

6. GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

6.1 Introduction

This Chapter of the EA presents a review of baseline conditions and potential impacts on the water environment and flood risk as a result of the Proposed Development as described in **Chapter 2: Project Description**. The ground and water environment as described in this Chapter includes geology, hydrology and hydrogeology receptors. The Chapter is supported by the following Annexes:

- Annex K: Drainage Strategy and Drainage Plans
- Annex L: Hydrology Methodology
- Annex M: Private Water Supply Risk Assessment
- Annex N: Water Construction Management Plan

6.2 Study Area

The assessment of impacts in relation to geology, hydrology and hydrogeology receptors will be undertaken for the Hydrology Study Area, as shown in **Figure 6.1**, an area which extends 250 m from infrastructure of the Proposed Development and the Associated Development, together known as the Project Site. An area of extending to 2 km from the Proposed Development and Associated Development has been defined to assess the potential effects on private water supply (PWS) (the PWS Study Area), and a wider study area extending 10 km from the Proposed Development and Associated Development has been identified to assess potential effects on the downstream water environment (the Wider Study Area). These are also shown on **Figure 6.1**.

6.3 Baseline Environment

6.3.1 Surface Hydrology

Based on SEPA mapping¹, the Hydrology Study Area is located within Abhainn Bheag an Tunns, Crarae Burn and Auchgoyle Burn catchment. The existing access tracks are located within the Auchgoyle Burn, Abhainn Bheag an Tunns and Loch Fyne catchments. To the north and east of the Hydrology Study Area, Crarae Burn flows south-east, before discharging into Loch Fyne. South of the Hydrology Study Area is the Auchgoyle Burn which collects from several unnamed watercourses present within the Hydrology Study Area before flowing south through Minard and discharges into Loch Fyne. The watercourses are associated with the Loch Fyne Coastal Catchment (SEPA ID 200334) which have a classification of Good. The north western part of the Hydrology Study Area drains to the north west via an unnamed loch, which flow south west along the Abhainn Bheag an Tunns watercourse within the wider River Add catchment. The hydrological catchments associated with these watercourses are shown in **Figure 6.6**.

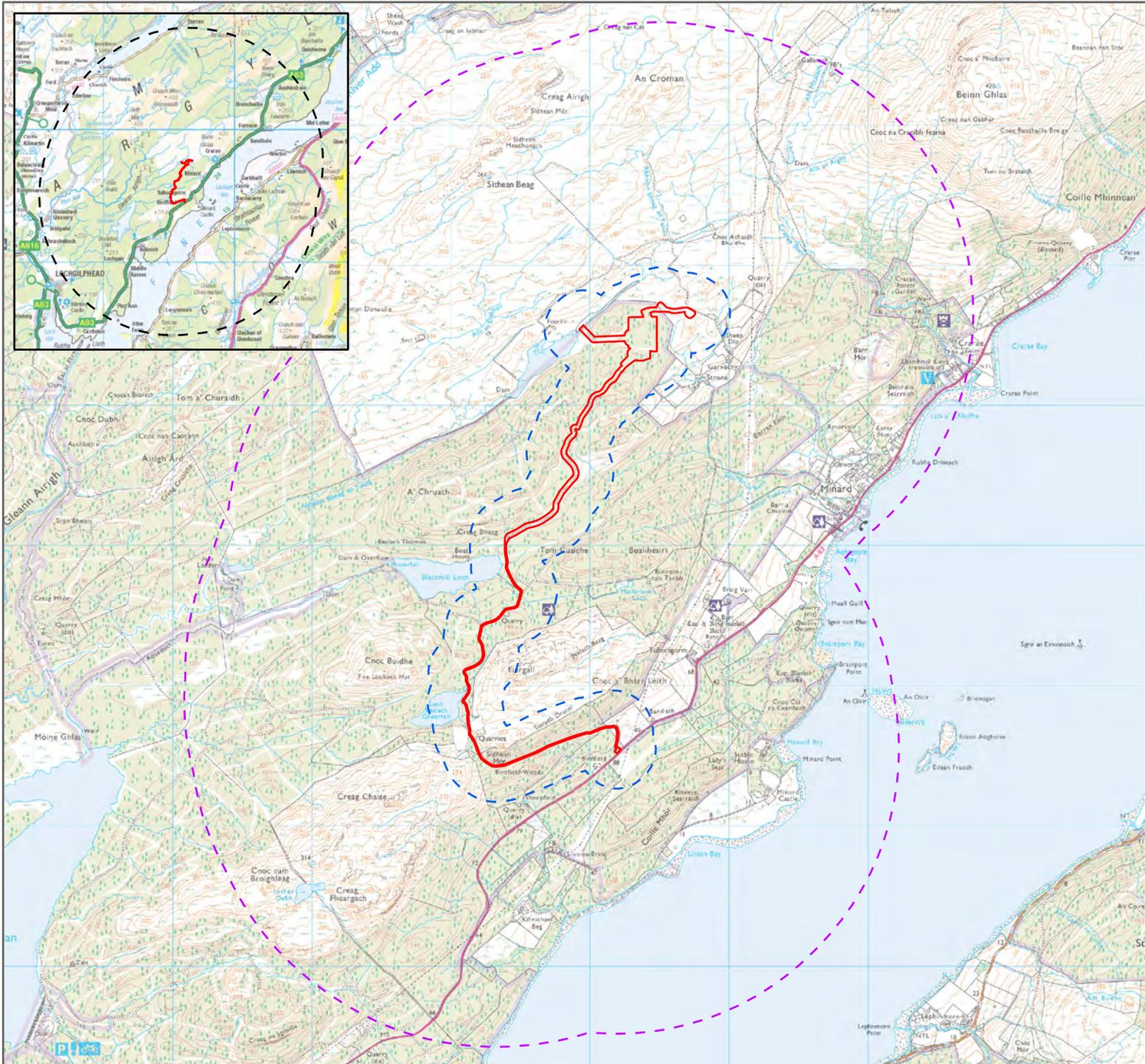
There are numerous lochs adjacent to the existing access tracks including Blackmill Loch and Loch Belach Ghearran south east of the Hydrology Study Area. There are numerous small watercourses connecting to these lochs which are crossed by the Hydrology Study Area along existing access tracks.

6.3.2 Coastal Waters

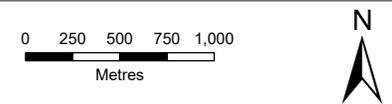
The surface watercourses drain into Loch Fyne coastal waters to the south-east. It has an overall condition of 'Good'². There are no protected bathing waters in the surrounding area. However, Loch Fyne is a shellfish waters protected area which is currently "*not at target objective*" due to diffuse source pressures as a result of rural activities.

¹ SEPA (2014) Water Environment Hub [online] Available at <https://www.sepa.org.uk/data-visualisation/water-environment-hub/> (Accessed 17/11/2021)

² SEPA (2014) Water Environment Hub [Online] Available at: <https://www.sepa.org.uk/data-visualisation/water-environment-hub/> (Accessed 17/11/2021)



- Town & Country Planning Boundary
- Hydrology Study Area - 250 m Buffer
- Private Water Supply - 2 km Buffer
- Wider Study Area - 10 km Buffer



SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: DN
PROJECT: 0607366	CHECKED: WB
DATE: 15/07/2022	APPROVED: KG

Figure 6.1
Hydrology Study Areas



PROJECTION: British National Grid

6.3.3 Hydrogeology

The overall groundwater classification for the Oban and Kintyre groundwater body has an overall classification of “Good”³. In the region of this Hydrology Study Area, the underlying bedrock aquifer is shown to be of low productivity in which groundwater “*flow is virtually all through fractures and other discontinuities*”.

6.3.4 Flood Risk

The SEPA flood map shows that flooding as a result of river flooding is not present within the Hydrology Study Area. There are small, isolated areas within the Project Site, which are also shown to be at medium to high risk of annual flooding from surface water. The unnamed reservoir west of the Hydrology Study Area is at medium to high risk of annual flooding from river flooding and surface water. This is also true of Blackmill Reservoir situated west of the access tracks and Crarae Burn, east of the Hydrology Study Area. The Hydrology Study Area is not at risk from coastal flooding.

6.3.5 Geology

The British Geological Survey (BGS)⁴ 1:50,000 superficial deposit mapping (shown on **Figure 6.2**) shows the landscape of the Hydrology Study Area area to consist mainly of Devensian Till with areas of no superficial units mapped. The BGS 1:50,000 bedrock mapping (shown on **Figure 6.3**) shows the area consists largely of psammite, semipelite and pelite of the Argyll Group. However, to the north and west of Crarae, there are large bands of igneous intrusions (late Silurian to early Devonian) throughout the area.

6.3.6 Soils

The National Soils Map of Scotland mapping indicates the Site to consist of mineral gleys to the centre of the Site and to the south at the existing access track Site entrance. Peaty gleys are present to the south west and north east of the Site. The Carbon and Peatland Map (SNH, 2016)⁵ indicates that the centre of the Site is underlain by mineral soils. The north east of the Site is underlain by Class 1 and 2 Peat Soil.

A peat depth survey was undertaken in November 2021 focusing on proposed infrastructure, as outlined in the Peat Management Plan (**Annex O**). Peat depths were found to vary across the Project with depths ranging from 0 m to 6 m. The Project Site is located in an area of average peat depths of 2.02 m. The location for the towers are situated on areas where average peat depths is lower than 0.63 m and the other infrastructure onsite (including temporary tracks and Temporary Works Area) is located in areas that have average peat depths lower than 1 m.

6.3.7 Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

In accordance with SEPA guidance⁶ the NVC communities that have the potential to be moderately or highly groundwater dependent GWDTEs based on the SEPA guidance are outlined in **Table 6.1** and shown in **Figure 6.4**.

³ Scottish Government (2021) Scotland Environment Map. Available at: <https://map.environment.gov.scot/sewebmap/> (Accessed 17/11/2021)

⁴ British Geological Survey (BGS) Geoindex Onshore [online]. Available at: <http://mapapps2.bgs.ac.uk/geoindex/home.html> (Accessed on 17/11/2021)

⁵ Scotland’s Environment, Carbon & Peatland 2016. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10 (Accessed 31/08/2021)

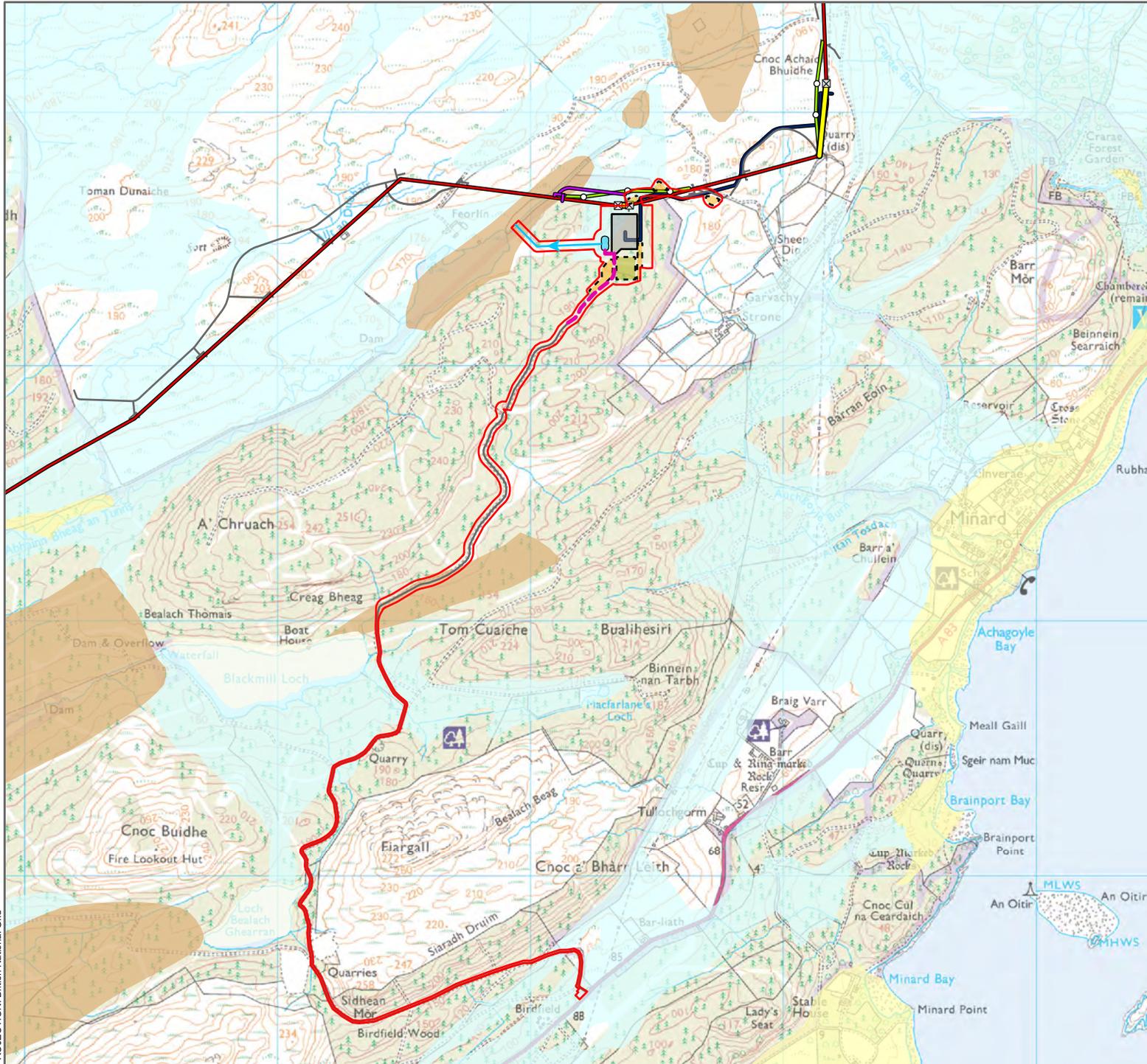
⁶ SEPA (2017) Land Use Planning System Guidance Note 31.

Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3 [Online] Available at: <https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf> (Accessed: 01/12/2021)

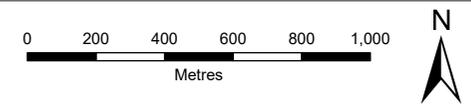
Table 6.1 Potential GWDTE Communities and Project-specific Groundwater Dependency

NVC communities within Core Study Area	SEPA Groundwater Dependency Classification	Project Description	Project-specific Groundwater Dependency
M23	High	Moderate or lower habitat condition. Located in the riparian zone along banks of watercourses, ditches and surface water flushes.	Low – located in area fed by surface water
M15	Moderate	Moderate habitat condition. Located along roadside ditches and riparian settings associated with tributary of Loch Bealach Ghearran.	Low – located in area fed by surface water

As a result of the Project-specific groundwater dependency, it is considered that the above GWDTE habitats identified in the NVC survey are ombrotrophic in nature, meaning they are rain-fed as opposed to being supported by groundwater and are therefore scoped out of further assessment. It should be noted that some areas of the Project were not mapped due to access.



- Proposed Development:**
- Proposed Permanent Access Track
 - SUDs Outfall Pipeline
 - Proposed Substation Layout
 - Town & Country Planning Boundary
 - SUDs Pond
 - Proposed Substation Temporary Works Area
 - Temporary Peat Storage Area
- Associated Development:**
- Proposed Temporary Tower Location
 - ⊠ Proposed Tower Location
 - Temporary Access Track
 - Proposed OHL Alignment
 - Proposed Temporary OHL Bypass
- Permitted Development:**
- 33kV Interconnector Cable Route
- Existing Infrastructure:**
- Existing Inveraray to Crossaig Overhead Line
 - Existing Access Track
- Superficial Geology (1:50k scale):**
- Alluvium - Clay, Silt, Sand and Gravel
 - Till, Devensian - Diamicton
 - Peat
 - Raised Marine Deposits - Clay and Sand
 - Superficial Theme Not Mapped [for Digital Map Use Only] - Water, Type Unspecified

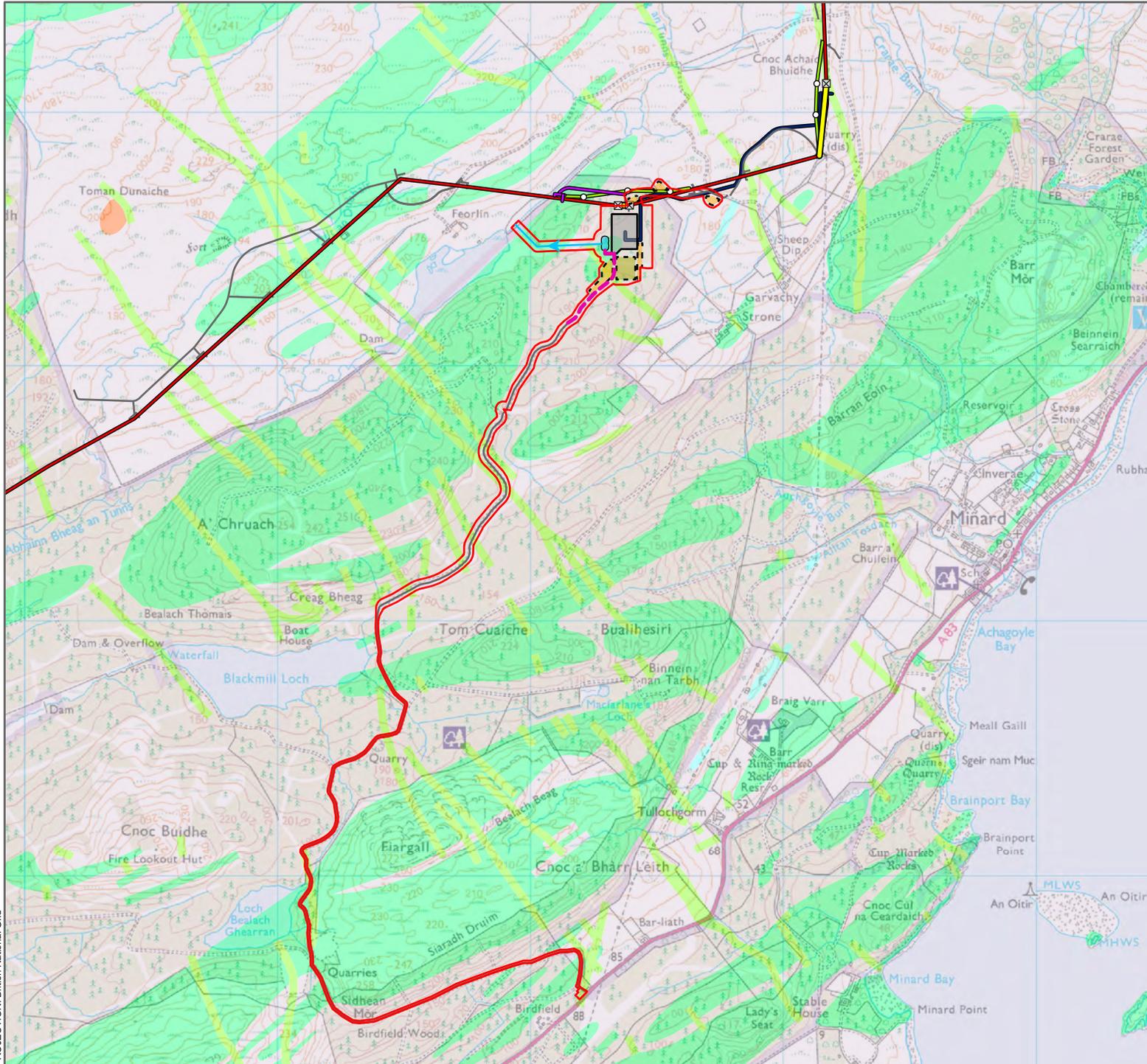


SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: DN
PROJECT: 0607366	CHECKED: WB
DATE: 15/07/2022	APPROVED: KG

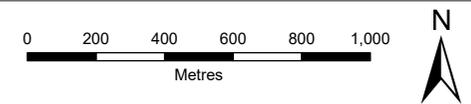
Figure 6.2
Superficial Geology



PROJECTION: British National Grid



- Proposed Development:**
- Proposed Permanent Access Track
 - SUDs Outfall Pipeline
 - Proposed Substation Layout
 - Town & Country Planning Boundary
 - SUDs Pond
 - Proposed Substation Temporary Works Area
 - Temporary Peat Storage Area
- Associated Development:**
- Proposed Temporary Tower Location
 - Proposed Tower Location
 - Temporary Access Track
 - Proposed OHL Alignment
 - Proposed Temporary OHL Bypass
- Permitted Development:**
- 33kV Interconnector Cable Route
- Existing Infrastructure:**
- Existing Inveraray to Crossaig Overhead Line
 - Existing Access Track
- Underlying Bedrock Geology (1:50k scale):**
- Mull Dyke-Swarm - Basalt and Microgabbro
 - Scottish Highland Siluro-Devonian Calc-Alkaline Minor Intrusion Suite (Other Than Dykes) - Felsite
 - Dalradian Supergroup - Metagabbro and Metamicrogabbro
 - Ardrishaig Phyllite Formation - Semipelite, Calcareous
 - Ardrishaig Phyllite Formation - Metalimestone

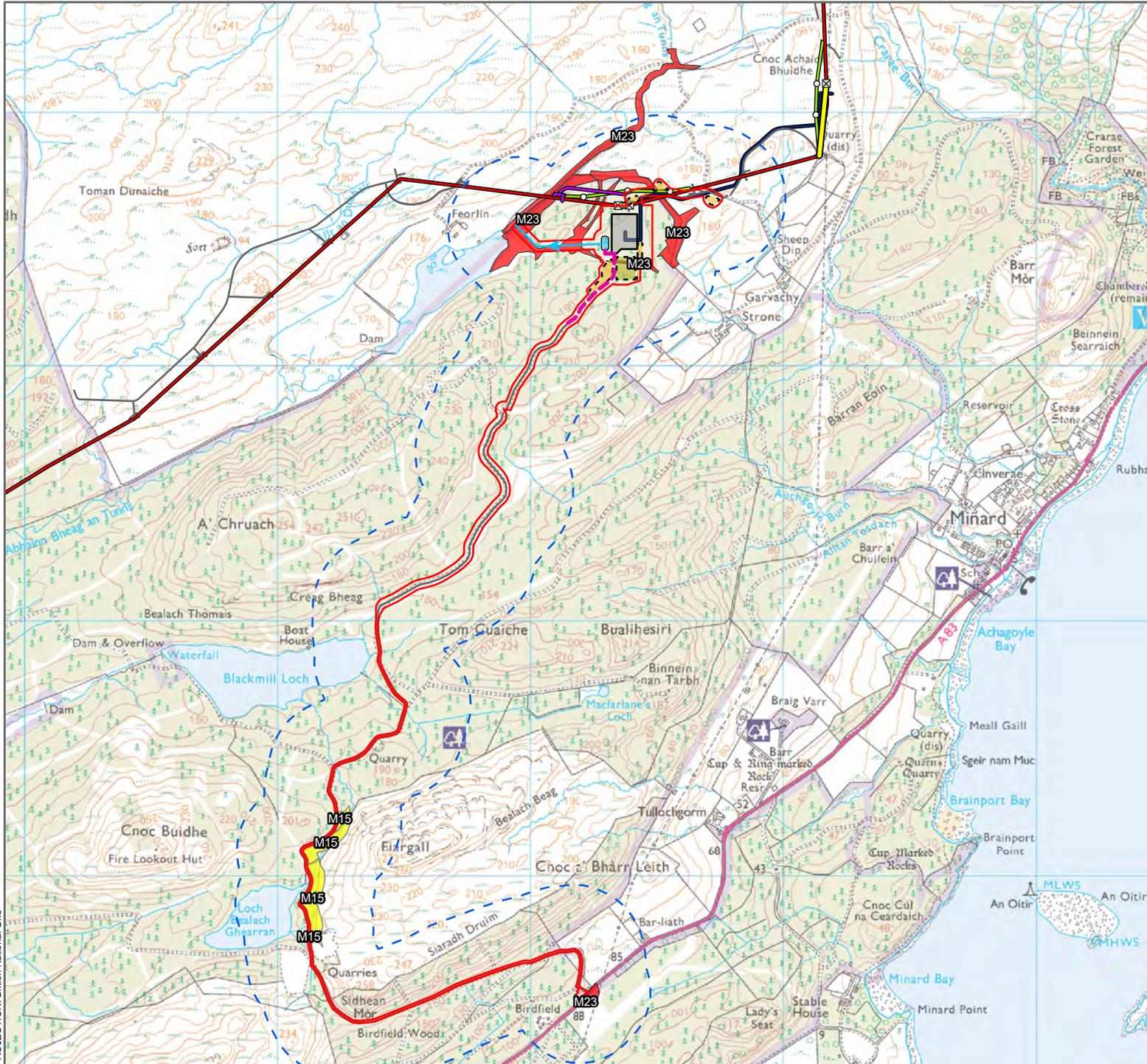


SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: DN
PROJECT: 0607366	CHECKED: WB
DATE: 15/07/2022	APPROVED: KG

Figure 6.3
Underlying Bedrock Geology



PROJECTION: British National Grid



Proposed Development:

- Proposed Permanent Access Track
- SUDs Outfall Pipeline
- Proposed Substation Layout
- Town & Country Planning Boundary
- SUDs Pond
- Proposed Substation Temporary Works Area
- Temporary Peat Storage Area

Associated Development:

- Proposed Temporary Tower Location
- ⊗ Proposed Tower Location
- Temporary Access Track
- Proposed OHL Alignment
- Proposed Temporary OHL Bypass

Permitted Development:

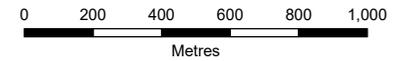
- 33kV Interconnector Cable Route

Existing Infrastructure:

- Existing Inveraray to Crossaig Overhead Line
- Existing Access Track

GWDTE Potential Groundwater dependency (based on SEPA guidance):

- High Dependency
- Moderate Dependency
- Hydrology Study Area - 250 m Buffer



SCALE: See Scale Bar

SIZE: A4

PROJECT: 0607366

DATE: 15/07/2022

VERSION: A01

DRAWN: DN

CHECKED: WB

APPROVED: KG

**Figure 6.4
Potential Groundwater Terrestrial
Ecosystems**



6.3.8 Public Water Supplies

From consultation with Scottish Water, it was confirmed the Project is not located within a Drinking Water Protected Area. As such, impacts to public water supplies can be scoped out from further assessment.

In relation to assets, it was confirmed that there are assets in the area surrounding the Proposed Development and Associated Development. An asset pipe and hydrant were identified at the Proposed Development existing access track entrance.

6.3.9 Private Water Supplies

From consultation with Argyll and Bute Council, six private water supplies (PWS) were recorded within 2 km of the Project as shown in **Table 6.2** and **Figure 6.5**. Further consultation will be carried out to determine the source location and type.

Table 6.2 Private Water Supplies registered within 2 km of the Project

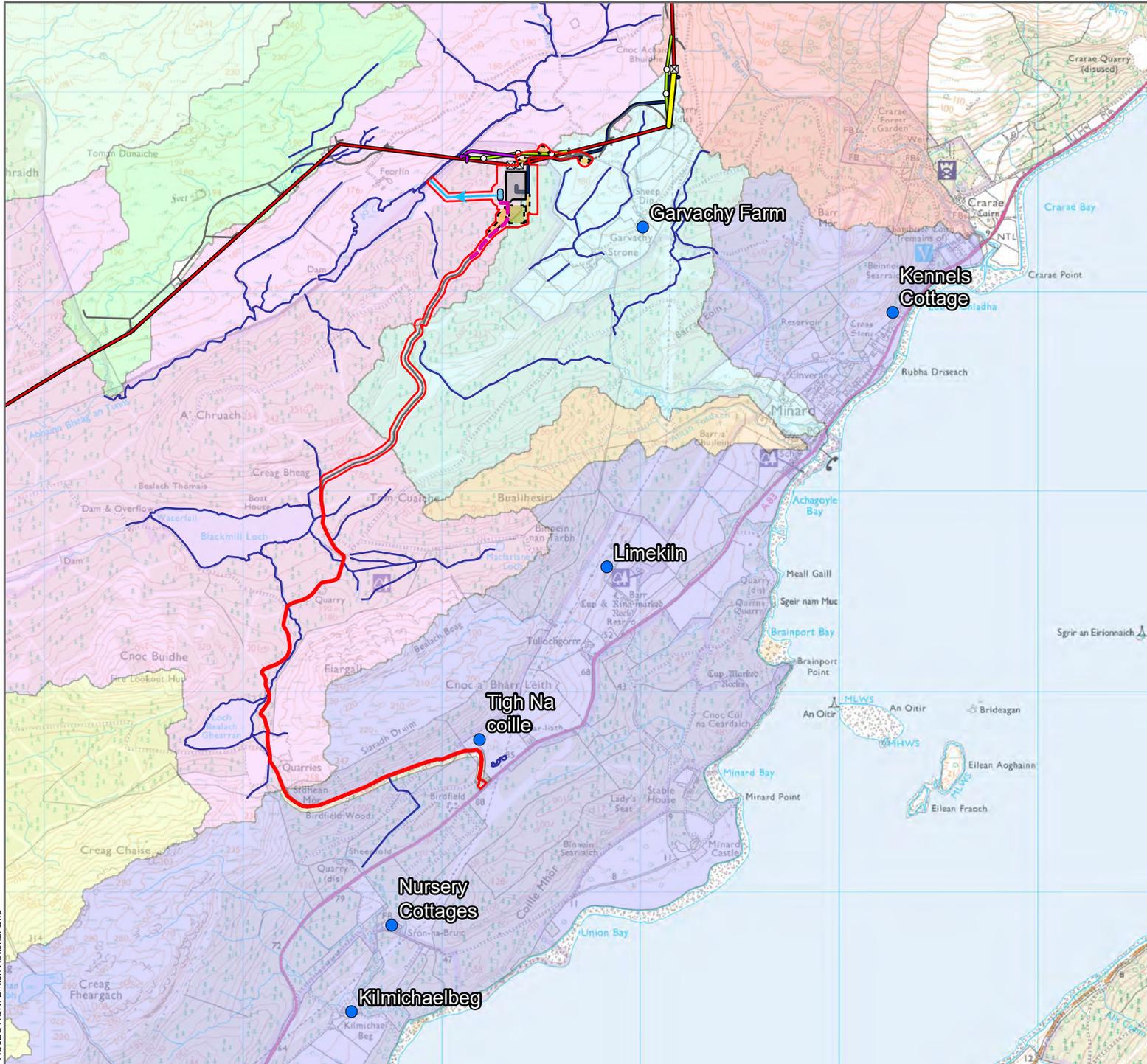
Property	Grid Reference	Distance from Project	Source Type	Comment
Kennels Cottage	198270 696895	1.85 km south-east and downslope of the Project	No	Property confirmed to be on mains supply during consultation. PWS scoped out of further assessment.
Kilmichaelbeg	195546 693401	1.04 km south and downslope of the Site access tracks	Unknown	Potential for hydrological connectivity via an unnamed watercourse which flows south, under access tracks in close proximity to property. PWS scoped into further assessment
Limekiln	196831 695623	1.12 km east of the Site access tracks	Unknown	Potential PWS is hydrologically disconnected from Development by topography and Auchgoyle Burn. Disconnected from access tracks due to intervening topography. PWS scoped out of further assessment.
Nursery Cottages	195748 693833	0.69 km south and downslope of the Site access tracks	Unknown	Potential for hydrological connectivity via an unnamed watercourse which flows south, under existing access tracks in close proximity to property. PWS scoped into further assessment
Tigh Na Coille	196190 694760	48 m north of the Site access tracks	Unknown	Due to the unknown nature of access tracks upgrades in this location and the exact location of PWS source, there is potential for hydrological connectivity. PWS scoped into further assessment.
Garvachy Farm	196967 697477	412 m south-east and downslope of the Site	Groundwater	Location of supply unknown but potentially located from Proposed Development. PWS scoped into further assessment.

A private water supply risk assessment (PWSRA) was carried out for the EIA for Inveraray to Crossaig overhead line (OHL) project published in July 2018, which was reviewed in order to inform the assessment⁷. No additional PWS were identified as part of the PWSRA surrounding the Proposed Development. This PWSRA did confirm a PWS to be present at Garvachy Farm.

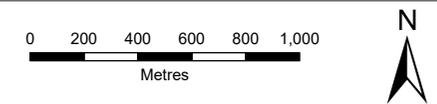
Following consultation with residents it was confirmed that Kennels Cottage is supplied by mains water rather than PWS. A visit to Garvachy farm was attempted by Arcus Personnel on 15th March 2022, however no property owner was available to speak with. Additionally, no consultation letter has been returned, as such no PWS information has been provided.

As detailed in the PWSRA accompanying this EA (**Annex M**), there is potential for hydrological connectivity between the Proposed Development, Associated Development and four private water supplies serving Garvachy Farm, Nursery Cottages, Kilmichaelbeg and Tigh Na Coile.

⁷ Inveraray to Crossaig 275 kV Overhead Line Reinforcement (2018) [online] Available at: <https://www.energyconsents.scot/> (Accessed 16/11/2021)



- Proposed Development:**
- Proposed Permanent Access Track
 - SUDs Outfall Pipeline
 - Proposed Substation Layout
 - Town & Country Planning Boundary
 - SUDs Pond
 - Proposed Substation Temporary Works Area
 - Temporary Peat Storage Area
- Associated Development:**
- Proposed Temporary Tower Location
 - ⊠ Proposed Tower Location
 - Temporary Access Track
 - Proposed OHL Alignment
 - Proposed Temporary OHL Bypass
- Permitted Development:**
- 33kV Interconnector Cable Route
- Existing Infrastructure:**
- Existing Access Track
 - Existing Inveraray to Crossraig Overhead Line
- Hydrological Catchments:**
- Abhainn Bheag an Tunns
 - Allt an Dubhair
 - Alltan Tosdach
 - Auchgoyle Burn
 - Crarae Burn
 - Loch Fyne
 - Loch Glashan / Abhainn Mhor
 - River Add
 - Onsite Watercourses
 - Private Water Supplies

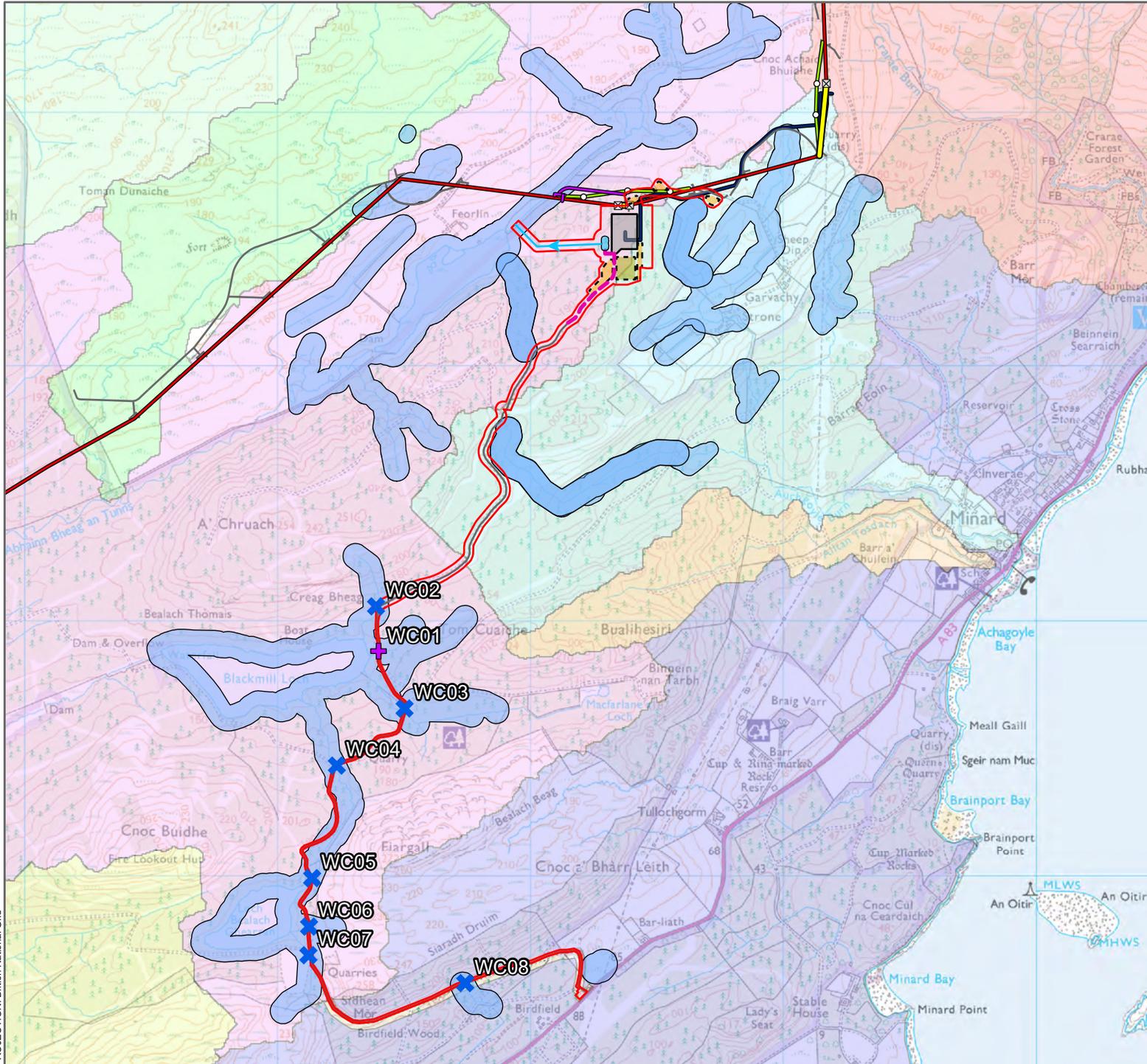


SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: DN
PROJECT: 0607366	CHECKED: WB
DATE: 15/07/2022	APPROVED: KG

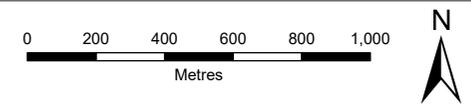
Figure 6.5
Private Water Supplies



PROJECTION: British National Grid



- Proposed Development:**
- Proposed Permanent Access Track
 - SUDs Outfall Pipeline
 - Proposed Substation Layout
 - Town & Country Planning Boundary
 - SUDs Pond
 - Proposed Substation Temporary Works Area
 - Temporary Peat Storage Area
- Associated Development:**
- Proposed Temporary Tower Location
 - ⊗ Proposed Tower Location
 - Temporary Access Track
 - Proposed OHL Alignment
 - Proposed Temporary OHL Bypass
- Permitted Development:**
- 33kV Interconnector Cable Route
- Existing Infrastructure:**
- Existing Inveraray to Crossaisle Overhead Line
 - Existing Access Track
 - 50 m Watercourse Buffer
- Hydrological Catchments:**
- Abhainn Bheag an Tunns
 - Allt an Dubhair
 - Alltan Tosdach
 - Auchgoyle Burn
 - Crarae Burn
 - Loch Fyne
 - Loch Glashan / Abhainn Mhor
 - River Add
- Watercourse Crossing:**
- + Watercourse Crossing
 - + Upgraded Watercourse Crossing



SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: DN
PROJECT: 0607366	CHECKED: WB
DATE: 15/07/2022	APPROVED: KG

Figure 6.6
Watercourse Crossings



PROJECTION: British National Grid

6.3.10 Designated Hydrological Receptors

Review of NatureScot (formerly Scottish Natural Heritage) GIS datasets available through the Scotland's Environment mapping service was used to identify statutory designated sites related to the water environment within the Wider Study Area.

Statutory designations within 10 km of the Project and their potential hydrological connectivity to the Project are outlined in **Table 6.3**.

Table 6.3 Statutory Designations within 10km of the Project

Designation	Approximate distance from the Project	Qualifying Interest	Hydrologically Connected to the Project
Upper Loch Fyne and Loch Goil MPA ⁷	0.8 km south east	Shellfish waters protected area.	Crarae Burn and Auchgoyle Burn discharge directly into Loch Fyne
Craignure Mine SSSI ⁸	3.6 km north east	Mineralogy of Scotland – area of exploration for base metals in the pillow lavas and sills of the Dalradian Tayvallich volcanics.	Hydrologically disconnected by topography and Crarae Burn
Glendaruel Wood and Craggs SSSI ⁹	7.2 km southeast	Upland Oak Woodland, rocky slopes (includes inland cliffs, rocky outcrops and chasmophytic vegetation)	Hydrologically disconnected by Loch Fyne

6.4 Sensitivity of Receptors

The sensitivities of the identified receptors and their likelihood of being affected by the Project are detailed in **Table 6.4**

Table 6.4 Sensitivity of Receptors

Receptor	Sensitivity of Receptor	Sensitivity Description
Surface Hydrology (watercourses)	High	A large, medium or small waterbody with a SEPA water quality classification of 'Moderate'.
Coastal Waters	High	Coastal waterbody with a SEPA water quality classification of 'Good'.
Hydrogeology (groundwater)	High	Oban and Kintyre groundwater body classified as 'Good' and as a 'low productivity aquifer'
Near-surface Water	High	Supports carbon-rich and peaty soils.
Soils	High	Presence of Class 2 peat
Designated Receptors	High	Loch Fyne MPA is hydrologically connected to the Development.
Private Water Supplies	High	The hydrological receptors have potential to support abstractions for four private water supplies within 2 km of the Site.

⁸ NatureScot (2021) Craignure Mine SSSI [online] Available at: <https://sitelink.nature.scot/site/443> (Accessed 17/11/2021)

⁹ NatureScot (2021) Glendaruel Wood and Craggs SSSI [online] Available at: <https://sitelink.nature.scot/site/733> (Accessed 17/11/2021)

6.5 Embedded Mitigation

The Project has been designed to reduce potential impacts as far as reasonably practicable. This includes mitigation that is embedded into the design of the project in accordance with industry standard methods and procedures, which will reduce impacts from construction and operation. The following mitigation measures relating to the hydrological environment are embedded into the design and construction of the Proposed Development:

- 50 m watercourse buffers (OS 1:50,000 scale) for construction works with the exception of watercourse crossings along access tracks; and
- The Proposed Development will utilise much of the existing forestry track already in place at this location, this will help to minimise ground disturbance and requirement for watercourse crossings.

A Water Construction Environmental Management Plan (WCEMP) accompanies this EA Report (**Annex N**) and will form part of the embedded development design. Relevant sections of the SSEN General Environmental Management Plans (GEMPs) will inform a CEMP to be implemented by the Project's selected contractor post submission. GEMPS are included as **Annex A** to this report and relevant GEMPS include the following.

- Private water supplies;
- Working in or near Water;
- Soil Management;
- Contaminated Land;
- Oil Storage and Refuelling;
- Bad Weather; and
- Working with concrete.

As consultation with Scottish Water confirms there are assets at the existing access track entrance, precautionary mitigation will be embedded. This includes fencing off the hydrant at the side of the road to prevent potential slippage of machinery.

The construction phase of the works will be undertaken in accordance with good practice guidance within the following documents.

- Control of Water Pollution from Construction Sites - Guide to Good Practice, CIRIA 2002;
- Environmental Good Practice on Site C650, CIRIA 2005; and
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) – A Practical Guide (Version 8.4), SEPA, October 2019.

The Pollution Prevention Guidelines (PPGs) and Guidance for Pollution Prevention (GPPs) identified below will be applied during construction and operation.

- GPP 1 Understanding your environmental responsibilities – good environmental practices General Guide to the Prevention of Pollution (GPP 1, October 2020);
- PPG3 Use and Design of Oil Separators in Surface Water Drainage Systems (PPG3, April 2006);
- GPP5 Works and maintenance in or near water (GPP5, February 2018);
- PPG6 Working at Construction and Demolition Sites (PPG6, May 2012);
- PPG 7 Safe Storage – the safe operation of refuelling facilities (PPG 7, July 2011)
- GPP8 Safe Storage and Disposal of used oils (GPP8, July 2017);
- GPP13 Vehicle Washing and Cleansing (GPP13, April 2017);
- PPG18 Managing fire water and major spillages (PPG18, June 2000);
- GPP21 Pollution Incident Response Planning (GPP21, July 2017); and

- GPP22 Dealing with Spills (GPP2, October 2018).

As detailed in the WCEMP, substation transformers and diesel generator will be located in secondary containment concrete bunds which will be designed to accommodate a minimum of 110% of the volume of oil in the transformers, in accordance with relevant GPPs and PPGs, including GPP8¹⁰.

6.6 Appraisal - Potential Construction Effects - Substation

6.6.1 Activities Assessed

The nature and magnitude of effects that could result from construction activities, are assessed in the following paragraphs and include the following activities:

- The potential upgrade of existing forestry access tracks for the construction of the Proposed Development from the A83;
- The potential upgrade of five existing watercourse crossing on existing forestry access tracks, in accordance with the Routeing Report Option D (**Annex Q**);
- Boreholes for the provision of a water supply for the substation;
- Construction of an attenuation pond and piped filter drain system and associated outfall;
- Construction of new watercourse crossing on proposed new access tracks;
- Construction of a new substation and associated infrastructure, areas of hardstanding and Temporary Working Area for the Proposed Development;
- Construction of new access track; and
- Tree felling required to facilitate the new access into the Proposed Development.

6.6.2 Felling

Felling of trees will be required for the Project, which in accordance with **Chapter 5: Forestry** will result with the total loss of woodland area of 21.62 ha for the Proposed Development and 0.16 ha for the Associated Development. The effects from felling are considered within impacts to surface watercourses and coastal waters and groundwater and near-surface water. The effects from felling are considered within impacts to surface water receptors relating to water quality and increased runoff.

6.6.3 Runoff from Hardstanding

The areas of new hardstanding, including temporary works area and temporary tracks (assuming track width of 5m), in terms of the percentage of the relevant catchments that may be affected, are as follows:

- 0.051 % Crarae Burn;
- 0.464 % Auchgoyle Burn; and
- 0.18 % Abhainn Bheag an Tunns.

Details of mitigation measures to prevent acidification of watercourses and increased flow within the immediate catchment of the felling area is detailed within the WCEMP. Based on the increase in flow rates and mitigation measures included, the magnitude of change as a result of increased run-off as a result of felling is considered to be Negligible.

¹⁰ GPP 8 Safe storage and disposal of used oils (2017) [online] Available at: <https://www.netregs.org.uk/media/1435/gpp-8-v3-swini.pdf/> (Accessed 10/01/2022)

6.6.4 Effects

Mitigation measures for the Proposed Development are outlined within the WCEMP. The requirement for upgrades to watercourse crossings, including new watercourse crossings for new access tracks (on 1:50,000 scale mapping) are shown in **Figure 6.6**.

Table 6.5 Summary of Effects (Construction Phase Substation)

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
Surface Watercourses and coastal waters	Potential for temporary impact on surface water quality during construction. Potential for changes to water flow and quality due to felling.	Best practice and GEMPs as implemented by WCEMP. These include a Construction Site Licence under CAR and SuDS.	High	Negligible	Minor
Groundwater and Near surface water	Potential for temporary impact on groundwater quality and changes in groundwater interflow patterns during construction.	GEMP as implemented by WCEMP	High	Negligible	Minor
Designated Sites	Potential for temporary impact on flow and water quality during construction	GEMP as implemented by WCEMP	High	Negligible	Minor
Private Water Supply	Potential for impact on flow and water quality during construction.	Private water supply GEMP as implemented by WCEMP. To include preparation of a site specific PWS Protection Plan and implementation of surface water monitoring programme.	High	Negligible	Minor

6.7 Appraisal - Potential Construction Effects – OHL

6.7.1 Activities Assessed

The nature and magnitude of effects that could result from construction activities, are assessed in the following paragraphs and include the following activities:

- Construction of three new towers, overhead lines and associated infrastructure for the Associated Development;
- Construction of new temporary access track; and
- Tree felling required to facilitate the new access into the Proposed Development.

Mitigation measures for the Proposed Development are outlined within the WCEMP. The requirement for upgrades to watercourse crossings, including new watercourse crossings for new access tracks (on 1:50,000 scale mapping), are shown in **Figure 6.6**.

Table 6.6 Summary of Effects (Construction Phase OHL)

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
Surface Watercourses and coastal waters	Potential for temporary impact on surface water quality during construction. Potential for changes to water flow and quality due to felling.	Best practice and GEMPs as implemented by WCEMP. These include a Construction Site Licence under CAR and SuDS.	High	Negligible	Minor
Groundwater and Near surface water	Potential for temporary impact on groundwater quality and changes in groundwater interflow patterns during construction.	GEMP as implemented by WCEMP	High	Negligible	Minor
Designated Sites	Potential for temporary impact on flow and water quality during construction	GEMP as implemented by WCEMP	High	Negligible	Minor
Designated Sites	Potential for temporary impact on flow and water quality during construction	GEMP as implemented by WCEMP	High	Negligible	Minor
Private Water Supply	Potential for impact on flow and water quality	Private water supply GEMP as implemented by	High	Negligible	Minor

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
	during construction.	WCEMP. To include preparation of a site specific PWS Protection Plan and implementation of surface water monitoring programme.			

6.8 Appraisal - Potential Operational Effects - Substation

Potential effects associated with the operation of the Proposed Development are:

- Increased run-off rates and volume from increased hardstanding, resulting in increased flood risk;
- Alterations to natural flow pathways from runoff from areas of hardstanding; and
- Risk of a chemical pollution event from minor spills from maintenance vehicles to downstream surface water receptors.

As a result of felling during the construction phase, there may be increased run-off rates during the operational phase. On-site and off-site compensatory planting for woodland removed for infrastructure will take place which will limit increase in run-off rates. In accordance with **Chapter 5: Forestry** there will be no net loss of woodland area.

The substation design features an attenuation pond and piped filter drain to discharge surface water to an open land drain, with information on treatment outlined within Annex L. A package sewerage treatment plant will separately discharge surface water via a raised soakaway, ensuring water is treated prior to discharge.

Table 6.7 Summary of Effects (Operational Phase Substation)

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
Surface Watercourses and Coastal Waters	Potential for impact on surface water quality during operation.	Implement best practice measures and operational procedures and SuDS design features.	High	Negligible	Minor
Designated Sites	Potential for impact on flow and water quality during operation	Implement best practice measures and operational procedures.	High	Negligible	Minor
Private Water Supply	Potential for impact on flow and water quality during operation	Implement best practice measures and operational procedures.	High	Negligible	Minor

6.9 Appraisal - Potential Operational Effects - Substation

Potential effects associated with the operation of the Proposed Development are:

- Increased run-off rates and volume from increased hardstanding, resulting in increased flood risk;
- Alterations to natural flow pathways from placement of pylons and runoff from areas of hardstanding; and
- Risk of a chemical pollution event from minor spills from maintenance vehicles.

As outlined in **Chapter 5: Forestry** while there may be increased run-off rates as a result of felling there are plans for replanting which will result in no net loss of woodland area.

Table 6.8 Summary of Effects (Operational Phase OHL)

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
Surface Watercourses and Coastal Waters	Potential for impact on surface water quality during operation.	Implement best practice measures and operational procedures.	High	Negligible	Minor
Designated Sites	Potential for impact on flow and water quality during operation	Implement best practice measures and operational procedures.	High	Negligible	Minor
Private Water Supply	Potential for impact on flow and water quality during operation	Implement best practice measures and operational procedures.	High	Negligible	Minor

6.10 Appraisal - Cumulative Effects

A cumulative effect is considered to be an additional effect on hydrological resources (within the same hydrological catchment) arising from the Proposed Development in combination with the Associated Development in addition to the Project effects in combination of other developments likely to affect the hydrological environment.

6.10.1 Proposed Development and Associated Development Cumulative Effect Assessment

Cumulative effects may result to downstream receptors where constructive works are active simultaneously at the Proposed Development and Associated Development. Since construction works at substation and tower bases are unlikely to occur concurrently and will be active as short a time as practicable these are not considered to result in extensive cumulative effects. In addition to this mitigation measures as detailed in the WCEMP will be implemented and it is therefore considered that there is no potential for cumulative effects on receptors downstream.

6.10.2 Project and Other Developments Cumulative Effect Assessment

The following developments associated with substation within 10 km of the Proposed Development are identified below (scoped in):

- Installation of two 33 kV double poles directly under existing 33 kV overhead line at Strone, Minard;
- Construction of access track at Feorlin, Cumloddan Estate; and

- Use of existing borrow pit for extraction at Land south-east of Loch Bealach Gherran.

The developments above may result in cumulative effects to downstream receptors; however, these are likely to be minimal as the only construction activities will be upgrades to existing access tracks. In addition to this, mitigation measures as detailed in the WCEMP will be implemented and it is therefore considered that there is no potential for cumulative effects on receptors downstream.

6.10.3 Residual Cumulative Effects

Mitigation measures detailed in the WCEMP will be implemented and no significant residual cumulative effects are predicted.

Table 6.9 Summary of Cumulative Effects

Receptor	Potential Effect	Magnitude	Significance of Effect	Additional Mitigation Proposed	Residual Significance
Surface hydrology	Chemical Pollution	Negligible	Minor	None	Minor
	Erosion and Sedimentation	Negligible	Minor	None	Minor
	Impediments to Flow	Negligible	Minor	None	Minor
	Increase in Run-off from increase in hardstanding	Negligible	Minor	None	Minor
	Acidification of watercourses	Negligible	Minor	None	Minor
Coastal Water	Chemical Pollution	Negligible	Minor	None	Minor
	Erosion and Sedimentation	Negligible	Minor	None	Minor
	Acidification of watercourses	Negligible	Minor	None	Minor
Hydrogeology (groundwater)	Chemical pollution	Negligible	Minor	None	Minor
	Erosion and Sedimentation	Negligible	Minor	None	Minor
	Changes in Groundwater Interflow Patterns	Negligible	Minor	None	Minor
	Acidification of watercourses	Negligible	Minor	None	Minor
Near-surface water	Chemical pollution	Negligible	Minor	None	Minor
	Erosion and Sedimentation	Negligible	Minor	None	Minor

Receptor	Potential Effect	Magnitude	Significance of Effect	Additional Mitigation Proposed	Residual Significance
	Acidification of watercourses	Negligible	Minor	None	Minor
Soils	Compaction or loss of soil	Negligible	Minor	None	Minor
Designated Sites	Chemical pollution	Negligible	Minor	None	Minor
	Erosion and Sedimentation	Negligible	Minor	None	Minor
Private Water Supplies	Chemical pollution	Low	Moderate	Mitigation measures in WCEMP and best practice guidance	Minor
	Erosion and Sedimentation	Low	Moderate		Minor
	Changes in Groundwater Interflow Patterns	Low	Moderate	Following consultation, the sources of PWS will be monitored throughout construction.	Minor

6.11 Summary of Impacts

This environmental appraisal has assessed the likely effects of the Project on geology, hydrology and hydrogeology. Following the implementation of the embedded mitigation and measures set out in accordance with industry best practice in the WCEMP, as well as the GEMP, the residual effects arising from the Proposed Development will be minor or negligible for most of the receptors. The exception to this are private water supplies which requires further consultation with relevant consultees and supply owners (further detail in **Annex M**). Following consultations any receptors considered at risk of impacts will be mitigated through measures outlined in the WCEMP, which includes a water monitoring schedule to be agreed with consultees.

The conclusion of this environmental appraisal is that the residual effects arising from the construction and operation of the Proposed Development would not result in a significant effect on geology, hydrological or hydrogeological resources.