

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 method applied to the hydrology assessment is provided in **Annex M**. A Private Water Supply Risk Assessment (PWSRA) has been undertaken and is provided in **Annex L**. A water construction management plan is provided in **Annex N**.

6.2 Baseline Survey Methodology

6.2.1 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 Associated Development. An area extending 2 km from the site of 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 Dippin Burn, Badden Burn and Auchoish Burn catchments. The Proposed Development is located in an area of wet vegetation with standing water present, with numerous small ditches within the Hydrology Study Area draining the site to the south-east. The hydrological catchments associated with these watercourses are shown in **Figure 6.1**.

6.3.2 Coastal Waters

The surface waters from the Hydrology Study Area drains into Loch Fyne coastal waters. It has an overall condition of 'Good'². Loch Fyne is part of the Upper Loch Fyne and Loch Goil Marine Protected Area (MPA), with the area identified as a shellfish waters protected area³ which is currently "*not at target objective*" due to diffuse source pressures as a result of rural activities.

6.3.3 Hydrogeology

The underlying Oban and Kintyre groundwater body has an overall SEPA groundwater classification of "Good"⁴, with a low productivity in which "*flow is virtually all through fractures and other discontinuities*".

6.3.4 Flood Risk

The SEPA flood map⁵ shows that flooding as a result of river flooding is not present within the Hydrology Study Area. There are small, isolated areas underlying the proposed substation, which are also shown to be at medium

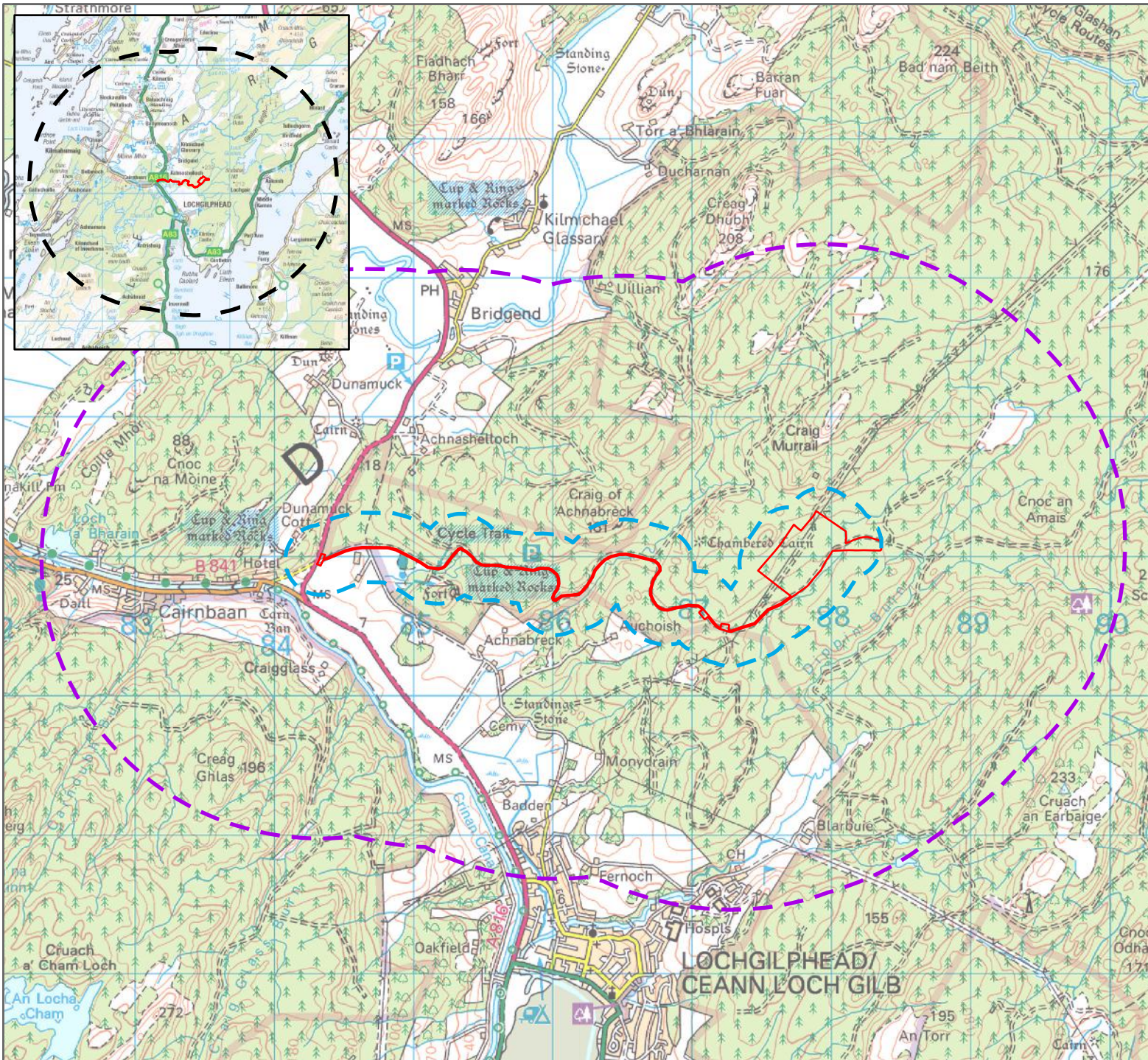
¹ SEPA (2014) Water Environment Hub [online] Available at <https://www.sepa.org.uk/data-visualisation/water-environment-hub/> (Accessed 17/11/2021)

² SEPA (2014) Water Environment Hub [online] Available at: <https://www.sepa.org.uk/data-visualisation/water-environment-hub/> (Accessed 16/11/2021)

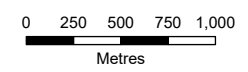
³ Scottish Government (2013) Shellfish Protected Areas [online] Available at <https://www.gov.scot/publications/shellfish-water-protected-areas-maps/> (Accessed 10/01/2021)

⁴ Scottish Government (2021) Scotland Environment Map. Available at: <https://map.environment.gov.scot/sewebmap/> (Accessed 17/11/2021)

⁵ SEPA (2021) SEPA Flood Maps [online] Available at: <https://map.sepa.org.uk/floodmaps> (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



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 DATE: 14/07/2022

VERSION: A01
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Figure 6.1
Hydrology Study Areas



PROJECTION: British National Grid

to high risk of annual flooding from surface water, with surface water flooding present along the Badden Burn and Auchoish Burn near to the access track to the west of the site. The Hydrology Study Area is not at risk from coastal flooding.

6.3.5 Geology

The BGS 1:50,000 superficial deposit mapping (shown on **Figure 6.2**) shows superficial deposits are not present across the majority of the Hydrology Study Area. with small areas of till and peat. The British Geological Survey (BGS)⁶ 1:50,000 bedrock mapping (shown on **Figure 6.3**) shows the Hydrology Study Area is largely underlain by quartzite of the Crinan Grit Formation to the west and metagabbro and metamicrogabbro of the Dalradian Supergroup to the north, with small areas of Dalradian metagabbro and metamicrogabbro and metalimestone.

6.3.6 Soils

The National Soils Map of Scotland mapping indicates the Project to be underlain by brown soils to the south and west and peaty gleys to the north and east. The existing forestry access track consists of brown soils to the east and mineral gleys to the west. The Carbon and Peatland Map (SNH, 2016)⁷ indicates the north and east of the Proposed Development is underlain by Class 5 Peat Soil.

A peat depth survey was undertaken in November 2021, as shown in **Annex O**. Peat depth was found to vary across the Project from 0 m to 4.5 m thickness. The proposed substation is located in area of average peat depths of 1.16 m depth, while other infrastructure on site is located in areas of average peat depths lower than 1.3 m.

6.3.7 Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

In accordance with SEPA guidance⁸ 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**.

Table 6.1 Potential GWDTE Communities and Project-specific Groundwater Dependency

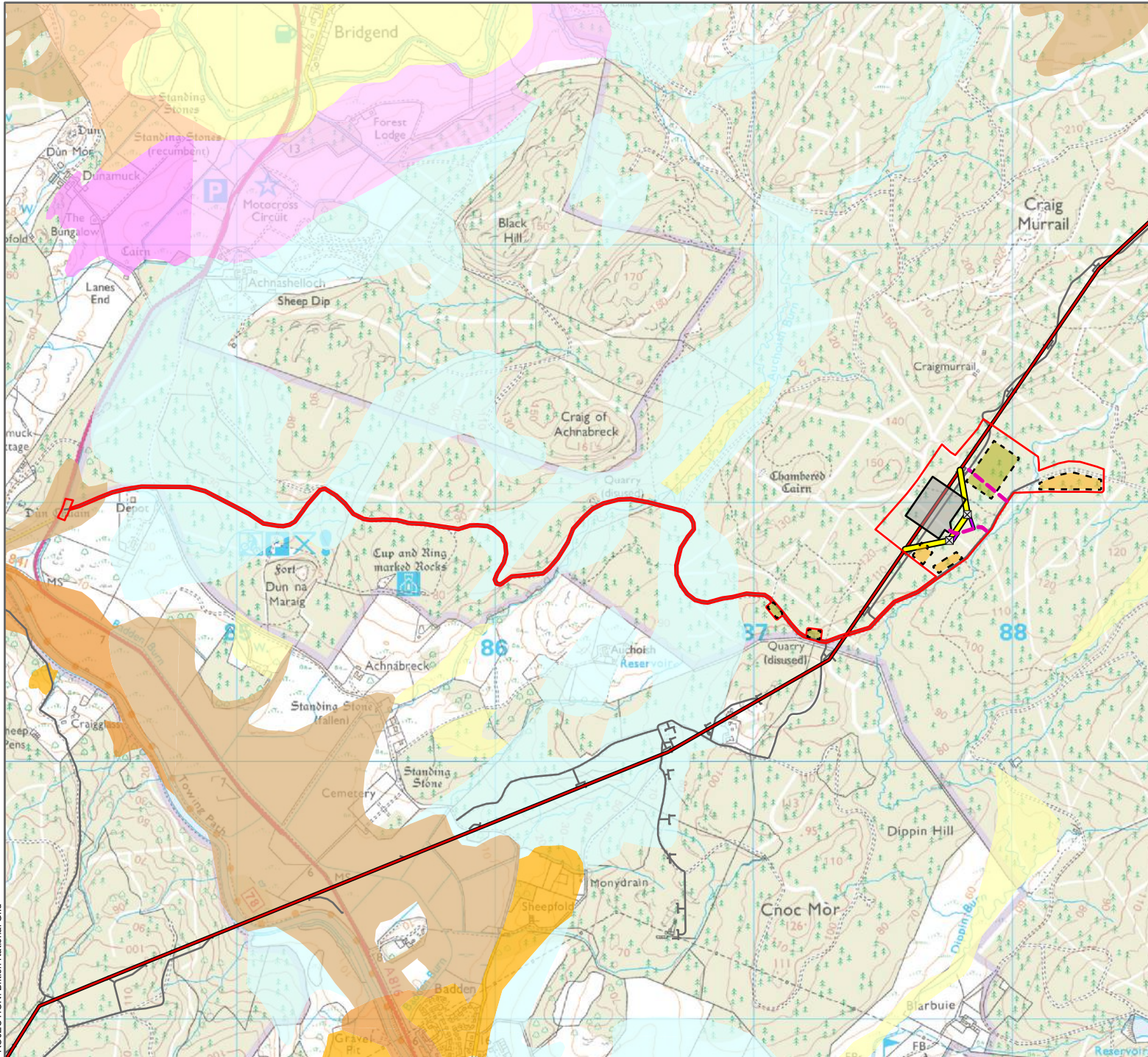
NVC class	SEPA Groundwater Dependency	Project Description	Project-specific Groundwater Dependency
M6	High	Located in open area of recently felled coniferous woodland. Area of waterlogged depressions. Access road present in area. Located in the riparian zone along small watercourses to the north east.	Low – located in areas fed by surface water, not associated with obvious, diffuse or point sources of groundwater emergence
M23	High	Located in the riparian zone along the banks or headwaters of watercourses.	Low – located in area fed by surface water
W4	High	Located in shallow, waterlogged depressions amongst riparian settings and roadside ditches.	Low – located in area fed by surface water

⁶ British Geological Survey (BGS) Geoindex Onshore [online]. Available at: <http://mapapps2.bgs.ac.uk/geoindex/home.html> (Accessed on 17/11/2021)

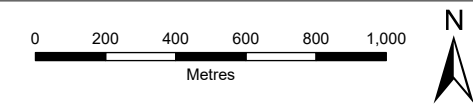
⁷ Scotland's Environment, Carbon & Peatland 2016. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10 (Accessed 06/12/2021)

⁸ 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)



- Proposed Development:**
- Proposed Permanent Access Track
 - Proposed Substation Layout
 - Town & Country Planning Boundary
 - Proposed Substation Temporary Works Area
 - Temporary Peat Storage Area
- Associated Development:**
- X Proposed Tower Location
 - Temporary Access Track
 - Temporary OHL Diversion
- Existing Infrastructure:**
- Existing Inveraray to Crossraig Overhead Line
 - Existing Access Track
- Superficial Geology (1:50k scale):**
- Alluvium - Clay, Silt, Sand and Gravel
 - Raised Marine Deposits of Flandrian Age - Sand and Gravel
 - Raised Marine Deposits, Devensian - Sand and Gravel
 - Till, Devensian - Diamicton
 - Glaciofluvial Ice Contact Deposits - Gravel, Sand and Silt
 - Glaciofluvial Sheet Deposits - Gravel, Sand and Silt
 - Peat
 - Raised Marine Deposits - Clay and Sand
 - River Terrace Deposits (Undifferentiated) - Gravel, Sand, Silt and Clay

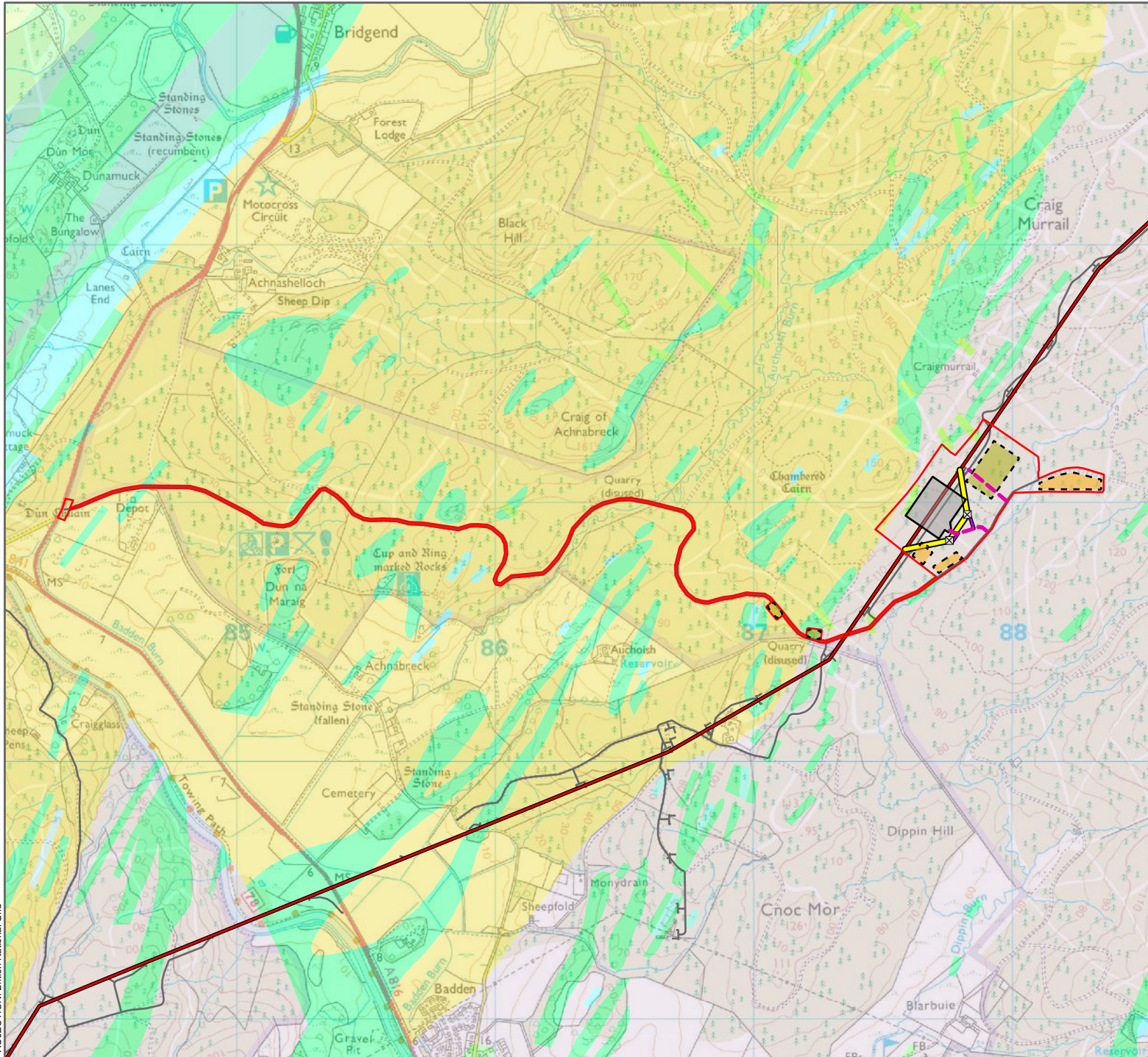


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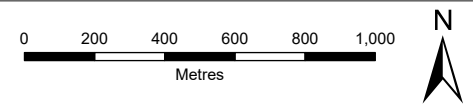
Figure 6.2
Superficial Geology



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- Proposed Development:**
- Proposed Permanent Access Track
 - Proposed Substation Temporary Works Area
 - Proposed Substation Layout
 - Temporary Peat Storage Area
 - Town & Country Planning Boundary
- Associated Development:**
- Proposed Tower Location
 - Temporary Access Track
 - Temporary OHL Diversion
- Existing Infrastructure:**
- Existing Inveraray to Crossaig Overhead Line
 - Existing Access Track
- Underlying Bedrock Geology (1:50k scale):**
- Mull Dyke-Swarm - Basalt and Microgabbro
 - Dalradian Supergroup - Metabasalt
 - Dalradian Supergroup - Metagabbro and Metamicrogabbro
 - Ardrishaig Phyllite Formation - Semipelite, Calcareous
 - Ardrishaig Phyllite Formation - Metalimestone
 - Crinan Grit Formation - Metalimestone
 - Crinan Grit Formation - Pelite
 - Crinan Grit Formation - Quartzite
 - Tayvallich Volcanic Formation - Metabasaltic-Rock
 - Tayvallich Volcanic Formation - Metalimestone
 - Tayvallich Volcanic Formation - Pelite, Graphitic
 - Tayvallich Volcanic Formation - Quartzite, Psammite and Sempelite



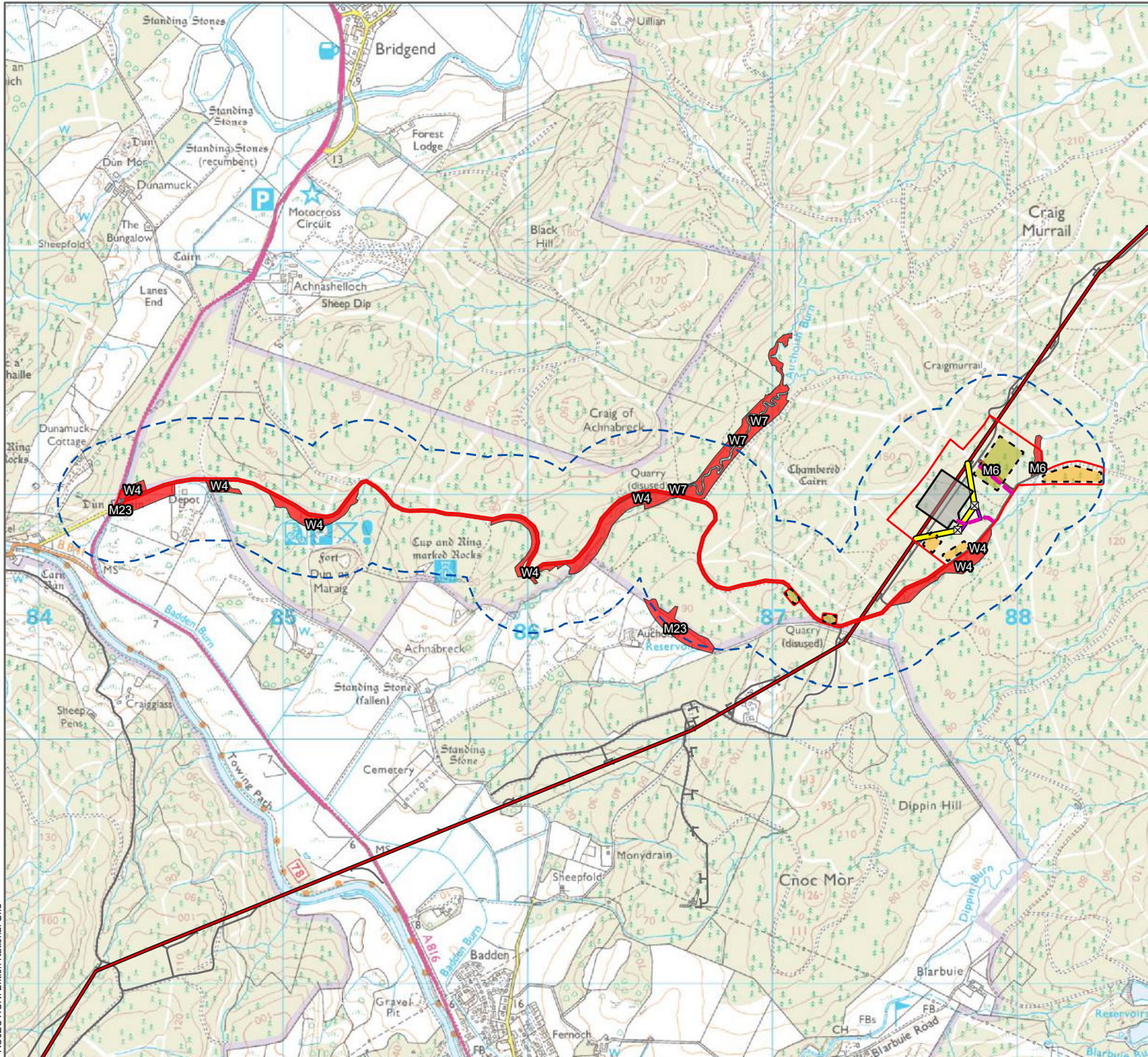
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**Figure 6.3
Bedrock Geology**



PROJECTION: British National Grid

Source: © Landmark Information Group Limited and/or its Data Suppliers (All rights reserved 2010); Contains Ordnance Survey data © Crown copyright and database right [2014]



Proposed Development:

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

Associated Development:

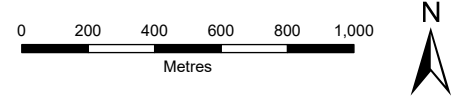
- Proposed Tower Location
- Temporary Access Track
- Temporary OHL Diversion

Existing Infrastructure:

- Existing Inveraray to Crossaig Overhead Line
- Existing Access Track

GWDTE Potential Groundwater dependency (based on SEPA guidance):

- High Dependency
- Hydrology Study Area - 250 m Buffer



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 PROJECT: 0607366
 DATE: 29/06/2022

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Figure 6.4
Potential Groundwater Dependent Terrestrial Ecosystems



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NVC class	SEPA Groundwater Dependency	Project Description	Project-specific Groundwater Dependency
W7	High	Located in the riparian zone of the Auchoish Burn.	Low – located in area fed by surface water
M25	Moderate	Located in open area of recently felled coniferous woodland. Area of waterlogged depressions. Access road present in area. Also likely located along water feature to the north east.	Low – located in areas fed by surface water, not associated with obvious, diffuse or point sources of groundwater emergence

As a result of the site-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.

6.3.8 Public Water Supplies

Consultation with Scottish Water confirmed that while there are assets within the surrounding area of the Proposed Development, no assets would be impacted by the Project.

In relation to utilities, they while there are Scottish Water assets present at the site entrance in the west, they would not be impacted by the Project.

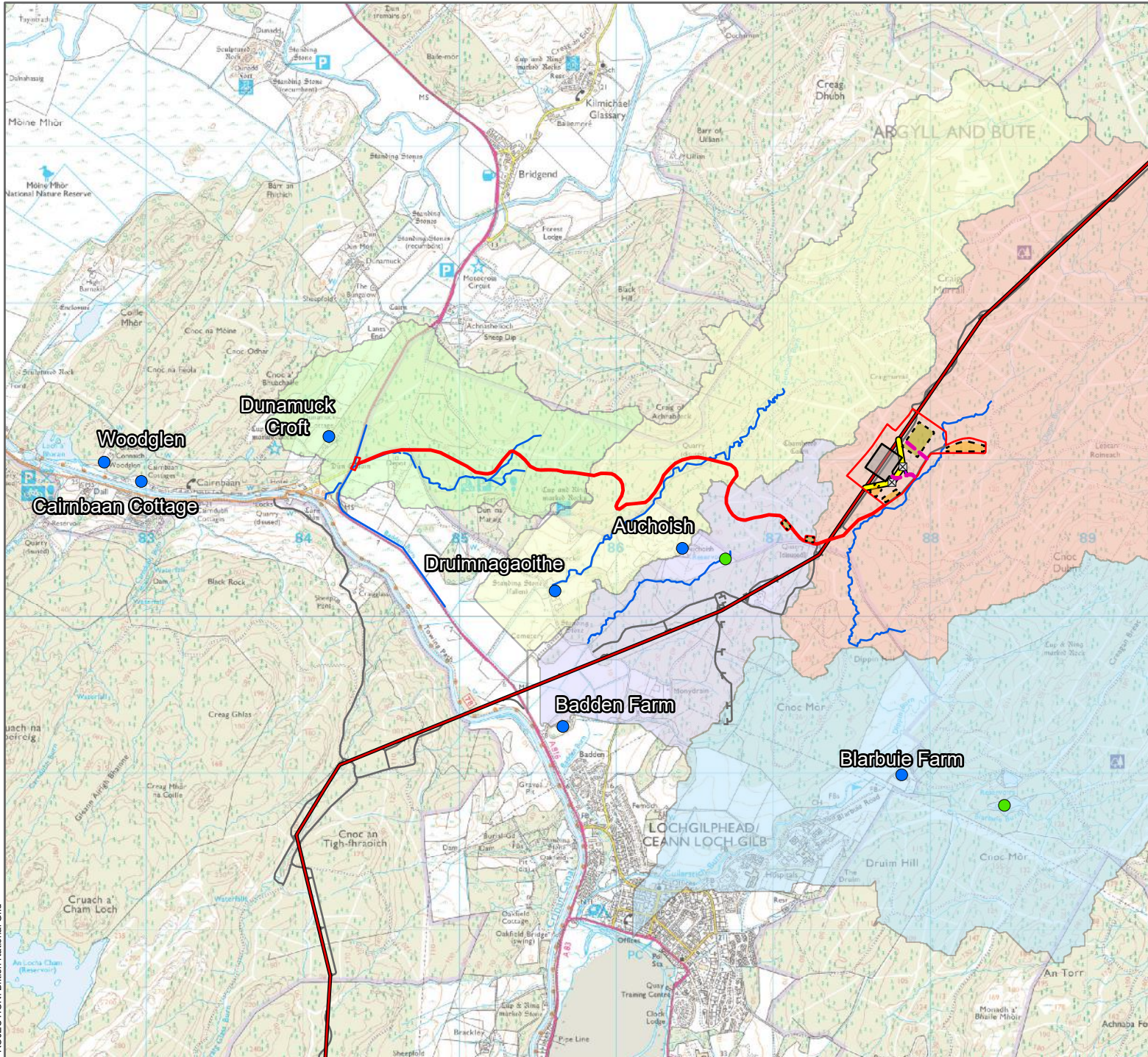
6.3.9 Private Water Supplies

Consultation with Argyll and Bute Council was undertaken on 12 November 2021, to determine if any private water supplies (PWS) were recorded within 2 km of the Project. A review of the private water supply risk assessment (PWSRA) carried out for the EIA for Inveraray to Crossaig overhead line (OHL) project published in July 2018 was also reviewed to inform the assessment⁹. Seven PWS were recorded within 2 km of the Project as shown in **Table 6.2** and **Figure 6.5**.

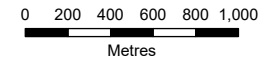
Table 6.2 Private Water Supplies within 2 km of the Project

Private Water Supply	Grid Reference	Approximate distance from Project	Hydrological Connection to the Project
Badden Farm	186334 688683	1.43 km south of Site	During PWS visit, resident confirmed that the property was previously served by a PWS which is no longer in use. PWS scoped out of further assessment.
Blarbuie (two properties)	187821 688989	1.57 km south of Site	Letter response received from residents – supply fed from Blarbuie reservoir. Private water supply scoped into assessment.
Cairnbaan Cottages	182969 690862	1.34 km west of Site	PWS hydrologically disconnected by intervening topography and is situated in a separate hydrological catchment from the access tracks. PWS scoped out of further assessment
Druimnagaoithe	185609 690163	650 m south of the Site	Residents confirmed property is on mains supply during site visit.

⁹ Inveraray to Crossaig 275 kV Overhead Line Reinforcement (2018) [online] Available at: <https://www.energyconsents.scot/> (Accessed 16/11/2021)



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 - Temporary Peat Storage Area
- Associated Development:**
- Proposed Tower Location
 - Temporary Access Track
 - Temporary OHL Diversion
- Existing Infrastructure:**
- Existing Inveraray to Crossaig Overhead Line
 - Existing Access Track
- Hydrological Catchments:**
- Auchoish Burn
 - Cuilarstich Burn
 - Dippin Burn
 - Unnamed Tributary of Badden Burn (One)
 - Unnamed Tributary of Badden Burn (Two)
 - Onsite Watercourses
- Private Water Supply:**
- Private Water Supply - Property
 - Private Water Supply - Source



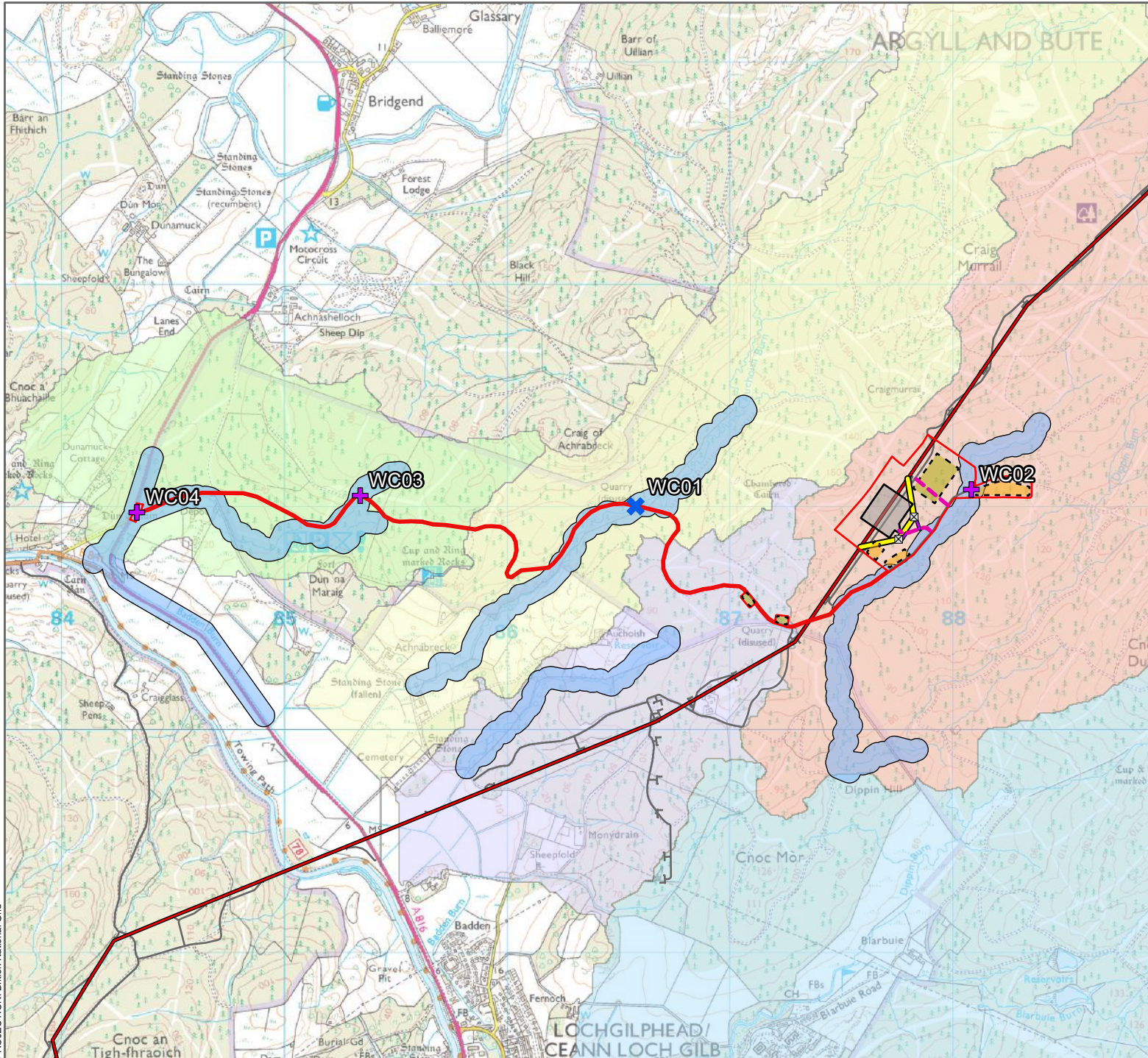
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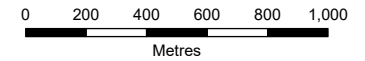
Figure 6.5
Private Water Supplies



PROJECTION: British National Grid



- Proposed Development:**
- Proposed Permanent Access Track
 - Proposed Substation Temporary Works Area
 - Proposed Substation Layout
 - Temporary Peat Storage Area
 - Town & Country Planning Boundary
- Associated Development:**
- Proposed Tower Location
 - Temporary Access Track
 - Temporary OHL Diversion
- Existing Infrastructure:**
- Existing Inveraray to Crossaig Overhead Line
 - Existing Access Track
 - An Suidhe 50 m Watercourse Buffer
- Hydrological Catchments:**
- Auchoish Burn
 - Cuilarstich Burn
 - Dippin Burn
 - Unnamed Tributary of Badden Burn (One)
 - Unnamed Tributary of Badden Burn (Two)
- Watercourse Crossing:**
- + Existing Watercourse Crossing
 - X Upgraded Watercourse Crossing



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 SIZE: A4
 PROJECT: 0607366
 DATE: 29/06/2022

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Figure 6.6
Watercourse Crossings



Private Water Supply	Grid Reference	Approximate distance from Project	Hydrological Connection to the Project
			PWS scoped out of further assessment.
Dunamuck Croft	184166 691149	215 m north west of Site	PWS is located upslope of Project access tracks and is therefore hydrologically disconnected. PWS scoped out of further assessment.
Woodglen	182732 690985	1.58 km west of the Site	PWS hydrologically disconnected by intervening topography and is situated in a separate hydrological catchment from the access tracks. PWS scoped out of further assessment
Auchoish	186732 690381	381 m south of Site	Letter response received by Arcus from residents previously in relation to nearby project. Supply is located downslope of the existing access tracks. Private water supply scoped into assessment.

A hydrological site walkover was undertaken on 15th March 2022. Following consultation with resident and the site walkover, it was confirmed that Druimnagaoithe is supplied by mains water rather than PWS. Consultation confirmed a PWS present at Auchoish and Blarbuie Farm which will be scoped into further assessment.

The accompanying PWSRA for the EIA is supplied in **Annex M**.

6.3.10 Designated Sites

Review of NatureScot GIS datasets¹⁰ 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 10 km of the Project

Designation	Approximate distance from the Project	Qualifying Interest	Hydrologically Connected to the Project
Moine Mhor SAC ¹¹	1.5 km west	Active raised bogs, Atlantic salt meadows, degraded raised bogs, Marsh Fritillary Butterfly, Otter, intertidal mudflats and sandflats and western acidic oak woodland.	Hydrologically disconnected by the Auchoish Burn
Moine Mhor SSSI ¹²	1.5 km west	Active raised bogs, Atlantic salt meadows, degraded raised bogs, Marsh Fritillary Butterfly, Otter, intertidal mudflats and sandflats and western acidic oak woodland.	Hydrologically disconnected by the Auchoish Burn

¹⁰ NatureScot (2021) SiteLink Map [online] Available at: <https://sitelink.nature.scot/map> (Accessed 17/11/2021)

¹¹ NatureScot (2021) Moine Mhor SAC [online] Available at: <https://sitelink.nature.scot/site/8319> (Accessed 17/11/2021)

¹² NatureScot (2021) Moine Mhor SSSI [online] Available at: <https://sitelink.nature.scot/site/1174> (Accessed 17/11/2021)

Designation	Approximate distance from the Project	Qualifying Interest	Hydrologically Connected to the Project
Upper Loch Fyne and Loch Goil MPA ¹³	4.0 km southeast	Shellfish waters protected area	Cuilarstich Burn discharges directly into Loch Fyne, however, the MPA is disconnected as due to its location it is unlikely to be impacted due to dispersion and dilution
Taynish and Knapdale Woods SAC ¹⁴	3.7 km west	Marsh Fritillary Butterfly, Otter, western acidic oak woodland and Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels.	Hydrologically disconnected by the Auchoish Burn
Knapdale Woods SSSI ¹⁵	3.7 km west	Marsh Fritillary Butterfly, Otter, western acidic oak woodland and Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels.	Hydrologically disconnected by the Auchoish Burn
Knapdale Lochs SSSI ¹⁶	4.4 km south west	Black-throated diver	Hydrologically disconnected by Badden Burn and Crinan Canal
Loch Sween MPA ¹⁷	6.6 km west	Native oysters, maerl beds, burrowed mud and sublittoral mud and mixed sediment communities	Hydrologically disconnected by Badden Burn and Crinan Canal
Loch Sunart to the Sound of Jura MPA ¹⁸	8.0 km west	Common Skate	Hydrologically disconnected by the Auchoish Burn
Inverneil Burn SSSI ¹⁹	9.0 km south	Upland oak woodland and non-vascular plants	Hydrologically disconnected by Badden Burn and Crinan Canal

6.3.11 Sensitivity of Receptors

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

Table 6.4 Sensitivity of Receptors

Receptor	Sensitivity	Sensitivity Description
Surface Hydrology (watercourses)	High	A large, medium or small waterbody with a SEPA water quality classification of 'Good'.

¹³ NatureScot (2022) Upper Loch Fyne and Loch Goil MPA [online] Available at: <https://sitelink.nature.scot/site/10424> (Accessed 10/06/2022)

¹⁴ NatureScot (2021) Taynish and Knapdale Woods SAC [online] Available at: <https://sitelink.nature.scot/site/8391> (Accessed 17/11/2021)

¹⁵ NatureScot (2021) Knapdale Woods SSSI [online] Available at: <https://sitelink.nature.scot/site/8158> (Accessed 17/11/2021)

¹⁶ NatureScot (2022) Knapdale Lochs SSSI [online] Available at: <https://sitelink.nature.scot/site/8105> (Accessed 10/06/2022)

¹⁷ NatureScot (2022) Loch Sween MPA [online] Available at: <https://sitelink.nature.scot/site/10419> (Accessed 10/06/2022)

¹⁸ NatureScot (2021) Loch Sunart to the Sound of Jura MPA [online] Available at: <https://sitelink.nature.scot/site/10418> (Accessed 17/11/2021)

¹⁹ NatureScot (2021) Inverneil Burn SSSI [online] Available at: <https://sitelink.nature.scot/site/816> (Accessed 17/11/2021)

Receptor	Sensitivity	Sensitivity Description
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 area of carbon-rich and peaty soils.
Soils	Medium	No areas of Class 1 or 2 peat
Private Water Supplies	High	The hydrological receptor supports abstractions for private water supplies within 2 km of the Proposed Development.

6.4 Embedded Mitigation

The Proposed Development 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 Project:

- 50 m watercourse buffers for construction works with the exception of watercourse crossings along access tracks; and
- The Project 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 SEN General Environmental Management Plans (GEMPs) will inform a CEMP to be implemented by the Development'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.

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;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) – A Practical Guide (Version 8.4), SEPA, October 2019; and
- Regulatory Method (WAT-RM-04) Indirect Sewage Discharges to Groundwater (Version 8.0), SEPA, April 2022.

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 generators 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 GPP8²⁰.

6.5 Appraisal - Potential Construction Effects – Proposed Development

6.5.1 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 A816;
- 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.

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 8.36 ha for the Proposed Development and 2.99 ha for the Associated Development. The effects from felling are considered within impacts to surface water receptors relating to water quality and increased runoff.

Runoff from Hardstanding

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

- 0.852 % Dippin Burn; and
- 0.175 % Badden Burn.

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.

New Licensed Activities

²⁰ GPP 8 Safe storage and disposal of used oils (2017) [online] Available at: <https://www.netregs.org.uk/media/1435/gpp-8-v3-swni.pdf/> (Accessed 10/01/2022)

As part of the Proposed Development, new licensed activities will include abstraction of groundwater from a borehole and a septic tank with assumed soakaway discharge to groundwater. The detailed design of the septic tank will consider discharge is in line with SEPA guidance.

Effects

Mitigation measures for the Proposed Development are outlined within the WCEMP. The requirement for upgrades includes one new watercourse crossing (based on **Annex Q**) (on 1: 50,000 scale mapping) with both existing and upgraded crossings shown in **Figure 6.5**.

Table 6.5 Summary of Effects (Construction Phase Proposed Development)

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. The site will require a Construction Site Licence process, to be considered at pre-construction phase which will provide detail on CAR licence and SuDs requirements.	High	Negligible	Minor
Groundwater and Near surface water	Potential for temporary impact on groundwater quality and changes in groundwater interflow patterns during construction, including septic tank discharge	GEMP as implemented by WCEMP SEPA requirements for septic tanks outlined in WCEMP	High	Negligible	Minor
Soils	Direct temporary impacts during construction	GEMP as implemented by WCEMP	Medium	Low	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 and implementation of	High	Negligible	Minor

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
		private water supply protection plan.			

6.6 Appraisal - Potential Construction Effects – Associated Development

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:

- Construction of two temporary new towers, overhead lines and associated infrastructure for the Associated Development;
- Construction of two new temporary access tracks;
- One temporary OHL diversion; and
- Tree felling required to facilitate the new access into the Proposed Development.

Mitigation measures for the Proposed Development are outlined within the WCEMP.

Table 6.6 Summary of Effects (Construction Phase Associated Development)

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. Potential for changes to groundwater flow and quality due to felling.	GEMP as implemented by WCEMP	High	Negligible	Minor

Receptor	Development Interaction	Mitigation Measures	Receptor sensitivity	Magnitude of effect following mitigation	Significance of effect
Soils	Direct temporary impacts during construction	GEMP as implemented by WCEMP	Medium	Low	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 and implementation of private water supply protection plan.	High	Negligible	Minor

6.7 Appraisal - Potential Operational Effects - Proposed Development

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.

As a result of felling during the construction phase, there may be increased run-off rates. On-site and off-site compensatory planting for woodland removed for infrastructure and replanting onsite for areas removed for management felling 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.

Table 6.7 Summary of Effects (Operational Phase Proposed Development)

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 operation.	Implement best practice mitigation measures and operational procedures.	High	Negligible	Minor
Private Water Supply	Potential for impact on flow and water quality during operation	Implement best practice mitigation measures and operational procedures.	High	Negligible	Minor

6.8 Appraisal - Potential Operational Effects – Associated Development

Potential effects associated with the operation of the Associated 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.

As outlined in the Woodland Report (**Annex J**), 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 Associated Development)

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 operation.	Implement best practice mitigation measures and operational procedures.	High	Negligible	Minor
Private Water Supply	Potential for impact on flow and water quality during operation	Implement best practice mitigation measures and operational procedures.	High	Negligible	Minor

6.9 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, as well as the effects of the Project in combination with other developments likely to affect the hydrological environment.

6.9.1 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.

6.9.2 Cumulative Effect Assessment

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

- Retainment of built access road, SSE LT40, Craig Murrail (consented);
- Wind farm at 'Land at Sidh Mor South of Lochan Anama and North West of A-Chruach Wind Farm, Kilmichael Forest' (in planning);
- Use of borrow pit at 'Land South East of Bridgend Ach nabreck Forest Lochgilphead' (consented); and

- Removal of Condition 14, operation of wood fired combined heat and power plant at 'Land North East of E McGinty Ltd Achnabreck Cairnbaan (consented).

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.

There is potential for cumulative impacts on the PWS at Auchoish, following feedback from the resident is assumed to be relating to LT40 works but unconfirmed at the time of reporting. Based on the mitigation measures detailed in the WCEMP (including surface water monitoring and mitigation measures onsite) being implemented it is considered that there is no potential for cumulative effects on receptors downstream.

6.9.3 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 groundwater	Negligible	Minor	None	Minor
Near-surface water	Chemical pollution	Negligible	Minor	None	Minor

Receptor	Potential Effect	Magnitude	Significance of Effect	Additional Mitigation Proposed	Residual Significance
	Erosion and Sedimentation	Negligible	Minor	None	Minor
	Acidification of watercourses	Negligible	Minor	None	Minor
Soils	Compaction or loss of soil	Negligible	Minor	None	Minor
Private Water Supplies	Chemical pollution	Low	Moderate	Implementation of surface water monitoring programme and PWS protection plan	Minor
	Erosion and Sedimentation	Low	Moderate		Minor
	Changes in Groundwater Interflow Patterns	Low	Moderate		Minor

6.10 Summary of Effects

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 GEMPs, the residual effects arising from the Project will be minor or negligible for all receptors. Further consultation is required in relation to private water supplies with relevant consultees and residents who benefit from these supplies. Mitigation measures outlined in the WCEMP, which includes a water monitoring schedule should be agreed with consultees.

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