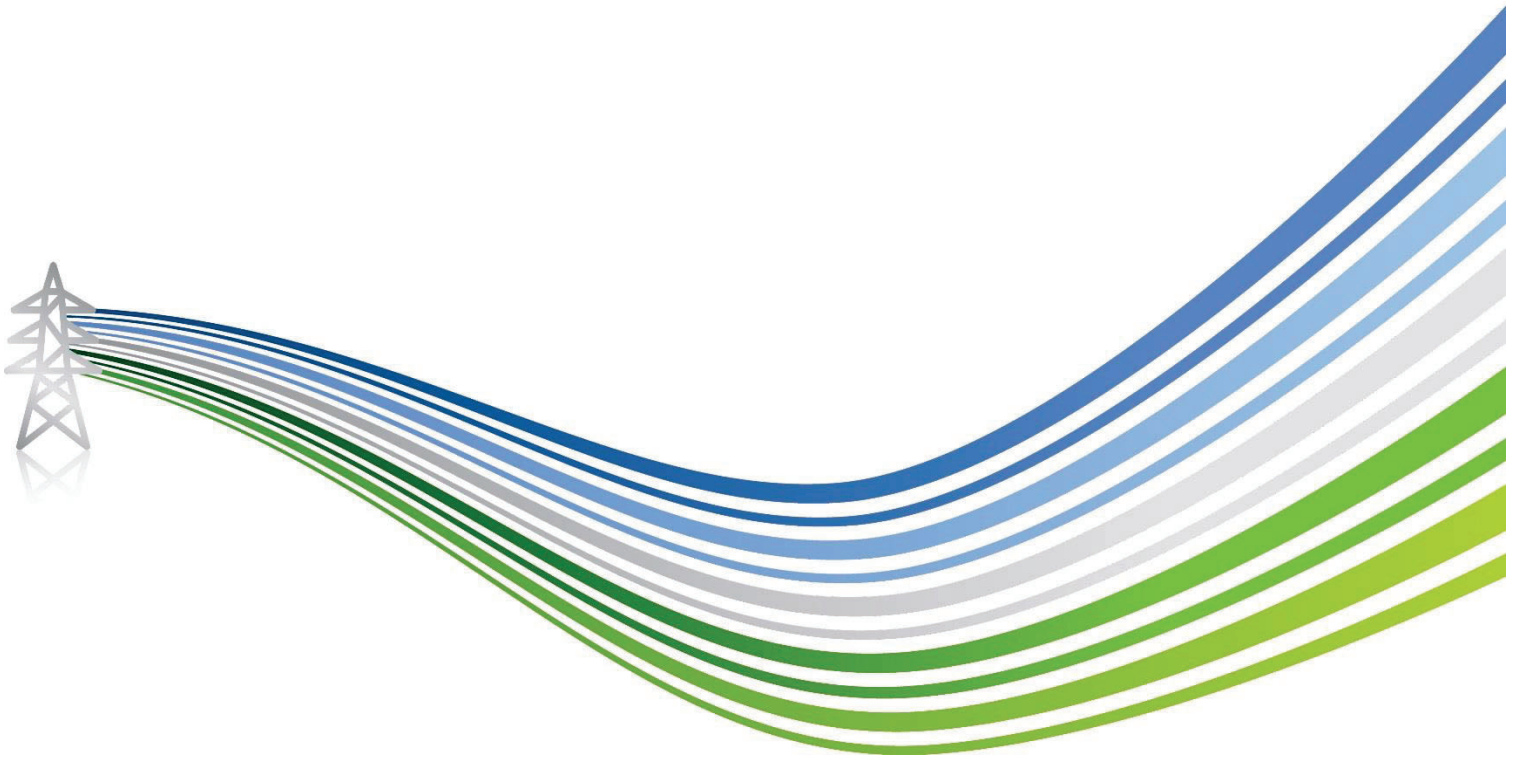
Scottish & Southern Electricity Networks
TRANSMISSION

Fanellan Hub 400 kV Substation and Converter Station Environmental Impact Assessment Report Volume 2 | Chapter 13 - Hydrology, Hydrogeology, Geology and Soils

February 2025



CONTENTS

13 HYDROLOGY, HYDROGEOLOGY, GEOLOGY AND SOILS

13.1 Introduction

13.1.1 This chapter sets out the assessment of the potential for effects on hydrology, hydrogeology, geology, and soils resulting from the Proposed Development. The assessment considers effects within the Site (area within the red line boundary shown in **Figure 1.1** of this Environmental Impact Assessment (EIA) report) and the relevant Study Areas (defined below). For each of the following bullet points, this chapter details the baseline description, identifies and assesses the effects on each receptor and, where relevant, identifies proposed mitigation:

- geomorphology and geology – geomorphological characteristics of the Site and changes to geological structures or effects on designated sites;
- soils – changes to soil characteristics related to erosion, compaction and soil quality;
- contamination – historical site uses which may have resulted in existing contaminant impact to soils and the water environment and has the potential to harm sensitive receptors;
- hydrogeology – changes to groundwater infiltration and groundwater levels, water quality and wetland characteristics; and
- hydrology – changes to drainage regime and associated alteration to surface water runoff rates and volumes, erosion / sedimentation and water quality characteristics across the Site and the wider catchment, including designated sites and Groundwater Dependent Terrestrial Ecosystems (GWDTE). Also, changes to water resources such as Scottish Water drinking water abstractions, private water supplies (PWS), and both Scottish Environment Protection Agency (SEPA) and Scottish Water (SW) Drinking Water Protected Areas.

13.1.2 This chapter should be read in conjunction with the following Chapters, Appendices and Figures:

- **Chapters 1 – 7 of this EIA report;**
- **Chapter 18: Schedule of Mitigation of this EIA report;**
- **Figure 13.1: Superficial Geology;**
- **Figure 13.2: Hydrology;**
- **Appendix 13.1: Flood Risk Assessment (FRA);**
- **Appendix 13.2: Drainage Strategy Report (DSR);**
- **Appendix 13.3: Drainage Impact Assessment (DIA);**
- **Appendix 13.4: Ground Investigation (GI) Report; and**
- **Appendix 13.5: Earthworks Strategy Report.**

13.2 Assessment Methodology and Significance Criteria

Legislation

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

- The Water Environment and Water Services (Scotland) Act 2003[1];
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended (CAR)[2];
- The Private Water Supplies (Scotland) Regulations 2006[3];
- The Flood Risk Management (Scotland) Act 2009[4]; and
- Environmental Protection Act (1990).

Policy

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

- National Planning Framework 4 (NPF4) 2023[5];
- SEPA Policy No. 19, Groundwater protection policy for Scotland[6];
- The Highland-wide Local Development Plan (HwLDP)[7];
- Planning Advice Note (PAN) 33: Development of contaminated land (2017)[8];
- SEPA's Position Statement on Planning and Soils (2022)[9];
- SEPA's Position Statement on Land Protection (2022)[10];
- Planning Advice Note 60: Natural Heritage (2000)[11]; and
- The Scottish Soil Framework (2009)[12].

Guidance

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

- Construction industry research and information association (CIRIA) Report C532 – Control of water pollution from construction sites: Guidance for consultants and contractors[13];

[1] Water Environment and Water Services (Scotland) Act 2003. asp 3. Available at: https://www.legislation.gov.uk/asp/2003/3/contents.
[2] The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Available at: https://www.legislation.gov.uk/ssi/2011/209/contents/made.
[3] The Private Water Supplies (Scotland) Regulations 2006. Available at: http://www.legislation.gov.uk/ssi/2006/209/contents/made.
[4] Scottish Government (2009). Flood Risk Management (Scotland) Act 2009. Available at: https://www.legislation.gov.uk/asp/2009/6/contents.
[5] National Planning Framework (2023). Available at: https://www.gov.scot/publications/national-planning-framework-4/
[6] Scottish Environment Protection Agency (2009). Groundwater Protection Policy for Scotland v3, November 2009, Environmental Policy Number 19. Available at: https://www.sepa.org.uk/media/34371/groundwater-protection-policy-for-scotland-v3-november-2009.pdf.
[7] The Highland Council (2017 – 2024) Highland-wide Local Development Plan (HwLDP). Available at: https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/199/highland-wide_local_development_plan/.
[8] Planning Advice Note (PAN) 33: Development of contaminated land (2017) Available at: https://www.sepa.org.uk/media/143286/lups-gu3-planning-guidance-on-land-subject-to-contamination-issues.pdf
[9] Scottish Environment Protection Agency (SEPA) Position Statement on Planning and Soils (2022). Available at: https://www.sepa.org.uk/environment/land/soil/
[10] SEPA's Position Statement on Land Protection (2022). Available at: https://www.sepa.org.uk/media/159201/ep-054_position_statement_on_land_protection.pdf
[11] Planning Advice Note 60: Natural Heritage (2000). Available at: https://www.gov.scot/publications/pan-60-natural-heritage/
[12] The Scottish Soil Framework (2009). Available at: https://www.gov.scot/publications/scottish-soil-framework/
[13] Masters-Williams, H., Heap, A., Kitts, H., Greenshaw, L., Davis, S., Fisher, P., Hendrie, M. and Owens, D. (2001). CIRIA C532 Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors.

- CIRIA Report C753 – The SuDS Manual[14];
- Scottish Government – River crossings & migratory fish: Design guidance (2012)[15];
- Scottish Natural Heritage (now 'NatureScot') – A handbook on environmental impact assessment Version 5 (2018)[16];
- SEPA – The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended): A Practical Guide (Version 9.2, December 2022)[17];
- SEPA – Position Statement WAT-PS-06-02 Culverting of watercourses[18];
- SEPA – WAT-SG-25, Good practice guide – river crossings[19];
- SEPA – WAT-SG-31, Special requirements for civil engineering contracts for the prevention of pollution[20];
- SEPA – Land Use Planning System Guidance Note 31, Guidance on assessing the impacts of development proposals on groundwater abstractions and groundwater dependent terrestrial ecosystems[21];
- Scottish Government (2006), Environmental Protection Act 1990 - Part IIA Contaminated Land: statutory guidance edition 2[22];
- BS 10175:2011+A2:2017 Investigation of potentially contaminated sites. Code of practice (BSI, 2017)[23];
- BS 5930:2015+A1:2020 Code of practice for ground investigations (BSI, 2020)[24];
- Environment Agency (2020), Land Contamination Risk Management (LCRM)[25];
- Scottish Government, Scottish Natural Heritage (SNH), SEPA (2017), Peatland Survey. Guidance on Developments on Peatland[26];
- SEPA (2022c), Land Remediation and Waste Management Guidelines[27]; and
- DEFRA (2009), Construction Code of Practice for the Sustainable Use of Soils on Construction Sites[28].

[14] CIRIA (2015). The SuDS Manual (C753).
[15] Scottish Government (2012). River Crossings and Migratory Fish: Design Guidance.
[16] Scottish Natural Heritage and Historic Environment Scotland (2018). Environmental Impact Assessment Handbook.
[17] Scottish Environment Protection Agency (2022). The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) – A Practical Guide (Version 9.2, December 2022).
[18] Scottish Environment Protection Agency (2011). WAT-PS-06-02: Culverting of Watercourses – Position Statement and Supporting Guidance.
[19] Scottish Environment Protection Agency and Natural Scotland (2010). Engineering in the Water Environment: Good Practice Guide River Crossings (Second Edition).
[20] Scottish Environment Protection Agency (2006). Prevention of Pollution from Civil Engineering Contracts: Special Requirements (Version 2, June 2006).
[21] Scottish Environment Protection Agency (2017). Land Use Planning System Guidance Note 31, Guidance on assessing the impacts of development proposals on groundwater abstractions and groundwater dependent terrestrial ecosystems.
[22] Scottish Government (2006), Environmental Protection Act 1990 - Part IIA Contaminated Land: statutory guidance edition 2
[23] BS 10175:2011+A2:2017 Investigation of potentially contaminated sites. Code of practice (BSI, 2017)
[24] BS 5930:2015+A1:2020 Code of practice for ground investigations (BSI, 2020).
[25] Environment Agency (2020), Land Contamination Risk Management (LCRM).
[26] Scottish Government, Scottish Natural Heritage (SNH), SEPA (2017), Peatland Survey. Guidance on Developments on Peatland.
[27] SEPA (2022c), Land Remediation and Waste Management Guidelines.
[28] DEFRA (2009), Construction Code of Practice for the Sustainable Use of Soils on Construction Sites

Extent of the Study Area

13.2.4 The assessment is based upon the land within the Study Area, applying professional judgement and experience of assessing similar developments in similar environments. The following terms are used throughout this EIA Report:

- Proposed Development – relates to the proposed substation and converter station and associated enabling works / infrastructure.
- Site – relates to the area within the red line boundary shown in **Figure 1.1** of this Environmental Impact Assessment report.
- Study Area – encompasses sensitive receptors within the zone of influence of the Proposed Development, up to and including 1 km. This radius is considered conservative for the assessment of potential adverse effects resulting from the Proposed Development.
- GWDTE Study Area – comprises a 250 m buffer of the Proposed Development where excavations are likely to be greater than 1 m, and a buffer of 100 m for excavations less than 1 m.

Consultation Undertaken to Date

13.2.5 An EIA Scoping Report (Appendix 6.3) was received by The Highland Council (THC) on 14th June 2024, which outlined the proposed scope of this EIA based on the available baseline data at the time. In undertaking this assessment, consideration has been given to the scoping responses referred to by THC in their Scoping Opinion 24/02655/SCOP, as detailed in Table **13.1**. A copy of the Scoping Opinion can be found in Appendix 6.4.

13.2.6 **Table13.1** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 13.1: Consultation Responses

Consultee	Type of consultation	Response	How response has been considered within this EIA Report
Scottish Water (SW)	THC EIA Scoping Opinion	SW noted that there is live infrastructure in the proximity of the development area that may impact on the existing Scottish Water assets. The applicant must identify any potential conflicts with Scottish Water assets and contact their Asset Impact Team via Scottish Water Customer Portal for an appraisal of the proposals. For reasons of sustainability and to protect our customers from potential future sewer flooding, SW will not accept any surface water connections into our combined sewer system.	This information is considered further within **Section 13.4 - Water Supplies.** This information is addressed within the **Appendix 13.2 DSR** and **Appendix 13.3 DIA**.
	A list of SW public water abstractions within a 5 km radius of the Proposed Development was	Response received January 2023. Scottish Water provided public water abstractions within a 5 km radius of the Proposed Development.	This information is considered further within **Section 13.4 - Water Supplies**.

Consultee	Type of consultation	Response	How response has been considered within this EIA Report
	requested via email in December 2022		
The Highland Council (THC)	EIA Scoping Opinion	The EIA report should fully describe the likely significant effects of the development on the local geology including aspects such as earthworks, site restoration and the soil generally including direct and indirect effects. Proposals should demonstrate construction practices that help to minimise the use of raw materials and maximise the use of secondary aggregates and recycled or renewable materials. The soils and overburden balance calculation should demonstrate whether additional material will be required or will be generated, and where it is proposed to be temporarily or permanently stored. The applicant is encouraged to achieve a cut and fill balance on or in the immediate vicinity of the development footprint to avoid haulage via the local road network. The EIA report needs to address the nature of the hydrology and hydrogeology of the site, and of the potential impacts on water courses, water supplies, water quality, water quantity and on aquatic flora and fauna. Impacts on watercourses, lochs, groundwater, other water features and sensitive receptors, such as water supplies, need to be assessed The Highland Council's contaminated land officer is satisfied with scoping response that there are no significant concerns in terms of known potential contaminated land issues within the red line site boundary presented. The Council's Flood Risk Management Team had no substantive site-specific comments to make at this stage. However, there are a number of watercourses and waterbodies on the site therefore the following generic advice applies: • All tracks should be kept a minimum 10 m away from any waterbody except water crossings;	This information is considered further within: **Section 13.4 Baseline Conditions – Geology and Soils, River Catchment, Hydrogeology, Contaminated Land, Flood Risk** and **Future Baseline** **Section 13.6 – Mitigation by Design / Good Practice Measures** provide further details regarding flood risk, soil / earthworks and appropriate mitigation. **Appendix 13.1 FRA, Appendix 13.2 DSR, Appendix 13.3 DIA** and **Appendix 13.5 Earthworks Strategy Report**.

Consultee	Type of consultation	Response	How response has been considered within this EIA Report
		• Access tracks not acting as preferential pathways for runoff and efforts being made to retain existing natural drainage wherever possible; • Natural flood management techniques should be applied to reduce the rate of runoff where possible; use of Suds to achieve pre-development runoff rates and to minimise erosion on existing watercourses; • Water crossings in the form of culverts or bridges, or upgrades to existing crossings must be designed to accommodate to 1 in 200-year flood event, plus climate change; • Land rising within any floodplain to be avoided; if ultimately required, compensatory storage must be provided; and, •The EIA report should be informed by the Council's Flood Risk and Drainage Impact Assessment SG.	
	THC PWS records within a 5 km radius of the Proposed Development was requested via email in December 2022	Response received January 2023. THC provided an up to date (as of January 2023) private water supply register within 5 km of the Proposed Development.	This information is considered further within **Section 13.4 - Water Supplies** section of this chapter.
THC	Email consultation with THC regarding the scoping out of peat.	THC responded on 10th October 2024 confirming that they had no objection to the scoping out of peat on the basis of the evidence provided to them.	This response is considered and expanded upon in more detail within **Section 13.5. Issues Scoped Out**.
THC	THC PWS records for THC administrative areas was requested via email in February 2024	Response received February 2024. THC provided PWS for their administrative areas.	This information is considered further within **Section 13.4 - Water Supplies** section of this chapter.
SEPA	THC EIA Scoping Opinion	<u>Local Hydrology and Watercourse Crossings</u> The proposals should demonstrate how impacts on local hydrology have been minimised and the site layout designed to minimise watercourse crossings and	<u>Local Hydrology and Watercourse Crossings</u> **Section 13.6** – **Assessment of Effects, Mitigation and Residual Effects** addresses the details how impacts on local hydrology have been

Consultee	Type of consultation	Response	How response has been considered within this EIA Report
		avoid other direct impacts on water features. Measures should be put in place to protect any downstream sensitive receptors. The EIA report will be expected to identify all water crossings and include a systematic table of watercourse crossings or channelising, with detailed justification for any such elements and design to minimise impact. The table should be accompanied by photography of each watercourse affected and include dimensions of the watercourse. Private Water Supplies SEPA has no record of private water supplies within the site, and they have also noted the presence of a well to the northwest of Upper Fanellan Cottages. The status of this should be confirmed in the final submission. Peat It should be clearly demonstrated that the assessment has informed careful project design and ensured, in accordance with relevant guidance and the mitigation hierarchy in NPF4, that adverse impacts to peatland are first avoided and then minimised through best practice. If disturbance of the areas where carbon rich soils are present is avoided, SEPA are content with the approach of scoping out peat. However, if this is not the case a proportionate Peat Management Plan should be included in the submission, and it should be demonstrated how impacts have been minimised with a detailed map of where the areas of peat with peat depths are located. Flood Risk If it is considered the development could result in an increased risk of flooding to a nearby receptor, then a flood risk assessment (FRA) must be submitted. Our Technical Flood Risk Guidance for Stakeholders outlines the information we require to be submitted in an FRA. GWDTE A set of drawings demonstrating all GWDTE, and existing groundwater	minimised and watercourse crossings have been minimised to avoid direct impacts on water features. **Section 13.6.** – **Mitigation by Design / Good Practice Measures** addresses the best practice measures suggested to protect downstream sensitive receptors. **Appendix 13.2 DSR** addresses the information regarding watercourse crossings. Private Water Supplies **Section 13.4** – **Water Supplies** expands on this information, including confirming the status of the identified well. Peat **Section 13.4.5** – **Geology and Soils** addresses this information in more detail. Peat has been scoped out of this assessment on the basis that peat soils are limited to few isolated pockets within the Site, with only four out of 91 machine excavated trial pits from 2023 ground investigations in the area showing evidence of shallow organic surface layer described as peat. Flood Risk An FRA has been completed and can be found in **Appendix 13.1 FRA** GWDTE This response is addressed in further detail in **Section 13.4 – Groundwater Dependent Terrestrial Ecosystems**. A GWDTE assessment is currently pending but will be undertaken in accordance with SEPA guidance.

Consultee	Type of consultation	Response	How response has been considered within this EIA Report
		abstractions are outwith a 100 m radius of all excavations shallower than 1m and outwith 250 m of all excavations deeper than 1m and proposed groundwater abstractions. The survey needs to extend beyond the site boundary where the distances require it.	
SEPA	Email consultation with SEPA regarding culverting of watercourse crossing for access track.	Response received August 2024. SEPA warned of likely objection to substantial culverting for proposed access track to the north of the Proposed Development as it appeared to be over 100 m in length and permanent. SEPA also opposed the construction of a SuDS basin which crossed an existing watercourse, suggesting the infrastructure be moved to at least 10 m away from the watercourse.	This response was considered in the design stage and has been replaced by a bridge in lieu of culverting. The location of the SuDS basin has been altered to keep at least 10 m away from the nearest watercourse. This information is considered further within **Section 13.6 - Mitigation by Design / Good Practice Measures**.
	Email consultation with SEPA regarding the scoping out of peat.	SEPA responded on 10th October 2024 confirming that they had no issue with the scoping out of peat on the basis of the evidence provided to them, however stated that the local authority (THC) was responsible for providing the final decision as the scoping authority.	This response is considered and expanded upon in more detail within **Section 13.5. - Issues Scoped Out**.
	SEPA abstractions data for a 7 km radius from the Proposed Development was requested via email in January 2023.	Response received January 2023. SEPA provided all records of activities authorised under the Controlled Activities Regulations (CAR)[29].	This information is considered further within **Section 13.4 - Water Supplies** section of this chapter.
	FRA and DIA response	<u>Flooding</u> SEPA have agreed with the FRA and DIA that there are unlikely to be any impact on flood risk for nearby receptors as a result of the Proposed Development. <u>Watercourse Crossings</u> SEPA have confirmed it is likely that the culverting of the manmade drainage channels for a permanent access track to the south of the	This response is considered further within **Section 13.4 – River Catchment** and **Section 13.5 - Issues Scoped Out.**

[29] The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Available here: https://www.legislation.gov.uk/ssi/2011/209/contents/made [Accessed: June 2024]

Consultee	Type of consultation	Response	How response has been considered within this EIA Report
		Proposed Development will be acceptable and is unlikely to be subject to CAR authorisation.	

13.2.7 Records of SW abstractions were gathered in January 2024, directly from SW's asset database under agreement between SW and WSP. This information is considered further within **Section 13.4,** Water Supplies section of this chapter.

Method of Baseline Data Collation

13.2.8 Chapter 3 - Methodology and Consultation of this EIA report outlines the overall assessment methodology. This methodology has been expanded to assess hydrology, hydrogeology, geology and soils; details of this are outlined below.

13.2.9 To investigate baseline conditions and to consider potential effects of the Proposed Development with respect to hydrology, hydrogeology, geology, and soils, a review of available desk-based information has been undertaken.

13.2.10 A site visit took place on 28th October 2024 by the WSP Hydrology Team to survey watercourse crossing locations.

13.2.11 The general methodology used to assess the effect of the Proposed Development on the hydrology, hydrogeology, geology, and soils receptors within the Study Area is as follows:

- Desktop study to obtain baseline and historical data, including the use of relevant appendices (**13.1** to **13.5)**;
- Consultation with SW, THC, and landowners to identify water abstractions and PWS;
- Identification of the potential effects of the Proposed Development on sensitive receptors; and
- Identification of options for the mitigation of potential effects, taking account of the Applicant's General Environmental Management Plans (GEMPs) (**Appendix 3.1**).

Determining Magnitude of Change and Sensitivity of Receptors

13.2.12 The assessment of significance will consider the magnitude of change (from the baseline conditions), the sensitivity of the affected environment / receptors and (in terms of determining residual effects) the extent to which mitigation and enhancement will reduce or reverse adverse effects.

Sensitivity of Receptor

13.2.13 The sensitivity of the receptor will be determined using professional judgement, and consideration of existing designations and quantifiable data, where possible. The criteria used to determine the sensitivity of receptors is shown in **Table 13.2**.

Table 13.2: Sensitivity of Receptor Criteria

Sensitivity	Example of Characteristics
High	• Receptor has 'High' or 'Good' Water Framework Directive (WFD) overall status and / or water quality status for surface water or groundwater body. • Receptor is a designated site protected under national or international legislation, such as Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), and Special Protection Area (SPA), for the disciplines assessed in this chapter. • Receptor contains Geological Conservation Review (GCR) sites designated as SSSIs or Candidate SSSIs. • Receptor contains areas of regionally important economic mineral deposits. • Receptor supports key species and habitats sensitive to changes in suspended sediment concentrations and turbidity, such as salmon or freshwater pearl mussels. • Receptor supports habitats indicative of potential highly groundwater dependent GWDTE. • Receptor contains a range of hydromorphological features with very little modification. • Receptor is a watercourse or floodplain, with a possibility of direct flood risk to populated areas, which are sensitive to increased flood risk by the possible increase in water levels. • Receptor provides clear flood alleviation benefits. • Receptor used for abstraction or storage for public water supply or large private water supply serving ≥10 properties. • Receptor contains Class 1 or 2 priority peatland, with carbon-rich and peaty soils covering ≥20% of the Proposed Development. • Receptor is classed as a high productivity aquifer.

Sensitivity	Example of Characteristics
Medium	• Receptor has 'Moderate' WFD overall status and / or water quality status for surface water or groundwater body. • Receptor contains GCR sites with Local Geodiversity Site (LGS) status. • Receptor contains areas of locally important economic mineral deposits. • Receptor supports habitats indicative of potential moderately groundwater dependent GWDTE. • Receptor contains limited hydromorphological features and a limited range of fluvial processes, such areas may have been subject to past modification such as straightening, bank protection and culverting or other anthropogenic pressures. • Receptor is a watercourse or floodplain, with a possibility of direct flood risk to high value agricultural areas, which are moderately sensitive to increased flood risk by the possible increase in water levels. • Receptor provides limited flood alleviation benefits. • Receptor used for abstraction or storage for private water supply serving <10 properties or for agricultural / industrial use. • Receptor contains Class 1 or 2 priority peatland, with carbon-rich and peaty soils covering <20% of the Proposed Development, or Class 3 and 5 peatland areas, carbon rich and peaty soils present within the Proposed Development. • Receptor is classed as a moderate or low productivity aquifer.
Low	• Receptor has 'Poor' or 'Bad' WFD overall status and / or water quality status for surface water or groundwater body. • Receptor contains GCR sites without SSSI (or Candidate SSSI) designation or LGS status, and non GCR sites with potential geodiversity interest. • Receptor supports no key species and habitats sensitive to changes in suspended sediment concentrations and turbidity. • Receptor supports habitats indicative of potential groundwater dependency with local water sources not considered to be predominantly groundwater. • Receptor contains no hydromorphological diversity and / or are identified as 'heavily modified water bodies' or 'artificial water bodies'. • Receptor is a watercourse or floodplain which passes through low value agricultural areas, less sensitive to increased flood risk by the possible increase in water levels. • Receptor provides limited flood alleviation benefits. • Receptor does not support any water abstractions. • Receptor contains Class -2, -1, 0, and 4 non-peatland areas, with no carbon-rich and peaty soils. • Receptor is classed as a very low productivity aquifer.

Magnitude of Impact

13.2.14 The likely magnitude or extent of an impact (or change) on a receptor is established by assessing the degree of the impact relative to the nature and extent of the Proposed Development. The criteria used to determine the magnitude of change is shown in **Table 13.3**.

Table 13.3: Magnitude of Impact Criteria

Magnitude of Change	
Major	• Long-term (≥12 months) or permanent change in surface water quality, resulting in a change in WFD status and / or prevention of attainment of target status of 'Good'. • Results in loss of feature(s) and failure of hydromorphological elements (morphology, quantity and dynamics of flow) resulting from the works. Loss or damage to existing habitats. Replacement of natural bed and / or banks with artificial materials. Extensive change to channel planform. • Loss of floodplain due to construction within flood risk area. • Permanent loss of water supply. • Major or total loss of a geological site or mineral deposit, where the value of the receptor would be severely affected. • Major or total loss of soils or peatland deposits or where the value of the receptor would be severely affected. • Long-term (≥12 months) or permanent change in groundwater quality, resulting in a permanent change in WFD status and / or prevention of attainment of target status of 'Good'. Major loss of an aquifer in terms of water level or yield, with total loss of, or major changes to, dependent abstractions / habitats. • Major change or total loss of a GWDTE, where the value of the receptor would be severely affected. • Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements; exposure to acutely toxic contaminants.
Moderate	• Mid-term (≥6 months) change in local surface water quality, potentially resulting in a temporary change of WFD status (or equivalent status at local scale) or preventing attainment of target overall status of 'Good' during this period. • Results in adverse change on integrity of hydrological feature(s) or loss of part of feature / moderate shift away from baseline conditions. Failure of one or more hydromorphological elements (morphology, quantity and dynamics of flow) resulting from the works. Some damage or loss to habitat due to the modifications. Replacement of the natural bed and / or banks with artificial material. • Floodplain reduction due to extensive increases in impermeable area within catchment and / or drainage design which would result in an increase in peak flood level. • Temporary loss of water supply. • Partial loss of a geological site or mineral deposit, with major change to the settings, or where the value of the receptor would be affected. • Partial loss of soils or peatland deposits or where the value of the receptor would be affected. • Mid-term (≥6 months) change in local groundwater quality, not affecting overall WFD status. • Changes to an aquifer in terms of water level or yield, with small changes to nearby dependent abstractions / habitats. • Partial change or loss of a GWDTE, where the value of the receptor would be affected. • Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements; short-term exposure to contaminants with chronic (long-term) toxicity.

Magnitude of Change	
Minor	• Short-term (≥1 month) change in local surface water quality, resulting in minor temporary changes such that ecology is affected for short-term. Equivalent to a temporary minor, but measurable, change within WFD status class. • Potential failure in one of hydromorphological elements (morphology, quantity and dynamics of flow) resulting from the works. Results in minimal shift away from baseline conditions or partial loss or damage to habitat due to modifications. • Floodplain changes due to limited increases in impermeable area within catchment and / or drainage design which would result in a minor increase in peak flood level. • Temporarily reduced quality and quantity of water supply. • Small loss to a geological site or mineral deposit, such that the value of the receptor would not be affected. • Small loss of soils or peatland, or where soils will be disturbed but the value not affected. • Short-term (≥1 month) change in local groundwater quality. • Small change to an aquifer in terms of water level or yield, with little discernible change to dependent abstractions / habitats. • Small change to or loss of a GWDTE, where the value of the receptor would not be affected. • Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
Negligible	• Negligible change to surface water quality, very slight temporary change in water quality with no discernible change to watercourse ecology. • No alteration to hydromorphological elements. Some change to feature(s), but of insufficient level to affect the use / integrity, approximating to a 'no change' situation. • Floodplain variations of negligible change. • No anticipated change to water supply. • Minimal or no change to a geological site or mineral deposit. • Minimal or no change to soils or peatland deposits. • Negligible change to groundwater quality, very slight temporary change in local water quality. • Minimal or no change to an aquifer in terms of water level or yield, with no discernible change to dependent abstractions / habitats. • Minimal or no change to or loss of a GWDTE. • Very minor loss or detrimental alteration to one or more characteristics, features or elements.

Probability

13.2.15 The probability of the occurrence of an effect has been evaluated as being high, medium, or low during the phase of work being assessed. Professional judgment is used to determine the probability of occurrence.

13.2.16 The application of good practice as detailed in the Applicant's GEMPs (Appendix 3.1), a CEMP implemented by the Principal Contractor, and mitigation measures, reduces the probability of an effect occurring.

Significance

13.2.17 The findings of the three criteria considered in the evaluation of an effect has been applied to a matrix for each potential effects (Table 13.4) to assess its significance, including probability which is a standard piece of criteria

within the hydrology chapter. The probability of occurrence is important to determine the overall significance of an effect.

13.2.18 Through the assessment, potential effects are concluded to be of major, moderate, minor, or negligible significance. Major and moderate effects are considered significant, and minor and negligible effects are considered not significant. Effects are considered adverse unless stated otherwise.

Table 13.4: Significance Matrix

Sensitivity	Magnitude	Probability	Significance of Effect
High	Major	High	Major
		Medium	Major
		Low	Moderate
	Moderate	High	Moderate
		Medium	Moderate
		Low	Minor
	Minor	High	Minor
		Medium	Minor
		Low	Minor
	Negligible	High	Minor
		Medium	Negligible
		Low	Negligible
Medium	Major	High	Major
		Medium	Moderate
		Low	Minor
	Moderate	High	Moderate
		Medium	Minor
		Low	Minor
	Minor	High	Minor
		Medium	Minor
		Low	Negligible
	Negligible	High	Negligible
		Medium	Negligible
		Low	Negligible
Low	Major	High	Moderate
		Medium	Minor
		Low	Negligible
	Moderate	High	Minor
		Medium	Minor
		Low	Minor
		High	Minor

Sensitivity	Magnitude	Probability	Significance of Effect
	Minor	Medium	Negligible
		Low	Negligible
	Negligible	High	Negligible
		Medium	Negligible
		Low	Negligible

Limitations and Assumptions

13.2.19 Baseline conditions have been established from a variety of sources, including historical data, although due to the dynamic nature of certain aspects of the environment, conditions are likely to change during the construction and operation of the Proposed Development.

13.2.20 It is assumed that information received by third parties is complete and up to date.

13.2.21 It is assumed that the design, construction and completed stages of the Proposed Development will satisfy minimum environmental standards, consistent with contemporary legislation, practice, and knowledge.

13.3 Sensitive Receptors

13.3.1 Sensitive receptors identified in relation to the Proposed Development include:

13.3.2 Surface water bodies – for the basis of this assessment, sensitive surface watercourses will be considered High sensitivity receptors, on account of several watercourses holding Good WFD classifications. These receptors are the River Beauly and the tributaries that flow directly into the River Beauly.

13.3.3 PWS – there are two named PWS located within 1 km of the Proposed Development, none of which are within the Site. There is a historic groundwater well 250 m southeast of the Proposed Development. However, this has been confirmed to be non-operational by the landowner.

- Two SEPA abstractions within 1 km of the Proposed Development.

13.3.4 Surface water flood risk – for the basis of this assessment, areas subject to surface water flood risk will be considered low sensitivity receptors. This is due to the Site being located on low value agricultural areas, away from residential land, less sensitive to increased flood risk by the possible increase in water levels.

13.3.5 Groundwater – The Proposed Development and Site are within a Drinking Water Protected Area (DWPA) for groundwater and due to the receptor's (Northern Highlands Groundwater Body) 'Good' overall WFD status and the supplies supported by the water body, groundwater is considered as High sensitivity.

13.3.6 GWDTE – Based on National Vegetation Classification (NVC) data and local topography, the noted NVC communities are unlikely to be groundwater dependent. However, for precautionary purposes GWDTE sensitivity is considered Medium.

13.4 Baseline Conditions

Study Area

13.4.1 The Study Area for hydrology, hydrogeology, geology and soils receptors includes the area within the Site and within 1 km of the Site.

13.4.2 SEPA's guidance on assessing the impacts of developments on groundwater abstractions and GWDTE (LUPS-GU31)30 requires assessment of groundwater abstractions and potential GWDTE located within 250 m of excavations greater than 1 m and within 100 m of excavations less than 1 m. Therefore, the 'GWDTE Study Area' includes the area within 250 m of the Proposed Development. Abstractions within 250 m of the Proposed Development have also been identified.

River Catchment

13.4.3 The Site for the Proposed Development is located within the River Beauly Catchment, with its closest point being approximately 90 m to the river at the northeast of the boundary. Access tracks are located closer to the river, including Black Bridge which crosses the River Beauly (**Appendix 3.2: Black Bridge**). The River Beauly flows in an easterly direction, past Aigas and Kilmorack hydroelectric power stations and dams, before discharging into the Beauly Firth, leading into the Moray Firth coastal water body. The River Beauly drains a catchment of approximately 1,000 km2 of land.

13.4.4 The Site is located approximately 400m northwest of Allt na Loin, 800m southeast of Breakachy Burn, and 900m west of Bruiach/Belladrum Burn; all tributaries of the River Beauly. The "River Beauly – Beauly Firth to Cannich" (SEPA Water Body name) (ID: 20209) has been classified by SEPA under the WFD as having a good overall status (2022) and a good ecological potential. "Allt na Loin" (ID: 20215) is classified as having a moderate overall status (2022), on account of moderate ecology status. "Breakachy Burn" (ID: 20216) is classified as having a high overall status (2022). "Bruiach Burn / Belladrum Burn" (ID: 20213) is classified as having a moderate overall status (2022).

13.4.5 The Proposed Development does not require any crossings or culverting of existing watercourse channels, shown on OS 1:50,000 scale mapping that would be subject to SEPA Controlled Activities Regulations

[30] SEPA Land Use Planning System. SEPA Guidance Note 31 (2017). [online] Available at: https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions.pdf (June 2024)

authorisation. It would be reasonable to anticipate a combination of smaller or ephemeral surface channels and sub-surface field drainage in this area, which may be more apparent during wet conditions.

13.4.6 OS 1:25,000 scale mapping and aerial imagery indicate three small unnamed watercourses and drainage channels, within the Site; with one crossing required in the northeast for the proposed access track and the other two in the east of the Proposed Development along the access track to Upper Fanellan Cottages, which will be removed and landscaped during construction. There are two small unnamed watercourses that are located within 10 m of the Proposed Development footprint and have been included in **Table 13.6** as watercourse encroachments, in accordance with SEPA guidelines.

Table 13.5: Watercourse Crossings

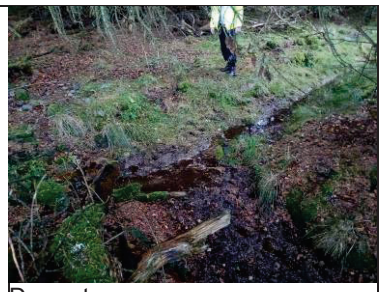
Watercourse ID	Crossing Location BNGR	Description	Bed width (m)	Bank top width (m)	Bank height (m)	Watercourse Photograph
1	249438, 843754	Slow flow, bracken on banks, no existing infrastructure	0.56	1.20	0.4	 Upstream  Downstream

2	248594, 842869	Very slow flow, overgrown weeds in channel, no existing infrastructure	0.30	2.40	1.20	 Upstream  Downstream
3	248639, 842920	Very slow flow, overgrown weeds in channel, no existing infrastructure	0.65	2.10	0.70	 Upstream

						 Downstream

Table 13.6: Watercourse Encroachments

4	248696, 843327	Very slow flow, channel clear of vegetation, no existing infrastructure	0.60	0.77	0.60	 Upstream  Downstream

5	247873, 842692	Very slow flow, overgrown weeds in channel, no existing infrastructure	0.55	2.10	0.40	 Downstream

Statutory Designated Sites

13.4.7 No SSSI, SAC, SPA, Ramsar sites, Geological Conservation Review (GCR) sites, or Marine Protection Areas have been identified within 1 km of the Site.

Water Supplies

13.4.8 The Highland Council has indicated there are two private water supplies (PWS) located within 1 km of the Site.:

- Culburnie (groundwater – spring), ~1 km southeast of the Proposed Development; and
- Aigas Power Station (surface – watercourse), ~ 940 m northwest of the Proposed Development.

13.4.9 SEPA has advised their records indicate a well at NGR: NH 48485 43033, approximately 250 m to the southeast of the Proposed Development, within the Site, which is also indicated on OS 1:25,000 scale mapping. This has been confirmed as non-operational by the landowner, who additionally reported no properties within their ownership being on private supplies at Fanellan. There have been no other properties served by a PWS identified within 1 km of the Site.

13.4.10 SW data indicates that there are no public water abstraction points within a 1 km radius of the Site.

13.4.11 SEPA data indicates that there are two water abstractions within 1 km of the Site:

- CAR/L/1011467 (Authorisation activity: Abstraction Monitoring Point; Abstraction Return; Abstraction Hydropower; Impoundment Hydropower), 430 m north of the Proposed Development; and
- CAR/L/5002035 (Authorisation activity: Water Resources - Abstraction; Water Resources - Mining and Quarrying), 600 m north west of the Proposed Development.

13.4.12 The SEPA DWPA – Scotland River basin district maps[31] indicate that the Site is not located within a DWPA for surface water; however, it is located within a DWPA for groundwater.

Geology and soils

13.4.13 According to the British Geological Survey (BGS) Geoindex Onshore Bedrock[32] and Superficial Deposits geology mapping, superficial deposits underlying the Site for the Proposed Development include glacial sand and gravel, and till (diamicton) and undifferentiated river deposits (clay, silt, sand and gravel). The underlying bedrock is the Ousdale Arkdale Formation, composed of Breccia, conglomerate and sandstone with subsidiary

[31] The Scottish Government drinking water protected areas - Scotland river basin district: maps [online]. Available at: https://www.gov.scot/publications/drinking-water-protected-areas-scotland-river-basin-district-maps/ [Accessed June 2024].

[32] BGS Geoindex (interactive web map). Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.245552583.25395335.1617804149-924903878.1582883826 [Accessed: June 2024].

mudstone. GI trial pit information from 2023 (**Appendix 13.4**) confirmed the underlaying bedrock and superficial deposits indicated by BGS geology mapping. Development is underlain by Class 0 (mineral soils – peatland soils are not typically found on these soils), which are not classified as priority peatland habitats and indicates that peat is not present within the Site. A sizeable area of Class 2 peat (nationally important carbon-rich soils, deep peat and priority peatland habitat), likely to be of high conservation value and restoration potential is located approximately 1.5 km south of the Site.

13.4.14 According to the James Hutton Institute National Soil Map of Scotland33, the Proposed Development is mostly underlain by humus-iron podzols, with a very small area within the eastern side of the Site underlain by mineral alluvial soils with peaty alluvial soils. No peaty soils are indicated within the footprint of the Proposed Development.

13.4.15 GI trial pit information from 2023 indicates the presence of peat soils are limited to a few isolated pockets within the Site, with only four out of 91 machine excavated trial pits showing evidence of peat soils present within. The trial pits noted have been summarised below:

- TP49: Possible peat, no odour at a depth of 0.4-0.5m.
- TP60: Occasional pockets of peat at a depth of 0.1-0.3m.
- TP60A: Occasional pockets of peat at a depth of 0.1-0.3m.
- TP65: Clay with peat pockets and boulders at a depth of 0-0.05m.

13.4.16 Whilst some of the soils observed within each of these four trial pits have been described as containing pockets of peat, the photographic evidence supports the available mapping in their general soil characterisations, and whilst more organic surface layers are likely present, with consideration to the highly modified state of this agricultural land, peat depth surveys would not be appropriate based on the soils information obtained.

Contaminated Land

13.4.17 There are no historical records of contaminated land within the Proposed Development.

13.4.18 The ground investigation did not encounter any made ground or other anthropogenic sources of contamination at the Site. There is also no known off-site source of contamination within the vicinity of the Site, so the slightly elevated metal concentrations encountered in the groundwater are considered likely to be naturally occurring. Contaminated soil is unlikely to be present within the Site due to it being previously undeveloped, with historical and present land use being for agricultural purposes. Historical mapping indicates there was a mill dam pre-1973, however more recent mapping indicates that they are no longer present.

Hydrogeology

13.4.19 The online BGS hydrogeology map (1:625,000 scale)[34] indicates the Site is underlain by the Lower Old Red Sandstone moderately productive aquifer, which is a locally important multi-layered aquifer.

13.4.20 SEPA Water Classification Hub35 mapping indicates that the Site is underlain by the Muir of Ord (ID: 150619) groundwater body, covering a total area of 158.3 km2. This is classified as having 'poor' overall status on

[33] National Soil Map of Scotland (interactive web map). Available at: https://map.environment.gov.scot/Soil_maps/?layer=1 [Accessed: June 2024].

[34] BGS Geoindex (interactive web map). Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.245552583.25395335.1617804149-924903878.1582883826 [Accessed: June 2024].

[35] SEPA Water Classification Hub Available at: https://www.sepa.org.uk/data-visualisation/water-classification-hub/ [Accessed June 2024].

account of poor surface water interaction, as of 2022. GI surveys encountered 4 out of 27 boreholes struck groundwater, ranging between depths of 0.4 m and 4.4 m, one within suspected cohesive glacial till and the other three in granular glacial till deposits. Subsequent groundwater monitoring was undertaken, with the results concluding that the site has generally shallow groundwater levels, typically within the range of 0 m – 3 m in depth, with only one borehole having a minimum groundwater level in excess of 5 m.

Flood Risk

13.4.21 SEPA's indicative flood risk mapping[36] suggests that there are no areas of high, medium or low risk of river flooding within the Site. There is a high risk associated with the River Beauly, approximately 100 m from the northeastern Site and 500 m – 600 m from the northern and western side of the Site, respectively.

13.4.22 There are small, localised areas at high risk of surface water flooding within the forested areas in the northern and eastern extents of the Site and immediately west beyond the Site.

13.4.23 A Flood Risk Assessment (FRA) (**Appendix 13.1**) and Drainage Impact Assessment (DIA) (**Appendix 13.2**) have been undertaken for the Proposed Development. Both documents have assessed the impact of the Proposed Development and proposed drainage outfalls ensuring pre-development greenfield run-off is not exceeded.

Groundwater Dependent Terrestrial Ecosystem (GWDTE)

13.4.24 SEPA's guidance on assessing the impacts of developments on GWDTE (LUPS-GU31) 37 requires assessment of GWDTE located within 250 m of excavations greater than 1 m and within 100 m of excavations less than 1 m.

13.4.25 NVC Surveys were undertaken between 9th – 11th September 2024 by the WSP Ecology Team. NVC communities within the Study Area (250 m of the Site) that are indicative of potentially supporting GWDTE are displayed in **Table 13.7** and shown in **Volume 4**, **Figure 9.1.2 - National Vegetation Classification.**

Table 13.7. NVC communities within the Study Area

NVC Community[37,38]	Potential Groundwater Dependency based on SEPA LUPS-GU31[37]
H10 - *Calluna vulgaris–Erica cinerea* heath M15 - *Scirpus cespitosus - Erica tetralix* wet heath W23 - *Ulex europaeus–Rubus fruticosus* scrub	- Moderate -
M25 - *Molinia caerulea-Potentilla erecta* mire M4 - *Carex rostrata–Sphagnum recurvum* mire	Moderate -
W7 - *Alnus glutinosa–Fraxinus excelsior–Lysimachia nemorum* woodland	High

[36] Scottish Environment Protection Agency – Flood Maps: https://map.sepa.org.uk/floodmap/map.htm [Accessed: June 2024].

[37] SEPA Land Use Planning System SEPA Guidance Note 31 (LUPS-GU31) (2017). Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. [online]. Available at: https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf [Accessed July 2024]

[38] National Vegetation Classification: Users' handbook. (2006). Available at: https://data.jncc.gov.uk/data/a407ebfc-2859-49cf-9710-1bde9c8e28c7/JNCC-NVC-UsersHandbook-2006.pdf [Accessed: October 2024].

13.4.26 The communities identified on-site are often associated with surface water or direct rainfall, with surface water flowing downslope locally to eventually form or join surface water channels. These habitats are typically located on moderately sloping ground, away from likely groundwater emergence.

13.4.27 The cluster of H10/M15/W23 habitats, is located 40 m southwest of the Proposed Development and within an area of property development, overhead lines and existing tracks, as such, it is likely the groundwater regime has already been modified and further changes are unlikely to be consequential. M1539 is found in areas with a moderate to high rainfall and is the typical form of wet heath in the north and west of the UK. Consequentially, the predominant local water sources are considered to be surface water and direct precipitation.

13.4.28 The cluster of M25/M4 is located 10 m west of the Proposed Development and 20 m north of a small unnamed watercourse which flows from east to west until it meets the River Beauly. M25 (mire)39 is generally associated with bog and wet heath, with low groundwater dependency. The predominant local water sources are considered to be the tributaries of the River Beauly and direct precipitation.

13.4.29 W7 is located 120 m northwest of the Proposed Development and on either side of an unnamed watercourse which flows from west to east until meet river Beauly. W7 (wet woodland)39 often found on poorly drained or seasonally wet soils, including base-poor flushes, valley floors and floodplain. There may be some groundwater dependence, but flow is likely to be following the riparian basin and fed by the watercourse. Wet woodland also potentially utilises deeper groundwater sources via a deeper root system but is not considered critically dependent in the local setting.

13.4.30 Given the presence of the watercourses, topography, and the noted NVC communities, these are unlikely to be groundwater dependent. Based on these assumptions, the presence of GWDTE is unlikely, however a precautionary approach has been undertaken and therefore the sensitivity of GWDTE is considered Medium.

Fisheries

13.4.31 The Proposed Development is in the area managed by the Beauly District Fishery Board. The Beauly Angling Club and the river management team are responsible for the operation of a hatchery (location not currently known), the commissioning of electro surveys of juvenile population, the repairing of riverbanks and improving the accessibility to the spawning beds of the returning adult salmon and trout[40].

Future Baseline

13.4.32 There is potential for climate change to impact on future baseline conditions. Climate change studies[41] predict a decrease in summer precipitation and an increase in winter precipitation alongside slightly higher annual average temperatures. This suggests that there may be greater pressures on water supplies in summer months

[39] An Illustrated Guide to British Upland Vegetation (2004). [online]. Available at https://data.jncc.gov.uk/data/a17ab353-f5be-49ea-98f1-8633229779a1/IllustratedGuideBritishUplandVegetation-2004.pdf [Accessed July 2024]

[40] Beauly District Fishery Board. Available at: https://beauly.dsfb.org.uk/ [Accessed: June 2024].

[41] Scotland's Environment. Available at: Climate | Scotland's environment web [Accessed: November 2024].

in the future. Storms are predicted to be of greater intensity. Therefore, peak fluvial flows associated with extreme storm events may also increase in volume and velocity.

13.4.33 In the absence of the Proposed Development, it is likely that the conditions in the Site will remain as they are reported within this chapter and no significant change to the current baseline would be predicted.

13.5 Issues Scoped Out

13.5.1 With the implementation of good practice measures outlined within this EIA report chapter, the FRA and DIA, there are no anticipated significant operational effects from the Proposed Development. Operational impacts have therefore been scoped out.

13.5.2 There are no statutory designated sites within 1 km of the Proposed Development and for this reason potential impacts have been scoped out.

13.5.3 Significant effects to bedrock geology and superficial geology are not anticipated and therefore are scoped out.

13.5.4 It is acknowledged that the Proposed Development is within a DWPA for groundwater; however, not for surface water. With the assumption that construction good practice and measures detailed within the Applicant's GEMPs are implemented, on account that the majority of Scotland is classified as a DWPA for groundwater and that groundwater is already being considered as part of this assessment, significant effects to the DWPA, specifically, are not anticipated and have therefore been scoped out.

13.5.5 There are no DWPA for surface water within 1 km of the Proposed Development and for this reason potential impacts have been scoped out.

13.5.6 Impacts related to disturbance, compaction and loss of peat on the basis of GI information (Appendix 13.4) - Ground Investigation Report), BGS Superficial Deposits geology mapping, James Hutton Institute National Soil Map of Scotland, and NatureScot Carbon and Peatland mapping indicating presence of peat soils to be very limited within the Site and considering the current arable land use; therefore, significant effects are not anticipated. Issues relating to peat have therefore been scoped out, something SEPA and THC have no objection to based on the reasons outlined in this chapter.

13.5.7 There are no significant effects regarding potential contaminated land issues within the Site, and therefore contaminated land has been scoped out.

13.5.8 Significant impacts of pollution on fisheries, including from suspended sediment in surface water bodies, oil, and hydrocarbons, are not anticipated and therefore have been scoped out.

13.6 Assessment of Effects, Mitigation and Residual Effects

Mitigation by Design / Good Practice Measures

13.6.1 A number of good practice measures are detailed in **Chapter 3** – **Description of Proposed Development**, including the Construction Environmental Management Plan (CEMP) (which will be prepared and implemented by the Principal Contractor) and the Applicant's GEMPs (provided in **Appendix 3.1**). As outlined in **Chapter 3**, implementation of the CEMP would be managed on site by a suitably qualified and experienced Environmental Clerk of Works, with support from other environmental professionals, as required. A summary of those good

practice measures most relevant to hydrology, hydrogeology and geology of the Proposed Development is provided below.

13.6.2 Measures set out in Chapter 3 will be implemented during the construction of the Proposed Development, detailing best practice construction management measures, including measures to manage risks associated with construction of the Proposed Development to the environment and human health, such as those associated with pollution and resource use.

13.6.3 The adoption of the applicable GEMPs would reduce the probability of an incident occurring and also reduce the magnitude of any incident due to a combination of good site environmental management procedures, staff training, contingency equipment and emergency plans.

The GEMPs (see **Appendix 3.1)** applicable to this chapter are:

- Working in or near water;
- Working in sensitive habitats;
- Watercourse crossings;
- Private water supplies;
- Soil Management;
- Oil Storage and Refuelling;
- Contaminated Land;
- Working with concrete; and
- Bad weather.

13.6.4 The Proposed Development covers an area greater than 4 ha. As a result, a Construction Site Licence will be required. The site will be operated in accordance with general binding rules specified in the Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended (CAR) prior to any construction work commencing based on the Proposed Development area.

13.6.5 Further consultation will be required with local property owners regarding the potential for unregistered PWS located within 250 m of works. The Principal Contractor will be required to consider all construction activities and satisfy themselves that they are aware of all PWS and associated network infrastructure in the local area that may be at risk of adverse effects as a result of the Proposed Development. Should any PWS be identified, an assessment of potential impacts will be undertaken and, where required, specific mitigation will be developed and agreed with SEPA and the PWS owner.

13.6.6 Further consultation with SW is required prior to construction to confirm any SW assets which require protection. Specific mitigation measures will be developed and will be agreed with SW.

13.6.7 Pre-application consultation with SEPA will be required to identify potential CAR authorised activities associated within the Proposed Development in accordance with SEPA Controlled Activity Regulations, and the CAR Practical Guide.

13.6.8 In relation to watercourse crossings, all structures will be designed and constructed following good practice techniques and in accordance with SSEN Drainage Specification. This would be of sufficient capacity to receive

1 in 200 years storm flows with an allowance for increased flows due to climate change. Key measures identified to minimise alterations to surface water drainage patterns include:

- Application of sustainable drainage techniques to increase peak lag time and implementation of cross-drains at appropriate intervals and frequent discharge points to reduce scour potential; and
- Minimising the size and duration of in-channel works.
- Excluding the need to culvert for land drainage, design was amended to a bridge in lieu of culverts where feasible following consultation with SEPA (**Table 13.1**) in line with SEPA guidance[42].

13.6.9 The application of Sustainable Drainage Systems (SuDS) to reduce the increase of flood risk to downstream areas will be utilised. Development tends to increase impermeable areas such as roofs, roads, car parking areas etc. The aim of SuDS is to emulate natural drainage systems to return post-development flows to pre-development levels. The design discharge rates from the SuDS are lower than the existing IH124* greenfield runoff rates, meaning that the impact on flood risk to the existing watercourses is not increased and that there is no significant flood risk to the surrounding areas. Following consultation with SEPA, the design was amended to relocate the proposed SuDS basin at least 10 m away from any watercourses in order to avoid watercourse crossings. Further details have been considered in **Appendix 13.2 (DSR)** and **Appendix 13.3 DIA**.

** A method used to estimate the peak flow rate of greenfield runoff for a mean annual flood. IH124 was specifically produced to address the runoff from small catchments.* [43]

13.6.10 The Principal Contractor will follow SEPA guidance in relation to soil, earthworks and site restoration including but not limited to land remediation and waste management guidelines44. SEPA land remediation and waste management guidelines outline how SEPA regulate the reuse of potential contaminated materials at an excavation site.

13.6.11 Any identified contaminated material not suitable for reuse can be treated on site to render it suitable for reuse under waste management legislation by a licenced contractor. The treated materials must still meet the criteria listed in the 'Land remediation and waste management guidelines' publication and be suitable for use once remediated. The Principal Contractor must follow and implement all appropriate waste and environmental legislation and, which is to be agreed with The Highland Council and SEPA prior to excavation commencing.

13.6.12 An Outline Earthworks Strategy Report (**Appendix 13.5**) has been provided by the Early Work Contractor. The Principal Contractor will review this during detailed design and re-assess the quantities of materials that may be available at the Site, identifying any further potential for the sustainable re-use and recycling of material for the Proposed Development. If necessary, a Material Management Plan will be produced. The Principal Contractor will adhere to construction good practices that help to minimise the use of raw materials and maximise the use of secondary aggregates and recycled or renewable materials within the Site. The Principal Contractor will carry out material balance calculations to inform final design which will demonstrate whether additional material will be required / generated, and where it is proposed to be temporarily or permanently stored. Final design should look to achieve a cut and fill balance on or in the vicinity of the Site where possible to avoid haulage via the local road network. If required, the Principal Contractor will investigate the possibility that any excess material

[42] SEPA: Culverting of Watercourses – Position Statement and Supporting Guidance. Available at https://www.sepa.org.uk/media/150919/wat_ps_06_02.pdf [Accessed: November 2024].

[43] UK SuDS - HR Wallingford. Available at: https://www.uksuds.com/tools/surface-water-storage-volume-estimation)

[44] Scottish Environment Protection Agency (2009) Land remediation and waste management guidelines. Available at: Land Remediation and Waste Management Guidelines [Accessed: November 2024].

might be recycled into a sustainable aggregate for suitable re-use off-site, subject to the necessary licensing requirements.

13.7 Assessment of Likely Significant Effects

13.7.1 The following assessment of effects assumes that the measures contained within the CEMP and GEMPs are implemented. The following impacts have the potential to result in significant effects to the soils, geology, local hydrology (surface water) and hydrogeology (groundwater):

- pollution incidents, erosion and sedimentation;
- modification of groundwater levels and flows;
- modification of surface water drainage patterns;
- potential impacts on PWS;
- modification of flood risk; and
- impacts on GWDTE.

Construction Phase

13.7.2 During the construction phase of the Proposed Development, there is the potential for the following short-term impacts on the hydrology, hydrogeology, geology and soils environment, in the absence of additional mitigation measures.

Pollution Incidents, Erosion and Sedimentation

13.7.3 During the construction phase, a number of potential pollutants would be present on-site to facilitate civil engineering activities, including oil, fuels, chemicals, unset cement and concrete, sediments, and waste and wastewater from construction activities. With chemicals and oil being stored and used on-site there is the potential for an incident. Potential sources of suspended sediments on the site include (but are not limited to): the excavations of the drainage design, the earthworks cuttings, the construction of the road, the construction of the temporary construction compound, and from the construction of the Proposed Development.

13.7.4 Soil erosion, loss of soil, and sediment generation may occur in areas where the ground has been disturbed during construction including in situations where:

- Engineering activities occur close to or in watercourses;
- Watercourse realignment activities take place;
- Higher velocity surface water flows may occur due to local slopes and drainage design;
- Surface water passing through small surface drains, efficiently draining the new infrastructure, could exhibit higher localised flows, increasing the potential for bank erosion; and
- Sediment transport in watercourses can result in high Total Suspended Solids (TSS) and turbidity levels which affect the ecology, particularly fish stocks, by reducing the light and oxygen levels in the water. Sediment deposition can further affect watercourses by potentially smothering plant life, invertebrates, and spawning grounds, and can reduce the flood storage capacity of channels and block culverts, resulting in an increased flood risk.

13.7.5 Any pollution incident occurring on site could have a detrimental effect on the water quality of the nearby surface waters, groundwaters and / or soil, including the River Beauly, Allt na Loin, Breakachy Burn,

Bruiach/Belladrum Burn and Muir of Ord Groundwater Body. Major causes of environmental harm associated with working in or near watercourses include:

13.7.6 Silt, e.g. disturbance of riverbed or bank, dewatering and pumping of excavations, run-off from exposed ground, plant washing, roads and river crossings.

- Cement and concrete – which is very alkaline and corrosive and can cause serious pollution.
- Chemicals and solvents – oil storage, refuelling, trade materials etc.
- Waste materials (including special waste), e.g. oily wastes, spent acids and solvents.

13.7.7 Temporary drainage during construction will utilise hessian lined or grassed drainage ditches and filter drains to treat and convey water. All works will be supervised and inspected to ensure drainage is constructed according to the detailed design, outlined further in the DIA (Appendix 13.3). This will eliminate the possibility of cross contamination between the foul network and surface water network during construction.

13.7.8 In the case of pollution incident effects, good practice site environmental management measures and the dilution factor involved would be expected to reduce any potential sedimentation effect downstream.

13.7.9 Taking into account the good practice measures, specifically working in or near water, watercourse crossings, private water supplies, soil management, oil storage and refuelling, and bad weather GEMPs, the effects have been assessed as follows:

- The magnitude of the impact of a pollution incident upon surface waters (High sensitivity) is Moderate and the probability is considered to be Low, which results in an overall Minor Adverse (**not significant**) effect.
- The magnitude of the impact of a pollution incident upon PWS (High sensitivity) is Minor and the probability is considered to be Low, which results in an overall Minor Adverse (**not significant**) effect.
- The magnitude of the impact of a pollution incident upon SEPA abstractions (High sensitivity) is Negligible and the probability is considered to be Low, which results in an overall Negligible Adverse (**not significant**) effect.
- The magnitude of the impact of a pollution incident upon groundwater (High sensitivity) is Minor and the probability is considered to be Low, which results in an overall Minor Adverse (**not significant**) effect.
- The magnitude of the impact of a pollution incident upon GWDTE (Medium sensitivity) is Minor and the probability is considered to be Low, which results in an overall Negligible Adverse (**not significant**) effect.

13.7.10 Foul drainage will be managed by disposal via suitable package treatment works prior to discharge into an appropriately sized Herringbone drainage field in the east of the site. The strategy is subject to appropriate treatment and pollution control measures.

Modification of Groundwater Levels and Flows

13.7.11 Excavations can disrupt groundwater systems resulting in the lowering of groundwater levels in the immediate vicinity of the works, thus causing potential alterations to groundwater flow paths during dewatering activities.

13.7.12 Earthworks associated with the Proposed Development would likely result in minor changes to the local subsurface and groundwater flows.

13.7.13 The Proposed Development may compromise the quality and / or quantity of groundwaters which provide public supply within the catchment and care must be taken to protect water quality during construction and thereafter. The Principal Contractor will be required to consider all construction activities and satisfy themselves that they are aware of all Scottish Water precautions for a range of activities. Protection measures to be taken within DWPA, the wider drinking water catchment and Scottish Water assets in the area.

13.7.14 Taking into account good practice measures, watercourse crossing and private water supplies GEMPs, the effects have been assessed as follows:

- The magnitude of impact on levels and flows upon groundwater (High sensitivity) is Minor and the probability is considered to be Medium, which results in a Minor Adverse (**not significant**) effect.
- The magnitude of impact on levels and flows of groundwater upon PWS (High sensitivity) is Minor and the probability is considered to be Low, which results in a Minor Adverse (**not significant**) effect.
- The magnitude of the impact of a pollution incident upon SEPA abstractions (High sensitivity) is Negligible and the probability is considered to be Low, which results in an overall Negligible Adverse (**not significant**) effect.
- The magnitude of impact on levels and flows of groundwater upon GWDTE (Medium sensitivity) is Minor and the probability is considered to be Low, which results in a Negligible Adverse (**not significant**) effect.

Modification of Surface Water Drainage Patterns

13.7.15 The Proposed Development includes a detailed Drainage Strategy Report found in Appendix 13.2.

13.7.16 Surface flows could be impeded by construction activity in or adjacent to stream channels, poor choice of watercourse crossing locations or inadequately designed crossing structures. Blockages could be caused by inadequate control of earthmoving plant, sedimentation, and poor waste management; all of which could lead to flooding upstream. There are a number of flood-sensitive locations, such as the River Beauly and its tributaries and multiple minor watercourses, Allt na Loin, Breakachy Burn and Bruiach/Belladrum Burn, as discussed in the Baseline Conditions. There are three watercourses that the Proposed Development crosses listed in Table 13.5, in addition to two watercourses that the Proposed Development encroaches within 10 m of, listed in Table 13.6.

13.7.17 The Proposed Development would restrict the infiltration of rainfall into the soil and underlying superficial deposits through the introduction of impermeable areas. This results in localised increased volumes of surface runoff and could exacerbate flood risk downstream. New permanent impermeable areas may result in the

interception of diffuse overland flow, which could disrupt the natural drainage regime of the Site by concentrating flows and influencing drainage in soils.

13.7.18 The adoption of applicable good practice measures would reduce the impact of modification to surface water drainage patterns, with artificial drainage installed only where necessary and, wherever practical, being installed in advance of ground being cleared of vegetation. All structures will be designed and constructed following good practice techniques and would be of sufficient capacity to receive storm flows with an allowance for increased flows due to climate change. Key measures identified to minimise alterations to surface water drainage patterns include:

13.7.19 Application of sustainable drainage techniques to increase peak lag time and implementation of cross-drains at appropriate intervals and frequent discharge points to reduce scour potential;

13.7.20 Any alteration to the drainage regime will require consideration of existing groundwater levels and ponding in the local area;

13.7.21 Any alteration to the drainage regime will be designed to be sympathetic to local watercourse features, including bed and bank materials, and gradients;

13.7.22 Minimising the size and duration of in-channel works; and

13.7.23 Appropriate design of any crossing structures to ensure sufficient capacity to convey 1:200-year storm flows and enable mammal and fish passage.

13.7.24 Considering the increased area of impermeable surfaces created during construction would be minor in comparison with the large overall catchment area and with good practice measures, the effect is assessed as follows:

- The magnitude of impact on surface waters (High sensitivity) is Minor and the probability is considered to be High, which results in a Minor Adverse (**not significant**) effect.

Private Water Supplies

13.7.25 Aigas Power Station PWS and Culburnie PWS are unlikely to be affected during the construction phase, given the local topography and due to intervening distance. The well approximately 250 m to the southeast of the Proposed Development, within the Site, as indicated on OS 1:25,000 scale mapping has been confirmed as non-operational, and therefore will not be affected during the construction phase.

13.7.26 Taking into account the good practice measures, specifically the working in or near watercourses and private water supplies GEMPs the effects have been assessed as follows:

- The magnitude of pollution effects on Aigas PWS and Culburnie PWS (High sensitivity) is Minor and the probability is considered to be Low, giving an overall significance of Minor Adverse (**not significant**).

Flood Risk Assessment

13.7.27 Short term increases in flood risk have the potential to impact construction workers, third parties, nearby developments, and floodplains.

13.7.28 Surface flows can be impeded by construction activity in or adjacent to stream channels and poor choice of crossing locations. Blockages can be caused by inadequate control of earthmoving plant, sedimentation, and poor waste management, all of which could lead to flooding upstream. Through the implementation of

appropriate drainage design during construction, flood risk will remain the same, if not improved, as outlined in the DIA (**Appendix 3.1**)

13.7.29 Within the wider Study Area, small areas of predicted surface water flooding have been noted in the FRA (**Appen**dix 13.1). However, with appropriate drainage design during construction, outlined in the DIA (Appendix 13.3), runoff created during works will be stored and discharge into downstream waterbodies will be controlled. This will prevent increased flood risk during the construction of the Proposed Development to downstream receptors.

13.7.30 Subject to appropriate surface water drainage design during construction, the Proposed Development will comply with Energy Networks Association Engineering Technical Report 138 (ENA ETR 138) and NPF45.

13.7.31 Taking into account the design mitigation, construction good practice and recommendations in the FRA (**Appendix 13.1**), DSR (**Appendix 13.2**) and DIA (**Appendix 13.3**), specifically the Working in or Near Water and Watercourse Crossings GEMPs (**Appendix 3.1**), the effects have been assessed as follows:

- The magnitude of the impact of a short-term increase in flood risk on third parties and nearby developments (Low sensitivity) is Minor and the probability of effect is considered to be Medium, which results in a Negligible Adverse (**not significant**) effect.
- The magnitude of the impact of a short-term increase in flood risk on floodplains and construction workers (Low sensitivity) is considered Minor (as there may be works undertaken in areas of flood risk) and the probability of effect is considered to be Medium, which results in a Negligible Adverse (**not significant**) effect.

GWDTE

13.7.32 Excavation of soil and bedrock during construction may cause localised disruption and interruption to groundwater flow, with associated dewatering potentially causing a large change to the quantity of groundwater supply. Where GWDTE are present, interrupting groundwater flow may reduce the proportion of the Zone of Contribution (ZoC) available to such ecosystems, by changing the quantity of groundwater supplying the GWDTE. The ZoC is defined for each habitat as the area up hydraulic gradient of the GWDTE, based upon the geology and topographic information within the Site.

13.7.33 Contamination of groundwater or surface water may cause physical or chemical contamination to the GWDTE.

13.7.34 Taking into account the good practice measures, the effects have been assessed as follows:

- The magnitude of impact on GWDTE (Medium sensitivity) is Minor and the probability is considered to be Low, giving an overall significance of Negligible Adverse (**not significant**).

Cumulative Effects

13.7.35 Cumulative developments which are operational are not considered to have the potential to lead to in-combination effects with the Proposed Development. This is because the potential for significant effects on hydrology, hydrogeology, geology and soils is considered greatest during construction. **Chapter 16** -

Cumulative Effects identifies other developments to be included in the assessment of cumulative effects. Developments within 5 km of the Proposed Development are included in **Table 13.8**.

Table 13.8: Cumulative Developments

ID	Project Name	Ref No.	Planning Portal Link	Application Status	Distance / direction to the Fanellan Hub
SSENT projects (Inter Developments):					
1	SSENT SLBB 400 kV OHL	24/04588/SCOP	LINK	Status: unknown – submission in process	-
2	SSENT BBNP 400 kV OHL	24/03064/SCOP	LINK	Status: unknown – submission in process	-
3	SSENT Western Isles HVDC UGC	-	-	Permitted Development	-
4	SSENT Aigas Substation - Construction of 132kV replacement substation	24/02830/FUL	LINK	Status: under consideration	GIS Substation – 1,591.7 m to the Southeast Converter Substation – 1,238.7 m to the Southeast
5	SSENT Erection of replacement Overhead Line –	22/03536/PNO	LINK	Decision: Prior approval not required	GIS Substation – 2,237.1 m to the Southwest Converter Substation – 1,807.7 m to the Southwest
6	Black Bridge replacement	-	-	Subject to ongoing discussion with The Highland Council	1.39km to the north east of the Proposed Development
3rd Party					

ID	Project Name	Ref No.	Planning Portal Link	Application Status	Distance / direction to the Fanellan Hub
8	Proposed energy storage facility	20/04849/PAN	LINK	Decision: Case Closed	GIS Substation – 2,061.3 m to the Southwest Converter Substation – 1,631.5 m to the Southwest
9	Erection and operation of battery energy storage system up to 49.9 MW, substations, switchgear and control buildings, landscaping, fencing and ancillary infrastructure –	24/01548/FUL (see also 23/03772/SCRE relating to the same project)	LINK	Status: under consideration	GIS Substation – 3,096.1 m to the Southwest Converter Substation – 2,742.1 m to the Southwest
10	Construction and operation of Battery Energy Storage System	24/02885/SCRE	LINK	Decision: Screening Application – EIA not required	GIS Substation – 4,102.5 m to the West Converter Substation – 3,790 m to the West
Associated Development (Intra and Inter development):					
11	Beauly-Denny OHL diversion and tie-ins	24/00834/SCRE	LINK	Decision: Screening application - EIA not required. Voluntary EA being completed	-

13.7.36 . In the event that these other developments present potentially significant effects to the receiving hydrology, hydrogeology and geology environment, given that no significant residual effects have been identified associated with the Proposed Development, and assuming effective ‘source’ controls for each individual

development and good practice methodology, significant cumulative effects are not anticipated. Furthermore, the differing construction programming and activities that would be anticipated to occur across various developments reduces the probability that water quality and flow issues would be coincident across the catchments.

13.8 Summary

13.8.1 The potential for construction effects on hydrology, hydrogeology, geology and soils receptors associated with the Proposed Development have been identified as follows:

- Surface water bodies, including the River Beauly, and its tributaries including multiple minor watercourses;
- Groundwater bodies, specifically the Northern Highlands Groundwater Body;
- GWDTE; and
- Flooding.

13.8.2 The assessment considered how the Proposed Development would affect the above sensitive receptors through the impacts of pollution of surface watercourses, groundwater and water supplies; changes to resource availability; and short-term increase in flood risk during the construction of the Proposed Development.

Through successful application of CEMP's and GEMP's as well as the good practice measures and mitigation by design identified, the assessment has concluded that the Proposed Development would not result in any significant residual effects on the hydrology, hydrogeology, geology and soils.