Chapter 11: Sloy Pumped Hydro Storage Scheme: Soils, Geology and Water Environment

Chapter 11: Soils, Geology and Water Environment - Contents

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11. Soils, Geology and the Water Environment

11.1. Executive Summary

This Chapter sets out the assessment of the potential effects on soils, geology, and the water environment of the Proposed Development. Water management and the transfer of water between Loch Lomond and Loch Sloy is considered in **Chapter 4: Description of Development**, and potential effects on ecology is given in **Chapter 9: Terrestrial Ecology**.

The scope of the assessment was informed by scoping responses received from statutory and non-statutory consultees.

Information for the study area was compiled using baseline information from a desk study which was verified by a site visit. The results of previous site investigations have also been reviewed. The assessment was undertaken considering the sensitivity of receptors identified during the baseline study and considering mitigation measures incorporated in the development of the design. It has also considered potential future changes to baseline conditions.

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.

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 will include provision for controls to limit erosion and sedimentation, and a commitment to provide a drainage management plan which would be agreed with statutory consultees, including SEPA and NatureScot and which would be used to safeguard water resources, including water quality in Loch Lomond and Loch Sloy, and manage any potential flood risk. Where feasible, Sustainable Drainage Systems (SuDS) will be included in these plans. The CEMP also includes provision of a Pollution Prevention Plan which would also be agreed with statutory consultees including SEPA prior to any construction works being undertaken.

As part of this application, detailed discussions have been held with Scottish Water and a commitment has been given to undertake a water quality assessment and process review of Belmore Water Treatment Works (WTW). This will enable Scottish Water and SSE Renewables to understand the water quality of the Lomond / Sloy blend and confirm whether it would remain within the treatable envelope for Belmore WTW. 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 would not have a significant effect on the water environment. The monitoring programme would also be used to ensure private water supplies within 500m of the PDA, Drinking Water Protected Areas, and water dependent designated sites are safeguarded. It is assumed that the monitoring programme would be agreed with statutory consultees as part of the detailed design stage of the project.

11.2. Introduction

This Chapter considers the potential effects, including cumulative effects, of the Proposed Development on soils, geology, and the water environment (hydrology and hydrogeology). The assessment of potential impacts has been made on the basis of the Proposed Development fully described in **Chapter 4: Description of Development**. It outlines the embedded good practice methods which would be used during construction and operation of the Proposed Development to prevent or reduce identified effects and risks.

As noted in **Chapter 4: Description of Development**, decommissioning has been scoped out from this assessment. Therefore, decommissioning is not discussed further in this Chapter.

Further mitigation methods to address any potential effects are proposed, where appropriate, and residual effects are assessed.

Supporting **Figures 11.1 to 11.5 (Volume 2)** are referenced in the text where relevant.

The assessment uses information and findings presented in **Chapter 4: Description of Development** and **Chapter 9: Terrestrial Ecology**.

This assessment has been carried out by SLR Consulting Limited under the supervision of Gordon Robb (BSc, MSc, MBA, C.WEM, FCIWEM). He 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.

11.3. Scope Of Assessment

11.3.1. STUDY AREA

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 500m buffer to the Proposed Development Area (PDA), as depicted on **Volume 2, Figure 11.1: Local Hydrology**.

11.3.2. CONSULTATION RESPONSES

To inform the scope of the assessment for the Proposed Development, consultation was undertaken with statutory and non-statutory bodies. **Table 11.1** summarises the scoping and consultation responses relevant to soils, geology and the water environment and provides information on where and / or how points raised have been addressed in this assessment.

Full details on the consultation responses and Scoping Opinion can be reviewed in **Chapter 6: Scoping and Consultation**, and associated appendices.

Table 11.1: Consultation Responses

Consultee	Consultation Type	Issued Raised	Response / Action Taken
Energy Consents Unit (ECU)	Scoping December 2023	Scottish Water provided information on whether there are any drinking water protected areas or Scottish Water assets on which the development could have any significant effect. Scottish Ministers request that the company contacts Scottish Water (via EIA@scottishwater.co.uk) and makes further enquires to confirm whether there any Scottish Water assets which may be	Further consultation has been (and continues to be) undertaken with Scottish Water. A summary of the consultation undertaken is given in this Chapter. Assessments of potential impacts on Scottish Water assets and Drinking Water Protected Areas, is

		affected by the development and includes details in the EIA report of any relevant mitigation measures to be provided.	included in this Chapter and includes assessment of water quality and quantity.
Energy Consents Unit (ECU)	Scoping December 2023	Scottish Ministers request that the Company investigates the presence of any private water supplies which may be impacted by the development. The EIA report should include details of any supplies identified by this investigation, and if any supplies are identified, the Company should provide an assessment of the potential impacts, risks, and any mitigation which would be provided.	Potential impacts to private water supplies are considered in this Chapter.
Energy Consents Unit (ECU)	Scoping December 2023	Scottish Ministers consider that where there is a demonstrable requirement for peat landslide hazard and risk assessment (PLHRA), the assessment should be undertaken as part of the EIA process to provide Ministers with a clear understanding of whether the risks are acceptable and capable of being controlled by mitigation measures. Where a PLHRA is not required clear justification for not carrying out such a risk assessment is required.	Potential impacts on peat are discussed within this Chapter. A PLHRA is not required and justification for this is given in the Baseline section of this Chapter.
Loch Lomond and the Trossachs National Park (LLTNP)	Scoping 4 August 2023	The National Park Planning Authority notes that SEPA and Scottish Water have been consulted as part of this scoping request and would defer to their position on technical matters.	Noted.
Scottish Water	Scoping 14 July 2023	Scottish Water has no objection to this planning application; however, the applicant should be aware that does not confirm that the proposed development can currently be serviced.	Noted.
Scottish Water (SW)	Scoping 14 July 2023	A review of our records indicate that the proposed activity falls within a drinking water catchment where a Scottish Water abstraction is located. Scottish Water abstractions are designated as Drinking	Further consultation has been undertaken with Scottish Water with updated flow rates and is

		Water Protected Areas (DWPA) under Article 7 of the Water Framework Directive (WFD). Loch Sloy supplies Belmore Water Treatment Works (WTW) and it is essential that water quality and water quantity in the area are protected. Scottish Water have produced a list of precautions for a range of activities. This details protection measures to be taken within a DWPA, the wider drinking water catchment and if there are assets in the area. Please note that site specific risks and mitigation measures will require to be assessed and implemented. These documents and other supporting information can be found on the activities within our catchments page of our website at www.scottishwater.co.uk/slm. We welcome that reference has been made to the Scottish Water drinking water catchment. The fact that this area is located within a drinking water catchment should be noted in future documentation. Also anyone working on site should be made aware of this during site inductions.	reported in the Baseline section of this Chapter. The assessment considers Scottish Water's assets and the operation of the existing Belmore Water Treatment Works which abstracts water from Loch Sloy. Further the presence of DWPA's is acknowledged and measures required to protect the yield and quality of water in these are given in this Chapter (see Mitigation section).
Scottish Water	Scoping 14 July 2023	Looking at the proposal to return 20m^3/s for 6 hours seems quite high volume which may cause disturbance to the raw water quality. Therefore, it would be useful to hold a meeting between ourselves to discuss the application to better understand the proposal. Please could the necessary contact advise of suitable dates and attendees via email at protectdwsources@scottishwater.co.uk. A member of the team will then coordinate a mutually agreeable time to suit all concerned parties.	Details of water management are discussed in **Chapter 4: Description of Development**. Further consultation has been undertaken with Scottish Water and is reported in the Baseline section of this Chapter.
Scottish Water	Scoping 14 July 2023	For reasons of sustainability and to protect our customers from potential future sewer flooding, Scottish Water will not accept any surface water connections into our combined sewer system.	Noted. No new connections are proposed to Scottish Water sewers.

Scottish Water	Additional Consultation 15 November 2023 30 January 2024	Project progress calls have been held between the Applicant and Scottish Water to discuss the results of the baseline studies and assessments completed in support of the application and to allow the Applicant to understand and address Scottish Water requests for information.	Commitments to protect Scottish Water assets are given in Section 11.7 (Potential Effects).
SEPA	Scoping 28 July 2023	We have reviewed the Scoping Report (dated June 2023) and while we are generally satisfied with the scope of the assessment, we request Geology, Soils and Water is scoped in and that information on the quantities and type of material to be excavated and associated reuse strategy is provided. We also recommend the applicant continues to liaise with our Water Permitting Team regarding the regulatory requirements for the site under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR).	Effects on soils, geology and the water environment are discussed in this Chapter. Details of the volume of material to be excavated and its reuse are given in **Chapter 3: Site Selection and Design Evolution**. It is confirmed that SEPA will continue to be consulted regarding permitting requirements.
SEPA	Scoping 28 July 2023	We support the intention to carry out hydrological modelling to explore and assess the potential effects of the project on water management in the Loch Lomond catchment and that this will be reported in the EIA. We understand it is not considered the maximum and minimum water levels of Loch Sloy and Loch Lomond would change due to the project, although variation in the levels would be expected to be more frequent than at present. The hydrological modelling should include full details of the model and method used for the assessment. The modelling should show the proposed development does not have an impact on water resource for both abstractions (abstractions for public water supply from Loch Lomond and Loch Sloy). The proposed new abstraction rate from Loch Lomond should also be clearly stated within the report.	Effects on soils, geology and the water environment are discussed in this Chapter. Information on the scheme hydrology is included in **Chapter 4: Description of Development**.

SEPA	Scoping 28 July 2023	The existing hydroelectric scheme has a licence from SEPA under CAR (CAR/L/1011861). It includes a number of abstractions which return to Loch Sloy and abstraction from Loch Sloy itself for the power station. The licence was varied in the past to include an abstraction from Loch Lomond for the previous pumped hydro storage scheme which was never built. The project will require authorisation from us under CAR. We therefore recommend the CAR and S36 applications are twin tracked. This will help to ensure that any CAR requirements can be accommodated more easily when proposals are at their most fluid. We understand initial discussions have already taken place with our Water Permitting Team and specifically about the new intake structure and associated extension of the tailrace and fish screens. Aspects of the design relating to the abstraction regime and fish screening will be considered at the CAR stage.	Noted. It is confirmed that a Licence Variation application will be made for the revised scheme and as part of the application further consultation will be undertaken with SEPA's Water Permitting Team.
SEPA	Scoping 28 July 2023	Engineering activities in the water environment, such as culverts, bridges, bank modifications and diversions should be avoided wherever possible so the site layout should be designed to avoid such works or other direct impacts on water features. The submission must include a map showing all proposed temporary or permanent infrastructure overlain with all lochs and watercourses. Appropriate buffer zones, of minimum 6m from the top of the bank, should be included around any water features. If direct impacts are anticipated drawings should be provided showing what is proposed in terms of engineering works and details provided of measures to be employed to protect downstream sensitive receptors.	Where possible, a buffer of 6m has been included in the design and infrastructure has been located outside of this buffer. This is shown on **Volume 2, Figure 11.1: Local Hydrology.**
SEPA	Scoping	We note a CEMP is to be provided including details on pollution prevention	Required mitigation measures and best practice

	28 July 2023	and drainage management. We recommend a schedule of mitigation supported by site specific maps and plans be submitted. These must include reference to best practice pollution prevention and construction techniques (for example, limiting the maximum area to be stripped of soils at any one time) and regulatory requirements. They should set out the daily responsibilities of Ecological Clerk of Works, how site inspections will be recorded and acted upon and proposals for a planning monitoring enforcement officer. Please refer to the Guidance for Pollution Prevention (GPPs) and our water run-off from construction sites webpage for more information.	that would be adopted to protect soils, geology and the water environment are presented in this Chapter. An outline CEMP has been prepared and presented as **Volume 4, Appendix 4.2**.
SEPA	Scoping 28 July 2023	Section 2.3.6 of the Scoping Report states the activities will result in rock excavations and the most appropriate areas for the reuse of these materials is being considered. While we acknowledge the scale of the works is limited to the area around the existing power station it is not clear what quantity of material will need to be excavated and reused. We suggest the CEMP describes the quantities and type of material to be excavated and the intended reuse strategy is for it along with rationale / justification reuse. We also recommend measures be taken through design to be minimise the quantities to be excavated as much as possible. The Applicant must consider the possibility of encountering contaminated materials arising from the construction of the original hydropower infrastructure. A procedure and plan for any contaminated materials should be included within the EIA. Materials removed as part of the works, including but not limited to the existing spray reduction structure, rubble walling and woodland, should be treated as	The volume of rock that may need to be excavated has been quantified and proposals for its reuse are reported in **Chapter 3: Site Selection and Design Evolution** Ground investigations have been undertaken and have not proven the presence of made ground or contaminated materials. The Contractor will be required to classify and manage all wastes generated on site in accordance with best practice and relevant legislation. Waste management procedures will form part of the final CEMP.

		waste. Wastes must be classified, taken to a suitably permitted facility and accompanied by the appropriate Duty of Care paperwork. Further guidance on Duty of Care responsibilities can be found on the NetRegs website.	
SEPA	Scoping 28 July 2023	Section 7.1.1 states an intrusive ground investigation survey was carried out in 2010 by Jacobs Engineering across the consented development area. We recommend this ground investigation be included in support of the EIA.	The ground investigation is included as **Appendix 11.1: 2010 Ground Investigation** and a summary of the confirmed ground conditions included in this Chapter.
SEPA	Scoping 28 July 2023	We note that there is no mention of Private Water Supplies (PWS) in the Scoping Report. A PWS assessment should be undertaken and should be included in the Geology, Soils and Water section of the EIA report.	Potential impacts to private water supplies are considered in this Chapter.
SEPA	Scoping 28 July 2023	Groundwater Dependent Terrestrial Ecosystems (GWDTE) are protected under the WFD. Excavations and other construction works can disrupt groundwater flow and impact on GWDTE. The layout and design must avoid impacts on such areas. We understand that 2022 surveys identified areas which could be potential GWDTE and further targeted National Vegetation Classification (NVC) surveys are planned.	Details of the NVC survey are presented in **Chapter 9: Terrestrial Ecology** whilst an assessment of potential GWDTE areas is included in this Chapter.
SEPA	Scoping 28 July 2023	While we have no specific concerns with scoping of flood risk out of the assessment, we suggest the proposed hydrological modelling be used to demonstrate the project will not increase the risk of flooding to nearby receptors. Please note any crossings must be designed to accommodate the 0.5% Annual Exceedance Probability flows (with an appropriate allowance for climate change), or information provided to justify smaller structures.	A flood risk screening assessment is presented in this Chapter. Details of the scheme hydrology are included in **Chapter 4: Description of Development**

SEPA	Scoping 28 July 2023	We understand that review of 'priority peatland mapping published by NatureScot indicates that the site is underlain by mineral soils and not located in an area designated as priority peatland'. We recommend the EIA be supported by information to demonstrate there is no peat on site.	No deposits of peat would be disturbed by the Proposed Development. Potential impacts on peat are discussed within this Chapter.
SEPA	Scoping 28 July 2023	We acknowledge there are no plans for decommissioning of the scheme in the future and therefore the assessment of effects associated with decommissioning have been scoped out of the EIA.	Noted.

As part of the consultation stage of the project the Applicant has sent details of the project proposals to Network Rail and asked for feedback and comment. At the time of writing no response has been received.

11.3.3. ISSUES SCOPED OUT OF ASSESSMENT

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 11.6** of this Chapter. Any potential increase in flood risk from Loch Sloy which might arise from operation of the Proposed Development would be regulated by the Reservoirs Act, and thus be mitigated. A drainage impact assessment (DIA) would be included in the CEMP following grant of planning permission as this is normally developed as part of the detailed design stage by the 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.
- **Derivation of operating rules for the movement of water between Loch Lomond and Loch Sloy:** The movement of water would be agreed with Scottish Environment Protection Agency (SEPA) and Scottish Water. The management controls would be secured by a Controlled Activity Regulation (CAR) authorisation which would be regulated by SEPA.
- **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 Applicant has committed to undertake a water quality assessment of Loch Sloy and process review of Belmore Water (WTW). This will enable Scottish Water and SSE Renewables to understand the water quality of the Lomond / Sloy blend and confirm whether it would remain within the treatable envelope for Belmore WTW. This will enable Scottish Water to quantify and mitigate potential impacts of the Proposed Development.

11.4. Legislation, Policy and Guidance

11.4.1. LEGISLATIVE CONTEXT

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;
- 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.

11.4.2. POLICY CONTEXT

Chapter 7: Planning Policy and Context provides an overview of the relevant planning policy. A standalone Planning Statement, separate to the EIA Report, has been prepared to support the application which assesses the Proposed Development against planning and energy policy. In summary, the National Planning Framework 4 (NPF4)[1] 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 4: Natural Places;
- Policy 5: Soils;
- Policy 11: Energy;
- Policy 20: Blue and Green Infrastructure; and
- Policy 22: Flood Risk and Water Management.

In addition, Argyll and Bute Council (A&BC)'s Local Development Plan (LDP)[2] provides planning guidance on the type and location of development that can take place in the region. The LDP presents the following policies of which are relevant to this study:

- Policy 04: Sustainable Development;
- Policy 06: Green and Blue Infrastructure;
- Policy 55: Flooding
- Policy 56: Land Erosion
- Policy 58: Private Water Supplies and Water Conservation
- Policy 59: Water Quality and the Environment
- Policy 61: Sustainable Drainage Systems (SuDS)

Loch Lomond & Trossachs National Park (LLTNP) also has a LDP[3] which outlines planning policies which will be used by the Loch Lomond and Trossachs National Park Authority (LLTNPA) to guide and determine planning applications. Of relevance to this Chapter includes the following policies:

- Natural Environment Policy 2: European Sites – Special Areas of Conservation and Special Protected Areas
- Natural Environment Policy 3: Sites of Special Scientific Interest, National Nature Reserves and RAMSAR Sites;

[1] Scottish Government (2023) National Planning Framework 4

[2] Argyll and Bute Council (2024) Local Development Plan 2

[3] Loch Lomond and the Trossachs National Park (2022) Local Development Plan 2017-2021

- Natural Environment Policy 5: Species and Habitats;
- Natural Environment Policy 7: Protecting Geological Conservation Review Sites;
- Natural Environment Policy 10: Protecting Peatlands;
- Natural Environment Policy 11: Protecting the Water Environment;
- Natural Environment Policy 12: Surface Water and Waste Water Management;
- Natural Environment Policy 13: Flood Risk;
- Natural Environment Policy 16: Land Contamination; and
- Renewable Energy Policy 1: Renewable Energy within the National Park.

The LLTNPA has also produced planning guidance for Renewable Energy Schemes[4] in the region which has also been considered as part of this assessment.

11.4.3. TECHNICAL GUIDANCE

The following technical guidance has been considered in the assessment:

- 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).
- SEPA Guidance of Pollution Prevention (GPP), including:
  - GPP01: Understanding your environmental responsibilities – good environment practices;
  - GPP02: Above ground oil storage;
  - GPP03: Use and design of oil separators in surface water drainage systems;
  - GPP05: Works and maintenance in or near water;
  - GPP06: Working on construction and demolition sites;
  - GPP08: Safe storage and disposal of used oils;
  - GPP13: Vehicle washing and cleaning;
  - GPP21: Pollution incident response plans; and
  - GPP22: Dealing with spills.
- 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).
- 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).

[4] Loch Lomond and the Trossachs National Park (2017) Planning Guidance: Renewable Energy

11.5. Methodology

11.5.1. DESK STUDY AND FIELD STUDY

An initial desk study was 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 to characterise the baseline conditions of the site and study area:

- Ordnance Survey (OS) 1:50,000 and 1:25,000 scale mapping;
- NatureScot SiteLink[5];
- Scottish Natural Heritage (now NatureScot) Carbon and Peatland 2016 Map[6];
- 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 (1,100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets)[9];
- Details of Drinking Water Protected Areas[10];
- SEPA flood maps[11];
- SEPA reservoir flooding maps[12];
- SEPA Water Classification Hub[13];
- SEPA Water Environment Hub[14];
- SEPA Rainfall Data[15];
- SEPA environmental data[16]; and
- Data requests to SEPA and the A&BC (October 2023).

In addition, the investigation records from a ground investigation completed in 2010 were provided and reviewed. These are presented as **Volume 4, Appendix 11.1: 2010 Ground Investigation Records**, and included the area for the proposed pumphouse and its foundations, and the spoil management area

[5] NatureScot, SiteLink, available online at https://sitelink.nature.scot/home [Accessed March 2024]

[6] Scottish Natural Heritage (now NatureScot) available at https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/ [Accessed March 2024]

[7] James Hutton Institute, National soil map of Scotland https://soils.environment.gov.scot/maps/ [Accessed March 2024]

[8] British Geological Survey GeoIndex (onshore), available at https://www.bgs.ac.uk/map-viewers/geoindex-onshore/ [Accessed March 2024]

[9] British Geological Survey Hydrogeological maps of Scotland, available at https://www.bgs.ac.uk/datasets/hydrogeological-maps-of-scotland/ [Accessed March 2024]

[10] Drinking Water Protected Areas – Scotland River Basin District Maps, available online at https://www.gov.scot/publications/drinking-water-protected-areas-scotland-river-basin-district-maps/ and https://www.sepa.org.uk/environment/environmental-data/ [Accessed March 2024]

[11] SEPA Flood Maps, available at https://www.sepa.org.uk/environment/water/flooding/flood-maps/ [Accessed March 2024]

[12] SEPA Reservoirs Inundation Map, available at https://map.sepa.org.uk/reservoirsfloodmap/Map.htm [Accessed March 2024]

[13] SEPA Water Classification Hub, available at https://www.sepa.org.uk/data-visualisation/water-classification-hub/ [Accessed March 2024]

[14] SEPA Water Environment Hub, available at https://www.sepa.org.uk/data-visualisation/water-environment-hub/ [Accessed March 2024]

[15] SEPA Rainfall Data for Scotland, available at https://www2.sepa.org.uk/rainfall [Accessed March 2024]

[16] SEPA environmental data, available at https://www.sepa.org.uk/environment/environmental-data/ [Accessed March 2024]

(which was previously used as a compound and storge area during construction of the existing power station).

11.5.2. FIELD STUDY

A site walkover survey was carried out by experienced SLR hydrologists on 4 October 2023 to allow an appreciation of the study area and sensitive soils, geological, hydrological, and hydrogeological receptors.

11.5.3. ASSESSMENT OF METHODOLOGY

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

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

Criteria for determining the significance of effect are provided in the sections below.

11.5.3.1. Sensitivity of Receptor

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 are set out in **Table 11.2**. Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at the associated level of sensitivity.

Table 11.2: Criteria for Assessing 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 PDA. • Receptor is at high risk from flooding in the future (2080s) 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. • Moderate classification of groundwater aquifer vulnerability.
Low	• Soil type and associated land use not sensitive to change in hydrological regime and associated land use (e.g. intensive grazing of sheep and cattle). • SEPA Water Framework Directive Water Body Classification: Poor or Bad. • Receptor is not at risk of flooding in the future (2080s). • Receptor not used for water supplies (public or private).
Not Sensitive	Receptor would not be affected by the Proposed Development i.e. lies within a different and unconnected hydrological / hydrogeological catchment.

11.5.3.2. Magnitude of Impact

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 11.3.**

Table 11.3: Criteria for Assessing Magnitude of Impact

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

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

11.5.3.3. Significance of Effect

The sensitivity of the receiving environment together with the magnitude of the impact determines the significance of the effect, which can be categorised into level of significance as identified in **Table 11.4**. 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.

Table 11.4 provides a guide to assist in decision making. However, it should not be considered as a substitute for professional judgment and interpretation. In some cases, the potential sensitivity of the receiving environment or the magnitude of potential impact cannot be quantified with certainty and, therefore, professional judgement remains the most robust method for identifying the predicted significance of a potential effect.

Table 11.4: Level of Significance

Magnitude of Impact	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

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

11.5.3.4. Assumptions and Limitations

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

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.

11.6. Baseline

11.6.1. SITE SETTING

Review of OS mapping indicates that the ground elevation ranges from approximately 10m Above Ordnance Datum (AOD) along the banks of Loch Lomond to approximately 40m AOD along the western boundary of the PDA. Elevations generally increase westwards across the study area to approximately 270m AOD. Loch Sloy is situated at approximately 285m AOD.

SEPA has provided precipitation data for the Inveruglas rainfall gauge (station number 115588)[15] which is located approximately 400m south of the Sloy Hydroelectric Power Station. In 2023, the annual rainfall at Inveruglas was recorded to be 2,967mm. In the mountains, which form the catchment to Loch Sloy, the average annual rainfall is >3,000mm/annum.

The site setting is show in **Volume 2, Figure 11.1: Local Hydrology**.

11.6.2. DESIGNATED SITES

Review of NatureScot SiteLink[5] indicates that there are no designated sites located within the PDA or within the study area.

Ben Vorlich, which is located between Loch Sloy and the Proposed Development, has been designated as part of the Ben Vorlich Site of Special Scientific Interest (SSSI). The SSSI is located approximately 1.2km northwest of the Proposed Development at its closest extent and has been designated for several upland habitats including alpine flush, subalpine wet heath and tall herb ledge. No development is

proposed within the area designated as part of the SSSI and therefore it has not been considered further in this assessment.

The Pollochro Woods SSSI, which is also part of the larger Loch Lomond Woods Special Area of Conservation (SAC), is located approximately 850m east of the Proposed Development, on the opposite bank of Loch Lomond. The SSSI and SAC has been designated for otters, bryophyte assemblage, lichen assemblage and several woodlands including wet woodland. The SSSI and SAC lie beyond the study area and whilst the Proposed Development is hydraulically linked to Loch Lomond, potential effects with regard to soils, geology and water quality are not considered in this assessment as the designated sites are remote and afforded protection by the distance between the Proposed Development and the designated sites. Furthermore, given the volume of Loch Lomond, it would be unlikely that any potential effects would be discernible due to the dilution factor. Changes in the fluctuation of water levels in Loch Lomond and associated effects are considered in **Chapter 4: Description of Development** and **Chapter 9: Terrestrial Ecology**.

It is noted that there are many other designated sites on the banks of Loch Lomond outwith the study area. As above, potential effects on these sites are not considered in this Chapter as they are remote from the Proposed Development and any pollution arising during construction or operation of the scheme would be mitigated by the presence of Loch Lomond such that no pollution of these sites would occur. Again, effects associated with water management, and specifically the fluctuation of water levels in Loch Lomond on these designated sites, are considered in **Chapter 8: Aquatic Ecology and Fish** and **Chapter 9: Terrestrial Ecology**.

11.6.3. SOILS AND GEOLOGY

The site benefits from very comprehensive ground investigation records. The investigation was completed between January and March 2010 and comprised the following:

- 11 cable percussion boreholes with rotary cored follow-on (to 35m depth);
- 3 rotary open holes with cored follow-on (to 35m depth);
- 7 machine dug trial pits;
- 27 hand dug trial pits with Mackintosh probes;
- concrete coring; and
- geophysical surveying.

In addition to geotechnical testing, variable head permeability testing was completed in 7 boreholes and 18 permeability packer tests were undertaken; Fugro report that very low flow rates were recorded at each pressure stage.

The site investigation locations were recorded by a Trimble GPS system. All the boreholes and machine dug trial pits were located within the PDA. The hand dug trial pits were within the woodland area to the north / northwest of the power station. 13 soil samples were submitted for chemical testing.

Reference to the investigation findings is made in the Sections that follow. The ground investigation report is included as **Volume 4, Appendix 11.1: 2010 Ground Investigation Records**.

11.6.3.1. Soils

The National Soil Map of Scotland[7] shows that the entirety of the Proposed Development is underlain by humus-iron podzols soils. The western extent of the study area is shown to be underlain by brown earths soils. No peat rich soils are recorded.

11.6.3.2. Superficial Deposits

An extract of BGS superficial deposit mapping[8] is presented as **Volume 2, Figure 11.2: Superficial Geology**.

Superficial mapping indicates that prior to development of the existing Sloy Hydroelectric Power Station the majority of the PDA was underlain by glacial till deposits. River terrace deposits, comprising gravel, sand, silt, and clay, are recorded to the south of the PDA. Superficial deposits are shown to be absent on higher ground to the north of the PDA. No peat deposits are recorded within the study area.

Priority peatland mapping[6] indicates that the Proposed Development and whole study area is underlain by Class 0 peatland which are considered mineral soils whereby peatland habitats are typically not found, and no peatland vegetation is recorded.

As a consequence of previous development and the construction of the existing Sloy Hydroelectric Power Station, the superficial geology has been disturbed and modified. Current ground conditions are discussed in the following Section.

11.6.3.3. Site Investigation Records

Power Station Area

Ground Investigation carried out in 2010 at the proposed pumphouse building comprised of 14 boreholes and seven trial pits and in summary:

- Topsoil was encountered to depths of 0 to 0.1m bgl;
- No peat was recorded within any of the boreholes or trial pits;
- Made ground (typically comprising dark brown sand and cobble of schist, although in isolated locations timber, concrete, plastic and brick) was encountered in 11 of the boreholes and six of the trial pits at depths of between 0 and 3.7m bgl; and
- Glacial till was encountered at depths varying between 0.1m bgl and 6.5m bgl with a thickness of between 1.3m and 6.3m.

The bedrock beneath the superficial deposits was recorded as very strong fractured foliated dark grey micaceous schist.

There is no evidence in the borehole or trial pit records of potentially contaminated ground conditions.

Spoil Management and Restoration Area

26 hand dug trial pits were made in this part of the Proposed Development. A summary of the trial pit log report recorded below:

- Made ground (comprising brick and gravel fragments) was only recorded in 1 trial pit (MP23);
- Dark grey and sand and light brown fine to coarse gravel is recorded in virtually all the investigation locations; and
- Peat [17]with a thickness greater than 0.5m was recorded at locations MP02, MP05, MP11, MP14, MP15, MP16, MP18, MP19, MP21 and MP22.

The trial pits that recorded peat are all located in the ground of shallow relief which was recorded as waterlogged at the time of the SLR site walkover. No surface evidence of peat habitat was recorded in this area, and it is noted that the vegetation mapping reported in **Chapter 9: Terrestrial Ecology** did not

[17] No evidence or peat was recorded on site during the site walkover and verification survey. It is considered that the trial pit logs wrongly reported organic silt soils as peat.

record the presence of peat habitat. Therefore, it is considered likely that the trial pit logs recorded saturated organic soils rather than peat. This is confirmed by published mapping. **Photograph 11.1** shows the typical ground conditions.

Photograph 11.1: Ground Conditions in the Spoil Management Area

There is no evidence from the site walkover survey or from the trial pit records of contaminated ground conditions.

11.6.3.4. Bedrock

An extract of the BGS bedrock and linear features geology mapping[8] is presented as **Volume 2, Figure 11.3: Bedrock Geology** and shows that the entire PDA is underlain by the Beinn Bheula Schist Formation which comprises psammite and pelite.

The 2010 site investigation data confirmed a rock head of between 1.2m bgl and 6.5m bgl at the location of the proposed pumphouse building. The bedrock was described as a strong fractured foliated dark and light grey quartz mica schist.

11.6.4. HYDROGEOLOGY

11.6.4.1. Aquifer Characteristics

Review of SEPA's environmental data website[16] confirms that no groundwater level monitoring is undertaken within the study area.

Water was encountered within 17 of the trial pits within the proposed stockpile area at depths of between 0m and 0.55m bgl; this is considered to be perched water in the sand and gravel and organic deposits recorded by the shallow trial pits and represents water perched above the underling low permeability schist.

Groundwater was not encountered within any of the boreholes or trial pits near the proposed pumphouse with the exception of one borehole where groundwater was encountered at 5.2m bgl (borehole BH11).

Variable head permeability testing completed as part of the ground investigation showed the following results:

- Shallow gravels recorded permeability values in the region of $1x10^{-5}$ - $1x10^{-6}$m/sec;
- The schist bedrock recorded permeability values in the region of $1x10^{-6}$ - $1x10^{-9}$m/sec

The BGS has classified the bedrock geology as a low productivity aquifer whereby small amounts of groundwater are expected in near surface weathered zones and secondary fractures[8]. This is consistent with observations from the site investigation. Limited shallow groundwater flow can therefore occur and where present is likely to follow topographical gradients. In the study area any groundwater flow will be shed toward Loch Lomond.

An extract of the BGS 1:100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets[9] are presented in **Volume 2, Figure 11.4: Groundwater Vulnerability**.

The Aquifer Productivity and Groundwater Vulnerability datasets classifies the underlying aquifer (superficial and bedrock) according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity. Review of **Volume 2, Figure 11.4: Groundwater Vulnerability** indicates that the bedrock aquifer is considered to be a low productivity aquifer generally without groundwater except at shallow depths and with flow almost entirely through fractures and other discontinuities.

The glacial till superficial deposits within the study area are not considered a significant aquifer. The river terrace deposits, where present, are considered to be a moderate to high productive aquifer with intergranular flow; groundwater within these deposits is likely to be in hydraulic conductivity with Loch Lomond.

Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable. The Proposed Development is shown to be underlain by groundwater vulnerability Class 4a.

11.6.4.2. Groundwater Quality

All of Scotland's groundwater bodies have been designated as 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.

The current status of groundwater bodies in Scotland has been classified by SEPA[13,14] in accordance with the requirements of the WFD. The study area is located within the Cowal and Lomond groundwater body (SEPA ID: 150689) which is designated with an overall classification of Good with no pressures identified in 2022 (which is the latest reporting cycle).

11.6.4.3. Groundwater Dependent Terrestrial Ecosystems (GWDTE)

A NVC habitat mapping exercise has been completed as part of the terrestrial ecology baseline assessment to identify potential GWDTEs. The results of the NVC habitat mapping exercise are discussed in detail within **Chapter 9: Terrestrial Ecology**. With reference to SEPA LUPS-31 guidance, areas of potential GWDTE are shown on **Volume 2, Figure 11.5: Groundwater Dependent Terrestrial Ecosystems.**

An assessment of the potential GWDTEs, and in particular a discussion on whether the habitats are sustained by ground or surface water, is summarised in **Table 11.5**.

Table 11.5: Groundwater Dependent Terrestrial Ecosystems

NVC Community	GWDTE Potential	Discussion
M27	Moderate	An area of M27 habitat is recorded approximately 80m southeast of the Sloy Hydroelectric Power Station near the banks of Loch Lomond. The area is underlain by river terrace deposits and therefore there is likely to be shallow groundwater at this location. There are no works proposed where this habitat is located, and any dewatering associated with construction of the pumphouse and tailrace would not lower the water level beneath this habitat as it is in hydraulic continuity with Loch Lomond. The Proposed Development will not have a direct or indirect impact on this habitat.
W4	High	Area of W4 is noted within the PDA approximately 180m northeast of the Sloy Hydroelectric Power Station and corresponds to the area of waterlogged ground recorded during the site walkover. During the site walkover the habitat was recorded over a range of different elevations and slopes and supported by water discharging from a culvert that passes water from the hillside north of the railway and runs under the railway embankment. The discharge then ponds and flows over the ground surface in the PDA. This distribution is not typical of that attributable to a groundwater discharge. It is therefore considered that rainfall, surface water and water logging of the soils sustain this habitat. The impact of this habitat loss and proposed mitigation is discussed further in **Chapter 9: Terrestrial Ecology**.

11.6.5. HYDROLOGY

11.6.5.1. Local Hydrology

The local hydrology is shown on **Volume 2, Figure 11.1: Local Hydrology**.

The study area is located entirely within the surface water catchment of Loch Lomond, which is located immediately east of the PDA. Two sub catchments of Loch Lomond (an unnamed tributary and the Inveruglas Water sub catchments) are noted within the southern extent of the study area.

The Proposed Development will involve the movement of water between Loch Lomond and Loch Sloy. Loch Sloy is located 3.3km northwest of the Sloy Hydroelectric Power Station. A network of aqueducts and tunnels was built to divert water into Loch Sloy from areas well to the north and south of the loch. From Loch Sloy the water is carried over 3km by a tunnel through Ben Vorlich, before the water then is routed in 4 penstocks to Sloy Hydroelectric Power Station

Loch Sloy also maintains a discharge to the Inveruglas Water from Loch Sloy Dam. The Inveruglas Water flows generally southeast and eastwards before discharging into Loch Lomond approximately 450m south of the PDA.

The Loch Lomond, Loch Sloy and Inveruglas Water surface water catchments have been designated as a DWPA[10]. Loch Sloy supplies Scottish Water's Belmore Water Treatment Works (WTW), and Loch

Lomond supplies their Blairlinnans and Balmore WTWs. Further details of the WTWs and their potential interaction with the Proposed Development are discussed in the sections that follow.

During the walkover a small waterbody, fed by a discharge from a culvert which passes beneath the railway, was noted within the woodland area to the northeast of the existing power station (see discussion of potential areas of GWDTE above). A small open drain was also noted along the northern boundary of the existing power station and was witnessed to route surface water runoff from the higher surrounding ground around the power station.

11.6.5.2. Surface Water Quality

Water quality is monitored by SEPA and classified annually in accordance with the requirements of the WFD[13,14]. **Table 11.6** provides summary details of the SEPA classifications reported in 2022 (the latest reporting cycle) for watercourses in the study area. Smaller watercourses within the study area are not monitored by SEPA.

Table 11.6: Surface Water Quality Data

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical Status	Hydromorphology	Pressures
Loch Lomond (North) (100339)	Good ecological potential	Moderate	High	Moderate	Modification to bed, banks and shores
Loch Sloy (100260)	Good ecological potential	Bad	High	Bad	None noted
Inveruglas Water (10162)	Bad ecological potential	Bad	-	Bad	Water abstraction and water storage for hydroelectricity generation

11.6.5.3. Fisheries

Fisheries within the study area are managed by the Loch Lomond Fisheries Trust (LLFT). Fishery interests are discussed in detail and assessed within **Chapter 8: Aquatic Ecology and Fish**.

11.6.5.4. Baseline Flood Risk

A summary of the potential sources of flooding[11,12] and a review of the potential risk posed by each source to the Proposed Development is presented in **Table 11.7**.

Table 11.7: Flood Risk Screening

Potential Source	Potential Flood Risk to the Proposed Development	Justification
Coastal flooding	No	The study area is remote from the coast and SEPA flood mapping confirms the PDA is not at risk from tidal or coastal flooding.
River flooding	Yes	SEPA river flood mapping shows that a small area of the PDA is at risk from flooding of Loch Lomond during both the present day and future flooding scenario (2080s). This includes the edge of the northeastern boundary of the proposed secondary compound, the existing tailrace, and parts of the A82 and existing access road. The proposed pumphouse building is shown to be outside of the future flooding scenario. All permanent elements of the Proposed Development (e.g. tailrace and pump house) within the floodplain are water compatible. All equipment sensitive to flooding will be raised above the 1 in 200-year flood level including an allowance for climate change and a sufficient freeboard. A detailed flood study will be carried out as part of the detailed design stage of the project.
Surface water flooding	Yes (minor)	SEPA flood mapping shows that the majority of the PDA is not at risk from surface water flooding, however, a small area of surface water flooding is noted within the existing Sloy Hydroelectric Power Station grounds and along the Network Rail embankment to the north of the PDA. Flood extents are shown to be small, localised areas, never forming large, linked areas or flow paths. The Proposed Development drainage design, which will be developed as part of the detailed design stage of the project, will take cognisance of the existing surface water drainage system and flow paths. Therefore, the risk of surface water flooding is considered to be low.
Groundwater flooding	No	Review of the SEPA groundwater flood maps illustrates that the PDA is not considered at risk from potential groundwater flooding. This is consistent with the proven site geology which has confirmed a low bulk permeability.

Flood Defence Breach (Failure)	No	The Scottish Flood Defence Asset Database (SFDAD) indicates that there is no flood defences noted within the study area. It is therefore considered that the PDA is not at risk from potential flood defence breach.
Flooding from artificial drainage systems	No	The PDA is located within a remote area and with the exception of the drainage for the existing power station and private water supply pipework (see Section 11.6.6), no artificial drainage systems are present. There are no Scottish Water mains or sewers located within the study area. The existing drainage system for the power station and private water supply pipework will be managed, safeguarded and diverted as required – details of which will be confirmed during the detailed design stage of the project. Therefore, risk of flooding from failure of artificial drainage systems is considered to be low.
Flooding due to infrastructure failure	Yes (Minor)	The Leven Barrage at the south end of Loch Lomond restricts flow in the summer months to maintain an optimum water level to serve boating, fishing and tourist interests. The barrage is fully open at water levels above 7.9m AOD and therefore offers no control of water levels in a flood scenario. SEPA has produced reservoir inundation maps for those sites currently regulated under the Reservoirs (Scotland) Act 2011 giving a worst-case scenario for dam breaches. Review of the SEPA inundation mapping highlights that a breach scenario from Loch Sloy reservoir or Loch Arklet reservoir, both present a potential risk to the PDA. The existing tailrace, parts of the A82 and the secondary site establishment area are shown to be at risk of flooding in these scenarios. Both dams are regulated by the Reservoirs (Scotland) Act 2011 which requires stringent inspection regimes and, if required, repair of existing dams. This mitigates and manages the flood risk from these sources and therefore it is not considered further. Loch Sloy Dam is owned, operated and maintained by the SSE and Loch Arklet Dam is managed by Scottish Water. As part of the Proposed Development, no modification to either Loch Sloy or Loch Arklet Dam is proposed, and therefore the flood risk from these sources does not change as a result of the Proposed Development. Sloy Hydroelectric Power Station is fed by four above ground steel penstocks. If full rupture of the penstocks was to occur, the PDA would experience flooding.

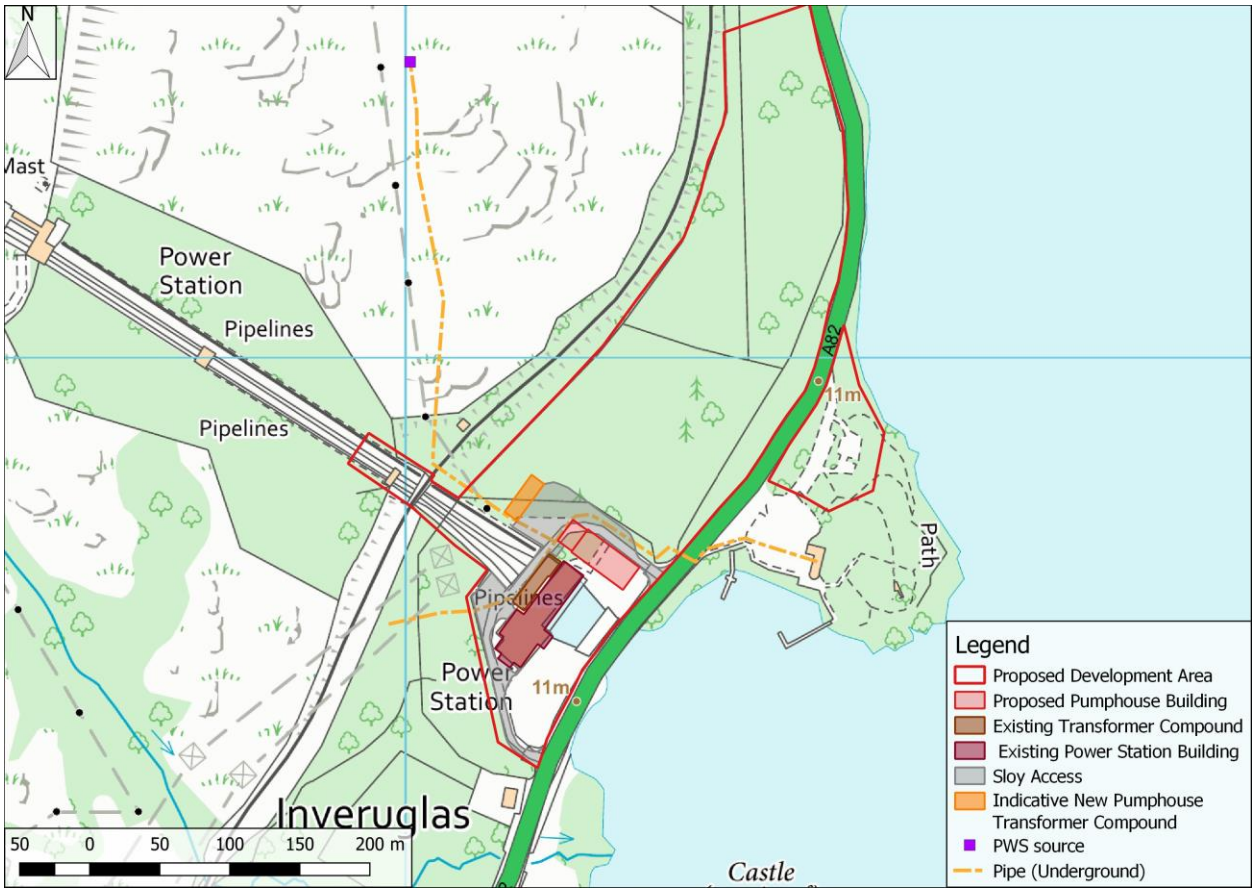
		These pipelines are fitted with rupture monitoring systems which activate the Automatic Self Closing Valves at the upstream valve house, shutting off the water to the penstocks in the event of a rupture. There also exists a burst culvert which diverts water under the A82 into Loch Lomond. All these existing assets and protection systems are owned and maintained by SSE. They undergo regular inspection and testing to maintain asset integrity and operability. The functionality of these systems will not be impacted by the Proposed Development. It is considered that the risk of breach or failure is very low and is therefore not considered further.

11.6.6. PRIVATE WATER SUPPLIES AND LICENCED SITES

As part of the assessment, a data request was made to A&BC for details of Private Water Supplies (PWS) sources within the study area. A&BC confirmed that none were recorded.

It is understood that the existing power station and surrounding properties, including the Inveruglas Visitor Centre, are supplied by a PWS which is sourced from a spring at NGR NN 32004 10211 as shown on **Volume 2**, **Figure 11.1: Local Hydrology**. Water from the source is piped towards Sloy Hydroelectric Power Station before it splits into two pipes, one which heads eastwards towards Inveruglas Visitor Centre and the other south-westwards towards a secondary holding tank before it supplies the properties to the south of the existing power station. The approximate route of the pipes is shown on **Plate 11.1**.

Plate 11.1: Private Water Supply Information



No development is proposed upgradient of the PWS source which is located a significant elevation above any element of the Proposed Development. The water source is therefore not considered at risk. However, the pipework between the PWS source, the secondary holding tank and the Inveruglas Visitor Centre passes through the PDA. This pipeline will need to be traced, and where necessary, rerouted and protected during and following construction, this will be confirmed during detailed design stage of the project.

Review of SEPA's environmental database indicates that there are six CAR authorisations within the study area:

- Three CAR authorisations and licences at the Sloy Power Station (CAR/L/1011861, CAR/R/1017709 and CAR/R/1081923) for water abstraction and impoundment, private sewage and other effluent discharge respectively; and
- Two CAR authorisation which permit the discharge of private sewage and existing sewage treatment system; and
- One CAR unknown activity for the Glen Sloy VISTA Underground Cabling Project.

11.6.7. SUMMARY OF SENSITIVE RECEPTORS

Table 11.8 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 11.2**. These receptors form the basis of the assessment, and as per the methodology presented at the start of this Chapter, are used in conjunction with an estimate of the magnitude of an impact to determine the significance of any potential effect.

Table 11.8: Summary of Sensitive Receptors

Receptor	Sensitivity	Reason for Sensitivity
Water Dependent Designated Sites	Not Sensitive	Whilst water dependent designated sites are recorded on the banks of Loch Lomond, they are located outside of the study area and significant protection is afforded by the loch such that effects with regard to water quality impacts on the designated sites would be unlikely to be discernible. They are not considered further in this Chapter. Potential effects on the designated sites are considered in **Chapter 8: Aquatic Ecology and Fish** and **Chapter 9: Terrestrial Ecology** as appropriate.
Soils	High	It has been confirmed that there is no peat on site, however, soil is considered a sensitive receptor as it can retain a high organic content which needs to be safeguarded.
Superficial and Bedrock Geology	Not sensitive	The superficial and bedrock geology in the study area is shown to be common regionally and have no rarity value. No geological designated sites are recorded within the study area.
Hydrogeology	High	Groundwater has been classified by SEPA as Good and vulnerability is classified as Medium to High.
GWDTE	High	Areas of potential GWDTE have been identified by NVC mapping. One area of W4c habitat has been recorded but it has been shown it is sustained by surface water rather than groundwater. This habitat will be lost as a consequence of the Proposed Development. Mitigation and enhancement are discussed in **Chapter 9: Terrestrial Ecology** and is not considered further in this Chapter.
Hydrology	High	Loch Lomond and Loch Sloy have been classified by SEPA as Good Overall Potential.
Flooding	Low	Parts of the Proposed Development have been identified to be at risk from the future flooding scenario associated with flooding from Loch Lomond. Loch Lomond is an actively managed loch as such, flood risk from this source is therefore considered low.
Drinking Water Protected Areas	High	It has been confirmed that both Loch Lomond and Loch Sloy have been designated as a DWPAs.

Private Water Supplies	High	No PWS source is at risk from the Proposed Development. Distribution pipework to Inveruglas Visitor Centre and neighbouring private properties will need to be safeguarded.
Licenced Sites	Not sensitive	There is only one licenced abstraction noted within the study area, for the Sloy Hydroelectric Power Station, which is owned by the Applicant.

11.6.8. FUTURE BASELINE

As there are no plans to decommission the Proposed Development, the temporal scope requires the consideration of the potential for climate change to impact on future baseline conditions. Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside slightly higher average temperatures. This suggests that there is likely to be greater pressures on water supplies and water levels in summer months in the future. In addition, summer storms are predicted to be of greater intensity. Therefore, peak fluvial flows associated with extreme storm events may also increase in volume and velocity.

11.7. Embedded Mitigation

A description of all elements of the Proposed Development is given in **Chapter 4: Description of Development**. Embedded mitigation and mitigation by design relevant to the soils, geology, and water environment is presented below.

11.7.1. WATER MANAGEMENT

11.7.1.1. Water Management and protection of Scottish water assets

The existing CAR licence (CAR/L/1011861/V2) will be varied to accommodate the Proposed Development. The abstraction and discharge rate between Loch Lomond and Loch Sloy water will be subject to controls agreed with SEPA and regulated by a CAR authorisation.

It is expected as part of the variation application SEPA will consult with Scottish Water and NatureScot such that their interests are reflected and afforded protection by the revised CAR authorisation.

Scottish Water has sought confirmation during pre-application consultation meetings that the Proposed Development would not have a detrimental effect on their existing water supply abstractions from Loch Lomond and Loch Sloy. The discussions focused on the following:

- The potential for impacting the current Scottish Water abstraction from Loch Lomond through changing water levels as a result of the Proposed Development. However, as covered in **Chapter 4: Description of the Development**, it is anticipated that the proposed pumping rates and volumes would have a negligible impact on the water levels in Loch Lomond and would operate within the historic range for the loch.
- The potential for impacting the efficacy of the treatment processes at Belmore WTW as a result of the introduction of Loch Lomond water to Loch Sloy through pumping. However, as part of the design development for the previously consented pumped hydro storage proposal, a water quality analysis and process review of Belmore WTW was commissioned to assess Belmore WTW's capability to treat a worst-case water blend. It was concluded that there would be no significant effect on water quality in Loch Sloy and on the efficacy of Belmore WTW.

In consultation with Scottish Water, the Applicant has agreed to commission an updated process review and water quality study to current Scottish Water standards. This study will consider current water quality data obtained from 12 months' sampling from both Loch Lomond and Loch Sloy and the proposed operating regime for the pumped hydro storage scheme. It has been agreed with Scottish Water that the sampling, water quality study and resultant process review can be undertaken during the Section 36 determination period.

It is anticipated there will be no need to alter the configuration of the Scottish Water offtake from Loch Sloy as a result of the Proposed Development as there would be no change to the operational range of Loch Sloy.

11.7.1.2. Buffer to Watercourses and Waterbodies

As requested by SEPA, a minimum buffer of at least 6m has been applied to watercourses and water bodies (shown on OS 1:25,000 mapping). Where practical, any proposed construction activities or infrastructure has been located outside of this buffer, this includes the secondary compound proposed at Inveruglas LLTNPA car park.

Construction of the proposed intake would require an extension of the existing tailrace, this would require works being carried out in the tailrace which is hydraulically connected to Loch Lomond. To enable safe construction and mitigate the potential of locally impairing water quality, it is proposed that the works would be isolated by use of a temporary cofferdam. This will ensure that there is no direct connection between the construction works and Loch Lomond. Water which collects behind the cofferdam, for example, from rainfall or groundwater ingress, would be collected and treated before discharge in-line with the CEMP, thus safeguarding water quality in Loch Lomond.

11.7.1.3. Thermal Stratification

Due to its size and depth, Loch Lomond 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. 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.

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 maintenance of thermal stratification due to the size of Loch Lomond, and the expected depth of the thermocline (the boundary of waters with different temperatures) relative to the elevation of the power station tailrace.

Thermal stratification is not anticipated in Loch Sloy as a consequence of the development, as the routine rise and fall in water level will prevent stratification occurring.

11.7.2. CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

The Proposed Development will be undertaken in accordance with good practice guidance, including UK and Scottish guidance on good practice for construction works detailed in **Section 11.4** of this Chapter.

A contractual requirement of the successful Contractor would be the development and implementation of a comprehensive and site-specific CEMP. This document would detail how the successful Contractor would manage the works in accordance with all commitments and mitigation detailed in the EIA Report,

statutory consents and authorisations, and industry best practice and guidance, including pollution prevention guidance. An outline CEMP has been prepared and is presented as **Volume 4, Appendix 4.2**.

The outline CEMP includes measures to ensure that the works minimise the risk of an adverse impact to soils, groundwater, surface water and water dependent habitats. The following sections detail the good practice measures to be implemented through the CEMP. For additional information, please refer to the outline Construction Environmental Management Plan (CEMP).

11.7.2.1. Environmental / Ecological Clerk of Works

A qualified Environmental/Ecological Clerk of Works (ECoW) will be appointed before construction begins. The ECoW will provide expert advice to SSE and the Contractor on ecological and hydrological issues throughout the construction phase. They would attend work programming meetings and conduct regular site audits, to provide advice on how mitigate potential adverse impacts on soil and water environments.

11.7.2.2. Soils Management

Excavated soils will be safeguarded and handled in accordance with industry best practice in order that their integrity and carbon content is safeguarded as required by NPF4. Where practicable, excavated soils would be beneficially reused as part of the landscaping and restoration proposals (see **Chapter 12: Landscape and Visual**).

It is recognised that the proposed spoil management area has been subject to previous development which dates back to the construction of the existing power station. Although there was no evidence of contamination in the 2010 ground investigation, there is potential for contaminated ground to be present. The Project CEMP will include a soils and materials management plan consisting of a method statement for identifying potentially contaminated soils, measures to quarantine these while testing of the soils is undertaken, and a procedure for their handling and management.

11.7.2.3. Water Quality Monitoring

Water quality monitoring plans would be developed during the detailed design stage in consultation with relevant stakeholders. Baseline surface water quality data will be collected prior to commencement of the works alongside ongoing monitoring during the works in order to identify any significant changes of water quality which may be attributed to the construction works. An example of monitoring frequency and an analysis suite is presented in the outline CEMP (see **Volume 4, Appendix 4.2**).

Water quality monitoring would also be used to confirm there is no impact to the Loch Sloy and Loch Lomond DWPAs and nearby private water supplies.

11.7.2.4. Pollution Risk

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

- On-site fuel storage will be bunded and safeguarded against vehicle collisions,
- COSHH items (chemical storage) shall be stored in lockable, bunded secondary containment,
- Emergency spill response kits will be available and maintained throughout the construction phase,
- Stationary plant items will have drip trays available. Each item of mobile plant shall carry an individual spill kit,
- Waste water from temporary welfare facilities will be collected for offsite disposal by a licensed contractor, in line with the duty of care for waste,

- Refuelling would take place at least 10m from watercourses / waterbodies. Where this buffer distance cannot be achieved a minimum distance will be agreed with the ECoW,
- Foul water generated onsite would be managed in accordance with Pollution Prevention Guidance 4 (PPG4),
- Fuel pipes on plant, outlets at fuel tanks etc will be regularly checked and maintained to ensure that no drips or leaks to ground occur,
- Areas designated for production of concrete or wash down would be a minimum distance of 10m from a watercourse. Washout water would be stored in the washout area before being treated and disposed of in accordance with the Site Waste Management Plan,
- Any runoff within the PDA would be collected and treated prior to discharge.

11.7.2.5. Erosion and Sedimentation Risk

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

- All excavated material will be stockpiled in-line with spoil management layout plans and as agreed with the ECoW,
- Measures will be implemented to prevent surface water runoff from entering excavations such as trenches and foundations.
- Appropriate mitigation measures would be employed, such as silt fencing and settlement ponds to prevent silt-laden runoff having an impact on the water environment. develop and implement a wet weather protocol for weather events that have the potential to result in sediment runoff, including provisions to temporarily suspend work during severe conditions.
- The ECoW and the Contractor would carry out regular visual inspections of watercourses to check for silt-laden water downstream of work areas.

The inflow / outflow to Loch Sloy from the existing hydraulic system already benefits from erosion protection. As part of the preliminary design completed to inform this planning application, it has been confirmed that the existing water transfer infrastructure from Sloy Power Station to Loch Sloy would maintain its structural integrity and does not need to be modified to safely transfer the proposed volume or rate of water transfer. This analysis has included review of the potential revised operating conditions and the more frequent rise and fall of water level which would be experienced in Loch Sloy as a result of the Proposed Development. No erosion of the banks of Loch Sloy is anticipated during the operational life of the Proposed Development.

Similarly, the proposed new intake arrangements in Loch Lomond at the tie in to the existing tailrace have been designed to accommodate the proposed water transfer volumes and rates (in both abstraction and power generation modes). This will ensure that there is no erosion impact in Loch Lomond as a result of operation of the Proposed Development.

11.7.2.6. Fluvial Flood Risk

During construction a wet weather working protocol would be implemented. This would restrict working in potential flood prone areas reducing the risk to workers and machinery. The wet weather working protocol would also specify low risk flood areas where construction equipment would be moved to should extreme weather warnings be issued by the Met Office and / or SEPA.

It is proposed to adopt good practice in relation to the management of surface water runoff rates and volumes and potential for localised fluvial flood risk. This would include the following:

- Drainage systems would be designed to ensure that any sediment, pollutants or foreign materials are removed before water is discharged into a watercourse,

- On-site drainage would be subject to routine checks to ensure that there is no build-up of sediment or foreign materials which may reduce the efficiency of the original drainage design causing localised flooding; and
- Drainage measures would attenuate runoff rates and/ reduce runoff volumes to ensure minimal effect upon flood risk. This may include collection in a tank for offsite disposal at an appropriately licenced facility.

Further information on drainage designs would be provided in the final Project CEMP.

11.7.2.7. Concrete Transport, Pouring and Batching

In relation to works involving concrete transport and pouring, in line with best practice 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. No transfers would be undertaken in proximity to watercourses or areas of standing water,
- There would be no full wash-out of concrete carrying vehicles within the proposed development. Concrete wash-down (e.g. chutes/small hoppers) would be carried out at suitably bunded/protected facilities. Water used for wash-down would be collected within a suitable container, allowed to settle and disposed at suitably licensed facilities,
- Excess concrete would not be discharged to drains or watercourses. This would be collected and disposed of in accordance with the waste management plan. Vehicles and plant working on foundations would be confined to the area required for safe working to prevent compaction, rutting and habitat damage to adjacent areas of land; and
- Concrete works will be supervised and monitored. Shuttering would be used to ensure all concrete is contained during pours and curing.

As stated above, the proposed pumphouse and tailrace would be isolated from Loch Lomond and dewatered and dry during concrete pouring, this is likely to be through the construction of a temporary cofferdam which will only be removed once all foundations and formation works have cured and approved by a suitably qualified engineer; this will ensure there is no risk to soils or water from pollution from concrete following construction.

Should any concrete batching be undertaken at site this would only be undertaken in accordance with strict controls and best practice. The need for concrete batching would be identified by the Contractor at the detailed design stage of the project and if required a method statement and controls required to safeguard the water environment specified in the final CEMP.

11.7.2.8. Dewatering

The proposed pumphouse requires a deep foundation in which the pumps will be located. Good practice measures which have been incorporated in the Proposed Development design will prevent significant dewatering occurring and include the following:

- Site investigation data have shown no contaminated ground (and therefore water) beneath the pumphouse footprint,
- The superficial and solid geology at this location have a low bulk permeability and thus would not store or permit a large quantity of groundwater movement,
- Measures will be taken to isolate the works from Loch Lomond (and therefore prevent ingress of water from the loch) during construction,

- Provision would be made for collecting incident rainfall and any limited groundwater ingress in the pumphouse foundation during construction; and
- A suitably qualified engineer would be present to confirm the temporary works and limited dewatering do not induce any ground instability.

Following construction there would be no need for any dewatering as the pumphouse foundations will be watertight. No permanent lowering of groundwater levels would occur.

11.7.2.9. Water Abstraction for Dust Suppression

There is potential that water may be required on occasion for dust suppression during the construction phase.

Dust suppression would only be required during dry periods and as directed by the site ECoW. There would be no requirement for dust suppression, or for water abstraction for any other use, during the operational phase of the Proposed Development.

Any water abstraction would only be made by the Contractor who would ensure authorisation from SEPA and in accordance with the CAR. Good practice that would be followed in addition to the CAR regulations includes:

- Confirmation of the proposed water source and point of abstraction,
- Water use would be planned to minimise abstraction volumes,
- Water would be re-used where possible; and
- Abstraction volumes would be recorded.

11.8. Construction Effects

11.8.1. PEAT AND SOILS

It has been shown that there are no deposits of peat that would be disturbed by the Proposed Development.

Soils, and the carbon entrained within them, are a high sensitivity receptor. With the identified safeguards and proposed good practice methodologies, the potential impact on deposits of soil is assessed as negligible and thus the significance of effect would be Negligible. No additional mitigation, over and above the proposed site supervision, would be required.

11.8.2. SURFACE WATER AND GROUNDWATER QUALITY

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

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

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 habitats and the Loch Lomond DWPA.

Loch Sloy water quality will not be affected by the construction phase of the Proposed Development as no construction activities are proposed within the Loch Sloy catchment. No transfer of water between Loch

Lomond and Loch Sloy will occur until after the development has been constructed and therefore changes in water quality at Loch Sloy are not considered under construction effects.

Surface water and groundwater are considered highly sensitive receptors. The Proposed Development and proposed safeguards embedded in the development design would reduce the magnitude of potential impact to negligible, during the construction phase. The significance of effect is therefore assessed as Negligible.

11.8.3. SURFACE AND GROUNDWATER FLOW

The baseline assessment has determined that the geological deposits which underlie the Proposed Development are unlikely to contain significant amounts of groundwater. In addition, the volume and rate of dewatering associated with construction of the pumphouse foundations would be low and temporary. With the exception of the pumphouse, no other significant excavations are proposed, therefore, limited dewatering would be required.

The transfer of water between Loch Sloy and Loch Lomond for generation will be maintained where possible during construction. This will be managed under the existing CAR authorisation. A period of full outage lasting approximately 12 weeks is anticipated, followed by a partial outage lasting approximately 8 weeks. SSE would work closely with Scottish Water to ensure there would be no impact on the operation of existing Scottish Water assets during the construction phase of the Proposed Development.

The best practice measures and embedded mitigation detailed in this chapter 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 within and adjacent to temporary working areas, for example the secondary compound adjacent to Loch Lomond at Inveruglas LLTNPA car park and within the proposed spoil management area.

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 would be Negligible. No additional mitigation, over and above proposed confirmatory monitoring, would be required.

11.8.4. FLOOD RISK

Areas of flood risk are considered to have a low sensitivity. As part of the detailed site design the Contractor would prepare a detailed construction method statement which would have regard to areas of known and potential flood risk, including at the proposed secondary compound at Inveruglas which would be adjacent to Loch Lomond.

As detailed in the embedded mitigation section above, a wet weather working protocol would be used at site and would restrict working in potential flood prone areas reducing the risk to workers, machinery, and downstream property in times of potential flood. 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.

The extent of the Proposed Development would be very small when compared to the area of the surface water catchment which drains to Loch Lomond, as a consequence, runoff from temporary working areas would not markedly increase rain-fall runoff rates or volumes. Notwithstanding this, incident rainfall onto working areas would be drained via SuDS, where feasible, which would attenuate and treat runoff from working areas prior to discharge off-site and thus would not result in an increased flood risk off-site.

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

11.8.5. SCOTTISH WATER ASSETS AND DWPAS

No development will be undertaken within the Loch Sloy catchment and therefore there would be no impact to Scottish Water infrastructure at Loch Sloy nor within the Loch Sloy DWPA during construction. With the best practice construction techniques to protect surface water and groundwater receptors outlined above, the quality of water in Loch Lomond would not be impaired.

Scottish Water assets and Loch Sloy and Lomond DWPAs are considered highly sensitive receptors. The potential impact on DWPAs is assessed as negligible and thus the significance of effect would be Negligible. No additional mitigation, over and above the proposed construction phase water quality monitoring of Loch Lomond, would be required.

11.8.6. PRIVATE WATER SUPPLIES

As discussed in **Section 11.6.6**, the distribution pipework for the PWS which supplies Sloy Hydroelectric Power Station and adjacent properties is potentially at risk from the Proposed Development. PWS pipework which lies within the PDA would be identified through surveys and, where required, diverted prior to commencement of construction.

Baseline water quality monitoring of properties downstream of the PWS distribution pipework intercepted by the Proposed Development is proposed. As detailed above (see **Section 11.7 Embedded Mitigation**) it is proposed this monitoring would continue during construction and for a period following construction so that in the unlikely event of potential effects on the PWS they could be identified and further mitigation measures agreed with A&BC.

With these safeguards, the magnitude of potential impact is assessed as negligible and the resultant significance of effect would be Negligible. No additional mitigation, over and above the proposed confirmatory monitoring, would therefore be required.

11.9. Operational Effects

11.9.1. SOILS

No excavation, movement or storage of soils is anticipated during the operation of the Proposed Development.

Soil is a high sensitivity receptor. The potential impact on soils is assessed as negligible and therefore the significance of the potential effect would be negligible. No additional mitigation would be required.

11.9.2. SURFACE WATER AND GROUNDWATER QUALITY

The possibility of a pollution event resulting in surface water or groundwater impairment during operation is unlikely. SSE is an industry leading operator of hydro-electric plant. Any future maintenance activities would be planned and undertaken using SSE's robust internal safety and maintenance procedures, developed around HSE and SEPA guidance. The scope of works likely to be undertaken are similar to those carried out in the existing power station and existing method statements and protocols.

Provision would be included in the site design for the collection of incident rainfall from the proposed buildings and hardstanding. Storm water drainage measures would be agreed during the detailed design stage of the project prior to construction.

The drainage system for the proposed pumping station transformers will be designed in accordance with industry standard best practice and the base and sidewalls of the below ground pumphouse will be

watertight. Any contaminant leak within the pumphouse, would be contained within the internal drainage system and will not pose a risk to soils, geology or the water environment.

Based upon the above, the potential risk associated with frequency, duration and likelihood of a pollution event is low. 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 additional mitigation would be required.

11.9.3. SURFACE AND GROUNDWATER FLOW

The transfer of water between Loch Lomond and Loch Sloy will be agreed with consultees and regulated by SEPA via a Variation to the existing CAR licence. When determining the Variation application, it is expected that SEPA will consult with Scottish Water, NatureScot, and other interested parties to ensure their interests are appropriately safeguarded.

As covered in **Chapter 4: Description of Development,** the proposed development would not alter water levels in Loch Lomond or Loch Sloy beyond their current operational ranges so therefore, no significant effects on surface water flows are predicted.

No groundwater would be intercepted or need to be managed during the operation of the Proposed Development.

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 for future maintenance activities would be planned and undertaken using the Applicant's robust internal safety and maintenance procedures, developed around HSE and SEPA guidance. 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 would be negligible. No further or additional mitigation would be required.

11.9.4. FLOOD RISK

All elements of the Proposed Development within the floodplain (e.g. the tailrace and pumphouse foundation) are considered water compatible. Control equipment associated with operation of the Proposed Development would be located and raised above the 1 in 200-year flood level including an allowance for climate change and a sufficient freeboard (e.g. not prone to fluvial flood risk).

Following construction, all rainfall runoff generated within the site and secondary compound would be collected and managed prior to controlled discharge/removal from site in line with industry best practice. Spill kits will be located in areas which will be subject to regular vehicle movements or parking. Details of the operational drainage scheme would be produced during the detailed design phase.

The proposed drainage infrastructure would be subject to routine inspection and maintenance. Any future works would be planned and undertaken using the Applicant's robust internal safety and maintenance procedures, developed around HSE and SEPA guidance.

Loch Sloy will continue to be a controlled reservoir under The Reservoirs (Scotland) Act 2011 mandating regular inspection and maintenance of Sloy Dam. The Proposed Development will have no impact on the integrity of the dam. The potential impact of flooding resulting from the Proposed Development would be negligible following adherence to good practice measures. Therefore, the potential significance of effect would be negligible. No mitigation would therefore be required.

11.9.5. SCOTTISH WATER ASSETS AND DWPAS

As detailed above, (see **Section 11.7 Embedded Mitigation**) in consultation with Scottish Water, it has been agreed that a water quality assessment and process review will be commissioned to assess the potential effects the transfer of water from Loch Lomond to Loch Sloy might have on the Sloy DWPA or efficacy of processes at Belmore WTW. The scope for this study has been agreed and, as it requires 12 months of water sampling data it is not yet complete and therefore cannot be commented on in this EIA. SSE has committed to working collaboratively with Scottish Water during this assessment and subsequent design stages. Any additional mitigation measures required to safeguard Scottish Water assets would be agreed on completion of the study.

As discussed in **Chapter 4: Description of Development** no significant change in water level variation in Loch Lomond would occur as a result of operation of the Proposed Development, and therefore there will be no effect on the operation of Scottish Water's assets in the loch.

The controls which would be adopted at the Proposed Development during the operational phase that would safeguard surface water and groundwater quality, surface water and groundwater flows, and mitigate flood risk would ensure that the potential impact on Scottish Water assets and DWPAs are negligible and the significance of effect would be negligible. No additional mitigation over and above water quality monitoring and process review would be required.

11.9.6. PRIVATE WATER SUPPLIES

During the construction phase, PWS distribution pipework would be safeguarded (see above).

During the operational phase, no impact on the PWS would be expected as there would be no anticipated works to be undertaken in proximity to the PWS source or distribution pipework.

Baseline water quality monitoring of properties downstream of the PWS distribution pipework intercepted by the Proposed Development is proposed. As detailed above (see **Section 11.7 Embedded Mitigation**) it is proposed this monitoring continues during construction and for a period following completion so that in the unlikely event of potential effects on the PWS occurring they could be identified and further mitigation measures agreed with A&BC.

With these safeguards the magnitude of potential impact is assessed as negligible, and the resultant significance of effect would be negligible. No additional mitigation, over and above the proposed confirmatory monitoring, would therefore be required.

11.10. Cumulative or In-Combination Effects

Given the nature of the Proposed Development, the safeguards and best practice methods detailed above it is considered that no cumulative or in-combination effects will occur as a result of the Proposed Development.

11.11. Mitigation

There are no predicted likely significant effects under the terms of the EIA regulations during the construction and operational phase of the Proposed Development. Other than the good practice measures and confirmatory monitoring, no specific mitigation would be required.

11.12. Residual Effects

Subject to adoption of best practice construction techniques and adherence to a Varied CAR authorisation no significant residual effects are predicted during the construction or operation period of the Proposed Development.

11.13. Summary And Conclusion

An assessment of the potential effects of the Proposed Development on soils, geology and water environment within the defined study area (including land within 500m of the PDA) has been undertaken.

The assessment has considered the construction and operational phases of the Proposed Development. This has included potential operational effects on Loch Sloy.

Prior to completing this assessment, consultation with Scottish Water has been undertaken and it has been agreed that a study will be commissioned to confirm whether the water quality of the Lomond / Sloy blend remains within the treatable envelope for Belmore WTW. The results of this study are not available at the time of writing (as 12 months of water sampling data is required). The Applicant has committed to continue to work with Scottish Water and share the results of the study with Scottish Water.

It is proposed that a Construction and Environmental Management Plan (CEMP) would be prepared by the Contractor at the detailed design stage of the project. The CEMP would be used to require soils and spoil management plans to be prepared, confirm final drainage requirements and monitoring programme. The principles which would be included in the CEMP to safeguard soils, geology and protect the water environment are given in this Chapter and have been used to complete the assessment.

During the operational phase of the Proposed Development, the transfer of water between Loch Sloy and Loch Lomond would be regulated by SEPA. The authorisation issued by SEPA (via a Variation to the existing CAR Licence) would include limits on the volume and rate of water transfer between Loch Lomond and Loch Sloy (and vice versa).

Loch Sloy will continue to be a controlled reservoir under The Reservoirs (Scotland) Act 2011 mandating regular inspection and maintenance of Sloy Dam.

Subject to the embedded mitigation and adoption of mitigation measures, no significant residual effects during construction or operational phases are predicted on:

- Soils;
- Geological receptors;
- Surface water or groundwater receptors;
- Scottish Water assets in Loch Lomond and Loch Sloy; and
- DWPA and PWS sources.