soils as a result of the construction of the Proposed Development can be minimised and the peat deposits safeguarded.

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

Proposed Mitigation

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

Residual Effects

6.169 No significant residual effects on soils, geology, surface water or groundwater receptors are predicted during the construction period of the Proposed Development.

Potential Operational Effects

6.170 During the operational phase of the Proposed Development, it is anticipated that routine maintenance of infrastructure and tracks would be required across the site. This may include work such as maintaining wind farm tracks and drainage and turbine maintenance.

6.171 Should any maintenance be required onsite during the operational life of the project which would involve construction type activities; mitigation measures would be adhered to along with the measures in the CEMP to avoid potential effects.

Pollution Risk

6.172 The possibility of a pollution event occurring during operation is very unlikely. There would be a limited number of vehicles required onsite for routine maintenance and the developer's 's operational presence. Storage of fuels/oils onsite would be limited to the hydraulic oil required in turbine gearboxes and this is bunded to (in accordance with the CAR) to prevent fluid escaping.

6.173 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 pollution event during the operational phase of the Proposed Development would be negligible, as no detectable change would likely occur. Therefore, the significance of effect for a pollution event during the operational phase of the development is predicted to be negligible for all receptors. No mitigation is therefore required.

Erosion and Sedimentation

6.174 During the operation of the Proposed Development, it is not anticipated that there would be any excavation or stockpiled material, reducing the potential for erosion and sedimentation effects.

6.175 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 velocity 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.

6.176 The likelihood, magnitude and duration of a potential erosion and sedimentation event occurring within the surface water catchments would be negligible following adherence to good practice measures. Therefore, the potential significance of effect on these high sensitivity receptors is of negligible significance. No mitigation is therefore required.

6.177 Should any non-routine maintenance be required at the sections of track crossing wet areas (defined visually onsite by a contractor or operational personnel) there would be potential for erosion and sedimentation effects to occur due to the existence of disturbed material. Should this type of activity be required, then the good practice measures as detailed for the construction phase would be required on a case-by-case basis. Extensive work at water crossings/adjacent to the water environment may require approval from SEPA under the CAR (depending upon the nature of the activity).

Fluvial Flood Risk

6.178 The risk of an effect on fluvial flood risk arises as a result of a potential restriction of flow at a permanent water crossing following intense rainfall. In accordance with good practice routine inspection and clearing of the culverts at site would be undertaken, reducing the likelihood of a blockage occurring, in accordance with any other construction teams working within the site e.g. Ben Aketil operational or Repowering Wind Farm (if relevant). In the unlikely event of a blockage any flooding would be localised and the magnitude of impact is assessed as negligible, and thus the significance of effect is assessed as negligible, and no further mitigation is required.

Infrastructure and Man-made Drainage

6.179 Operation of the Proposed Development requires limited activities relative to the construction phase. The presence of access tracks and hardstanding, as opposed to their construction, may affect the potential infiltration and groundwater conditions as well as the sub-surface flow paths around the infrastructure. In addition, cabling and crane hardstanding would also remain in situ to serve the Proposed Development.

6.180 Drainage would be required to service new sections of access track. This could also potentially alter groundwater levels and recharge. The dispersed nature of new drainage, coupled with good practice, means that the magnitude of the predicted effect of an alteration to drainage on groundwater levels and recharge of the groundwater body can be considered negligible. This magnitude level has been determined principally through the fact that any change is unlikely to be detectable through monitoring and the associated track drainage remaining during operation is likely to be less than 1m deep.

6.181 The magnitude of a potential effect on groundwater and sub-surface flows as a result of permanent hardstanding and associated drainage would be negligible on the overall groundwater body due to the dispersed nature of the proposed hardstanding. The significance of effect is negligible. No further mitigation is required.

Proposed Mitigation

6.182 As there are no predicated significant effects under the terms of the EIA Regulations, other than the good practice measures that Applicant would implement as standard, no specific mitigation during operation is required.

Residual Effects

6.183 No significant residual effects on soils, geology, surface water or groundwater receptors are predicted during the operational period of the Proposed Development.

Cumulative Effects

6.184 Ben Aketil Wind Farm, Ben Aketil Extension Wind Farm and Edinbane Wind Farm have already been constructed and are operational. Therefore, there would be no cumulative effects associated with concurrent construction of the Proposed Development on geology and the water environment.

6.185 The proposed developments (Balmeanach, Ben Aketil Repowering and Edinbane Repowering), if built, will be required to adopt current industry standard guidelines and be managed in accordance with best practice, industry standards and relevant legislation, planning policy and guidance regulated by statutory consultees. These standards ensure, with respect to soils, geology and the water environment, potential impacts are mitigated and controlled at source.

6.186 The surface water catchments are considered to be of high sensitivity. The magnitude of a potential pollution event at each of the developments is negligible following good practice measures as discussed above. This would result in a cumulative effect which is negligible and therefore not significant. The probability of a pollution event occurring at more than one development at one time is judged to be low.

6.187 The magnitude of a potential sedimentation and erosion event at each development is also negligible following good practice measures as discussed above. As with a pollution

event, the probability of a sedimentation event occurring at more than one development at one time is judged to be low.

6.188 The potential increase in peak runoff from each development should be mitigated through the detailed design of the drainage systems at each development. The developments should be managed to ensure there is no increased downstream fluvial flood risk.

6.189 The developments should not have a significant effect on the wider groundwater bodies but if a localised area of groundwater is thought to be at risk of alteration, it should be mitigated on a case by case basis dependant on the sensitivity of the receiving GWDTE. Assuming such mitigation is applied, there would be no cumulative effect.

6.190 It is concluded that there would be a negligible cumulative effect on hydrological receptors during the construction, operating and decommissioning phases of the Proposed Development.

Statement of Significance

6.191 An assessment of the potential effects of the Proposed Development on soils, geology, hydrology, hydrogeology within a defined study area (comprising land within 1km of the site boundary) has been undertaken and no significant impacts in terms of the EIA Regulations have been identified.

6.192 The assessment has considered the construction and operational phases of the Proposed Development.

Further Survey Requirements and Monitoring

6.193 This Chapter has demonstrated that the Proposed Development is not likely to have any significant effects on the study area's soils, geology, hydrological or hydrogeological receptors. The lack of significant effects relates primarily to the proposed 'Good Practice Measures' and the iterative design process (**Chapter 1**), which effectively act as 'designed-in' mitigation. No other further surveys or monitoring is considered necessary to complete this assessment.

6.194 It has been recognised in this assessment that a programme of water monitoring would be required prior to any construction activity and during construction of the Proposed Development. The monitoring programme would be agreed with THC, SEPA and SLRT and it is expected to include monitoring watercourses identified as potentially at risk without incorporation of best practice construction and mitigation techniques.

Summary

6.195 There is significant existing information that has been used to characterise current (or baseline) site conditions regarding soils, geology, and the water environment. This information has been reviewed and updated where relevant in response to datasets published since the EIA reports were prepared for the consented development (SLR 2020a, SLR 2020b and SLR 2021), to reflect the findings of recent site investigations, and the redesign stage of the project.

6.196 Where relevant, the requirements of updated National Planning Policy (NPF4), have been made and the Proposed Development considered in the context of the confirmed baseline conditions.

6.197 The embedded mitigation outlined above is the same as was agreed for the consented development. The assessment of the consented development concluded that no impact on soils, geology or the water environment were anticipated with the implementation of mitigation.

6.198 It is also concluded that as a result of these safeguards and embedded mitigation, no significant effects are likely to occur with respect to soils (inc. peat), geology and the water environment during the construction and operational phases of the Proposed Development; which is in accordance with the conclusions of the assessment undertaken for the consented development.

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Figures

Appendices