Scottish & Southern Electricity Networks
TRANSMISSION

SSEN Transmission

Bingally 400 kV Overhead Line Tie-In

Environmental Appraisal

April 2025

Scottish & Southern Electricity Networks
TRANSMISSION

CONTENTS

8.	**HYDROLOGY, HYDROGEOLOGY, GEOLOGY AND SOILS**	**8-1**
8.1	Introduction	8-1
8.2	Information Sources	8-1
8.3	Methodology	8-3
8.4	Study Area	8-3
8.5	Baseline Environment	8-4
8.6	Embedded Mitigation	8-23
8.7	Appraisal	8-27
8.8	Cumulative Effects	8-33
8.9	Recommendations and Mitigation	8-34
8.10	Climate Change	8-36

8. HYDROLOGY, HYDROGEOLOGY, GEOLOGY AND SOILS

8.1 Introduction

8.1.1 This EA chapter assesses the potential effects relating to hydrology, hydrogeology, geology and soils (including land contamination) in relation to the construction and operation phases of the Proposed Development. It details each of these items in turn, including a baseline description, followed by the identification of potential impacts on each receptor and, where relevant, identification of measures proposed to mitigate the impact. Agricultural soils have not been considered in this chapter as effects on agriculture have been scoped out, see **Section 3.2**.

8.2 Information Sources

8.2.1 The data relating to the Study Area (see **Section 8.4.1**) used to develop a baseline for soils, geology, land contamination, Water Framework Directive (WFD) catchments, and watercourses is summarised below:

- Groundsure Enviro + Geo Insight (ref. GSIP-2024-14714-18280_A to G), (1 May 2024) (appended as part of **Appendix G Geotechnical and Geo-Environmental Desk Study**);
- Jacobs, ASTI Substation Site - LT521 Fasnakyle Ground Investigation Report (April 2024) (appended as part of **Appendix G Geotechnical and Geo-Environmental Desk Study**);
- Igne, Proposed LT521 Fasnakyle 400KV Substation Report on Ground Investigation Report (May 2024) (appended as part of **Appendix G Geotechnical and Geo-Environmental Desk Study**);
- Online Ordnance Survey digital maps (2024)[1];
- SEPA rainfall data for Scotland (2024)[2];
- SEPA Water Environment Hub (2024)[3];
- SEPA Water Classification Hub (2024)[4];
- SEPA Flood Risk (2024)[5];
- NatureScot Standing Waters Database (2024)[6];
- Scotland's Aquaculture website (2024)[7];
- Scotland's Environment website (2024)[8];
- SSEN Transmission Fasnakyle Area 400 kV Substation, Report on Consultation (2024)[9]

[1] Ordnance Survey, 2024. *OS Maps* [online]. [Accessed 16 August 2024]. Available at: https://explore.osmaps.com/?lat=51.776100&lon=-1.894300&zoom=7.0000&style=Standard&type=2d

[2] SEPA. Rainfall for Scotland. [online] [Accessed 14 November 2024] Available from: https://www2.sepa.org.uk/rainfall/#115322

[3] SEPA, 2021. *Water Environmental Hub* [online]. [Accessed 17 October 2024]. Available at: https://informatics.sepa.org.uk/RBMP3/

[4] SEPA, 2024. *Water Classification Hub* [online]. [Accessed 16 August 2024]. Available at: https://www.sepa.org.uk/data-visualisation/water-classification-hub/

5 SEPA Sottish Flood Hazard and Risk Information, 2024. *Scottish Flood Hazard and Risk Information* [online]. [Accessed 16 August 2024]. Available at: https://map.sepa.org.uk/floodmaps/FloodRisk/Search

[6] NatureScot, 2023. *Standing Waters Database* [online]. [Accessed 04 September 2024]. Available from: https://opendata.nature.scot/datasets/snh::standing-waters-database/explore

7 Scotland's Aquaculture, 2024. *Scotland's Aquaculture* [online]. [Accessed 16 August 2024]. Available at: https://aquaculture.scotland.gov.uk/map/map.aspx?postcode=&layers=AQUA_1,AQUA_6

8 Scotland's Environment, 2024. *Scotland's Environment* [online]. [Accessed 16 August 2024]. Available at: https://map.environment.gov.scot/sewebmap/

[9] SSEN Transmission, 2024. *Fasnakyle Area 400 kV Substation, Report on Consultation* [online]. [Accessed 03 December 2024]. Available at: https://www.ssen-transmission.co.uk/globalassets/projects/beauly-denny-400kv-upgrade-project-downloads/bdup---bingally/report-on-consultation---fasnakyle-area-substation.pdf

- National River Flow Archive for surface water flow and rainfall information (2024)[10];
- British Geological Survey (BGS) mapping (2024)[11];
- NatureScot SiteLink (2024)[12];
- Scotland's aquifers and groundwater bodies (2024)[13];
- UK centre for Ecology and Hydrology (2024)[14];
- UK Radon map (2024)[15];
- UK Topography map (2024)[16];
- Google Earth satellite imagery (Google Earth) (2024)[17];
- Carbon and Peatland 2016 Map (2024)[18];
- National Soil Map of Scotland (2024)[19];
- The Coal Authority Interactive mapping (2024)[20];
- Historic Environment Scotland (HES) (2024)[21];
- Zetica Unexploded Ordnance (UXO) risk map (2024)[22];
- Zetica Pre-Desk Study Assessment (PDSA) (10 May 2024) (appended as part of the Geotechnical and Geo-Environmental Desk Study (**Appendix G Geotechnical and Geo-Environmental Desk Study**));
- SEPA data request for surface water and groundwater quality, discharges, abstractions, pollution events, monitoring stations and ecology surveys (received 20 March 2024);
- Email correspondence with Highland Council on potentially contaminated land (received 12 April 2024) (appended as part of the Geotechnical and Geo-Environmental Desk Study (**Appendix G Geotechnical and Geo-Environmental Desk Study**);
- Email correspondence with SEPA on potentially contaminated land (received 26 April 2024) (appended as part of the Geotechnical and Geo-Environmental Desk Study (**Appendix G Geotechnical and Geo-Environmental Desk Study**); and
- Private Water Supply (PWS) data from THC Online Database (2024)[23].

8.2.2 A walkover of the Study Area was conducted on 10 May 2024.

[10] UK Centre for Ecology and Hydrology and National River Flow Archive, 2024. *UK Centre for Ecology and Hydrology and National River Flow Archive* [online]. [Accessed 16 August 2024]. Available at: https://nrfa.ceh.ac.uk/

[11] BGS, 2020. *Onshore Geoindex* [online]. [Accessed 16 August 2024]. Available at: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/

[12] NatureScot, 2024. *Map Search* [online]. [Accessed 16 August 2024]. Available at https://sitelink.nature.scot/map

[13] BGS, 2024. *Scotland's aquifers and groundwater bodies* [online]. [Accessed 16 August 2024]. Available at: https://www2.bgs.ac.uk/groundwater/waterresources/ScotlandsAquifers.html

[14] UK centre for Ecology and Hydrology, n.d. *About the UK Centre for Ecology & Hydrology (UKCEH)* [online]. [Accessed 16 August 2024]. Available at: https://www.ceh.ac.uk/

[15] UK maps of radon, 2024. *UK maps of radon* [online]. [Accessed 16 August 2024]. Available at: https://www.ukradon.org/information/ukmaps

[16] United Kingdom topographic map, 2024. *United Kingdom topographic map* [online]. [Accessed 16 August 2024]. Available at: https://en-gb.topographic-map.com/map-cgt/United-Kingdom/

[17] Google Earth, 2023. *Google Earth* [online]. [Accessed 16 August 2024]. Available at: https://earth.google.com/web/

[18] Carbon and Peatland 2016 Map, 2024. *Soil Maps* [online]. [Accessed 16 August 2024]. Available at: https://map.environment.gov.scot/Soil_maps/?layer=1

[19] National Soil Map of Scotland, 2024. *National Soil Map of Scotland* [online]. [Accessed 16 August 2024]. Available at: https://map.environment.gov.scot/Soil_maps

[20] The Coal Authority, 2023. *The Coal Authority Map Viewer* [online]. [Accessed 16 August 2024]. Available at: https://datamine-cauk.hub.arcgis.com/

[21] Historic Environment Scotland, 2024. *Past Map* [online]. [Accessed 16 August 2024]. Available at: https://pastmap.org.uk/map

[22] Zetica UXO, 2024. *Risk Maps* [online]. [Accessed 16 August 2024]. Available at: https://zeticauxo.com/guidance/risk-maps/

[23] Highland Council, 2024. *Private Water Supplies* [online]. [Accessed 16 August 2024] Available at: https://map-highland.opendata.arcgis.com/datasets/ded172bbade24650bb2c1baec5e0d318/explore

8.3 Methodology

8.3.1 The general methodology used to assess the potential effects of the Proposed Development on the hydrology, hydrogeology, geology and soils of the Study Area is as follows:

- Consultation with SEPA, and THC to identify any information relating to water abstractions, contaminated land, historical land use and areas of sensitivity. No information on public water supply abstractions was provided by SEPA;
- Feedback from Scottish Water in the Report on Consultation[9] around the site selection for proposed Bingally substation has identified a nearby drinking water catchment where a Scottish Water abstraction is located. In their response to this consultation, they have requested further information on the designs and on any mitigation proposed within the catchment to protect both quantity and quality;
- Desktop study to obtain baseline and historical data. The Geotechnical and Geo-Environmental Desk Study is included in **Appendix G Geotechnical and Geo-Environmental Desk Study** and a summary of the baseline conditions are provided in this chapter in **Section 8.5**; and
- A field survey undertaken on 10 May 2024 to obtain baseline data relating to:
  - Identification of the potential effects of the Proposed Development and assessment of their magnitude and potential impact on sensitive receptors; and
  - Identification of options for the mitigation of potential effects taking account of the SSEN Transmission GEMPs (**Appendix M GEMPs and SPPs**).

8.3.2 The appraisal will be undertaken in accordance with the EA methodology provided in **Chapter 3 Methodology** The receptor sensitivity / importance is established using the guidance set out in Highways England, LA 113 Road Drainage and the Water Environment[24] and LA109 Geology and Soils[25].

8.3.3 The level of effect upon the baseline environment is defined by the following:

- Negligible / none: no detectable change to the environment;
- Minor: a detectable but non-material change to the environment;
- Moderate: a material but non-fundamental change to the environment; and
- Major: a fundamental change to the environment.

8.3.4 This assessment will include potential impacts from the Proposed Development. Particular attention will be paid to the potential hydrological and water quality impacts upon any water supplies within the vicinity of the Site, as defined in **Chapter 2 Description of the Proposed Development,** and any aquatic ecological features identified within **Chapter 5 Ecology**. The potential water quality impacts through enhanced erosion of disturbed peat will also be considered.

8.3.5 A direct effect would be where a pollution event takes place to a watercourse itself. An indirect effect would be to the aquatic ecology and / or fish as a consequence of the pollution event. The main focus of the chapter is therefore direct effects and their mitigation.

8.4 Study Area

8.4.1 The Study Areas are defined as:

[24] Highways England, 2020. LA 113 Road drainage and the water environment (formerly HD 45/09) https://www.standardsforhighways.co.uk/search/d6388f5f-2694-4986-ac46-b17b62c21727.
[25] Highways England, 2020. LA 109 Geology and Soils file:///C:/Users/ruth.carter/Downloads/LA%20109%20Geology%20and%20soils-web.pdf

- 1 km buffer from the Site for the assessment of the geology and soils;
- 250 m buffer from the Site for the assessment of contaminated land risk;
- The Site for the assessment of hydrology and hydrogeology for ordinary watercourses; and
- 2 km from the Site for the assessment of WFD water bodies.

8.4.2 The different Study Areas are shown on **Figure 8-1**, **Appendix A Figures**.

8.4.3 The baseline for hydrology and hydrogeology also considers downstream attributes beyond the Site as water quality impacts can sometimes propagate along watercourses. The distance downstream is usually determined by the nature of the risk, rate of conveyance, dilution and dispersion potential. For this appraisal a 2 km Study Area has been selected.

8.5 Baseline Environment

Study Area Topography, Land Use and Climate

8.5.1 The Site is characterised by peatland and heather land with elevations between 278 m - 324 m above Ordnance Datum (AOD). The surface cover is predominantly shrub land and forest with smaller portions of waterbodies, wetlands and / or herbaceous vegetation associations[26].

8.5.2 The Site is located approximately 2.2 km south of Tomich and 5.4 km south the existing Fasnakyle Substation (see **Figure 2-1, Appendix A Figures**).

8.5.3 The National River Flow Archive (NRFA) website[10] shows that the Site falls within two catchment areas which have two NFRA stations which record rainfall. These include the Glass at Fasnakyle catchment (NH315287) at the west of the Site, and the Glass at Kerrow Wood catchment (NH354320) at the east of the Site. Standard Annual Average Rainfall (SAAR) for the period 1961-1990 is 2209 mm per year at the Glass at Fasnakyle, and 2249 mm per year at the Glass at Kerrow Wood.

8.5.4 Corrimony Station located at NH 37593 30390 (approximately 10 km northeast of the Site) shows that October and January have the highest amounts of rainfall, while generally rainfall is lowest during April and May (see **Chart 1** below).

[26] OSM Landuse Cover, n.d. *OSM Landuse Landcover* [online]. [Accessed 4 September 2024]. Available from: https://osmlanduse.org/#13.47507317725987/-4.81384/57.29824/0/

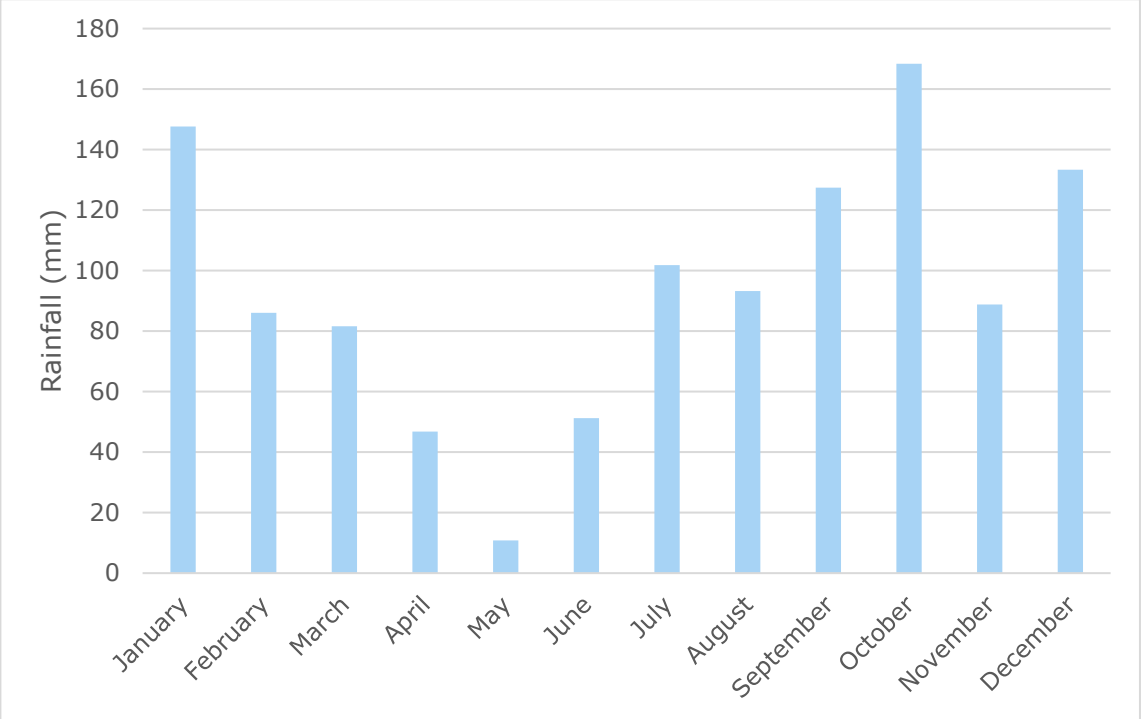

Chart 1 Average monthly rainfall recorded at Corrimony Station during 2023[27]

Surface Water Hydrology

8.5.5 Surface water features (and their attributes) within the Study Area are described in this section. Under the WFD, 'water bodies' are the basic management units, defined as all or part of a river system or aquifer. Water bodies form part of larger 'river basin districts' (RBD), for which River Basin Management Plans (RBMPs) are used to summarise baseline conditions and set broad improvement objectives. For Scotland, all water bodies are considered within the same RBMP[28]. This baseline is presented by each water body, noting that some features are present within the catchments of designated WFD water bodies rather than being designated as a WFD water body in their own right.

8.5.6 For the purposes of this assessment, WFD water bodies within 2 km of the Site and ordinary watercourses within the Site have been identified. Water features have been identified by a review of online Ordnance Survey maps and aerial imagery and are shown in **Figure 8-2, Appendix A Figures** and below in **Table 8-1**.

8.5.7 The Site and the wider Study Area is situated within the River Beauly Catchment (ID: 19) and within the River Glass sub-catchment.

8.5.8 The River Glass is sourced from multiple rivers including convergence of the River Affric and Abhainn Deabhag. The River Affric is sourced from Loch Beinn a' Mheadhoin (NH 27391 27573) and Abhainn Deabhag is sourced from NH 18778 17241. These rivers flow northeast and converge at NH 31072 28754, forming the River Glass. The River Glass continues to flow northeast before converging with the River Farrar at NH 40786 39900 to form the River Beauly. The River Glass is also part of the River Affric - Cannich to Loch Beinn a Mheadhoin (ID: 20210) WFD waterbody. The Site sits upgradient on the southern side of Abhainn Deabhag. The water features within the Study Area and the River Glass sub-catchment are described below in **Table 8-1**.

[27] SEPA, 2024. *Rainfall for Scotland* [online]. [Accessed 14 November 2024] Available from: https://www2.sepa.org.uk/rainfall/#115322

[28] SEPA, 2021. *The River Basin Management Plan for Scotland 2021 – 2027* [online]. [Accessed 3 September 2024]. Available at: https://www.sepa.org.uk/media/594088/211222-final-rbmp3-scotland.pdf

8.5.9 Q95s (the flow exceeded 95% of the time) in the area were only available for the River Glass at Fasnakyle (1.19 m^3/s) and the River Glass at Kerrow Wood (8.614 m^3/s). Q95 is the average flow for any one day expected to be greater than for 95 days in any 100 days. The higher Q95 equates to higher flow within the river. Both stations show that the River Glass has a high flow rate.

8.5.10 The River Glass was observed on the walkover at a location on the far side of the valley. At this location, its profile has a shallow riverbank on the far side of the river and steeper on the near side (the opposite side of valley to the Site). Vegetation cover was sparse to moderate and consisted of mainly grasses and trees. A number of large meanders, features of the River Glass, take the route closer to the Site, around Fasnakyle House, before veering back to the side of the valley from which **Photo 1** below was taken.

8.5.11 Allt na Faiche Bige and Allt nam Fiodhag coverge at NH 29926 25582 to form Allt na Sidhean. Allt na Sidhean flows north into Abhainn Deabhag. OS Maps[29] notes the watercourse to have a waterfall called Guisachan Falls.

8.5.12 Allt an Rathain is a small watercourse situated 152 m downgradient of tower 79T. It is sourced at NH 30289 23271 and flows into Allt na Sidhean at NH 28875 24490. It also flows along the eastern side of the Glen Affric Nature Reserve. It has a tributary at NH 31116 25512 which can be seen in **Photo 3**. Overall, Allt an Rathain is a narrow watercourse with highly vegetated banks. Riverbed is dominated by sediment with some bedrock and gravel. Allt na Faiche Bige and Allt nam Fiodhag will likely have similar morphologies.

8.5.13 Also observed on the walkover was the flood plain of River Abhainn Deabhag. The flood plain was vegetated with grass and sparse trees, and a small pond was observed (see **Photo 2**). Further information on Abhainn Deabhag is in **Section 8.5.17** below.

Photo 1 River Glass at NGR NH 324 307, looking SE (downstream). Taken on 10 May 2024

[29] OS Maps. [Online] [Accessed 16 August 2024] Available From https://explore.osmaps.com/?lat=51.776100&lon=-1.894300&zoom=7.0000&style=Standard&type=2d

Photo 2 River Abhainn Deabhag (in the distance by the trees which flows into the River Glass at NGR NH3100 2870)

Photo 3 Tributary of Allt an Rathain. Looking upstream. Approximate NGR NH 297 241.

8.5.14 **Table 8-1** lists all of the water features identified in the baseline alongside their National Grid Reference (NGR), a description summary and proximity to the Site.

Table 8-1 Water Features within the Study Area

Name	ID	NGR	Description	Proximity to the Site
Unnamed Watercourse	WF1	NH 30224 23865	Tributary of Allt an Rathain which it enters at approximately NH 29857 23874. Sourced at NH 30224 23865.	WF1 is 54 m downgradient from 79T, 84 m downgradient from 79R and 93 m from 79T.
River Glass	WF2	NH 34863 31767	WFD classified waterbody as part of the River Affric - Cannich to Loch Beinn a Mheadhoin (ID: 20210) (Good Ecological Potential 2022) and River Beauly - Beauly Firth to Cannich is a river (ID: 20209) WFD waterbodies (Good Ecological Potential 2022). It is sourced at approximately NH 31057 28743 at the confluence of the River Affric and Abhainn Deabhag. It becomes the River Beauly at NH408399.	The River Glass is not within the Site, situated approximately 8 km downstream of the Site. However, it has WFD status and is joined by the Abhainn Deabhag (WF3) downstream of the works.
Abhainn Deabhag	WF3	NH 28827 25646	Abhainn Deabhag (ID: 20235) is a WFD classified waterbody with 'Good' status. It is sourced from the Allt Riabhach at approximately NH 24215 21097 and joins the River Glass at NH 31071 28745.	Abhainn Deabhag is not within the Site. However, it is a receptor for WF1 and WF4 and there is a potential pathway. It is approximately 1.92 km from the Site for the proposed temporary tower arrangement, and 2 km from the proposed final tower arrangement.
Allt an Rathain	WF4	NH 29857 23873	Sourced at NH 30289 23271, tributary of Allt na Sidhean which it flows into at NH 28875 24490. Flows adjacent to the Glen Affric NNR.	152 m downgradient of tower 79T, 182 m downgradient of tower 79R, 154 m downgradient from tower 79T. WF1 is situated between the towers and WF4 and so contaminants would enter WF1 first. However, WF1 joins WF4 approximately 1 km downstream and so there is a potential pathway.
Unnamed Watercourse	WF5	NH 29843 23437	Sourced at NH 30123 22790 from Allt na Faiche Bige and joins Allt an Rathain at approximately NH 29465 24076. Flows adjacent to the Glen Affric NNR.	77 m downgradient from tower T80 working area and 96 m from temporary access track.
Various unnamed drains	WF6	NH 29853 23612	Various unnamed ditches / drains present. May be associated with access tracks for existing OHL and / or deer stalking operations.	Various within Site. Potentially directly adjacent to the tower T80 working area and 26 m from temporary access.
Abhainn Deabhag DWPA (surface)	WF7	NH 30224 23865	Drinking Water Protected Area for surface water (ID:20235) associated with the Abhainn Deabhag water feature. Follows a length of 24.09 km.	Within the Site.

WFD Classified Water Bodies

8.5.15 The water features listed in **Table 8-2** are within WFD water body catchment area, Abhainn Deabhag (ID: 20235). This watercourse then flows into the River Affric - Cannich to Loch Beinn a Mheadhoin (ID: 20210) waterbody, part of the River Glass Catchment.

8.5.16 River Affric - Cannich to Loch Beinn a Mheadhoin WFD waterbody includes the River Affric and the River Glass. It has a length of 10.2 km and has been designated as a heavily modified waterbody on account of physical alterations that cannot be addressed without a significant impact on water storage for hydroelectricity generation. It also has a 'Good Ecological Potential' classification from 2022 (Cycle 3). Modelled hydrology and hydrology (medium / high flows) have a classification of 'Poor'.

8.5.17 Abhainn Deabhag has a length of 24.09 km and also has a 'Good' classification from 2022 (Cycle 3) which it has maintained since 2008. The Study Area is also within the Abhainn Deabhag (ID: 20235) Drinking Water Protected Area (Surface).

Table 8-2 WFD Surface Water Bodies

RBMP Parameter	Abhainn Deabhag (2022)	River Affric - Cannich to Loch Beinn a Mheadhoin (2022)	River Beauly - Beauly Firth to Cannich (2022)
Overall status	Good	Good Ecological Potential	Good Ecological Potential
Pre-HMWB (highly modified water body) status	Good	Moderate	Moderate
Overall ecology	Good	Moderate	Moderate
Physico-Chem	High	N/A	Good
Temperature	High	N/A	High
Reactive phosphorus	High	N/A	High
Dissolved Oxygen	High	N/A	High
Acidity	High	N/A	Good
pH	High	N/A	Good
Biological elements	High	High	High
Invertebrate animals	High	N/A	High
Macroinvertebrates (River Invertabrate Classification Tool (RiCT) / Whalley Hawkes Paisley Trigg (WHPT)	High	N/A	High
Macroinvertebrates (Average Score per Taxon (ASPT))	High	N/A	High

RBMP Parameter	Abhainn Deabhag (2022)	River Affric - Cannich to Loch Beinn a Mheadhoin (2022)	River Beauly - Beauly Firth to Cannich (2022)
Macroinvertebrates (Number of Scoring Taxa (NTAXA))	High	N/A	High
Fish	High	High	High
Fish ecology	N/A	N/A	N/A
Fish barrier	High	High	High
Hydromorphology	Good	Moderate	Moderate
Morphology	Good	Good	Good
Overall hydrology	High	Moderate	Moderate
Modelled hydrology	High	Poor	Moderate
Hydrology (medium / high flows)	High	Poor	Moderate
Hydrology (low flows)	High	Moderate	High
Water quality	High	N/A	Good

Water Quality

8.5.18 Data provided by SEPA from a data request on 20 March 2024 showed that water sampling took place at Loch Beinn a Mheadhoin (NH 27213 27572), approximately 4 km from the Site, in 2018, 2019 and 2024[30]. In 2018 sampling took place over 10 months, in 2019 sampling took place over eight months and data received for 2024 shows sampling data for one month.

8.5.19 Groundwater sampling took place at Tomich Water Treatment Works (WTW), abstraction from emergency borehole, Cannich, Beauly (NH 31060 28340), approximately 650 m the Site[30]. Samples were taken in May 2018, August 2022 and February 2023. The data which was provided by SEPA, is generally limited and most determinands recorded have only one sample taken.

8.5.20 Although limited water samples were taken, including the flow conditions, and the suite of analysis was for key parameters only, as a whole, the data suggest the quality of water in water features in the Study Area is generally good but may have areas more susceptible to minor pollution as shown by some determinands exceeding environmental quality standards (EQS). However, these exceedances of EQS may also be related to the surrounding geology and natural environment. This is shown in **Table 8-3** and **Table 8-4**.

8.5.21 Dissolved oxygen is relatively high with an average result of 11.2 mg/l, which suggests Loch Beinn a Mheadhoin has clean water with limited pollution. Aluminium has exceeded the environmental quality standards; this however may be related to the surrounding geology (see **Section 8.5.35** for details on geology). Therefore, unlikely to indicate any source of pollution.

[30] This data was received from SEPA on the 4 June 2024.

8.5.22 There is one groundwater sampling site located at Tomich WTW, abstraction from emergency borehole, Cannich, Beauly' (NH 31060 28340). Samples were taken in May 2018, August 2022 and February 2023. The data which was provided by SEPA is generally limited and most determinands recorded have only one sample taken.

8.5.23 A summary of results and average (EQS) are shown in **Table 8-3** and **Table 8-4.** Results where the determinand is above the EQS are shown in red text.

Table 8-3 SEPA Chemistry Data Surface Water

Determinand	Units	Loch Beinn a Mheadhoin (Surface Water)			Environmental Quality Standards[31] (EQS)
		Average of Results	Min of Results	Max of Results	
Alkalinity (as CaCO3)	mg/L	4.1	3.4	4.2	N/A
Aluminium	µg/L	83.3	43.3	261	15
Ammoniacal Nitrogen (as N)	mg/L	0.0	0.0	0.0	N/A
Biochemical Oxygen Demand – Allyl thiourea (ATU) suppressed		0.8	0.5	1.4	N/A
Calcium	mg/L	0.8	0.7	1.1	N/A
Chemical Oxygen Demand		9.7	6	13.1	N/A
Chloride	mg/L	4.5	3.2	6.5	250,000
Electrical conductivity (25°C)	µS/cm	26.1	23	32.1	N/A
Iron	mg/L	0.3	0.1	2.7	1,000
Magnesium	mg/L	0.5	0.4	0.6	N/A
Manganese	mg/L	0.0	0.0	0.0	123
Nitrate (as N)	mg/L	0.2	0.1	0.2	N/A
Nitrite (as N)	mg/L	0.0	0.0	0.0	N/A
Nonionised ammonia (as N)	mg/L	0.0	0.0	0.0	N/A
Oxygen – dissolved	mg/L	11.2	9.5	13	N/A
Oxygen – dissolved - % saturation	%	95.7	90	103	N/A
pH	pH Units	6.3	6.0	6.4	N/A
Potassium	mg/L	0.3	0.2	0.6	N/A
Reactive Phosphorus (as P)	mg/L	0.0	0.0	0.0	N/A
Sample Temperature	°C	9	1.2	17.8	N/A

[31] SEPA, 2020. *Environmental Quality Standards* [online]. [Accessed 4 September 2024]. Available at: https://www.sepa.org.uk/media/152957/wat-sg-53-environmental-quality-standards-for-discharges-to-surface-waters.pdf

Determinand	Units	Loch Beinn a Mheadhoin (Surface Water)			Environmental Quality Standards[31] (EQS)
		Average of Results	Min of Results	Max of Results	
Sodium	mg/L	3.4	2.7	4.8	N/A
Sulphate (as SO4)	mg/L	0.3	0.2	0.4	N/A
Total Nitrogen (as N)		0.1	0.1	0.3	N/A
Total Oxidised Nitrogen (as N)	mg/L	0.2	0.1	0.2	N/A
Total Phosphorus (as P)		0.0	0.0	0.0	N/A

Table 8-4 SEPA Chemistry Data Ground Water

Determinand	Units	Tomich WTW, Abs from emergency BH, Cannich, Beauly (Ground Water)			Environmental Quality Standards[32] (EQS)
		Average of Results	Min of Results	Max of Results	
Alkalinity (as CaCO3)	mg/L	16.8	14.8	19.1	N/A
Aluminium *	µg/L	11	11	11	15
Ammoniacal Nitrogen (as N)	mg/L	0.0	0.0	0.0	N/A
Arsenic *	µg/L	2	2	2	50
Atrazine *	ng/L	2.8	2.8	2.8	0.6
Bentazone *	ng/L	24.6	24.6	24.6	500
Cadmium *	µg/L	0.0	0.0	0.0	N/A
Calcium *	mg/L	5.6	5.6	5.6	N/A
Chloride	mg/L	11.9	10	13.8	250,000
Chromium *	µg/L	0.5	0.5	0.5	N/A
Copper *	µg/L	1.5	1.5	1.5	1
Electrical conductivity (25°C)	µS/cm	85.7	83.7	86.9	N/A
Iron *	mg/L	0.0	0.0	0.0	1,000
Lead *	µg/L	3.3	3.3	3.3	1.2
Magnesium *	mg/L	1.6	1.6	1.6	N/A
Manganese *	mg/L	0.0	0.0	0.0	123
Nickel *	µg/L	0.9	0.9	0.9	4
Nitrate (as N)	mg/L	0.0	0.0	0.0	N/A

[32] SEPA, 2020. *Environmental Quality Standards* [online]. [Accessed 4 September 2024]. Available at: https://www.sepa.org.uk/media/152957/wat-sg-53-environmental-quality-standards-for-discharges-to-surface-waters.pdf

Determinand	Units	Tomich WTW, Abs from emergency BH, Cannich, Beauly (Ground Water)			Environmental Quality Standards[32] (EQS)
		Average of Results	Min of Results	Max of Results	
Nonionised ammonia (as N) *	mg/L	0.0	0.0	0.0	N/A
Organic Carbon *	mg/L	0.7	0.7	0.7	N/A
Oxygen - dissolved	mg/L	6.2	4.8	7.6	N/A
Oxygen - dissolved - % saturation	%	53.9	40.8	66.9	N/A
pH	pH units	6.3	6.2	6.4	N/A
Reactive Phosphorus (as P)	mg/L	0.0	0.0	0.0	N/A
Sample Temperature	°C	9.15	8.4	9.9	N/A
Sodium *	mg/L	9.4	9.4	9.4	N/A
Sulphate (as SO4)	mg/L	2.5	2.4	2.6	400,000
Suspended Solids (105°C) *	mg/L	2	2	2	N/A
Total Oxidised Nitrogen (as N)	mg/L	0.6	0.4	0.8	N/A
Vanadium *	µg/L	0.4	0.4	0.4	N/A
Zinc *	µg/L	33.3	33.3	33.3	10.9
*Determinand only has one sample recorded.					

Aquatic Ecology and Protected Species

8.5.24 There is limited information on aquatic ecology and protected species within the Study Area. However, 13 otter *Lutra lutra* records originating from the same 1 km grid square (NH 34000 30000) were identified near the River Affric (approximately 6 km from the Site). The River Affric and the Abhainn Deabhag represents highly suitable otter habitat. Also identified was a record of water vole *Arvicola amphibius*, near the River Enrick headwaters (0.65 km west of the Site). Field survey found water vole field signs at locations at least 700 m north of the Site, but none within or close to the Site itself (see **Chapter 5 Ecology and Nature Conservation**).

8.5.25 No records of any notable fish (i.e. fish species that are European protected species or are listed on Schedule 5 of the Wildlife and Countryside Act or listed on the Scottish Biodiversity List) were returned from the Geotechnical and Geo-Environmental Desk Study (**Appendix G Geotechnical and Geo-Environmental Desk Study**).

8.5.26 The River Affric, the Abhainn Deabhag and the River Enrick headwaters have been classed by Marine Scotland[33] as rivers supporting Atlantic salmon. Brown trout has also been noted to inhabit the River Glass[34].

8.5.27 A survey from the Ness and Beauly Fisheries trust conducted several Electro-fishing surveys back in 2018[35]. They carried out salmon and trout juvenile stock tests at 33 sites in the Beauly system. Overall, it was found the River Glass had excellent habitat for salmon and recorded good densities for salmon fry. However, there were low densities of trout parr recorded.

8.5.28 Therefore, it could be assumed that all surface water bodies identified in this chapter could support salmon and possibly some brown trout.

8.5.29 More information on ecology is provided in **Chapter 5 Ecology**.

Flood Risk

8.5.30 Within the Study Area there is no risk of groundwater, river or coastal flooding based on review of SEPA flood maps.

8.5.31 There are small areas of low, medium and high risk of surface water flood risk within the Study Area. These areas are mostly associated with the water courses and bodies within the Study Area and with dips in the topography.

8.5.32 Flood risk is not assessed in this chapter. A detailed flood risk assessment is being undertaken separately by Fairhurst, on behalf of the Applicant for the Proposed Development. Flood risk would be dealt with through the planning process based on the separate assessment carried out as part of the application and therefore is excluded from the EA.

Other Designations

8.5.33 The Glen Affric NNR is located 100 m southwest of the Site. The Allt an Rathain watercourse runs adjacent and within the designated site.

8.5.34 There are no other designations within the Study Area, including but not limited to Nitrate Vulnerable Zones (NVZ), Sites of Special Scientific Interest (SSSI) or Special Areas of Conservation (SACs).

Geology and Soils

8.5.35 According to BGS mapping, the drift geology at the Site comprises peat and Glacial Till (Devensian-Diamicton). These superficial deposits are also present across the majority of the Study Area. Additionally, Moranic Deposits of sand, gravel and boulders are shown approximately 160 m west of the Site and within the west of the Study Area. Alluvium (of sand, gravel and boulders) is shown approximately 1 km west of the Site. Superficial deposits are indicated as absent in some areas within the Study Area.

8.5.36 The bedrock underlying the Site belongs to the Tarvie Psammite Formation-Psammite from the Loch Eil Group. A localised area of unnamed igneous intrusion (pre-caledonian in age) is present 230 m west of the Site. The Glen Moriston Vein Complex

[33] Marine Scot, n.d. *Marine Scotland* Data [online]. [Accessed 4 September 2024]. Available at: https://data.marine.gov.scot/

[34] Kerrow House, n.d. *Trout & Salmon Fishing, Glen Affric* [online]. [Accessed 4 September 2024]. https://kerrow-house.co.uk/trout-salmon-fishing-glen-affric/

[35] Ness and Beualy Fisheries Trust. River Beauly Catchment, Electro-fishing Results 2018. [Online] Accessed 18 November 2024] Available At: https://beauly.dsfb.org.uk/files/2019/05/Beauly-E-fishing-report-2018.pdf

of microgranite, pegmatite and leucogranite is present approximately 680 m west of the Site.

8.5.37 There are no BGS designated areas of made ground or artificial ground recorded on the Site or within 250 m of the Site. However, made ground is expected to be associated with the construction of the existing towers, roads and tracks within the Study Area (**Section 8.4.1**).

8.5.38 The Strathglass Fault is shown approximately 1.4 km west of the Site.

8.5.39 Linear features of '*ice-marginal glacial single-sided meltwater channel*' are shown within the north of the Site and approximately 6 m, 190 m, 330 m and 910 m northwest of the Site. The *'axis of large-scale glacial flute*' is shown within 1 km east and north of the Site. Glacial meltwater channel centre lines (undifferentiated) are present at approximately 290 m to the west and at 1 km northeast of the Site.

8.5.40 According to the BGS GeoIndex database, four boreholes were recorded within the Site. These BGS boreholes are NH32SW1, NH22SE1, NH22SE2, and NH22SE4. Another borehole was located approximately 120 m southwest of the Site (NH22SE3) (still within the Study Area). The BGS historical borehole records encountered the following general sequence:

- Made ground (within Site) from surface to a maximum of 0.40 m bgl (below ground level) (NH32SW1). Made ground at this location is possibly from an existing track;
- Peat (within and beyond the Site, 250 m radius) from surface to a maximum of 0.80 m bgl (NH22SE1-on-site); Sand and gravel (within and beyond the Site, 250 m radius) underlying the peat or made ground up to a maximum of 4.00 m bgl (NH22SE1 - within the Site);
- Weathered psammite / broken rock (within and beyond the Site, 250 m radius) underlying the superficial deposits between 2.50 m bgl and 3.90 m bgl (top of bedrock) (NH32SW1 and NH22SE2, and NH22SE3 beyond the Site); and
- Psammite bedrock (within and beyond the Site) underlying the superficial deposits or weathered psammite between 2.50 m bgl and 4.00 m bgl (top of bedrock) (NH32SW1 and NH22SE1).

8.5.41 A ground investigation (GI) was carried out by Igne in late 2023 / early 2024 on-site (Igne, Proposed LT521 Fasnakyle 400KV Substation Report on Ground Investigation Report, May 2024 - appended as part of **Appendix G Geotechnical and Geo-Environmental Desk Study**). The GI covered part of the Study Area (except the western and southern areas[36]) and the adjacent proposed Bingally substation. The total GI comprised 25 boreholes sunk by a mixture of dynamic sampling, rotary open-hole and rotary core drilling methods. Six boreholes were sunk on the Study Area to a maximum depth of 8.75 m bgl (BH17). A total of 38 trial pits (TP) were excavated by mechanical means across the whole GI area, with seven trial pits sunk to a maximum depth of 2.00 m bgl (TP26) on the Study Area. The GI identified the following general sequence on the Study Area only:

- Topsoil was encountered in TP27 (on-site) only, to a maximum depth of 0.20 m bgl (TP27). Topsoil was described as dark brown sandy locally spongy fibrous peaty topsoil;

[36] The GI covered the proposed Bingally substation works for which some of the areas investigated overlapped with the Site.

- Made ground and evidence of contamination was not encountered during the Igne GI;
- Peat was encountered from surface to a maximum depth of 2.50 m bgl (TP17) within 4 boreholes and in 6 trial pits on the Site. Suspected peat was also encountered within peat probes undertaken locally within the Study Area. The peat depths estimated from the probing from the Igne Ground Investigation were typically less than 2 m in thickness, although localised areas of deeper peat were recorded. Where observed in the relevant exploratory holes within the Study Area, the peat was generally described as dark brown slightly sandy plastic amorphous locally spongey fibrous peat. The Von Post scale[37] for the humification and estimation of moisture content for the peat, was typically recorded in the range of H4 (slightly decomposed with the plant structure not easily identifiable) to H5 (moderately decomposed with recognisable but vague plant structure) / B1 (dry) to B2 (<500%), although humification of up to H8 (very strong decomposition with very indistinct plant structure) was locally recorded as well as moisture contents of up to B3 (500 – 1000%);
- Superficial deposits of sand and gravel were encountered from surface (BH14, BH16, BH23) to 3.20 m bgl (BH17). Granular Glacial Deposits were generally encountered beneath the peat or topsoil within five boreholes and five trial pits. Gravel was described as brownish grey sandy fine to coarse angular to subangular gravel of psammite (BH14). Sand was generally described as medium dense grey / brown very gravelly silty fine to coarse with cobbles (BH14). Gravel of psammite and granite (BH18);
- Some weathered bedrock was recorded within five boreholes beneath the peat and granular Glacial Deposits between 0.50 m bgl (BH20) and 3.40 m bgl (BH17) and was described as slightly or moderately weathered; and
- Bedrock was encountered within four boreholes between surface (BH20) and 3.20 m bgl (BH17). Within the trial pits, probable bedrock was encountered between 0.20m (TP27) and1.40 m bgl (TP15) (top of bedrock). Bedrock was not encountered in TP17 and TP26 which terminated at depths of 2.50 m and 2.00 m bgl respectively. The bedrock mainly comprises psammite and pelite with occasional igneous intrusions (granite).

8.5.42 According to the Coal Authority mapping, the Study Area does not lie within a Coal Mining Reporting Area.

8.5.43 The Groundsure Report indicates ‘Guisachan Forest Pit’ within the central west of the Site for commodity of Igneous and Metamorphic Rock. There is an additional ‘Guisachan Forest Pit’ located approximately 520 m east of the Site for the commodity of sand and gravel. Both pits are shown as ‘of ceased status’.

8.5.44 A review of The National Soil Map of Scotland identifies the main soil types across the Site and surrounding area as ‘Peaty gleys with dystrophic semi-confined peat’ and ‘Humus-iron podzols’.

8.5.45 According to the Carbon and Peatland 2016 Map[18], Class 0 (mineral soils) and Class 5 (Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat.) deposits are the predominant soil classes across the Study Area. Localised areas of Class 1 nationally important carbon-rich, deep peat and priority peatland habitat

[37] Hobbs, N.B., 1986. *Mire morphology and the properties and behaviour of some British and foreign peats*. QJEG, London, Vol. 19, pp 7 – 80.

deposits are recorded on the northeastern boundary and within the southern extent of the Site. The Class 1 soils recorded within the southern extent of the Site are recorded to extend to the south and east out with the Site.

8.5.46 A review of the NatureScot Map[12] indicates that there are no Geological Conservation Review (GCR) sites within the Study Area, or in surrounding areas beyond. There are no other geology and / or soil related designated sites within the Study Area, or in surrounding areas beyond.

8.5.47 According to the UK Radon Map[15], the majority of the Study Area is located within an area where 1-3% of homes are above the action level for radon gas. The southwest of the Study Area is located within an area where radon potential is greater than 30%. The radon risk is relevant to building construction. As there are no enclosed buildings planned as part of the Proposed Development, radon is not discussed further in this report.

8.5.48 The Site and surrounding area are in a low risk area, which is defined as an 'area indicated as having 15 bombs per 1000 acres or less' according to the Zetica UXO risk map[16].

8.5.49 A Zetica Pre-Desk Study Assessment (PDSA) has not identified World War Two (WWII) military activities on or affecting the Study Area. Zetica concluded that a detailed desk study, whilst always prudent, is not considered essential.

Hydrogeology

8.5.50 The Study Area is underlain by one groundwater aquifer according to the Hydrogeological Map of Scotland[38], the Loch Eil Group. This aquifer has been designated as a low productivity 2C aquifer with flow essentially through fractures and other discontinuities, and mainly within the upper weathered zone.

8.5.51 The Loch Eil Group is within the larger Precambrian North aquifer. As displayed within **Table 8-5,** the Loch Eil group aquifer has a low productivity. This is evidenced by the low transmissivity value, specific capacity and operational yield. The Precambrian North aquifer is weakly mineralised and with variable redox conditions. Groundwater flow tends to follow local surface water catchments[39], however data and information on the flow direction is limited. The vulnerability its likely to be classed as 5, meaning the aquifer is vulnerable to most pollutants with rapid impacts in most case[39].

8.5.52 There is limited groundwater level data available, however from borehole records on BGS GeoIndex, groundwater levels appear to be around 8-13 m bgl (BGS Reference: NH22SE14, NH22SE13). These boreholes are approximately 1.5 – 1.8 km from the Site.

8.5.53 A review of the most recent GI (Igne, Proposed LT521 Fasnakyle 400KV Substation Report on Ground Investigation Report, May 2024) undertaken on the Study Area (except within the western and southern areas (**Section 8.5.41**)) has identified groundwater strikes in four boreholes and trial pits in the Peat and Granular Glacial Deposits between shallow between 0.10 m (TP34) and 3.20 m bgl (BH28).

[38] BGS, 2024. *Hydrogeological Map of Scotland* [online]. [Accessed 4 September 2024]. Available at: https://www.bgs.ac.uk/datasets/hydrogeological-maps-of-scotland/

[39] BGS, 2015. *Scotland's aquifers and groundwater bodies* [online]. [Accessed 4 September 2024]. Available at: https://nora.nerc.ac.uk/id/eprint/511413/1/OR15028.pdf

8.5.54 There may also be pockets of groundwater within the permeable sands and gravels of other overlying superficial deposits present such as within Till-Diamicton, Peat and Glaciofluvial Deposits. This could occur particularly where superficial deposits are found at significant thickness. Flow would likely follow the topography of the surface and underlying bedrock.

Table 8-5 Aquifer properties of the Precambrian North

	Transmissivity (M^2/D)	Specific Capacity ($M^3/D/M$)	Operational Yield (M^3/D)
Moine	0.2 (1)	0.7-1.8 (2)	23-328 Median 38 (4)
*Number of values indicated in brackets.			

WFD Groundwater Bodies

8.5.55 Groundwater aquifers in Scotland have been divided into water bodies according to the River Basin Management Framework. The Site includes one bedrock water body, Northern Highlands (ID: 150701) which has an area of 9,382.3 km^2 and a 'Good' overall status (2022) according to SEPA with minor fracture flow. It has had a classification of 'Good' since 2012 and is described as having a very low to low productivity (see **Table 8-6**).

8.5.56 All of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas (DWPA). The Site and surrounding Study Area are situated within the Northern Highland Groundwater DWPA. The DWPA dataset represent the individual groundwater bodies in Scotland. These have been identified by SEPA in line with the requirements of the Water Environment (DWPA) (Scotland) Order 2013[40]. The dataset is required to fulfil the requirements of the European Union WFD.

8.5.57 WFD Groundwater Bodies and Drinking Water Protected Areas are shown in **Figure 8-3, Appendix A Figures**.

Table 8-6 WFD Groundwater Bodies

RBMP Parameter	Northern Highlands (ID: 150701) (2022)
Overall status	Good
Quantitative status	Good
Saline Intrusion	Good
Surface Water Interaction	Good
Water balance	Good
Chemical status	Good
Chem – Surface Water Interaction	Good
Specific pollutants	Good
Chromium	Good
Zinc	Good
Manganese	Good

[40] UK Government, 2013. The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013 [online]. [Accessed 5 September 2024]. Available at: https://www.legislation.gov.uk/ssi/2013/29/contents/made

RBMP Parameter	Northern Highlands (ID: 150701) (2022)
Other Substances	Good
Nitrate	Good
Priority substances	Good
Cadmium	Good
Lead	Good
Drinking Water Protected Area	Good
Priority substances	Good
Atrazine	Good
Simazine	Good
Other Substances	Good
Epoxyconazole	Good
Nitrate	Good
General tests	Good
Priority substances	Good
Atrazine	Good
Simazine	Good
Trichloroethene	Good
Benzene	Good
Specific pollutants	Good
Chromium	Good
Other Substances	Good
Electrical Conductivity	Good
Epoxyconazole	Good
Nitrate	Good
Free Product	Good
Vinyl Chloride	Good
Water quality	Good

Groundwater Dependent Terrestrial Ecosystems

8.5.58 Groundwater Dependent Terrestrial Ecosystems (GWDTEs) have been identified throughout the Study Area.

8.5.59 A number of National Vegetation Classification (NVC) vegetation communities were identified within the Study Area that are recognised as indicators that a habitat is likely

to be highly or moderately groundwater dependent according to SEPA (2017)[41]. These are detailed on **Figure 5-4 Groundwater Dependent Ecosystems.**

8.5.60 The results of a basic hydrological assessment undertaken in the field revealed that many of the potential GWDTE within the area surveyed were in good condition and may in many instances depend on groundwater for their maintenance. Notwithstanding, the GWDTE within the Site are often associated with ombrotrophic deep peat, and based on professional judgement and field assessment, in these situations it is likely that the hydrology of the GWDTE are largely (or perhaps entirely) maintained by surface water associated with rain-fed systems. Groundwater levels from the 16 boreholes and 24 trial pits in the Peat and Granular Glacial Deposits was relatively shallow between 0.10 m (TP34) and 3.20 m bgl (BH28). Therefore, it is likely that the habitats outlined below are dependent on groundwater.

8.5.61 Based on professional judgement and field assessment, wet woodlands (W4) are probably dependant on groundwater to maintain their condition. These GWDTE were found in isolated areas, often on the break of slopes or in a mosaic with dry woodlands in one woodland large parcel. It should be assumed that groundwater flows are present and have given rise to the wet woodlands on Site.

8.5.62 Potentially highly / moderately GWDTE are within depressions in sloping peatlands (M6c), within small valleys and / or associated with mapped watercourses (M25a and M25b), or in flushed rush-dominated mires down from a break in a slope (M23b), where the hydrological regime is near natural. In these situations, it is highly probable that the potential GWDTE are dependent on groundwater to maintain their condition. Also, CG10 (that was found in one highly localised area) most likely relies on sub-surface irrigation with lime-rich waters.

8.5.63 Regarding heathlands, M15a wet heaths are in particular likely to be (at least in part) sustained by ground water. However, many of the heathland GWDTE pertain to species-poor communities (e.g. M15 and M15b wet heathlands) which are regarded as ubiquitous in the Scottish Highlands. In addition, M15c wet heathland is not likely to be groundwater-fed, as these habitats were mostly present on rocky high ground, which was most likely nearly entirely rain-water fed.

8.5.64 Some of the potential GWDTE within the area surveyed were degraded and subject to a significant level of on-going artificial drainage caused by commercial forestry plantation (M15* and M25*). These potential GWDTE are on deep peat and have most likely developed from a blanket bog habitat and therefore they are most probably not dependent on groundwater.

8.5.65 Further detail on GWDTEs is provided in **Chapter 5 Ecology**.

Private Water Supplies

8.5.66 There were no PWS within the 1 km Study Area observed from data downloaded from THC's Open Map[42]. Letters and surveys were also sent out in October 2024 to local residents within the 1 km Study Area to identify any other PWS not recorded on the THC website.

[41] SEPA, 2017. *Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems* [online]. [Accessed 29 August 2024]. Available at: https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions.pdf

[42] The Highland Council, 2024.*The Highland Council Open Map Data* [online]. [Accessed 12th August 2024]. Available at: https://map-highland.opendata.arcgis.com/datasets/Highland::private-water-supplies/explore

8.5.67 SEPA recommend a 250 m buffer zone for groundwater abstractions from any excavations deeper than 1 m[43]. Any excavations 1 m or shallower, a 100 m buffer zone is recommended. A 10 m buffer zone is recommended for all works. A 1 km Study Area was selected, as the guidance is only suitable for groundwater abstractions and does not specify buffer zones for surface water abstractions. Therefore, using a 1 km Study Area, the downstream spread of contaminants to surface water supplied PWS can be studied.

8.5.68 From the survey and THC website, four PWS have been identified. None are within 1 km of the Study Area, however all are downgradient from the works and so should still be considered:

- One PWS is located at NH 29933 26103, Sawmill. It is a 60 m deep groundwater borehole, which is used for domestic purposes with 'good' water quality. It is situated 1.3 km downgradient from the Site at its closest point;
- A second PWS is located at NH 28067 24572, Plodda Lodge. The source is a borehole of unknown depth and domestic use. It was noted that water quality when tested in July 2024 was 'good'. It is situated 1.9 km downgradient from the Site at its closes point;
- A third PWS is located at NH 28300 24400, Plodda Cottage, which is sourced from surface water and has been used for the past 30 years. It is 1.6 km downgradient from Site at its closest point; and
- The final PWS is located at NH 31500 26800, The Fank. The source is a spring and use is domestic. The supply use is expected to increase due to a new house being built which will use the same supply. It is situated approximately 2.09 km downgradient from the Site at its closest point.

Other Abstractions

8.5.69 As mentioned, the Site is within the Abhainn Deabhag (ID: 20235) Drinking Water Protected Area (Surface) and the Northern Highland Drinking Water Protected Area. As discussed above, four PWS have been identified from our investigation.

8.5.70 Other abstractions should be covered by SEPA within a Water Environment (Controlled Activities) Regulations 2011[44] (CAR) Licences. However, from the data request from SEPA, none have been identified within the Study Area. As the Site is within two drinking water protected areas it is possible that there is a public water supply within the Study Area but no details on public drinking water abstractions were provided by SEPA.

8.5.71 It has been identified that there are two Scottish Water boreholes[45] (Tomich Treatment Works) located on the flood plain of the river Abhainn Dhebhag, which supply water up to works situated above the village of Tomich. These boreholes look to be over 3 km from the Site, therefore they have been scoped out of any further investigation.

8.5.72 However, Scottish Water should be notified three months in advance of works commencing. The location of any public drinking water abstraction would also be

[43] SEPA, 2024. *Guidance on Assessing the Impacts of Developments on Groundwater Abstractions* [online]. [27 May 2025}. Available at: https://www.sepa.org.uk/media/i2cnr03k/guidance-on-assessing-the-impacts-of-developments-on-groundwater-dependent-terrestrial-ecosystems.docx

[44] SEPA, 2011. *Water Regulations* [online]. [Accessed 12 August 2024]. Available at: https://www.sepa.org.uk/regulations/water/

8. [45] Legislation.Gov, 2006. The Scottish Water (Tomich Boreholes) Water Order 2006 [online]. [Accessed 27 March 2025]. Available at: The Scottish Water (Tomich Boreholes) Water Order 2006

further investigated pre-construction and there would be consultation with Scottish Water.

Land Contamination

8.5.73 The earliest available Ordnance Survey map reviewed was dated 1872 which shows the Site and surrounding area as undeveloped with mainly agricultural / open land. A sheepfold is shown within the west of the Site. Towers with OHLs passing through the Site are present on the 1969 map edition, as well as access tracks and fords.

8.5.74 A new quarry is shown within the west of the Site on map editions 2001 until 2024 (quarry is now possibly infilled). Additional access tracks are shown within 250 m from the Site. The surrounding land mainly comprises agricultural land and forestry.

8.5.75 Sources of contamination which may impact the Site and Study Area include:

<u>On-site</u>

- Made ground associated with the construction of the towers, paths and access tracks and potential infilling of the quarry; and
- Potential ground gas generation from the infilled quarry and the presence of peat deposits.

<u>Off-site</u>

- Made ground associated with the construction of the towers, paths and access tracks.

8.5.76 No other significant contaminant features were identified within 250 m of the Site.

Summary of Sensitivities

8.5.77 **Table 8-7** below summarises the sensitivities assigned to the various resources / receptors as discussed in this chapter.

Table 8-7 Sensitivity of Receptors

Receptors	Sensitivity	Justification
Northern Highlands WFD Groundwater Body	High	Low productivity WFD status aquifer. May support few PWS in weathered zones and fractures therefore considered have a high sensitivity due to the direct human receptors. Number of GWDTEs also present.
PWS	Very High	Direct human receptor which are used for domestic purposes.
Unnamed Watercourse (WF1)	Water Quality – Medium Hydromorphology – Low	Water Quality – Relatively small tributary of Allt an Rathain which does not have its own WFD status. Within Abhainn Deabhag surface drinking water protection zone. Hydromorphology – Minor, relatively unmodified watercourse.
River Glass (WF2)	Water Quality – High Hydromorphology – Low	Water Quality – 'Good' status WFD waterbody upstream, 'Good ecological potential' status downstream. Q95s ranging from 1.19 to 8.614 m^3/s. Likely has both salmon and trout present. Hydromorphology - Classed as heavily modified waterbody due to the hydro- electric scheme and associated regulated releases.
Abhainn Deabhag (WF3)	Water Quality – High Hydromorphology – Medium	Water Quality – 'Good' status WFD waterbody and has surface drinking water protected area classification. Likely has salmon and trout. Hydromorphology - 'Good' hydromorphology status.

Receptors	Sensitivity	Justification
Allt an Rathain (WF4)	Water Quality – Medium Hydromorphology – Low	Water Quality - Flows alongside Glen Affric NNR tributary of Allt na Sidhean which does not have WFD status. Within Abhainn Deabhag Surface Drinking Water Protection Area. Hydromorphology – Minor, relatively unmodified watercourse.
Unnamed Watercourse (WF5)	Water Quality – Medium Hydromorphology – Low	Water Quality- Flows alongside nature reserve, tributary of Allt an Rathain which does not have WFD status. Within Abhainn Deabhag Surface Drinking Water Protection Area. Hydromorphology – Minor, relatively unmodified watercourse.
Various unnamed drains (WF6)	Water Quality – Medium Hydromorphology – Low	Water Quality - May flow alongside nature reserve and into other watercourses. Within Abhainn Deabhag Surface Drinking Water Protection Area. Hydromorphology – Minor, relatively unmodified watercourse.
Abhainn Deabhag Drinking Water Protected Area (Surface) (WF7)	Very High	Drinking Water Protected Area which encompasses the entirety of the Site. Direct human receptor.
Peat	Areas of Class 5 peatland soils and areas where peat recorded from other sources (e.g. BGS, investigation records, etc.) - Medium Areas of Class 1 peatland soils - High	According to BGS, the most recent GI and the National Map of Scotland, there is peat in the Site and in the Study Area (**Sections 8.5.35, 8.5.44,** and **8.5.45**). The Carbon Peatland Map identifies the soils on the Study Area as being predominantly mineral soils and Class 5 which are not of national importance. However, localised areas of Class 1 nationally important deposits are recorded on the northeastern boundary and within the southern extent of the Study Area, as well as off-site to the south and southeast.
Receptors of Land Contamination; Human Health, Water Environment and the Built Environment	Low[46]	Potential sources of contamination are minimal, associated with limited made ground on-site and off-site. There is potential for ground gas generation from an infilled quarry (on-site) and the presence of peat deposits. However given the nature of the Proposed Development as an OHL with no buildings / enclosed structures, risk from ground gas is only relevant during construction works.

8.6 Embedded Mitigation

Secondary consents

CAR Licences

8.6.1 It is anticipated that all works would be carried out under the necessary consents / permits (e.g. CAR licences as required under the Water Environment (Controlled

[46] The risk rating is based on the Preliminary Risk Assessment (section 6) of the Fasnakyle OHL Geo-Env Desk Study Reference 60701792-R-001, AECOM August 2024.

Activities) Regulations 2011[47], and that the Principal Contractor would comply with any conditions imposed by any relevant permission. It is anticipated that the Principal Contractor would ensure all required permits / consents are in place for works in, or near watercourses.

8.6.2 The following activities would require CAR authorisation:

- Any discharges of polluting matter, this includes any water runoff from a construction site. This runoff includes any rainfall, meltwater from ice / snow;
- Abstraction of water from the water environment (groundwater and surface water);
- Artificial recharge to groundwater aquifers;
- Direct / indirect discharge and any activity likely to cause a direct or indirect discharge, into groundwater of any hazardous substance or other pollutant; and
- Any other activity which directly or indirectly has or is likely to have a significant adverse impact on the water environment.

Environmental Clerks of Works (EnvCoW)

8.6.3 The role of the EnvCoW is to monitor the compliance of a project and advise on the environmental management of a project to the client. The EnvCoW are also tasked with environmental monitoring, auditing and reporting. The EnvCoW have a separate role from the Ecological Clerk of Works (ECoW) who are responsible for on-site practical ecological support such as Protected Species Licencing.

8.6.4 The Proposed Development would have an assigned EnvCoW, who would monitor the environmental management of the project which would include water environment.

Design Mitigation and Assumptions

General Environmental Management Plan (GEMPs)

8.6.5 The adoption of the CEMP and applicable GEMPs (see **Table 8-8** and **Appendix M GEMPs and SPPs**) would reduce the probability of a pollution incident occurring and also reduce the magnitude of any incident due to a combination of good site environmental management procedures, including minimising storage of soil volumes, soil management, staff training, availability of contingency equipment and emergency plans.

Table 8-8 GEMPs

GEMP	Details on reducing impacts to the water environment, geology and soils
Working in or Near Water GEMP (TG-NET-ENV-512, 2023).	Avoid works within 10 m of a watercourse. If working within 10 m ensure that all pollution prevention controls are in place. Ensure of watercourses are routinely monitored for change in water quality. Diverting any clean surface water away from area using cut-off drains, catch pits and bunds. Do not allow water to drain down the length of a haul road.

[47] GOV.UK, n.d. *Controlled water activities (CAR) consents (Scotland)* [online]. Available: https://www.gov.uk/find-licences/controlled-water-activities-car-consents-scotland#:~:text=Apply%20for%20this%20licence&text=Protection%20Agency%20website-,You%20must%20be%20authorised%20by%20the%20Scottish%20Environment%20Protection%20Agency,impact%20on%20the%20water%20environment

GEMP	Details on reducing impacts to the water environment, geology and soils
Watercourse Crossings GEMP (TG-NET-ENV-515, 2023).	Seek to avoid watercourse engineering works wherever possible. Plan all works in accordance with best practice measures outlined in WAT-SG-25 Engineering water environment: Good Practice Guidance[48]. Culverts should be dug into bed of watercourse, allowing for natural strata in the watercourse to form the new bed and culverted watercourse. If a watercourse is wider than 1.5 m, use a bridge as opposed to a culvert. During construction, work should be done during the drier periods if possible (consult weather forecast at least three days beforehand). Vehicles should not work within water unless there are no other reasonable options. During construction and the use of a crossing, measures must be taken to prevent the transport of sediments or other materials into a watercourse. Vegetation removal should be minimised wherever possible. Storage of material should be far enough away from the watercourse to prevent wash off entering the watercourse.
Private Water Supplies GEMP (TG-NET-ENV-518, 2023).	A PWS assessment should be undertaken to identify PWS which have the potential to be affected by works. Avoid works within PWS catchments during wet weather or when wet weather is forecast. Ensure that there is adequate pollution control and emergency response measures in place to deal with any incidents that could affect a supply. There could be unidentified PWS. If that happens works should stop at that locations and specialist advice should be sought.
Soil Management GEMP (TG-NET-ENV-511, 2023).	Soil storage should be located 10 m from any watercourses and protected from runoff.
Working with Concrete GEMP (TG-NET-ENV-514, 2023).	Concrete shall not be used within 10 m of any watercourse or loch, where practically possible. Store bulk and bagged cement and concrete would be at least 30 m away from any watercourses, gullies and drains. Washing down of equipment to remove any surplus concrete.

[48] SEPA, 2010. *River Crossings* [online]. [Accessed 4 September 2024]. Available at: https://www.sepa.org.uk/media/151036/wat-sg-25.pdf

GEMP	Details on reducing impacts to the water environment, geology and soils
Contaminated Land GEMP (TG-NET-ENV-517, 2023).	Works would be carried out following best practices and all relevant waste regulations. During construction, keep a careful lookout for any signs of contamination. If contamination is identified, stop work immediately. Report the discovery to the site manager and project environmental representative within 30 minutes. If a risk of contamination is identified, further site investigations may be appropriate, including analysis of soil and water samples for specific suites of potential contaminants and more detailed contaminated land assessments. Where disposal of contaminated land is required, this should be done in accordance with current waste legislation.
Waste Management GEMP (TG-NET-ENV-516, 2023).	All waste to be stored within sealed container or on an impervious surface with barriers to lateral flow.
Oil Storage and Refuelling GEMP (TG-NET-ENV-510, 2023).	Maintaining a 30 m buffer from surface water, wetlands, GWDTEs, drinking water and private water supply catchment. Clearly identifying any areas where fuelling or fuel storage is not permitted on site plans.
Working in Sensitive Habitats (TG-NET-ENV-513, 2023).	Include a water management strategy for minimising impacts of construction activities on the peatland. Any water abstraction associated with this activity needs to be compliant with the CAR.
Dust Management GEMP (TG-NET-ENV-520, 2024)	Dust has the potential to smother habitats and pollute watercourses. Dust should be suppressed from stockpiles, haul roads and storage areas by spraying with water.
Bad Weather GEMP (TG-NET-ENV-523, 2024)	Bad weather can increase the risk for environmental impacts, such as increased risk of sediment laden runoff. Weather forecasts should be checked daily Plan for high run-off in advance, checking weather. And Identify protection measures (silt traps, straw bales and booms) Check any containment bunds have the appropriate capacity and empty if necessary to prevent uncontrolled discharge. Water containers and skips should be covered/closed to minimise water ingress. Include a water management strategy for minimising impacts of construction activities on the peatland. Any water abstraction associated with this activity needs to be compliant with the CAR.
Restoration GEMP (TG-NET-ENV-522)	Identify in the soil management and restoration plan where soils and peat would be stored. Topsoil and subsoil would be stored separately. Compression of soils would be avoided as much as possible on restoration. Large boulders would be removed to replace in restoration works.

8.7 Appraisal

8.7.1 This appraisal assumes that good practice measures (including GEMPs, a Surface Water Management Plan (SWMP) and abiding with any permit requirements for permitted activities) are adopted to manage potential effects, notably sedimentation of watercourses; surface water and groundwater contamination; and hydromorphological impacts. The conditions to prevent pollution and manage drainage would be addressed within a CEMP.

Construction Phase

8.7.2 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. The appraisal assessed the worst possible potential effects that could occur during construction.

Sediment-laden Runoff

8.7.3 There is the potential for adverse effects on the water environment from site runoff contaminated by excessive fine sediments (including the potential wash-out of fine sediment from temporary spoil storage, embankments, and access tracks), which may reduce water quality, smother habitats, and physically impact aquatic organisms; chemical spillages; and physical changes to the form and function of water features as a consequence of:

- Vegetation clearance, topsoil / subsoil stripping and stockpiling;
- General construction activities including runoff and activities at temporary construction compounds, the movement of plant and other vehicles, and their maintenance;
- Dewatering trenches;
- Excavation, crushing and transportation by overland conveyors of excavated materials to temporary stockpile locations;
- Construction of temporary access tracks; and
- Increased sediment inflow could smother habitats and physically impact aquatic organisms and cause physical changes to the form and function of water features.

8.7.4 Contamination could lead to adverse impacts to the receptors identified above in **Table 8-7** including Abhainn Deabhag Drinking Water Protected Area (surface).

8.7.5 Without mitigation this may have a minor adverse impact to surface water bodies. With the implementation of GEMP - Working In or Near Watercourses, GEMP - Private Water Supplies, Soil Removal, Storage and Reinstatement Management, GEMP - Working with Concrete, GEMP - Contaminated Land, GEMP - Waste Management, GEMP - Oil Storage and Refuelling, GEMP – Dust Management, GEMP - Bad Weather and GEMP Restoration (**Appendix M GEMPs and SPPs**), the overall impact to the water environment is considered to be negligible.

Oils, Hydrocarbons and other construction materials

8.7.6 During the construction phase, a number of potential pollutants would be introduced during the site works (from construction plant, equipment and materials) including oils, hydrocarbons, inorganics, sulphates, sulphides, cement, concrete, waste and wastewater.

8.7.7 There is the potential for any unidentified contamination from localised made ground associated with the construction of the existing towers (on-site and off-site), paths and access tracks (on-site and off-site), surrounding plant and equipment use in the forestry industry (on-site and off-site), the potential infilling of the quarry (on-site). Potential contaminants could include metals and inorganic compounds, pH, Polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH) and other organic compounds, sulphates, sulphides and phenols. It is noted that the GI undertaken to date on the Site and in the Study Area did not encounter made ground within the Site. However, BGS mapping records made ground at one location within the Site (surface to 0.40 m bgl) which was not considered significant. Where encountered, made ground and unexpected contamination should be carefully managed in accordance with Unexpected GEMP - Contaminated Land GEMP (**Appendix M GEMPs and SPPs**) to mitigate potential risks.

8.7.8 Sources of oils and hydrocarbons on construction site relevant to the Proposed Development includes oil / fuel storage in mobile tanks during construction, fuel storage in barrels and plant / equipment used. During construction works sources of oil and hydrocarbon spillage may be associated with storage tanks, plant and machinery during refuelling and or vandalism.

8.7.9 Oil and hydrocarbon contaminants used during the construction phase, could impact the water quality of the nearby surface waters and groundwaters and can also infiltrate and contaminate soils and bedrock. Potential effects associated with such contaminants are discussed below from **Section 8.7.10**.

Surface Water

8.7.10 The most direct pathway for contaminants to reach surface waterbodies on the Site is via surface water runoff, lateral migration of contaminants via shallow deposits and / or groundwater, service runs and drainage systems on site.

8.7.11 The water features WF2 and WF3 are both over 1 km from the Site. There are potential flow paths to both water features, however the distance and the dispersion and dissolution of contaminants would likely result in a negligible impact. Mitigation measures outlined in the GEMP (**Appendix M GEMPs and SPPs**), would also help to reduce any potential impact.

8.7.12 WF1 is 54 m downgradient from 79T, 84 m downgradient from 79R and 93 m from pylon 79T. It flows into WF4 which is within 200 m of the works. WF5 is also 77 m downgradient from the working area of T80 and 96 m from the proposed temporary access track. Due to the relative proximity of WF1, WF4 and WF5 the works there is the potential of a minor impact as a result of sediment runoff and chemical spillages which could indirectly and directly wash from the works. The impact from this however is likely to be temporary, and with the mitigation measures outlined in the GEMP (**Appendix M GEMPs and SPPs**) a minor impact is predicted.

8.7.13 There are also narrow drains from forestry activity situated within the Site (WF6). Without appropriate mitigation these drains could spread contaminants downstream to larger watercourses and have a minor impact on water quality.

Groundwater

8.7.14 The most direct pathway for contaminants to reach groundwater within the superficial deposits is by leaching and migration of contaminants via shallow made ground (if present) and natural superficial deposits. Excavation to depth where the groundwater

is exposed may also provide direct routes for potential contaminants to leach into groundwater. This could have a minor impact on groundwater quality, and where excavations would encounter the water table, dewatering and pumping may be required.

8.7.15 As discussed above, the Northern Highlands WFD Groundwater Body is essentially impermeable. Any accidental spills of oils and hydrocarbons are unlikely to infiltrate the groundwater aquifer. If any oils and hydrocarbons do enter the aquifer, they would likely be localised to one fracture network.

8.7.16 Assuming that GEMP – Oil Storage and Refuelling is implemented (**Appendix M GEMPs and SPPs**), impacts on water quality, soil and geology from routine construction activities are not considered likely to be significant. Additionally, GEMP – Contaminated Land and GEMP – Waste Management (**Appendix M GEMPs and SPPs**) would be implemented to mitigate potential risks from oils and hydrocarbons.

Contaminated Soil

8.7.17 The ground investigation undertaken to date on the Site and Study Area did not encounter made ground. However, BGS mapping records made ground at one location within the Site from surface to 0.40 m bgl (possibly from an existing track). Where encountered, made ground and unexpected contamination should be carefully managed in accordance with GEMP - Contaminated Land (**Appendix M GEMPs and SPPs**) to mitigate potential risks.

8.7.18 Potential contaminants noted in **Section 8.7.6** if present in ground which may be disturbed could impact nearby surface waters, underlying groundwater and soils. Potential effects to soils are discussed in **Sections 8.7.33** to **8.7.35** and potential effects to surface water and groundwater are discussed as follows.

8.7.19 As made ground is expected to be limited in extent within the Site and Study Area, as well as the lack of potentially contaminative historical land use, there is a reduced risk to groundwater and surface water from potential contamination sources.

Concrete and Cement

8.7.20 Reinforced in-situ concrete would be used on-site for the foundations of the OHL. In total there would be two new foundations which would be pad and column or piled. Mobilisation of concrete and cement products may occur during on-site concrete mixing and washing down of areas where mixing has taken place. Release of concrete or cement products into the water environment could have an adverse effect on water quality and ecology due to their highly alkaline nature.

8.7.21 It is proposed that cement be brought to site ready-mixed and poured in-situ. Other elements would be pre-cast. These measures significantly reduce the potential impact from cement contamination. Alternatively, should it be necessary to mix concrete on-site (worst possible scenario), the measures within GEMP – Working with Concrete (**Appendix M GEMPs and SPPs**) would be adhered to.

Surface Water

8.7.22 Concrete and cement products are highly alkaline and their release into the water environment could have an adverse effect on water quality and ecology. Surface water could be contaminated from contaminated runoff. However, if concrete and cement is brought ready mixed, impacts would be negligible.

Groundwater

8.7.23 The major pathways for cement contaminated water to reach soil and groundwater is via direct contact with construction materials (suspended in surface water runoff into drains and watercourses, especially during periods of high runoff rainfall events), aggressive ground conditions (pH and sulphate) and accidental wash downs.

8.7.24 However, as mentioned earlier the Northern Highlands WFD Groundwater Body is essentially impermeable apart from isolated fractures. Therefore, if any contamination were to occur it would likely be contained within a small fracture network and not widespread.

Equi-potential Zones (EPZs)

Surface Water

8.7.25 Two temporary EPZ pads are proposed over watercourse feature WF1. The EPZ pads are required to create a uniform electrical potential, which protect workers from potential electrical shocks as a result of the OHL works.

8.7.26 The EPZs would need to be constructed on flat ground created by cutting or filling, overlaid with aluminium access panels electrically bonded to the adjacent tower.

8.7.27 There is a likelihood of minor impact on water quality and hydromorphology as a result of the construction and use of EPZ pads over WF1. There is the potential for fine sediment deposition that may be introduced into the channel via surface water runoff from exposed areas stripped of vegetation and where the soil may become compacted due to the movement of construction vehicles.

8.7.28 Therefore, due to the likelihood of minor impact on water quality as a result of construction and use of the EPZ pads, the EPZ pads would be situated at a minimum distance of 15-20 m from any water feature. This measure along with the implementation of GEMP Working In or Near Water (**Appendix M GEMPs and SPPs**) would significantly reduce the potential impacts from the EPZ pads to negligible.

Ground Gas

8.7.29 There is potentially ground gas generated from the infilled quarry and the presence of peat deposits. However, the recent GI indicates generally low concentrations of ground gas, with generally low flows recorded. Ground gas is considered a potential risk in confined spaces during the construction phase due to toxicity from inhalation and the potential explosive risk (from methane).

8.7.30 Prior to construction work commencing, a Health and Safety Risk Assessment in accordance with current health and safety regulations should be carried out by the appointed Principal Contractor. This assessment should cover potential risks to construction staff, permanent site staff and the local population. Based on the findings of this risk assessment, appropriate mitigation measures should be implemented during the construction period.

8.7.31 There is a likelihood of minor impact on human health during the construction phase. However, following the Health and Safety Risk Assessment guidance, the risks from ground gas should be adequately controlled.

Soil Excavation and Waste

Geology and Soils

8.7.32 Disturbance of soil, peat and made ground for the implementation of foundation excavations has the potential to release potential contamination (if present as none identified during the recent GI, **Section 8.7.29**), and impact surrounding soil and groundwater. Any damage to soil quality affects the long-term functioning of the soils, which degrade and lose structure once excavated. These can result in impacts to the water environment, hydrogeology, and the built environment. Management of soil on-site would be undertaken in accordance with GEMP – Soil Management and Waste Management (**Appendix M GEMPs and SPPs**), which would minimise potential impacts to soil. Additionally, GEMP – Contaminated Land would be implemented to mitigate potential risks from unexpected contamination.

8.7.33 The Site is located within an area underlain by peat and organic material. Investigations undertaken within the Site indicate peat deposits are typically <2.00 m in thickness. Care should be taken when excavating this material given that peat is a protected carbon capture source and to minimise the release of any other potential contaminants. Management of peat would be undertaken in accordance with GEMP – Working in Sensitive Habitats. A site-specific Stage 1 (outline) Peat Management Plan (PMP) has been produced for the Proposed Development and has been included within **Appendix H Peat Management Plan**. This PMP provides information on the site selection process, the investigations undertaken to determine peat depth and extent, and an approximate volume of peat excavation based on the current design stage. The PMP also provides mitigation measures, which the detailed design and construction works would be undertaken in accordance with, in relation to the peat present on site to minimise the impact the Proposed Development has on it. The PMP also provides information on how the peat excavated as a result of the Proposed Development would be reused and commits the Applicant to reusing all peat excavated from the Site, as well as provides outline inspection and monitoring principles which would be taken forward as the design and construction works develop. The use and development of the PMP as the Proposed Development progresses, would ensure the impact of the peat soils is reduced as far as is practical.

8.7.34 As peat is recorded to be present within the Site, there is a risk of a peat landslide being caused by the Proposed Development or by natural causes which could affect the environment and the Site. As such, a Stage 1 Peat Landslide Hazard Risk Assessment (PLHRA) has been produced for the Proposed Development to assess the likelihood of a peat landslide occurring, as well as the exposure (impacts) a peat landslide could have, if it occurred. Where a peat landslide has been assessed to be likely, mitigation measures to reduce the impacts of this have been proposed as part of the PLHRA. The Stage 1 PLHRA has been included as part of **Appendix I Peat Landslide Hazard Risk Assessment**.

Groundwater

8.7.35 During construction, there is the potential for local groundwater levels, flow direction and patterns to be altered should dewatering activities be required for foundation construction.

8.7.36 There would only be shallow excavations required for the construction of the Proposed Development. Excavations depths would range from 1 m to 5 m for the foundations and 0.5 m for works areas. Groundwater is relatively shallow between 0.10 m (TP34)

and 3.20 m bgl (BH28). Therefore, it is likely that the excavations would intercept the water table. There would be a temporary effect on groundwater levels however, using cut offs such as temporary sheet piles would limit the wider effects and also reduce the amount of dewatering required. Therefore, there is unlikely to be any long-term impacts to groundwater levels and flows.

8.7.37 Rainwater entering excavations, may require to be pumped out and discharged to onsite drainage.

8.7.38 The appraisal of impacts to GWDTE is included in **Chapter 5 Ecology** (and where necessary, mitigation).

Public / Private Water Supplies

8.7.39 PWS were first identified from THC website. However, not all PWS are recorded on the website. Therefore, a questionnaire was also prepared and distributed to the residents of Tomich, approximately 1 km from the Site to investigate PWS in the area. Four PWS were identified from questionnaire responses received. All the PWS identified from THC website and the questionnaire responses are situated over 1 km from the Site. They are also downgradient and so there are pathways identified for contaminants to reach the PWS. However, due to the relative distance between the works and the PWS there would be a greater number of blockages[49], such as dense vegetation between the contamination and supply which would trap contaminants. This reduces the pathways available for contaminants to be distributed downstream and therefore the likelihood of contamination reaching the PWS. Dissolution and dispersion would also reduce contaminants reaching the PWS. Nevertheless, there is the potential for minor impacts to the PWS. In addition, SEPA recommend a buffer zone of 250 m around every groundwater abstraction from excavation deeper than 1 m. These PWS comply with this zone.

8.7.40 The known PWS were evaluated based on their position relative to the Site, and any potential pollutant-source-pathway-receptor relationships, in order to determine the potential for the Proposed Development to have an adverse effect on PWS. Information on the known PWS, including distance and NGR is described in **Section 8.5.67**.

8.7.41 As a precautionary measure water quality at the PWS is to be monitored pre-construction (up to 12 months, to comply with latest guidance[50]) and during construction (potentially contemporaneously when activities are near to PWS), and trigger levels for quality should be set after pre-construction monitoring. An alternate supply for PWS should be provided if needed.

8.7.42 With the implementation of GEMP – Private Water Supplies and mitigation, the potential impacts would be minimised to negligible. This includes, but is not limited to, the following:

- The use of silt mitigation to prevent runoff from works areas entering the PWS; and
- Avoiding undertaking works within and nearby to watercourses during wet weather or when wet weather is forecast (as subsequent increased surface water flows and surface water runoff into pathways may increase the amount of contaminants entering into the PWS and would be harder to control).

[49] Blockages – pathways are blocked between source of contamination and receptor.

[50] SEPA, 2024. *Guidance on Assessing the Impacts of Development on Groundwater Abstractions* [online]. [Accessed 08 April 2025]. Available from: https://www.sepa.org.uk/media/ijwd3q0y/guidance-on-assessing-the-impacts-of-developments-on-groundwater-abstractions.docx

Operation Phase

8.7.43 There would be no further impacts during the operation phase from the Proposed Development on geology and soils. The use of the electricity OHL is not anticipated to cause any contamination to soils or water environments on site or within the surrounding area.

8.8 Cumulative Effects

8.8.1 A comprehensive list of developments which are anticipated to be under construction or operational at the same time as the Proposed Development is included in **Table 3-2** of **Chapter 3 Methodology** and **Chapter 11 Summary of Cumulative Appraisal**.

8.8.2 **Table 3-2** includes the proposed Bingally substation which overlaps with the Site. The red line boundary of Fiodhag Wind Farm, consisting of 46 turbines, runs along the eastern edge of the Site.

8.8.3 Other developments including two BESS are over 1 km from the Proposed Development and therefore are not considered further in this appraisal.

8.8.4 The potential construction impacts of the cumulative developments identified would likely be related to potential contamination of underlying groundwater, nearby surface waters and soils from oils, fuel stored in mobile tanks and / or plant / equipment used, cement, concrete, waste and wastewater, and also potentially from made ground and soil disturbance associated with the excavations of foundations.

8.8.5 The potential effects on the Proposed Development would be managed through the Principal Contractor's CEMP and the following GEMPs (**Appendix M GEMPs and SPPs**):

- GEMP – Working in or near Water;
- GEMP – Watercourse Crossings;
- GEMP – Private Water Supplies;
- GEMP – Soil Management;
- GEMP – Working with Concrete;
- GEMP – Contaminated Land;
- GEMP – Waste Management;
- GEMP – Oil Storage and Refuelling;
- GEMP – Working in Sensitive Habitats;
- GEMP – Dust Management;
- GEMP – Restoration; and
- GEMP – Bad Weather.

8.8.6 Potentially silt laden runoff would be prevented from entering water courses and / or drainage channels through the use of straw bales, silt fences, cut off drains and drainage onto vegetated areas. An EnvCoW would be assigned to supervise the construction works to ensure that the CEMP and associated mitigation measures are being implemented effectively.

8.8.7 Although, the proposed Bingally substation and wind farm overlap the Site, and assuming their individual CEMPs and GEMPs are applied during the construction, operation and decommissioning it is unlikely that there would be any cumulative effects on geology, soils, and the water environment.

8.8.8 When considering hydrology impacts it is not considered that the combined effects of the Proposed Development's construction and operation phases with cumulative developments would be greater than the predicted effects for each project in isolation. This is due to the timing and spacing of the Proposed Development and the cumulative developments.

8.9 Recommendations and Mitigation

8.9.1 A summary of the mitigation measures would be provided to the Principal Contractor (**Table 8-9**), who would ensure mitigation measures are implemented. The implementation of the mitigation measures would be managed by a suitably qualified and experienced EnvCoW.

Additional Mitigation

8.9.2 Protection measures for watercourses, soils, geology and groundwater would be set out in the CEMP, which is to be prepared in consultation with SEPA and the LPA before being submitted prior to the commencement of construction activities and associated GI works as recommended in the Geotechnical and Geo-Environmental Desk Study (**Appendix G Geotechnical and Geo-Environmental Desk Study).** These measures would be in accordance with SSEN Transmission's GEMP – Working In or Near Watercourses; GEMP – Watercourse Crossings; GEMP – Private Water Supplies; GEMP – Soil Management; GEMP – Working with Concrete; GEMP – Contaminated Land; GEMP – Waste Management; GEMP – Oil Storage and Refuelling, GEMP – Working in Sensitive Habitats; GEMP – Dust management, GEMP - Restoration and GEMP – Bad Weather. All of which would be incorporated into a Water Protection Plan (WPP).

8.9.3 The Principal Contractor would be required to be aware of potential sources of contamination on or near the Site and should follow the CEMP. If suspected contamination is identified at any point during construction work, then contact should be made with a suitably competent environmental consultant to carry out further investigation and assessment.

8.9.4 Prior to work commencing, a health and safety risk assessment should be carried out by the appointed Principal Contractor / developed in accordance with current health and safety regulations. This assessment should cover potential risks from contamination to construction staff and the off-site users.

8.9.5 The Principal Contractor is required to ensure all personnel on site are aware of the Abhainn Deabhag Drinking Water Protected Area (Surface), which may be at risk of adverse effects from construction activities. Guidance is provided by Scottish Water[51], they include methods such as;

- Storing materials such as oils, fuels and chemicals securely and not leave any contaminants near a watercourse;
- Ensuring vehicles and equipment are maintained and leaks/spillages are contaminated; and
- Avoiding working through or within watercourses and to follow applicable SEPA guidelines if work in watercourses is required.

[51] Scottish Water. [Online] [Accessed 18 November 2024] Available Online: https://www.scottishwater.co.uk/Help-and-Resources/Document-Hub/Key-Publications/Sustainable-Land-Management

Water Monitoring and Private Water Supplies

8.9.6 Water quality and / or quantity monitoring before and during construction should be undertaken by the Principal Contractor at surface water receptors. Preconstruction monitoring should begin ideally up to twelve months before works commence. Scottish Water must also be given three months advanced notice before works commence[52]. If any of Scottish Water CAR Licences are within the Study Area or downstream of works, they should make the Principal Contractor aware.

8.9.7 The Principal Contractor would be required to consider all construction activities and satisfy themselves that they are aware of all PWS and public water supply abstractions in the local area that may be at risk of adverse effects to the supply sources or infrastructure. Should any further PWS or public water supply abstractions be identified which require protection, specific mitigation would be developed and agreed with the local property owners, the LPA and SEPA. Water quality and / or quantity monitoring before and during construction may be required by the Principal Contractor for these additional PWS.

8.9.8 A Water Monitoring Plan (WMP) should be prepared prior to the commencement of the works. The WMP would list the water features that would need to be monitored. At the time of writing this assessment, the following watercourses are likely to be included: unnamed watercourses WF1, WF5, WF6 and Abhainn Deabhag to capture any downstream contaminants. However, does not need to be limited to these features listed. PWS including the Plodda Lodge and the Fank should also be considered for monitoring. They are sourced from surface water and a spring downstream from works and thus could be susceptible to contamination.

8.9.9 The Principal Contractor would be required to be aware of potential sources of contamination on or near the Site and should follow the CEMP. If suspected contamination is identified at any point during construction work, then contact should be made with a suitably competent environmental consultant to carry out further investigation and assessment.

8.9.10 Prior to work commencing, a health and safety risk assessment should be carried out by the appointed Principal Contractor / developed in accordance with current health and safety regulations. This assessment should cover potential risks from contamination to construction staff and the off-site users.

8.9.11 The Principal Contractor would be required to adopt the Stage 1 PMP and PLHRA, included within **Appendix H Peat Management Plan** and **Appendix I Peat Landslide Hazard Risk Assessment**. The Principal Contractor would also be required to produce a Stage 2 PMP and PLHRA, post consent and following the design of the Proposed Development to full maturity, which would both take into account any new information obtained, provide full details on the proposed design as it relates to the peat and how impacts on the peat would be minimised / mitigated, providing full details on how the peat excavated would be reused and discharge any planning conditions which may be applied in relation to the peat. Following this, a construction phase PMP would be produced by the Principal Contractor prior to construction works starting and would be updated throughout the construction works.

[52] SSEN Transmission, 2024. *Fasnakyle Area 400 kV Substation, Report on Consultation* [online]. [Accessed 03 December 2024]. Available at: https://www.ssen-transmission.co.uk/globalassets/projects/beauly-denny-400kv-upgrade-project-downloads/bdup---bingally/report-on-consultation---fasnakyle-area-substation.pdf

Geotechnical Risk Register

8.9.12 As part of the development, design and construction of the Proposed Development a Geotechnical Risk Register (GRR) shall be developed and maintained to highlight key geotechnical risks associated with the Proposed Development. This GRR shall include the risks associated with the peat present and the mitigation measures which are used to reduce the risk and impact.

Table 8-9 Summary of Additional Mitigation

Mitigation Reference	Receptor	Mitigation Measure	Phase
HG1	Peat	Management of peat excavation PMP	Pre-construction
HG21	Peat	Peat landslide risk PLHRA	Pre-construction
HG3	Peat and Soils	Geotechnical Risk Register GRR	Pre-construction
HG4	Drinking Water Protected Areas	Follow guidelines set out by Scottish Water[53]	Construction
HG5	Surface Water Receptors & PWS	Water Monitoring Plan	Pre-construction (up to 12 months), construction (full duration) and post-construction/operation (up to 6 months)
HG6	Human Health & Water Environment	Principal Contractor to be made aware of potential sources of contamination & to follow the CEMP	Pre-construction
HG7	Human Health & Water Environment	Production of a health and safety risk assessment by the appointed Principal Contractor to cover potential risks from contamination	Pre-construction

8.10 Climate Change

Land Contamination

8.10.1 With respect to land contamination, an increase in the winter precipitation rate may lead to an increase in the migration of potential contaminants through an increase in infiltration and increased flood risk. Mitigation measures used during construction would include the investigation and removal of any identified contamination encountered. During the operational period, the design includes hardstanding which would reduce infiltration and subsequent mobilisation / migration of any residual contamination.

[53] Scottish Water. [Online] [Accessed 18 November 2024] Available Online: Sustainable Land Management - Scottish Water

8.10.2 The increase in wildfires may lead to an introduction of potential contaminants through use of fire-fighting methods and mobilisation / migration of contaminants due to loss of vegetation / increase in infiltration. The mitigation measures used during construction should include vigilance against potential for wildfires starting / spreading. During the operational period, the design includes hardstanding which would reduce impact of wildfires.