Chapter 14: Geology, Soils and Water - Contents

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14. Geology, Soils and Water

14.1 Executive Summary

14.1.1 This Chapter sets out the assessment of the potential effects on soils, geology, and the water environment of the Proposed Development. It considers both the construction and operational phases of the development. Water management and the transfer of water to and from Loch Kemp is considered in detail in **Chapter 7: Water Management**, and potential effects on ecology is given in **Chapter 10: Terrestrial Ecology**, **Chapter 12: Aquatic Ecology** and **Chapter 13: Fish**.

14.1.2 The scope of the assessment was informed by scoping responses received from statutory and non-statutory consultees and has been guided by advice given by NatureScot, Scottish Environment Protection Agency (SEPA) and Scottish Canals (SC) during development of the scheme proposals.

14.1.3 Information for the study area was compiled using baseline information from a desk study which was verified by an extensive programme of field work, which included peat depth probing, peat characterisation by augering, a water interests and private water supply survey and preparing a schedule of permanent watercourse crossings. The assessment was undertaken considering the sensitivity of receptors identified during the baseline study and considering mitigation measures incorporated in the development design. It has also considered potential future changes to baseline conditions.

14.1.4 The assessment considered designated sites and where these are water dependent and have a potential hydrological connection to the Proposed Development these have been considered in the assessment.

14.1.5 The assessment includes information on recorded peat depths, and these have been used to prepare a site-specific Peat Management Plan (PMP) and Peat Landslide Hazard Risk Assessment (PLHRA) which are provided as Technical Appendices. The PMP considers in detail the condition of peat and carbon rich soils recorded at site and how these would be safeguarded as required by National Planning Framework 4 (NPF4). A schedule of proposed permanent watercourse crossings associated with the Proposed Development is also provided as a supporting appendix.

14.1.6 The field work included investigation of private and public water supply sources in order to determine those of which might be hydrologically connected to and at risk from the Proposed Development. Measures required to protect these sources have been confirmed.

14.1.7 Subject to the adoption of best practice construction techniques and a project specific Construction Environmental Management Plan (CEMP), no significant adverse effects on the soils, geology and the water environment have been identified. The CEMP includes provision for controls to limit erosion and sedimentation, and a commitment to provide a drainage management plan which will be agreed with statutory consultees, including SEPA, SC and NatureScot and which will be used to safeguard water resources and manage flood risk. A commitment to deploy Sustainable Drainage Systems (SuDS) in these plans has been made. The CEMP also includes provision of a Pollution Prevention Plan which would also be agreed with statutory consultees including SEPA and SC prior to any construction works being undertaken.

14.1.8 With regard to potential cumulative or potential in-combination effects it has been shown that the Proposed Development would not result in any significant effects on soils, geology or water

environment. The potential effects of water storage and movement, associated with hydro power generation in combination with other hydro power scheme is assessed in **Chapter 7: Water Management**. Potential cumulative effects on ecology (including water dependent designated sites) and fisheries interests are assessed in **Chapter 10: Terrestrial Ecology**, **Chapter 12: Aquatic Ecology** and **Chapter 13: Fish**

14.1.9 Notwithstanding these safeguards, a programme of baseline and construction phase water quality monitoring is proposed which would be used to confirm that the Proposed Development does not have a significant effect on the water environment. The monitoring programme would also be used to ensure private water supplies, Drinking Water Protected Areas, and water dependent designated sites are safeguarded. It is proposed that the monitoring programme is agreed with statutory consultees and would be secured by a pre-development planning condition.

14.2 Introduction

14.2.1 This Chapter considers the potential effects, including cumulative effects, of the Proposed Development on soils, geology, and the water environment (hydrology and hydrogeology) during construction and operation. As described in **Chapter 3: Description of Development**, with proper maintenance the Proposed Development should remain functional indefinitely. If the project were to be decommissioned, it is anticipated that the potential effects on soils, geology and the water environment would be equal to and/or lesser than the construction impacts. As such, a separate assessment of potential decommissioning effects on soils, geology and the water environment is not included in this Chapter. Where likely significant effects are predicted during construction and operation, appropriate mitigation measures are proposed, and the significance of predicted residual effects are assessed.

14.2.2 This assessment uses information and findings presented in **Chapter 7: Water Management**, **Chapter 10: Terrestrial Ecology**, **Chapter 12: Aquatic Ecology** and **Chapter 13: Fish.** This Chapter also presents summary information from the following Appendices:

- Appendix 14.1: Peat Management Plan;
- Appendix 14.2: Peat Landslide Hazard Risk Assessment; and
- Appendix 14.3: Schedule of Watercourse Crossing Appendix.

14.2.3 This assessment has been carried out by SLR Consulting Ltd under the supervision of Gordon Robb (BSc, MSc, MBA, C.WEM, FCIWEM). Gordon is a Technical Director (Hydrology and Hydrogeology) and has more than 30 years' experience assessing renewable energy and electrical infrastructure projects and specifically their potential effects on soils, geology and the water environment. He is based in Scotland and has worked throughout Scotland, including sites in similar settings to the Proposed Development. He has also prepared and given expert witness testimony for renewable and electrical infrastructure projects. A table presenting relevant qualifications and experience of key staff involved in the preparation of this Chapter is included in **Volume 4, Appendix 4.1: EIA Team** and contained within Volume 4 of this EIA Report.

14.3 Scope of Assessment

Study Area

14.3.1 The study area encompasses the area over which all desk-based and field data were gathered to inform the assessment presented in this Chapter. The study area comprises all elements of the Proposed Development and a 500 m buffer to the Site Boundary, as depicted on **Volume 2, Figure 14.1**.

Consultation Responses

14.3.2 To inform the scope of the assessment for the Proposed Development, consultation was undertaken with statutory and non-statutory bodies. **Table 14.1** summarises the scoping and consultation responses relevant to soils, geology and water environment and provides information on where and/or how points raised have been addressed in this assessment.

14.3.3 Full details on the consultation responses and scoping opinion can be reviewed in **Chapter 5: Scoping and Consultation**, and associated appendices.

Table 14.1: Consultation Responses

Consultee	Consultation Type	Issue Raised	Response/Action Taken
The Highland Council (THC)	Scoping	The EIAR should include a full assessment on the impact of the development on peat and include peat probing for all areas where development is proposed. A peat landslide hazard and risk assessment (PHLRA) should be undertaken as part of the EIA.	Peat effects are discussed in detail in **Appendix 14.1: Peat Management Plan** and **Appendix 14.2: Peat Landslide Hazard Risk Assessment**. A summary is included in Section 14.6 and Section 14.7 in this Chapter.
		Carbon balance calculations should be included.	Carbon balance calculations are detailed in **Volume 4, Appendix 3.6: Carbon Balance**.
		EIAR should describe the likely significant effects of the development on the local geology including aspects such as borrow pits, earthworks, site restoration and the soil generally including direct effects and any indirect.	Addressed in this Chapter, see Section 14.7 and in Appendix 14.1: Peat Management Plan as well in **Appendix 3.4: Outline Spoil Management Plan**.
		Where borrow pits are proposed the EIAR should include information regarding the location, size (including depth) and nature of these borrow pits.	Borrow pit appraisal presented in **Appendix 3.5: Draft Borrow Pit Screening Assessment**.
		The EIAR needs to address the nature of the hydrology and hydrogeology of the site and potential impacts on watercourses, water supplies (including an investigation on private water supplies), water quality, water quantity and on aquatic flora and fauna. EIAR should identify all water crossings.	Effects on the water environment, including flooding, is included in **Section 14.6** and **Section 14.7** of this Chapter. Details of water management are discussed in **Chapter 7: Water Management**.

		Measures to prevent erosion, sedimentation or discolouration will be required.	The potential effects on water levels in Loch Ness, as a result of this scheme and in combination with other consented schemes is presented in **Chapter 7: Water Management.**
		Assessment will need to recognise periods of high rainfall which will impact on calculations of runoff, high flow in watercourses and hydrogeological matters. Detailed comments on impacts on the water environment, in particular on water levels in Loch Ness will be required.	A screening of flood risk sources is presented in this Chapter (see **Section 14.6)** and principles for drainage management in **Section 14.7**.
		Flood Risk Assessment and Drainage Impact Assessment should be included.	Measures, and design standards that will be used and that will be included in a site specific drainage plan are presented in this Chapter.
		The assessment should include effects on GWDTEs.	An assessment of potential effects on GWDTEs is presented in **Section 14.6**.
SEPA	Scoping	A peat management plan is required for this development, which should minimise impact on peat and area of peatland. Information should be provided on how areas of disturbed and undisturbed peat will be managed so that carbon loss is reduced. The assessment must (a) demonstrate how the layout has been designed to minimise the disturbance of peat and consequent release of CO2 and b) outline the preventative / mitigation measures to avoid significant drying or oxidation of peat through, for example, the construction of access tracks, drainage channels, cable trenches or the storage and re-use of excavated peat.	See **Appendix 14.1: Peat Management Plan** and **Appendix 14.2: Peat Landslide Hazard Risk Assessment**. Details of peat re-use and habitat restoration is also provided in **Chapter 10: Terrestrial Ecology**. **Volume 4, Appendix 14.1: Peat Management Plan** shows the Proposed Development and recorded peat depths, the results of peat coring and details measures for safeguarding peat and carbon rich soils.

		Other elements of the scheme much be designed to avoid impact on water environment, including 10m buffer to watercourses and lochs.	A buffer of at least 10 m to watercourses and lochs/lochans has been included in the development design (see **paragraph 14.7.15** to **14.7.17**).
		The assessment should include effects on GWDTEs and existing abstractions. Measures to prevent pollution should be included.	The development with respect to the local hydrology is shown on **Volume 2, Figure 14.1: Local Hydrology** and discussed within **Section 14.6** and **Section 14.7** within this Chapter. This includes areas of potential GWDTE, existing abstractions and measures to be deployed to prevent pollution.
SEPA	Further Consultation	Emerging development plans and the results of ongoing surveys were presented to SEPA and advice sought regarding the Proposed Development with regard to peat management, water management and pollution prevention.	Results incorporated in the design of the Proposed Development and presented in this Chapter.
SEPA	Gatecheck Report Response	We have had good constructive dialogue with the developer since the last formal scoping stage and seen some early drafts of elements of the submission on which we have a specific interest.	Noted.
		NPF4 has been adopted since the formal scoping process was completed and will need to be taken into consideration in determination of the application.	Noted.
		All significant watercourse crossings should now be designed to accommodate the 0.5% Annual Exceedance Probability flow (the 1 in 200 year event) plus an allowance for climate change.	Included in development proposals, see Embedded Mitigation (Section 14.7) and Volume 4, Appendix 14.3: Schedule of Watercourse Crossings.

		Policy 5 in NPF4 more explicitly requires consideration of habitat condition and we ask that a figure is included that shows the differing condition of peatland.	See Volume 4, Appendix 14.1: Peat Management Plan and Figure 14.1.4.
Scottish Water	Scoping	No objection to the Proposed Development. The Proposed Development is located within the Loch Ness DWPA which supplies the Invermoriston Water Treatment Works (WTW). From a water quantity perspective activity is likely to be of low risk, however, from a water quality point of view mitigations are required to reduce any risks that could affect our drinking water supplies.	Noted. See **Section 14.7** of this chapter for proposed mitigation.
RSPB	Scoping	The EIAR should include assessment on the Ness Woods SAC, Loch Knockie SPA and peatland habitats.	See **Section 14.6** and **14.7** within this Chapter. Effects on SAC, SPA and other habitats are discussed in detail in Chapter 10: Terrestrial Ecology, Chapter 11: Ornithology and the separate Habitats Regulations Appraisal (HRA) Report.
Ness District Salmon Fishery Board (NDSFB)	Scoping	The EIAR should include assessment on salmon and sea trout smolts, particularly those originating from the River Moriston Special Area of Conservation (SAC). The assessment should also consider cumulative impacts of the pumped hydro schemes (PSH) (including Foyers and Red John PSH) on water levels in Loch Ness, River Ness and Caledonian Canal.	Effects on aquatic ecology and fish are considered in **Chapter 12: Aquatic Ecology** and **Chapter 13: Fish** respectively. Impacts on the qualifying features of the River Moriston SAC are also considered in the separate **HRA Report**. Cumulative effects with respect to the water environment are considered in **Section 14.8** within this Chapter and **Chapter 7: Water Management**.
Fisheries Management	Scoping	Agreement with comments from NDSFB.	Noted.

Scotland (FMS)			
NatureScot	Scoping	The EIAR should consider impacts on the qualifying habitats of Ness Wood SAC, River Moriston SAC and Easter Ness Woods Site of Special Interest (SSSI).	See **Section 14.6** and **14.7** within this Chapter. Effects on SACs, SPA and other habitats are discussed in detail in **Chapter 10: Terrestrial Ecology**, **Chapter 11: Ornithology**, **Chapter 13: Fish** and the separate **HRA Report**.
NatureScot	Further Consultation	The EIAR should consider impacts on Urquhart Bay SAC.	Effects on SACs, SPA and other habitats are discussed in detail in **Chapter 10: Terrestrial Ecology**, **Chapter 11: Ornithology**, **Chapter 13: Fish** and the separate **HRA Report**.
Scottish Canals	Scoping	The assessment should include consideration of cumulative effect of the proposal, along with the existing schemes at Foyers, Glen Doe and the approved Red John scheme on water management and effects to flows to the River Ness. The impact of fluctuating water levels on lock operations needs to be considered The potential for sedimentation needs to be considered.	Cumulative effects on water management and water level in Loch Ness are included in **Chapter 7: Water Management**. Controls to limit the potential for sedimentation (and therefore shallows in navigable waterbodies) in presented in **Section 14.7 (**Embedded Mitigation) of this chapter.

Issues Scoped Out of Assessment

14.3.4 The following aspects have been scoped out of the assessment:

- Detailed flood risk and drainage impact assessment. A screening assessment of flood risk is included in **Section 14.7** of this Chapter**.** A drainage impact assessment (DIA) would be included in the CEMP following grant of consent as this is normally developed as part of the detailed design stage by the Principal Contractor / Developer. Principles for drainage management are presented in this Chapter and it is expected these would be adopted in the DIA when the CEMP is finalised.
- Dam breach failure. Management of the upper reservoir and flood risk associated with failure of any of the proposed dams is regulated by the Reservoirs Act, as discussed in **Chapter 7: Water Management.**
- Derivation of compensation flows and geomorphological assessment. The management of the upper reservoir and the rate and volume of discharge of water to watercourses downstream of

the upper reservoir would be agreed with and regulated by Scottish Environment Protection Agency (SEPA). The management controls would be secured by a Controlled Activity Regulation (CAR) authorisation.

- Water quality monitoring. Classification data is available from SEPA for watercourses in the study area and there are no known sources of potential water pollution that might give rise for the need for water quality monitoring as part of the EIA. The assessment concludes that water quality monitoring is required prior to, during and post construction if the project were it to be granted consent, and this would be specified in the site CEMP.
- Increased flood risk caused by blockages during operation and maintenance of the Proposed Development. Permanent watercourse crossings would be subject to maintenance requirements under the CAR, flood risk on-site is low, and the development design would ensure no critical infrastructure is located in areas prone to flood risk.
- Potential effects on geology. With the exception of peat, there are no protected geological features within the application or study boundary. Furthermore, the nature of the activities during construction and operation of the Proposed Development would not alter regional superficial or solid geology. Potential effects on peat and carbon rich soils are not scoped out of the assessment and are considered in full.
- Potential cumulative effects associated with the construction and operation of the associated 275 kV switching station, electrical export cable and access track (as described in **Section 3.7: Associated Works** in **Chapter 3: Description of Development**), as these will be subject to and assessed as part of a subsequent planning application[1]. These developments would also be designed, developed, and managed in accordance with best practice, industry standards and relevant legalisation, planning policy and guidance regulated by statutory consultees. These standards ensure, with respect to the geology and soils environment, potential impacts are mitigated and controlled at source.

14.3.5 The embedded mitigation and best practice detailed in this Chapter will be used to ensure that there are no likely significant effects on soils, geology or the water environment during construction of the Proposed Development. Potential in-combination or cumulative effects associated with operation of the Proposed Development with other operational or consented developments on Loch Ness, such as the existing Foyers pumped storage hydro scheme (PSH) and the consented Red John PSH, are considered in **Chapter 7: Water Management**.

14.4 Legislation, Policy and Guidance

Legislative Context

14.4.1 The following legislation has been considered in the assessment:

- EU Water Framework Directive (2000/60/EC);
- EU Drinking Water Directive (98/83/EC);
- The Environment Act 1995;

[1] The peat management plan (Appendix 14.1) and peat landslide hazard risk assessment (Appendix 14.2) have considered the Associated Works and show that these can be developed with due regard to safeguarding carbon rich soils and peat. These data and analysis will be presented again when the planning application for the Associated Works is prepared and in support of that application.

- Environmental Protection Act 1990;
- The Water Environment (Controlled Activities) (Scotland) Amendment Regulations, 2013 (CAR);
- The Water Supply (Water Quality) (Scotland) Regulations, 2001;
- The Flood Risk Management (Scotland) Act 2009;
- Water Environment and Water Services (Scotland) Act 2003 (WEWS Act);
- Private Water Supplies (Scotland) Regulations 2006; and
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017.

Policy Context

14.4.2 National Planning Framework 4 (NPF4)[2] provides planning guidance and policies regarding sustainable development, tackling climate change and achieving net zero. Policy's relevant to this Chapter include:

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

14.4.3 In addition, The Highland Council's (THC) Highland wide Local Development Plan (HwLDP)[3] provides planning guidance on the type and location of development that can take place in the region. The HwLDP presents development policies of which the following are relevant to this Chapter:

- Policy 60: Other Important Habitats and Article 10 Features;
- Policy 63: Water Environment;
- Policy 64: Flood Risk; and
- Policy 69: Electricity Transmission Infrastructure.

Technical Guidance

14.4.4 The following technical guidance has been considered in the assessment.

14.4.5 Planning Advice Notes (PANs) and Specific Advice Sheets, published by the Scottish Government of relevance to this assessment, including:

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

14.4.6 SEPA Pollution Prevention Guidance Notes (PPG) and Guidance of Pollution Prevention (GPP), including:

[2] Scottish Government (2023) National Planning Framework 4 (NPF4)

[3] The Highland Council (2012) Highland wide Local Development Plan (HwLDP)

- GPP01: Understanding your environmental responsibilities – good environment practices;
- GPP02: Above ground oil storage;
- PPG03: Use and design of oil separators in surface water drainage systems;
- GPP05: Works and maintenance in or near water;
- PPG07: Safe storage - the safe operation of refuelling facilities
- GPP08: Safe storage and disposal of used oils;
- GPP13: Vehicle washing and cleaning;
- GPP21: Pollution incident response plans; and
- GPP22: Dealing with spills.

14.4.7 CIRIA publications, including:

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

14.4.8 SEPA publications, including:

- Engineering in the Water Environment: Good Practice Guide – Sediment Management (2010);
- Groundwater Protection Policy for Scotland, Version 3 (2009); and
- Guide to Hydropower Construction Good Practice, Version 3 (2019).

14.5 Methodology

Desk Study

14.5.1 An initial desk study has been undertaken to determine and confirm baseline characteristics by reviewing available information on soils, geology and the water environment. The following sources of information have been consulted in order to characterise the baseline conditions of the site and study area:

- Ordnance Survey (OS) 1:50,000 and 1:25,000 scale mapping;
- National Library of Scotland, Historic Ordnance Survey (OS) Mapping[4];
- Natural England MAGIC map[5];
- NatureScot SiteLink[6];

[4] National Library of Scotland Historical Ordnance Survey Mapping. Available at https://maps.nls.uk/geo/explore/#zoom=5.0&lat=56.00000&lon=-4.00000&layers=1&b=1 accessed May 2023

[5] Natural England MAGIC map. Available at https://magic.defra.gov.uk/MagicMap.aspx accessed May 2023

[6] NatureScot SiteLink. Available at https://sitelink.nature.scot/home accessed May 2023

- James Hutton Institute, The National Soil Map of Scotland (1:250,000)[7];
- British Geological Survey (BGS) Onshore GeoIndex (1:50,000)[8];
- BGS Hydrogeological maps of Scotland[9];
- SEPA flood maps[10];
- SEPA environmental data[11]; and
- Data requests to SEPA and the THC (March 2022).

Field Study

14.5.2 The project engineers, hydrologists, hydrogeologists, 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.

14.5.3 Detailed site visits and walkover surveys have been completed which have been used to verify information collected during the desk and baseline study. These include peat probing and hydrological surveys completed on the following dates:

- September 2021 to conduct an initial hydrological walkover;
- January 2022 to conduct initial peat / soil depth probing exercise;
- May 2022 to conduct additional peat / soil depth probing exercise and undertake a survey of watercourse crossings;
- January 2023 to conduct private water supply survey, peat depth probing and augering;
- May 2023 to conduct additional peat / soil depth probing and auguring and undertake a survey of watercourse crossings;
- June 2023 to complete additional peat / soil depth probing and undertake a survey of watercourse crossings; and
- July 2023 to conduct additional peat / soil depth probing and peat augering.

14.5.4 The field work has been undertaken in order to:

- verify the information collected during the desk and baseline study;
- assess the geology, condition and distribution of peat;
- assess potential habitat restoration areas;

[7] James Hutton Institute, National Soil Map of Scotland. Available at https://soils.environment.gov.scot accessed May 2023

[8] British Geological Survey, Onshore Geoindex. Available at https://mapapps2.bgs.ac.uk/geoindex/home.html accessed May 2023

[9] British Geological Survey, Hydrogeological maps of Scotland. Available at https://www.bgs.ac.uk/datasets/hydrogeological-maps-of-scotland/ accessed May 2023

[10] Scottish Environment Protection Agency, Flood Maps. Available at https://www.sepa.org.uk/environment/water/flooding/flood-maps/ and https://map.sepa.org.uk/reservoirsfloodmap/Map.htm accessed May 2023

[11] Scottish Environment Protection Agency, Environmental Data. Available at https://www.sepa.org.uk/environment/environmental-data/ accessed May 2023

- allow appreciation of the study area and undertake visual assessment of ground conditions and hydrology relative to the Proposed Development;
- identify drainage patterns, areas vulnerable to erosion or sedimentation deposition and any pollution risks;
- assess areas of potential GWDTE; and
- visit potential watercourse crossing and prepare a schedule of potential watercourse crossings.

14.5.5 The desk study and field surveys have also been used to identify potential development constraints and have been used as part of the iterative design process.

14.5.6 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.

Assessment Methodology

Sensitivity of Receptor

14.5.7 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 14.2: Sensitivity of Receptors**. Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at the associated level of sensitivity.

Table 14.2: Sensitivity of Receptors

Sensitivity	Definition
High	• soil type and associated land use is highly sensitive (e.g. unmodified blanket bog / peatland) • SEPA Water Framework Directive Water Body Classification: High-Good or is close to the boundary of a classification: Moderate to Good or Good to High • receptor is of high ecological importance or National or International value (e.g. Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), habitat for protected species) which may be dependent upon the hydrology of the Development Area • receptor is at high risk from flooding above 0.5% Annual Exceedance Probability (AEP) and/or water body acts as an active floodplain or flood defence • receptor is used for public and/or private water supply (including Drinking Water Protected Areas) • groundwater vulnerability is classified as High • if a Groundwater Dependent Terrestrial Ecosystem or Geological Conservation Review is present and identified as being of high sensitivity
Moderate	• soil type and associated land use moderately sensitive (e.g. arable, commercial forestry)

	• SEPA Water Framework Directive Water Body Classification: Moderate or is close to the boundary of a classification: Low to Moderate • receptor is at moderate risk from flooding (0.1% AEP to 0.5% AEP) but does not act as an active floodplain or flood defence • moderate classification of groundwater aquifer vulnerability
Low	• soil type and associated land use not sensitive to change in hydrological regime and associated land use (e.g. intensive grazing of sheep and cattle). • SEPA Water Framework Directive Water Body Classification: Poor or Bad • receptor is at low risk from flooding (less than 0.1% AEP) • 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

14.5.8 The potential magnitude of impact would depend upon whether the potential effect would cause a 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. The criteria that have been used to assess the magnitude of impact are defined in **Table 14.3: Magnitude of Change**.

Table 14.3: Magnitude of Change

Magnitude	Criteria	Definition
Major	Results in a loss of attribute	Long-term or permanent changes to the baseline soils, geology, hydrology, hydrogeology and water quality 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 • 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 soils, geology, hydrology, hydrogeology and water quality, such as: • loss of extensive areas of soils habitat, damage to important geological structures/features

		• some fundamental 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 • 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 soils, 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 • 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 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 • no alteration to groundwater recharge or flow mechanisms

Significance of Effect

14.5.9 Any potential effects of the Proposed Development on geology or the water environment identified by the assessment have been addressed and mitigated by the design and the application of good practice guidance to be implemented as standard during construction and operation to prevent, reduce or offset effects where possible. As such a number of measures would form an integral part of the construction process and these have been taken into account prior to assessing the likely effects of the Proposed Development (embedded mitigation as discussed in **Section 14.7**). Where appropriate, and furthermore tailored mitigation measures have been identified prior to determining the likely significance of residual effects.

14.5.10 Good practice measures would be applied in relation to pollution risk, sediment management, peat management and management of surface runoff rates and volumes. This would form part of the CEMP to be implemented for the Proposed Development which would be secured by a planning condition and would be prepared prior to construction commencing (see **Volume 4, Appendix 3.3: Outline CEMP**). The final CEMP would include details and responsibilities for environmental management on-site for environmental aspects and would outline the necessary surface water management, oil and chemical delivery and storage requirements, waste management, traffic and transport management and would specify monitoring requirements for wastewater, water supply and all appropriate method statements and risk assessments for the construction of the Proposed Development.

14.5.11 The sensitivity of the receiving environment together with the magnitude of the change determines the significance of the effect, which can be categorised into level of significance as identified in **Table 14.4: Significance of Effect**. This also considers good practice measures implemented and embedded as part of the design and construction of the Proposed Development and use of professional judgement where appropriate.

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

Table 14.4: Significance of Effect

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

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

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

14.5.15 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 and carbon rich soils during construction and operation; and
- potential impact on areas of GWDTE during construction and operation.

14.5.16 Cumulative or in-combination effects associated with operation of other PSH schemes on water levels in Loch Ness, flood risk in Loch Ness, and on navigation with the Great Glan Canal are considered in **Chapter 7: Water Management**.

Assumptions and Limitations

14.5.17 The assessment uses site investigation, 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.

14.5.18 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.

14.6 Baseline Conditions

Existing Baseline

Site Setting

14.6.1 The Site Boundary is located between the eastern bank of Loch Ness and the B862 road at Whitebridge, within the Dell Estate, centred on National Grid Reference (NGR) NH 47293 16079.

14.6.2 Review of OS mapping indicates that the ground elevation across the Site Boundary range from approximately 20 m Above Ordnance Datum (AOD) along the banks of Loch Ness within the western extent of the Site to approximately 300 m AOD at the summit of Torr Paiteag and the Whitebridge Plantation within the centre and southeastern extent of the Site Boundary respectively.

Designated sites

14.6.3 Review of NatureScot SiteLink indicates that there is one designated site located within the study area (see **Volume 2, Figure 14.1: Local Hydrology**):

- The northwestern extent of the Site Boundary lies within the Easter Ness Forest Site of Special Scientific Interest (SSSI), which is also part of the Ness Woods Special Area of Conservation (SAC). The SAC and SSSI are designated for otters (*Lutra lutra*) and various woodland habitats including upland mixed ash woodland, upland oak woodland, mixed woodland on base-rich soils associated with rocky sloped and western acidic oak woodlands. Measures to maintain existing water flow paths and water quality are presented in this Chapter and potential effects as a consequence of the Proposed Development on the SSSI and SAC are also considered in **Chapter 10: Terrestrial Ecology.** The potential for the Proposed Development to impact the integrity of the qualifying features Ness Woods SAC is assessed in the **Shadow HRA,** submitted in support of the Section 36 Application.

14.6.4 Three further designated sites have been highlighted through consultation with statutory consultees, which include:

- The Loch Knockie and nearby Lochs Special Protected Area (SPA), which is also designated as Knockie Lochs SSSI. The SPA and SSSI is located approximately 850 m southwest of the Site and is designated for Slavonian grebe breeding habitat. The qualifying feature of the SPA and SSSI is not water dependent and is located within a different surface water catchment to the Proposed Development. Therefore, it is not considered further in this Chapter. Potential effects of the Proposed Development on the SPA and SSSI are considered in **Chapter 11: Ornithology.** The potential for the Proposed Development to impact the integrity of the qualifying features he Loch Knockie and nearby Lochs SPA is assessed in the **Shadow HRA,** submitted in support of the Section 36 Application. It is not considered further in this Chapter.
- River Moriston SAC. The SAC is located approximately 2 km west of the Site. The river discharges into Loch Ness and is designated for Atlantic salmon and freshwater pearl mussel. The Proposed Development drains into Loch Ness. The potential for the Proposed Development to impact the integrity of the qualifying features River Moriston SAC is assessed in the **Shadow HRA,** submitted in support of the Section 36 Application. The SAC is considered to be at a sufficient distance from the Proposed Development that any effects that might be attributable to changes in water quality would not be discernible. It is not considered further in this Chapter.
- Urquhart Bay Wood SAC and SSSI. The SAC and SSSI is located approximately 14 km northeast of the Site, along the banks of Loch Ness downstream of the Proposed Development. The SAC and SSSI has been designated for wet woodland and alder woodlands on floodplain habitats. The potential for the Proposed Development to effect water levels at the SAC and SSSI is considered in **Chapter 10: Terrestrial Ecology** and **Volume 4, Volume 4, Appendix 10: 6: Eco-hydrological assessment of the impacts of the Loch Kemp Pumped Storage Scheme on Urquhart Bay Wood SAC.** The potential for the Proposed Development to impact the integrity of the qualifying features Urquhart Bay Wood SAC is assessed in the **Shadow HRA,** submitted in support of the Section 36 Application. It is not considered further in this Chapter.

Soils and Geology

Soils and Superficial Deposits

14.6.5 An extract of 1:250,000 National Soil Map of Scotland is presented as **Volume 2, Figure 14.2: Soils**. This shows that the western extent of the Site Boundary is underlain by rankers, peaty podzols and peaty gleys, whilst the eastern extent of the Site is underlain by humus iron podzols and peaty gleys. A small area of noncalcareous gleys is located along part of the southern boundary of the Site.

14.6.6 An extract of the peatland classification dataset published by Scottish Natural Heritage (now NatureScot) is shown on **Volume 2, Figure 14.3: Peatland Classification**. This shows that several discrete areas of Class 1 peatland are located within the Site, in particular an area approximately 260 m west of Dam 3 (within the proposed inundation area) and beneath and between Dam 4 and 5. Other small, isolated areas of Class 1 peatland are within the northern extent of the Site. Class 1 peatland is considered to be nationally important carbon-rich soils, deep peat and priority peatland habitat.

14.6.7 Superficial geological mapping published by the BGS, shown on **Volume 2, Figure 14.4: Superficial Geology**, indicates that the Site is generally underlain by hummocky glacial deposits (sand and gravel) to the east and lacustrine deposits (sand and silt) within the centre of the Site near Loch Kemp. Small areas of peat and glacial till deposits are noted within the western extent of the Site near Loch Ness. A larger area of peat is also noted within the northeastern extent of the Site near

Dam 3. Alluvium deposits are noted within the northeastern extent of the Site, near to the River Fechlin.

14.6.8 As part of the baseline assessment, a comprehensive peat probing exercise has been conducted and informs **Volume 4, Appendix 14.1: Peat Management Plan** and **Appendix 14.2: Peat Landslide Hazard Risk Assessment**. As part of the assessment, peat augering of the peat was undertaken in order to assess its composition, quality and fibrous content. In summary, the investigations show:

- the presence of peat has been assessed at nearly 6,000 locations;
- all elements of the Proposed Development have been subject to peat probing;
- approximately 85% of peat probe locations recorded either no peat or a peat depth of <0.5m;
- where present, the peat has been recorded as typically fibrous and thus suitable for safeguarding and re-use; and
- it is evident, and with reference to the peat depth plans shown in **Volume 4, Appendix 14.1: Peat Management Plan** and **Appendix 14.2: Peat Landslide Hazard Risk Assessment** that, where technically feasible, areas of confirmed peat have been avoided by the Proposed Development.

Bedrock

14.6.9 An extract of the BGS bedrock and linear features geology mapping is presented as **Figure 14.5: Bedrock Geology** which shows that the study area is mostly underlain by the Foyers Igneous complex which comprises granodiorite. Parts of the central areas of the Site is underlain by psammite of the Loch Laggan Psammite Formation and Gairberinn Pebbly Psammite Member. The northwestern boundary of the Site, near Loch Ness, is underlain by the Moine Supergroup which also comprises psammites. Several inferred faults are noted to cross the Site.

Hydrogeology

Aquifer Characteristics

14.6.10 An extract of the BGS 1:625,000 scale Hydrogeological Map of Scotland and 1:100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets are presented in **Volume 2, Figure 14.6: Regional Hydrogeology** and **Figure 14.7: Groundwater Vulnerability** respectively.

14.6.11 **Volume 2, Figure 14.6: Regional Hydrogeology** confirms that the bedrock deposits beneath the Site are unlikely to contain significant groundwater. The BGS classify the bedrock as a low productivity aquifer, whereby, small amounts of groundwater may be present within the near surface weathered zone or secondary fractures.

14.6.12 The Aquifer Productivity and Groundwater Vulnerability datasets (**Volume 2, Figure 14.7: Groundwater Vulnerability**) classify the underlying aquifer (superficial and bedrock) according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity. Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable. It is shown that the superficial deposits within the Development Area are classified as not a significant aquifer. The alluvial deposits within the northeastern extent of the Site are considered to be a moderate to high productivity aquifer dominated by intergranular flow. The bedrock aquifer is confirmed to be a very low productivity aquifer generally without groundwater except at shallow depth with flow almost entirely through fractures and other discontinuities.

14.6.13 The Proposed Development is shown to be underlain by groundwater vulnerability Classes 4a – b, with a small area of Class 5 near the banks of Loch Kemp. The highest vulnerability is noted where little or no superficial deposits are recorded, and thus little attenuation of potential pollutants prior to entry to groundwater.

Groundwater Levels and Flow

14.6.14 Baseline factors that inhibit groundwater recharge locally include the following:

- sloping topography that encourages formation of surface water runoff;
- peat and glacial till where present limits infiltration of rainwater as a result of their characteristic low bulk permeability; and
- the underlying bedrock (where not weathered or fractured) displays a low permeability that limits groundwater recharge.

Groundwater Quality

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

14.6.16 The current status of groundwater bodies in Scotland has been classified by SEPA in accordance with the requirements of the Water Framework Directive (WFD). The study area is located within the Northern Highlands groundwater (SEPA ID: 150701) which is designated with an overall classification of Good with no pressures identifies in 2020 (which is the latest reporting cycle).

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

14.6.17 A national vegetation classification (NVC) habitat mapping exercise has been completed as part of the ecology baseline assessment to identify potential GWDTEs within the Site. The results of the NVC habitat mapping exercise are discussed in detail within **Chapter 10: Terrestrial Ecology** and areas of potential GWDTE are shown on **Volume 2, Figure 14.8: Potential GWDTE**. As assessment of the GWDTE, and in particular a discussion whether the habitats are sustained by ground or surface water, is summarised in **Table 14.5: Groundwater Dependent Terrestrial Ecosystems**.

Table 14.5: Groundwater Dependent Terrestrial Ecosystems

Dominant NVC Community	GWDTE Potential	Location	Discussion
M15	Moderate	Small areas across the entire Site Boundary.	The M15 habitats are typically located on sloped ground which is underlain by low permeability deposits (lacustrine, peat, hummocky glacial deposits and igneous and metamorphic bedrock). The distribution is not typical of that attributable to a dominant groundwater discharge and is not consistent with changing geological units which underlie the area. It is therefore considered that

			rainfall, surface water and water logging of the soils sustain these habitats, and not groundwater.
M25	Moderate	A small area to the northeast of Dam 5, on sloped ground adjacent to the Allt Leachd Gowrie.	The M25 habitat is located within or adjacent to a watercourse corridor. It is therefore considered that these habitats are sustained by surface water and waterlogging of soils adjacent to the watercourses.
MG10	Moderate	A small linear area within the eastern extent of the Development Area, along where the new water supply pipe is proposed.	The MG10 habitat is located on sloped ground adjacent to an unnamed loch and watercourse and upslope of the unnamed watercourse. It is therefore considered that these habitats are sustained by surface water and waterlogging of soils adjacent to the watercourses.

14.6.18 Review of **Volume 2, Figure 14.8: Potential GWDTE** and **Table 14.5: Groundwater Dependent Terrestrial Ecosystems** indicates that there are no areas of high potential GWDTE, or flush communities noted within the Site.

14.6.19 It is concluded that the areas mapped as potential 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, as discussed in **Section 14.7**.

Private Water Supplies and Licensed Sites

14.6.20 As part of the assessment, a data request was made to THC for details of Private Water Supplies (PWS) sources within the study area. These are shown on **Volume 2, Figure 14.1: Local Hydrology**, review of which indicates:

- 12 PWS are located within the study area, one of which lies within the Site (PWS01); and
- the PWS sources consist of seven boreholes, two wells, one spring, one watercourse abstraction and one loch abstraction.

14.6.21 The majority of the PWS sources outside of the Site are located either upstream of the Proposed Development or are separated from the site by a large watercourse; they are not considered to be hydraulically connected to the Site and therefore not considered further in this assessment.

14.6.22 There is one PWS within the Site (PWS01) which is a surface water abstraction from Loch Paiteag, located at NGR 247402 815421, and serves six properties within the Dell Estate. The PWS is owned and managed by the estate, who are party to the Application. No development is proposed in the surface water catchment to Loch Paiteag, and thus the source of this water supply will not be impaired by the Proposed Development. A new water pipeline is proposed to route water from the loch to the properties and maintain this water supply as part of the Proposed Development (as shown on **Volume 2, Figure 3.1: Proposed Development**). It is therefore not considered to be at risk from the Proposed Development.

14.6.23 As part of this assessment and walkover survey three further PWS sources were identified:

- Two sources are associated with the property at Braeholm which is located approximately 80 m south of the Site at NH 47978 14610. One source (PWS02) is a borehole. Following discussion with the site owner is reported to be completed within the superficial deposits. It is located >250 m from the nearest element of the Proposed Development and therefore, in accordance with SEPA guidance, is not considered further as it is not considered at risk. A second, surface water source is maintained at the property (PWS03), which it is understood is used for animal watering and is located at NH 47999 14710, approximately 100 m northeast of the property. The water catchment area to this source extends northwards and includes the proposed access track within the Site. Existing drainage pathways, therefore, will need to be maintained to ensure the integrity of this water source.
- The property at Easter Drummond is supplied by a surface water source (PWS04), which is located at NH 47837 14565, approximately 130 m north of the property. The catchment to this source extends north eastwards within the Site. Existing drainage pathways, therefore, will need to be maintained to ensure the integrity of this water source.

14.6.24 CAR authorisations and licences were obtained from SEPA's environmental database; 24 are reported within the study area and are generally located towards the southeast of the study area and are associated with properties at Whitebridge. Two CAR licences are located within the Development Area, within the Whitebridge Plantation area. At the time of reporting no information had been provided by SEPA that details the type and holder of the authorisations.

Hydrology

14.6.25 The local hydrology is shown on **Volume 2, Figure 14.1: Local Hydrology**. A detailed description of the local hydrology and management of water at the Proposed Development is given in **Chapter 7: Water Management**.

14.6.26 The study area is located wholly within the surface water catchment of the Loch Ness. The eastern extent of the study area is located in the River Foyers catchment, a tributary of Loch Ness.

14.6.27 Much of the Development Area lies within the catchment of Loch Kemp. The loch has a catchment area of approximately 4.1 km^2 and which extends southwards from the loch. The loch has an outflow on its northern boundary and which flows for a short distance before discharging to Loch Ness.

14.6.28 The entire Loch Ness catchment (i.e. including the Site and the study area) has been designated as a DWPA. The DWPA supplies the Invermoriston Water Treatment Works (WTW).

Surface Water Flow

14.6.29 SEPA do not maintain any surface water flow gauges in the study area.

14.6.30 To inform the design of the Proposed Development, the outflow of Loch Kemp has been monitored by MNV Consulting on behalf of the Applicant. The monitoring location is at NGR NH 46779 16869 (see **Volume 2, Figure 14.1: Local Hydrology**). Flow is monitored with a water level sensor with data logger and stageboard and water level data is recorded every 15 minutes. The following are summary statistics from the monitoring record (January 2022 – February 2023):

- Q5 – 0.2236 m^3/s;
- Q10 – 0.1800 m^3/s;

- Q50 – 0.0524 m^3/s;
- Q90 – 0.0000 m^3/s;
- Q95 – 0.0000 m^3/s; and
- Q99 – 0.0000 m^3/s

Surface Water Quality

14.6.31 Water quality is monitored by SEPA and classified annually in accordance with the requirements of the WFD. **Table 14.6: SEPA Surface Water Quality Data** provides summary details of the SEPA classifications reported in 2020 (the latest reporting cycle) for watercourses in the study area. Smaller watercourses within the study area are not monitored by SEPA. It is shown that typically, the watercourses have a Good overall status.

Table 14.6: SEPA Surface Water Quality Data

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical Status	Hydromorphology	Pressures
Loch Ness (ID: 100156)	Good	Good	Good	High	None
River Foyers – Loch Ness to Whitebridge (ID: 23387)	Good ecological potential	Moderate	High	Moderate	None
River Fechlin – Whitebridge to Loch Mhor Transfer (ID: 23388)	Moderate ecological potential	Moderate	-	Moderate	Water abstractions and water flows from hydroelectricity generation
Allt Breineag (ID: 20275)	Good ecological potential	Moderate	High	Moderate	None

Fisheries

14.6.32 Fisheries within the study area are managed by the Ness and Beauly Fisheries Trust (NBFT) in partnership with the Ness District Salmon Fisheries Board (NDSFB). Fishery interests are discussed in detail and assessed within **Chapter 13: Fish**.

Flood Risk

14.6.33 A summary of the potential sources of flooding and a review of the potential risk posed by each source to the Site is presented in **Table 14.7: Flood Risk Screening**.

Table 14.7: Flood Risk Screening

Potential Source	Potential Flood Risk to the Proposed Development	Justification
Coastal flooding	No	SEPA flood mapping confirms the Proposed Development is not at risk from tidal or coastal flooding.
River flooding	Yes (minor)	SEPA mapping has identified that the main floodplain extents are local, never extending far from the main waterbodies or watercourses. This is not considered to pose a development constraint.
Surface water flooding	Yes (minor)	SEPA have identified several areas of surface water flood risk across the Site Boundary, generally consistent with the main waterbodies. It is noted that flood extents are localised, never forming large, linked areas or flow paths. This is not considered to pose a development constraint.
Groundwater flooding	No	The SEPA groundwater flood map illustrates that the Site Boundary is considered at low risk from potential groundwater flooding. The desk-based assessment which has shown that there is little potential for significant quantities of groundwater.
Flood Defence Breach (Failure)	No	SEPA has produced reservoir inundation maps for those sites currently regulated under the Reservoirs Act 1975. Review of the SEPA Inundation Mapping highlights that there is no risk of reservoir inundation at the Site Boundary. There are several reservoir risks associated with Loch Ness and Loch Mhor to the northwest and northeast of the Site Boundary respectively, however they don't encroach onto the Site Boundary itself.
Flooding from artificial drainage systems	No	The Site Boundary is located within a remote area and no flood defences are noted within the Site Boundary.
Flooding due to infrastructure failure	Yes	There is no infrastructure, such as water mains and sewers, located within the Site Boundary.

Summary of Sensitive Receptors

14.6.34 **Table 14.8: Summary of Sensitive Receptors** outlines the receptors identified as part of the baseline study and from the field investigation programme, and their sensitivity based upon the criteria contained in **Table 14.2: Sensitivity of Receptors**. These receptors form the basis of the assessment, and as per the methodology, are used in conjunction with an estimate of the magnitude of an impact to determine the significance of any potential effect.

Table 14.8 Summary of Sensitive Receptors

Receptor	Sensitivity	Reason for Sensitivity
Designated Sites	High	The River Moriston SAC and Urquhart SAC and SSSI both lie on the banks of Loch Ness – as described in this Chapter these are assessed in **Chapter 10: Terrestrial Ecology** and a separate **Shadow HRA**. The Proposed Development passes through Easter Ness Forest Site SSSI which is also part of the Ness Woods SAC. While the qualifying interests are not water dependent existing water flows paths and quality will need to be maintained. This is considered in this Chapter.
Soils and Geology	High	Areas of peat and carbon rich soils have been recorded with the Development Area. With the exception of peat the superficial and bedrock geology is not rare and is not considered sensitive.
Hydrogeology	High	Groundwater beneath the Site Boundary has been classified as Good and vulnerability is classified as High. All of Scotland's groundwater bodies have been designated as DWPAs.
Hydrology	High	Surface water catchments within the study area have been classified by SEPA as Good – Moderate.
Flooding	Moderate	Little flood risk has been identified on-site, but the Proposed Development has potential to alter surface water flow paths and increase flood risk downstream of the Site Boundary.
Private Water Supplies and Licenced Sites	High	A private water supply source at Braeholm is used for animal and garden watering, which abuts the southern Site Boundary (PWS03). Easter Drummond is supplied by a surface water source (PWS04). The catchment to this source extends north eastwards within the Site Boundary. The Proposed Development lies within the surface water catchment to both of these supplies. No licensed sites have been identified at risk from the Proposed Development.
Drinking Water Protected Area	High	The Site Boundary lies within a DWPA.
GWDTE	High	Areas of moderate potential GWDTE have been identified by NVC mapping. It has been shown that the habitats are not sustained by groundwater but by rainfall and surface water flow paths. Surface water flow paths to these habitats will need to be safeguarded to ensure these habitats are sustained.

Future Baseline

14.6.35 Due to proposed consent in perpetuity, the temporal scope requires consideration for climate change to alter future baseline conditions. 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, in summer and winter, may also increase in volume and velocity.

14.7 Mitigations by Design / Embedded Mitigation

14.7.1 Mitigation has been developed as the project design has progressed as described in **Chapter 2: Design Evolution and Alternatives**. The impact assessment and mitigation process has been iterative and therefore mitigation has been developed for the design to be as specific as possible and as an assumed part of the Proposed Development. This has included avoiding areas of deep peat or potential peat instability, watercourse locations, areas of potential flooding, PWS and GWDTE.

14.7.2 A description of all elements of the Proposed Development is given in **Chapter 3: Description of Development**. Embedded mitigation and mitigation by design relevant to the soils, geology, and water environment is presented below.

Water Management

14.7.3 A compensation flow discharge to the Allt an t-Sluichd which mimics the natural outflow from the existing (baseline) catchment would be made (see **Chapter 7: Water Management**). This outflow would also be maintained during construction. The rate of discharge will be agreed with SEPA as part of a CAR application and would be informed by the existing site-specific flow monitoring record.

14.7.4 The quality of water shed to and discharged via the Allt an t-Sluichd to Loch Ness would also be subject to controls agreed with SEPA during the construction and operational phases and regulated by a CAR authorisation. Measures which would be used to minimise erosion and generation of suspended sediment, control water quality and the rate of storm water runoff during construction of the Proposed Development are given in the sections that follow.

14.7.5 Similarly, works on the banks of Loch Ness, would be regulated by SEPA using the powers afforded by the CAR. Prior to any construction occurring, a CAR application would be made and will contain details of proposed construction methods, and safeguards to protect the water environment. Works would only commence once these details have been agreed with SEPA in consultation with statutory consultees.

14.7.6 The CAR authorisation(s) would also ensure navigation and fisheries interests are not impaired.

Peat Management and Landslide Hazard Risk Assessment

14.7.7 The potential presence of peat within the Site Boundary formed a key consideration in the design of the Proposed Development. Informed by the extensive programme of peat probing undertaken across the Development Area, the design has tried to avoided areas of deeper peat whilst maximising the potential energy yield of the development.

14.7.8 A comprehensive programme of peat depth probing has been undertaken in order to accurately determine the volume of peat which will be disturbed by the Proposed Development. This data has been used to prepare a site specific PMP (see **Volume 4, Appendix 14.1: Peat Management Plan**) which details peat condition, the volume of acrotelmic and catotelmic peat which would be disturbed, and how this would be safeguarded and reused on-site.

14.7.9 As shown in **Volume 4, Appendix 14.1: Peat Management Plan** and **Appendix 14.2: Peat Landslide Hazard Risk Assessment** measures have been proposed to ensure the stability of peat and carbon rich soils and that peat and soils that would be disturbed by the Proposed Development can be safeguarded and beneficially re-used on-site. The Policy aims of NPF4, regarding soils and peat, are therefore met.

14.7.10 A Design and Geotechnical Risk Register would be compiled to include risks relating to peat instability, as this would be beneficial to both the developer and the Contractor in identifying potential risks that may be involved during construction. Good construction practice and methodologies to prevent peat instability within areas that contain peat deposits are identified in **Volume 4, Appendix 14.2: Peat Landslide Hazard Risk Assessment**. 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 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.

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

Geology and Ground Stability

14.7.12 Given the locality of the Proposed Development in relation to the Great Glen Fault, and the presence of inferred fault lines on BGS mapping, there is potential for varying rock quality, even at significant depths. To mitigate issues with varying rock quality, which could result in unstable rock faces during

underground excavation and tunnelling works, the potential requirement for lining of the tunnels and underground excavations is embedded in the design.

14.7.13 Seismic activity in the area could have the potential to destabilise the permanent works however, embedded within the design is the legal requirement that the proposed dams will be designed, constructed and operated in accordance with the Reservoirs (Scotland) Act 2011.

14.7.14 Although the impacts on geology have largely been scoped out, during the construction phase substantial excavation, tunnelling and earthworks will be required. A materials balance has been prepared (see **Volume 4, Appendix 3.4: Outline Spoil Management Plan**), which shows that excavated materials can be used on site and in the formation of the required dams.

Buffer to Watercourses

14.7.15 In accordance with consultation responses, a 10 m buffer has been applied to watercourses (shown on OS 1:50,000 mapping) and, with the exception of the proposed watercourse crossings, where practical any proposed construction activities or infrastructure has been located outside of this buffer. The buffer included the existing Loch Kemp but excludes the inundation area, which wouldn't be present until the Proposed Development is operational.

14.7.16 The buffer between the the Allt a' Chinn Mhonaich watercourse and the access track to the lower works, which is located within the Easter Ness Forest SSSI/ Ness Woods Special Area of Conservation (SAC), has been increased as far as feasible, to a minimum of 14 m, given the topography and protected habitats present in this area, as described in **Chapter 2: Design Evolution and Alternatives**.

14.7.17 The layout of the access tracks was designed to minimise the requirement for watercourse crossings. Where possible existing tracks have been used and incorporated into the Proposed Development.

Groundwater Dependent Habitats

14.7.18 It has been shown that areas identified as being potentially moderately groundwater dependent are likely to be sustained by incident rainfall and local surface water runoff rather than by groundwater. Accordingly, the buffers proposed in SEPAs GWDTE guidance need not apply. No areas of potentially high groundwater dependent habitat were identified.

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

Good Practice Construction Measures

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

14.7.21 The Proposed Development will be in accordance with good practice guidance, including UK and Scottish guidance on good practice for construction projects detailed in **Section 14.4** of this Chapter.

Construction and Environmental Management Plan (CEMP)

14.7.22 A contractual management requirement of the successful Principal Contractor would be the development and implementation of a comprehensive and site-specific CEMP. This document would detail how the successful Principal Contractor would manage the works in accordance with all commitments and mitigation detailed in the EIA Report, statutory consents and authorisations, and industry best practise and guidance, including pollution prevention guidance (see **Volume 4, Appendix 3.3: Outline CEMP**).

14.7.23 The CEMP will outline measures to ensure that the works minimise the risk of an adverse impact to peat, groundwater, surface water and water dependent habitats.

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

- any above ground on-site fuel and chemical storage would be bunded;
- emergency spill response kits would be maintained during the construction works;
- a vehicle management system would be put in place wherever possible to reduce the potential conflicts between vehicles and thereby reduce the risk of collision;
- a speed limit would be used to reduce the likelihood and significance of any collisions;
- drip trays will be placed under vehicles which could potentially leak fuel/oils;
- any water contaminated with silt or chemicals will not be discharged directly or indirectly to a watercourse without prior treatment; and
- water for temporary site welfare facilities will be brought to site, and foul water will be collected in a tank and collected for off-site disposal at an appropriately licensed facility.

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

Ecological Clerk of Works

14.7.26 To ensure all reasonable precautions are taken to avoid negative effects on the soils and water environment, a suitably qualified ECoW will be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on all ecological and hydrological matters. The ECoW will be required to be present on-site during the construction phase and will carry out monitoring of works and briefings with regards to any ecological and hydrological sensitivities on the site to the relevant staff of the Principal Contractor and subcontractors.

14.7.27 With respect to the water environment, the ECoW would also have responsibility to ensure water flow paths and quality to water dependant habitats are sustained during all phases of the Proposed Development.

Water Quality Monitoring

14.7.28 Water quality monitoring during the construction phase would be undertaken for the surface water catchments that drain from the Site Boundary to ensure that none of the tributaries of the main channels are carrying pollutants or suspended solids. Monitoring would be carried out at a specified frequency (depending upon the construction phase) on these catchments.

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

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

14.7.31 The water quality monitoring programme would also be used to confirm there is no impact to the Loch Ness DWPA and Easter Ness Forest SSSI, which is also part of the Ness Woods SAC.

Pollution Risk

14.7.32 Good practice measures in relation to pollution prevention would include the following (and which would also be included in the works information for the project:

- refuelling would take place at least 50 m from watercourses;
- foul water generated on-site would be managed in accordance with PPG4;
- areas would be designated for production of concrete or washout of vehicles which are a minimum distance of 50 m from a watercourse;
- washout water would also be stored in the washout area before being treated and disposed of, or re-used in concrete production;
- if any water is contaminated with silt or chemicals, runoff would not enter a watercourse directly or indirectly prior to treatment;
- water would be prevented as far as possible, from entering excavations such as trenches and foundations;
- procedures would be adhered to for storage of fuels and other potentially contaminative materials in line with the Controlled Activity Regulations, to minimise the potential for accidental spillage; and
- a plan for dealing with spillage incidents would be designed prior to construction, and this would be adhered to should any incident occur, reducing the effect as far as practicable. This would be included in the final CEMP for the Proposed Development.

14.7.33 Over the longer term, it would be expected that inorganic and organic sediment derived from the water abstracted from Loch Ness and from natural surface water runoff from the catchment to Loch Kemp will accumulate within Loch Kemp. The accumulation of sediment could increasingly influence, and potentially reduce, the quality of water within Loch Kemp either through mobilisation of fine sediment into the water column increasing turbidity, or nutrient enrichment and oxygen depletion.

14.7.34 However, it is not expected that the rate of accumulation would be rapid as the water from Loch Ness has a relatively low turbidity and productivity and the catchment area to Loch Kemp is relatively small. Sediment build up would also be monitored and when necessary sediment would be removed for appropriate disposal in accordance with waste legislation, although this is likely to be a very infrequent requirement.

Water Supply and Foul Water Management

14.7.35 During the construction phase, water for the site welfare facilities will either be brought to site by tanker or be provided by a connection to Scottish Water mains, with their prior approval. During operation, it is expected that rainwater harvesting will be used for grey water requirements and potable water will be brought to site or taken from a private water source yet to be determined (such as an abstraction from Loch Kemp), but which would be agreed with SEPA and THC prior to implementation.

14.7.36 As part of the Proposed Development proposals an alternative water supply source and pipeline has been provided for the estate (see **Volume 4, Figure 14.1: Local Hydrology**).

14.7.37 During the construction phase all foul water generated from the welfare facilities would be collected and either treated on site using a package water treatment plant to a standard agreed with SEPA, or removed from site for treatment and disposal at an appropriately licensed facility.

14.7.38 During the operational phase, subject to authorisation by SEPA as required by the CAR, foul water would either be disposed of to a septic tank or stored in a sealed tank prior to removal from site for treatment and disposal at an appropriately licensed facility.

Erosion and Sedimentation During Construction

14.7.39 Good practice measures for the management or erosion and sedimentation would include the following (and which would also be included in the works information for the project):

- all stockpiled materials would be located outwith a 50 m buffer from watercourses;
- water would be prevented, as far as possible, from entering excavations such as trenches and foundations through the use of appropriate cut-off drainage;
- where the above is not possible, water would pass through silt/sediment traps to remove silt prior to discharge into the surrounding drainage system;
- clean and dirty water on-site would be separated, and dirty water would be filtered before entering the water environment;
- silt fences would be deployed as required to reduce sediment transport;
- the amount of ground exposed, and time period during which it is exposed, would be kept to a minimum;
- silt/sediment traps, single size aggregate, geotextiles or straw bales would be used to filter any coarse material and prevent increased levels of sediment. Further to this, activities involving the movement or use of fine sediment would avoid periods of heavy rainfall where possible; and
- the ECoW and the Principal Contractor would carry out regular visual inspections of watercourses to check for suspended solids in watercourses downstream of work areas.

Fluvial Flood Risk

14.7.40 Construction and permanent site workers may be sensitive to flood risk at the Proposed Development. During construction, a wet weather working protocol would be used. This would restrict working in potential flood prone areas (for example in the inundation area or adjacent to watercourses), reducing the risk to workers and machinery.

14.7.41 The wet weather working protocol would also specify areas, which are not prone to flood risk, where construction equipment would be moved to should extreme rainfall or storm warnings be issued by the Met Office and/or SEPA.

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

- drainage systems would be designed to ensure that any sediment, pollutants or foreign materials which may cause blockages are removed before water is discharged into a watercourse;
- on-site drainage would be subject to routine checks to ensure that there is no build-up of sediment or foreign materials which may reduce the efficiency of the original drainage design causing localised flooding;
- drainage measures would attenuate runoff rates and reduce runoff volumes to ensure minimal effect upon flood risk; and
- where necessary, check dams would be used within cable trenches in order to prevent trenches developing into preferential flow pathways.

14.7.43 Further information on drainage designs would be provided in a Drainage Impact Assessment (DIA) which would form part of the final CEMP.

14.7.44 Flood risk during the operational phase of the Proposed Development would be mitigated, managed and regulated by the CAR and Reservoirs Act. The CAR authorisation would detail permitted rates and volume of discharge to / from the Proposed Development and would be cognisant of potential in-combination effects on flood risk as a result of operation of other PSH schemes in the Loch Ness catchment (refer to **Chapter 7: Water Management**).

14.7.45 The probability of flood risk being increased as a consequence of the Proposed Development and enlargement of Loch Kemp is extremely low due to the high standard of design, management, and maintenance required under the Reservoirs Act. As required by the Act, routine inspection of the dams would be undertaken.

14.7.46 The design freeboard within the enlarged Loch Kemp mitigates the potential for wave action on the embankment crests and potential overtopping by waves, by ensuring water levels are below the crest level.

Thermal Stratification in Loch Ness

14.7.47 Due to its size and depth Loch Ness will exhibit seasonal thermal stratification and is expected to be dimictic, meaning that it stratifies twice per year, normally in the spring and autumn. Warming in

the spring creates a warmer well mixed upper layer known as the epilimnion during the summer, which would be expected to be tens of metres deep.

14.7.48 Beneath the epilimnion is the deeper and colder hypolimnion, which is separated from the epilimnion by a transition zone known as the metalimnion. During the autumn cooling of the epilimnion and wind induced turbulence results in an overturn that will mix the water column and induce deeper circulation.

14.7.49 The risk to thermal stratification would only occur during the late spring to early autumn and would increase with more frequent operation. However, it is unlikely that discharges from the Proposed Development would impact the formation and maintaining of thermal stratification due to the relative size of Loch Ness, and the expected depth of the thermocline relative to the elevation of the inlet / outlet structure.

14.7.50 Changes in water temperature of the discharge water will be minimised by the size and depth of water in Loch Kemp, which is also at a slightly higher elevation (cooler), is unlikely to warm differently to the upper layers of Loch Ness. As discussed in **Chapter 13: Fish**, modelling has been undertaken to assess the potential effects of warm water being discharged from Loch Kemp on Loch Ness which showed that thermal stress would not occur in Loch Ness and temperatures rapidly return to background levels in Loch Ness at the point of discharge.

14.7.51 During operation, although highly unlikely, should there be extended periods of time that the system does not operate, this may provide time for heat to be transferred from the bedrock and in turn, could be then transferred to water if contained in the tunnels (again this is unlikely). Nonetheless, this temperature range is considered to be within the natural fluctuation of surface water in Loch Ness and thus not discernible in Loch Ness where water with a slightly different temperature can be quickly assimilated.

Dewatering – Tunnel and Dam Construction

14.7.52 The tunnels would be constructed using a boring machine and would be lined as each tunnel is progressed. This will minimise the potential for groundwater to enter the tunnels. Once constructed, the tunnel lining and the circular cross-sectional shape of the tunnels would allow groundwater to flow around them. Further review of baseline conditions has confirmed the bedrock geology has little potential to store or allow movement of large quantities of groundwater.

14.7.53 The portals for the construction and access tunnels are likely to be constructed by excavation into the bedrock, and as such, it is not envisaged that sheet piling would be required. Again, little groundwater flow is expected as a consequence of low permeability of the superficial and bedrock deposits. The SuDS measures detailed above would be used to attenuate any limited groundwater ingress before it is discharged to surrounding ground. No direct discharge would be made to a watercourse.

Risk of Algal Blooms

14.7.54 Standing waterbodies such as lochs and reservoirs follow yearly cycles of stratification when a temperature gradient is created due to high temperatures, also freezing conditions can cause stratifications.

14.7.55 When high volumes of water are discharged into a standing waterbody during stratification, especially when the frequency of pumping / discharge cycles is high, this can alter the stability of the water column, especially when water enters at higher temperature and velocity that can

mobilise nutrients from existing bed sediments. These conditions increase water turbulence, promoting the mobilisation of nutrients and making them more available for phytoplankton, thus increasing the potential for an algal bloom to occur. However, it is predicted that the risk of this occurring is low because:

- the temperature of water discharged from Loch Kemp is not expected to be significantly higher than that in Loch Ness (see section above 'Thermal Stratification in Loch Ness'); and
- Loch Ness is a low nutrient / productivity water body and it is not anticipated that water in Loch Kemp will have a high concentration of nutrients. · Further there will be high dilution and dispersion potential, even when Loch Ness is thermally stratified.

Permanent Watercourse Crossings

14.7.56 Good practice in relation to new water crossings involves the following aspects:

- the design of the watercourse crossings would be agreed with SEPA prior to construction and be regulated in accordance with CAR;
- the appropriate crossing type would be identified from SEPA's good practice guidance and would take into account any ecological and hydrological constraints; and
- the crossing would be sized and designed so as to minimise effect upon flood risk (sized to accommodate at least the 200 year flow).

14.7.57 No works are proposed to existing watercourse crossings associated with existing access tracks. Should it become apparent, as part of the detailed design stage of the project, that an existing crossing needs to be replaced, then the principles identified above for new crossings would be used.

14.7.58 The location or proposed permanent watercourse crossings are shown on **Volume 2, Figure 14.1: Local Hydrology**. Five are required to provide access to all elements of the Proposed Development. A schedule of watercourse crossings is included within **Volume 4, Appendix 14.3: Schedule of Watercourse Crossings**.

14.7.59 The crossings would be designed to pass the 200-yr flood event and would be agreed upon by SEPA and THC as part of the final CEMP.

Dam Construction

14.7.60 The following measures are proposed to mitigate the effects of dam construction:

- where excavations for foundations encounter localised limited quantities of groundwater or become flooded due to surface water runoff or heavy rainfall, appropriate treatment of dewatering would be instigated under direction of the site ECoW;
- no dewatering discharge would be permitted directly adjacent to watercourses;
- unless directed otherwise by the site ECoW, dewatering discharge would drain across buffer areas of vegetation (e.g. grassland, heather) of at least 20 m width, which would provide for natural attenuation and dispersal of the flow and removal of silt;
- where no suitable vegetation is available for natural treatment of dewatering, the discharge would be passed through on-site settling tanks/lagoons prior to discharge by soakaway or to watercourse;

- the requirement for dewatering would be minimised in all locations by timely and efficient excavation of the foundation void and subsequent concrete pouring and backfilling;
- all procedures for dewatering would be agreed by the Principal Contractor with SEPA, THC and NatureScot, and detailed in the CEMP; and
- the Principal Contractor would develop a method statement to address the transport, transfer, handling and pouring of liquid concrete at foundation sites.

Concrete Batching, Transport and Pouring

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

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

Permanent Access Track Construction

14.7.62 In relation to permanent access track construction the following principles would be adopted:

- tracks would be completed with permeable construction that will allow infiltration of rainwater and lateral movement of surface water flows;
- where required have frequent cross drains to maintain existing surface water flow paths, – location of drains would be determined by the ECoW; and
- they would be constructed with rock and aggregate won on-site and therefore with the same geochemical properties as existing rock and tracks at site.

Water Abstraction (Dust Suppression and Concrete Production)

14.7.63 Any water abstraction would only be made with authorisation from SEPA and in accordance with the CAR. Should a suitable source not be identified, a water bowser would be used. Good practice that would be followed in addition to the CAR regulations includes:

- water use would be planned so as to minimise abstraction volumes;
- water would be re-used where possible; and
- abstraction volumes would be recorded.

14.8 Potential Significant Effects

14.8.1 This section considers the potential impacts and associated effect significance of the construction, and operation of the Proposed Development based on the typical activities described in **Chapter 3: Description of Development.**

Construction Effects

Peat and Soils

14.8.2 It has been shown (see **Volume 4, Appendix 14.1: Peat Management Plan**) and **Section 14.7** that the disturbance of peat and soils as a result of construction of the Proposed Development, can be minimised and the peat deposits safeguarded. Further the Proposed Development proposals include for a significant improvement of peat habitat (refer to **Volume 4, Appendix 10.7: Outline Habitat Management Plan (non-SAC)**).

14.8.3 Peat is a high sensitivity receptor. With the identified safeguards and proposed good practice methodologies, the potential impact on deposits of soil and peat is assessed as negligible and thus the significance of effect is Negligible. No additional mitigation, over and above the proposed site supervision, is required.

Surface Water and Groundwater Quality

14.8.4 As stated above, the Proposed Development would be established in accordance with relevant technical guidance, PPG/GPPs and other codes of best practice, to limit the potential for contamination of both ground and surface waters. In addition, a site-specific CEMP would be prepared by the Principal Contractor and include a groundwater and surface water quality management plan.

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

14.8.6 The safeguards included in the Proposed Development design and the committed best practice construction techniques would also safeguard the quality of water which sustains water dependent habitat, Loch Ness DWPA, Easter Ness Forest Site SSSI and Ness Woods SAC and the PWS's at Braeholm and Easter Drummond.

14.8.7 Surface water and groundwater are considered highly sensitive receptors. The Proposed Development and proposed safeguards embedded in the development design reduce the magnitude of potential impact to negligible, during the construction phase. The significance of effect is therefore assessed as Negligible. No additional mitigation, over and above the proposed confirmatory monitoring, is therefore required.

Surface and Groundwater Flow

14.8.8 Water abstractions associated with construction works can result in local lowering of the water table. This is important in areas of peat deposits, where the water table is characteristically near the ground surface.

14.8.9 The baseline assessment has determined that the deposits which underlie the Proposed Development are unlikely to contain significant amounts of groundwater. In addition, dewatering

associated with construction would be shallow and temporary. Therefore, limited or little dewatering is likely to be required.

14.8.10 The flow of water from Loch Kemp and Loch Ness will be maintained and controlled by a CAR authorisation agreed with and regulated by SEPA. The rate and volume of flow would be agreed post planning and as part of the detailed site design. This would be applicable to both the construction and operational phases of the site development.

14.8.11 Notwithstanding this, the best practice measures listed above would be included in the final CEMP and would be used to control and manage surface and groundwater flows and maintain existing water flow paths at a local scale and be used to ensure water flow paths to water dependent habitat, Loch Ness DWPA, Easter Ness Forest Site SSSI and Ness Woods SAC and the PWS's at Braeholm and Easter Drummond would be maintained.

14.8.12 Surface water and groundwater are highly sensitive receptors. With these safeguards, the potential impact on ground and surface waters is assessed as negligible and thus the resultant significance of effect is Negligible. No additional mitigation, over and above proposed confirmatory monitoring, is required.

Flood Risk

14.8.13 Areas of flood risk are considered to have a moderate sensitivity. As part of the detailed site design the Principal Contractor will prepare a detailed construction method statement which will have regard to areas of known and potential flood risk.

14.8.14 It is proposed that access to the Proposed Development will use existing tracks and watercourse crossings wherever possible. Where permanent new access tracks or watercourse crossings cannot be avoided, the new tracks and watercourse crossings will be constructed in accordance with the best practice methods outlined above.

14.8.15 The design and capacity of the watercourse crossings would also be agreed by the Principal Contractor in consultation with SEPA as part of the detailed design.

14.8.16 With these safeguards the magnitude of potential impact is assessed as negligible, and the resultant significance of effect is assessed as Negligible. No additional mitigation is required.

Designated Sites and DWPAs

14.8.17 With the best practice construction techniques to protect surface water and groundwater receptors outlined above, in combination with the proposed monitoring programme (see Section 14.7) Easter Ness Forest Site SSSI and Ness Woods SAC and Loch Ness DWPA would also be safeguarded.

14.8.18 Easter Ness Forest Site SSSI and Ness Woods SAC and Loch Ness DWPA are both considered highly sensitive receptors. The potential impact on designated sites and DWPA is assessed as negligible and thus the significance of effect is Negligible. No additional mitigation, over and above the proposed water quality monitoring, is required.

Operational Effects

14.8.19 During the operation phase of the Proposed Development, it is anticipated that routine monitoring of infrastructure would be occasionally required. Should any maintenance be required on-site which

would involve construction activities, method statements would be developed and used which will adopt the best practices agreed with regulators as part of the construction phase CEMP.

14.8.20 Operation of the Proposed Development will be managed by CAR licence obtained from SEPA which would be used to safeguard water resources and ensure sustainable use of water.

Peat and Soils

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

14.8.22 Peat is a high sensitivity receptor. The potential impact on deposits of soil and peat is therefore assessed as negligible and thus the resultant significance of effect is Negligible. No additional mitigation is required.

Surface Water and Groundwater Quality

14.8.23 The possibility of a pollution event, resulting in surface water or groundwater impairment, occurring during operation is very unlikely. Any maintenance activities would be undertaken using the same controls agreed with statutory consultees and deployed during the construction phase, including supervision of all works. Further, the scope of works which might be undertaken are no different to the work which would be undertaken during the construction phase.

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

14.8.25 The Applicant is committed to delivering a Habitat Management Plan for the Proposed Development, details of which will be provided and agreed with consultees prior to construction commencing, and which it is expected will be secured by a condition of consent. Habitat management works, as set out in **Volume 4, Appendix 10.7: Outline Habitat Management Plan (non-SAC)**, would be undertaken in accordance with the best practice detailed in this Chapter and would mitigate potential effects on ground and surface water quality.

14.8.26 Based upon this, the potential risk associated with frequency, duration and likelihood of a pollution event is low. It is, therefore, anticipated that the magnitude of a potential impact on surface water or groundwater during the operational phase of the Proposed Development would be negligible, as no detectable change would likely occur. Therefore, the significance of effect during the operational phase of the Proposed Development is predicted to be Negligible on surface water and groundwater. No further or additional mitigation, therefore, is required.

Surface and Groundwater Flow

14.8.27 During the operation of the Proposed Development, it is not anticipated that there would be any excavation or need to stockpile soils, reducing the potential for effects on surface and groundwater flows. Any excavation, handling and placement of material which might be undertaken should maintenance require this, would be subject to the same safeguards that would be used during the construction phase of the project.

14.8.28 The abstraction of surface and groundwater is regulated by SEPA through the CAR licences. Any authorisation issued by SEPA will specify maximum abstractions rates and volumes, and periods of abstraction. It will also specify monitoring the Applicant will need to undertake to show that the abstraction is not impairing surface or groundwater flows.

14.8.29 The management of water and duration and rate of water movement between the proposed upper reservoir (Loch Kemp) and lower reservoir (Loch Ness) will be agreed with consultees and regulated by SEPA by a CAR licence.

14.8.30 Given these controls, the likelihood and magnitude of potential impact on surface and groundwater flow paths would be negligible. Therefore, the potential significance of effect on surface and groundwater flow is Negligible.

14.8.31 No further or additional mitigation, therefore, is required other than the proposed confirmatory operational phase surface and groundwater programme.

Flood Risk

14.8.32 The proposed drainage infrastructure would be subject to routine inspection, and if required maintenance. Where identified, any remedial works would be undertaken using the same controls deployed during the construction phase of the project.

14.8.33 The design, efficacy, inspection and maintenance of the proposed dams will be controlled and regulated by the Reservoirs Act. The Act will ensure that the dams do not increase flood risk.

14.8.34 The likelihood and magnitude of impact which have the potential to increase flood risk would be negligible following adherence to good practice measures. Therefore, the potential significance of effect on surface and groundwater is Negligible. No mitigation is therefore required.

Designated Sites and DWPAs

14.8.35 The controls which would be adopted at Site during the operational phase, and which are in accordance with best practice, will safeguard surface water and groundwater quality, surface water and groundwater flows, and mitigate flood risk. They would ensure that the potential impact on Easter Ness Forest Site SSSI and Ness Woods SAC and Loch Ness DWPA is negligible and thus the significance of effect is Negligible.

14.8.36 No additional mitigation, over and above water quality monitoring, is required.

Cumulative Effects

14.8.37 As discussed in **Section 14.3,** potential in-combination or cumulative effects associated with operation of the Proposed Development with other operational or consented developments on Loch Ness, such as the existing Foyers PSH and the consented Red John PSH, are assessed in **Chapter 7: Water Management** and are therefore not assessed as part of this chapter. Potential effects associated with the construction and operation of the Associated Works (as described in **Section 3.7** of **Chapter 3: Description of Development**) have also been scoped out of further assessment as these will be subject to and assessed as part of a subsequent planning application(s). As discussed in **Section 14.3**, the Peat Management Plan (**Volume 4, Appendix 14.1**) and Peat Landslide Hazard Risk Assessment (**Volume 4, Appendix 14.2**) have considered the Associated Works and have shown the carbon rich soils and peat can be safeguarded; these data and analysis will be presented again in support of the planning application for the Associated Works.

14.8.38 In relation to Associated Works, as set out in **paragraph 14.3.4**, other developments would also be designed, developed, and managed in accordance with best practice, industry standards and relevant legalisation, planning policy and guidance regulated by statutory consultees. These standards ensure, with respect to the geology and soils environment, potential impacts are mitigated and controlled at source.

14.8.39 No cumulative effects are therefore anticipated during the construction or operation phase of the Proposed Development in relation to geology, soils and water.

14.9 Mitigation

Mitigation during Construction

14.9.1 As there are no predicted likely significant effects under the terms of the EIA Regulations during the construction phase of the Proposed Development other than the good practice measures and confirmatory monitoring no specific mitigation is required.

Mitigation during Operational

14.9.2 As there are no predicted likely significant effects under the terms of the EIA Regulations during the operational phase of the Proposed Development other than the good practice measures no specific mitigation is required.

14.10 Residual Effects

Construction Residual Effects

14.10.1 Subject to adoption of best practice construction techniques no significant residual effects are predicted during the construction period of the Proposed Development.

Operational Residual Effects

14.10.2 No significant residual effects are predicted during the operational phase of the Proposed Development.

14.11 Conclusion

14.11.1 An assessment of the potential effects of the Proposed Development on soils, geology, hydrology, hydrogeology within a defined study area (comprising land within 500 m of the Site) has been undertaken.

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

14.11.3 As a consequence of the embedded mitigation included in the site design and subject to the adoption of mitigation measures including good practice measures, no significant residual effects on soils (including peat), geological, surface water or groundwater receptors, including designated sites, Loch Ness DWPA and PWS sources are predicted during the construction and operational phases of the Proposed Development. Potential in-combination or cumulative effects associated

with operation of the Proposed Development with other operational or consented developments on Loch Ness, such as the existing Foyers PSH and the consented Red John PSH are considered in **Chapter 7: Water Management** and are therefore not assessed as part of this chapter.

14.11.4 Confirmatory monitoring is proposed to ensure the construction of the Proposed Development does not impair soils, geology or the water environment during construction. Monitoring of the PWS's at Braeholm and Easter Drummond would form part of the monitoring plan.

14.11.5 During the operational phase of the Proposed Development the transfer of water between Loch Kemp and Loch Ness will be regulated by SEPA and THC. The licences and authorisations issued by regulators will include limits on the volume and rate of surface to ensure there are no cumulative or in-combination effects associated with other operational pump storage schemes in the Loch Ness catchment area.

14.11.6 Further to this the Reservoirs (Scotland) Act secures regular inspection and maintenance of the proposed dams.